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Krista E. Larson

University of Richmond

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Running head: MEMORY TRAINING, PERFORMANCE, SELF-EFFICACY, ATTRIBUTIONS, AGE DIFFERENCES

Abstract

An investigation of age differences in memory performance for list and text recall was conducted in the context of a training manipulation. It was hypothesized that there would be age differences in performance, measures of self-efficacy, and attributional style, but that training in memory strategies would have an effect on those differences. The training manipulation appeared to be more effective for the list portion of the experiment, and improvements in performance and changes in attributions were induced. The text portion of the experiment revealed the predicted age differences, but training failed to elicit any of the other predicted effects. The findings give support to the effectiveness of brief training manipulations in evoking changes in older adults' performance and beliefs about performance.

Effect of Memory Training on Memory Performance, Self-Efficacy Ratings and Patterns of Attributions in Older Adults

Memory failure in older adults is a subject which has received considerable attention in recent years. It has been the focus of numerous surveys which indicate that memory deterioration is a very real concern for the majority of the elderly population. In a national probability sample of 14,783 people aged 55 and older, 74% reported they had some difficulty remembering things during the last year (Cutler & Grams, 1988). A study by Lovelace and Marsh (1985) revealed that 62% of older adults indicated that they have experienced an increase in forgetting. This result becomes especially troubling when combined with the information that most older adults believe that they have no control over these changes because memory deterioration is part of the inevitable aging process (Lachman, 1991). The perceived certainty of decline is astonishing. An unpublished study by Langer and Mulvey reveals that whereas 65% of younger people felt certain that they would not become senile, only 10% of the older adults made that claim.

These fears are not without foundation. There is little debate over the fact that memory functioning changes with age. The current debate centers around the nature of those changes. Some researchers argue that older adults' memory problems are the result of a processing deficiency where older adults do not encode information as well as younger adults.

This approach is based on the levels-of-processing theory of Craik and Lockhart (1972). Under this theory, there are a variety of ways in which incoming information can be encoded. These ways may be organized on a continuum from shallow (e.g. the appearance of a presented word) to deep (e.g. the meaning of the presented word. Deeper processing produces a better memory trace and facilitates efficient retrieval.

This framework has been influential in creating the processing deficiency hypothesis which suggests that older adults can no longer process as deeply as a result of age-related changes in memory. This hypothesis has generally been tested using an incidental-learning paradigm which compares the performances of subjects who are divided into groups based on the type of orienting task. Following the processing deficiency hypothesis, it is predicted that age differences should be greatest for subjects instructed to use deeper processing (e.g. visual imagery). Consistent with this hypothesis, several studies have found that subjects show greater age differences on semantic processing tasks (Erber, Herman, & Botwinick, 1980; Eysenck, 1974; Simon, 1979). However, other studies have not produced similar results. For example, in a study by Mitchell and Perlmutter (1986) the researchers found that different age groups benefited similarly from the level of processing manipulation. The authors reconcile their apparently divergent findings by pointing out that in studies which revealed significant age X level of processing interactions, older subjects did benefit from deeper processing orienting tasks, just not as much as the younger subjects did.

The findings of the Mitchell and Perlmutter (1986) study lend more support to the alternative explanation for age differences in memory performance - the production deficiency hypothesis. This theory states that older adults are less likely than younger adults to spontaneously use efficient encoding and retrieval strategies, even though they may be aware of those strategies. This hypothesis receives support from studies which show that older adults generate significantly fewer strategies than younger adults do (Hartley & Anderson, 1986; Hulicka & Grossman, 1967; Mitchell & Perlmutter, 1986; Perlmutter, 1978).

The ability of this hypothesis to explain and account for the age differences are confounded by evidence showing that even when strategy usage is equated across age levels, there are still discrepancies between the performances of young and older adults.

One salient question which emerges from the production deficiency literature is "If older adults are aware of memory deterioration, as suggested by the literature, why in the face of such deterioration, do they fail to utilize memory strategies?"

One possible explanation for this discrepancy has come from the metamemory literature. Metamemory, a concept taken from child development theory, broadly refers to one's knowledge about memory. Studies designed to evaluate age differences in metamemorial abilities have yielded varying results. Some studies (Lachman, Lachman, & Thronebery,1979; Loewen, Shaw, & Craik, 1990; Perlmutter, 1978) have reported no age differences between young and older adults whereas other studies (Bruce, Coyne, & Botwinick, 1982; Murphy, Schmitt, Caruso, & Sanders, 1987; Rabbitt, & Abson, 1991) have concluded that such differences exist. The apparent inconsistency in this body of literature may be reconciled by refining the definition of metamemory itself. Rather than viewing metamemory as a single element of knowledge in which older adults may or may not be deficient, it may be more accurate to define metamemory differently, for example as "a complex constellation of facts about capacity, tasks, strategies, and their interactions" (Murphy et al.,1987).

This reconceptualization has the power to redirect and refine research efforts into age-related changes in metamemory. Using the new definition, it is possible that older adults may exhibit deterioration in some aspects of metamemory and not in others. Consequently, research questions have become geared toward more specific analyses.

There are several areas of metamemory which require research to determine the existence of age differences. As mentioned earlier, one area which has received considerable attention has been strategy use. A number of studies have established that older adults do not spontaneously engage in optimal strategies. One pcssible metamemorial explanation for this is that older adults may not effectively evaluate the usefulness of such strategies. A study by Hartley and Anderson (1986) provided older adults with a series of possible strategies used to solve search problems and asked them to rate the effectiveness of each strategy. The results of the study showed that older adults gave significantly lower ratings to optimal strategies when they were presented and that older adults were less likely to use those strategies in solving actual problems.

Another possible explanation for the failure of older adults to use mnemonic strategies to combat memory changes is related to self efficacy theory. Self efficacy expectations are beliefs about one's ability to carry out a given task (Lachman, Steinberg, & Trotter, 1987). These expectations are generally based on past performance and, perhaps more importantly, on one's causal attributions for that performance. The attribution that one makes affects the expectation that one has, and that in turn affects behavior (Forsterling, 1985). In the case of an older adult approaching a memory task, they may have low expectations as a result of the belief that their memory is declining, and therefore not put forth the effort to utilize efficient memory strategies.

Low self-efficacy can affect performance in a more direct manner as well. When confronted with a difficult task, people with high self-efficacy expectations generally approach it as a challenge to be met, are able to maintain efficient analytical thinking during the task, and increase effort in the face of setbacks. Conversely, people with low self-efficacy expectations shy away from difficult tasks, and when confronted with one, dwell on their personal deficiencies and the potential adverse consequences of failure. This anxiety can interfere with organized analytic thought and can cause the person to exert less cognitive effort (Bandura, 1989).

Although self-efficacy expectations are usually based on past performance with a given task, in the absence of such experience, performance predictors will be based on general self-efficacy beliefs for the type of task (Hertzog, Dixon, & Hultsch, 1990). For example, an older person faced with a novel memory skills task might base their expectations on their general beliefs about their memory. This can cause problems because older people's beliefs about memory are negatively impacted by the existing stereotypes about the elderly in our society. Studies have shown that the general public perceives the lives of elderly people to be substantially negative (Schultz & Fritz, 1988). These stereotypes create a picture of a person who is feeble both mentally and physically. Despite the fact that less than 5% of Americans over the age of 65 require custodial care, and that only 4% of persons in that age group meet the medical criteria for severe senility, the perceptions persist (Rodin & Langer, 1980), and no matter how unfounded, these perceptions reflect a cultural expectation.

Deaux (1976) theorized that behavior which is consistent with cultural expectations for a group tend to be attributed to internal stable causes whereas behavior which is not expected for a group will be attributed to external or unstable causes. This fundamental difference in the appraisal of behavior accounts for the abundant literature an the differing perceptions of memory failures in the old and the young.

Erber, Szuchman, and Rothberg (1990b) conducted a study which examined the age differences in appraisal and attribution for everyday memory failures. They presented their subjects with a vignette describing a woman who had forgotten something common, such as a name or a phone number. The manipulation concerned the age of the woman in the vignette. Half of the subjects were told that the woman in the story was of an age between 23 and 32, and the other half were told that the woman was of an age between 63 and 74. The subjects were asked to evaluate the situation and provide a causal attribution. The results revealed the use of a definite double standard which was biased against older adults. Subjects appraising the younger woman's behavior responded that the memory failure was a result of a lack of attention or effort or that "she probably had other things on her mind". When subjects evaluated the older woman's behavior, they characterized the situation as being reflective of mental difficulty and meriting professional evaluation and intervention.

Erber et al. replicated their study in 1990 using both men and women and found that the double standard was not restricted to perceptions of women. They concluded that the deciding factor was not gender, but age. These results are consistent with Deaux' theory. Memory failure is not expected for younger adults and therefore was attributed to the unstable cause of effort. However, memory failure is consistent with our expectations of older people and therefore the failure was attributed to mental difficulty, an internal, stable cause. Another interesting finding was that these biases were found in the responses of both the younger and the older subjects, which reflects the far-reaching effects of these expectations. These studies show that stereotypes do influence how we judge others, but also that they influence how we perceive ourselves.

There is empirical evidence to support the idea that older adults have low self-efficacy expectations for intellectual tasks and that these expectations influence their performance. A study by Prohaska, Parham, and Teitelman (1984) examined the self-efficacy and causal attributions of failure in younger and older adults. The subjects were asked to fill out a questionnaire asking about their perceptions of their memory abilities. It included questions which assessed their general beliefs about memory as well as questions about the experimental task. The results showed that older adults were significantly more likely to expect to do poorly than were young adults, that older adults felt that their intellectual abilities have shown deterioration recently whereas younger adults felt that their intellectual abilities had improved, and that more older adults felt that the amount of effort they expended would have little effect on their performance. These findings support the concept that the elderly have a negative view of their mental capacities and that that view is attributed to internal stable causes. The authors concluded that these attributions, when paired with expectations of failure and a perception of deteriorating intellectual capacity in the elderly exert a negative influence which is apparently difficult to overcome.

The effects of such attributions on subsequent self-efficacy expectations and performance have also been examined empirically. A study conducted by Lachman, Steinberg, and Trotter (1987) demonstrated that internal control beliefs were associated with higher assessments of performance before experience with the task. They also concluded that after experience with a task, it is the explanations that are generated for their performance that affect subsequent performance. They also found that "the detrimental effects of maladaptive attributions were more pronounced than the facilitative effects of adaptive ones" (p.270).

Memory strategy training has been used in addressing the performance deficits of the elderly. The approach has generally been designed to assess increases in performance regardless of the cause of the original deficit. The results of these studies have been reasonably consistent in that most reveal that instruction in mnemonic techniques leads to increased performance (Dittman-Kohli, Lachman, Kliegl, & Baltes, 1991; Labouvie-Vief, & Gonda, 1976; Schaie & Willis, 1986).

Additional evidence of the effectiveness of memory strategy training as an experimental treatment comes from a meta-analysis. The analysis examined 33 studies of mnemonic training with the elderly by comparing treatment gains of those given training with the gains of no treatment control groups and placebo groups. The results showed that although simply retesting the subjects led to an increase in performance, the effect size for groups receiving training was consistently larger.

Although it appears intuitively obvious that if you instruct a person in the skills necessary to complete a task, they should perform at a higher level than people who receive no such instruction, there are more subtle aspects of the training-performance relationship that merit investigation. One such subtlety once again draws on the self-efficacy literature, hypothesizing that through memory strategy training, self-efficacy perceptions can be improved (Dittman-Kohli, Lachman, Kliegl, & Baltes, 1991; Hill, Sheikh, & Yesavage, 1988; Rebok & Balcerak, 1989). This is an important facet of the effects of memory training because judgments of self-efficacy influence choice of task, motivation, affect, and persistence (Bandura, 1989). Consequently, if training is not accompanied by a change in self-conception which fosters effective use of new skills, training effects are unlikely to show maintenance over time or generalizability across tasks (Dittman-Kohli et al., 1991). In addition, if the person has negative beliefs about their memory, unless the training improves these beliefs, the people are unlikely to even use the technique being taught to them. "It would seem pointless to use a method that one believed did not improve one's capabilities" (Bandura, 1989).

As has been the case with many areas of older adult cognition research, investigations of the training-cognitive self-efficacy relationship have yielded mixed results. Rebok and Balcerak (1989) found that training in the method of loci enhanced serial recall, but failed to lead to increases in either self-efficacy strength or level. They concluded that perhaps older adults needed more extensive practice and training than the one-hour session provided them.

Hill et al. (1988) utilized a more comprehensive two-week program, consisting of eight hours of training in a name-face recall technique, but also did not produce a significant increase in task-specific confidence. One finding of interest in this study was that memory training did produce increases in the relationship between perceived confidence and actual performance, that is, the subjects became more accurate in their estimations of their abilities. This is a key finding because it points to another possibility of how memory strategy training could be related to performance - accuracy. Bandura (1986) theorized that accurate appraisals of one's capabilities are important for successful cognitive functioning in that they allow one to allocate an appropriate amount of effort to the task. These appraisals are also tied to self-efficacy because "the higher the perceived self-efficacy, the higher the goals that people set for themselves and the firmer their commitment to those goals" (Bandura, 1989, p.730). Thus, people who are not hindered by negative beliefs about their abilities are enabled in their attempts to complete tasks.

Awareness of one's capabilities an aspect of metamemory which is also closely linked to memory strategy use. Analyzing a task in light of an accurate appraisal of one's memory capabilities is an important part of selecting an appropriate strategy. Failing to accurately evaluate either the task or one's abilities may prevent the implementation of a strategy. This idea is consistent with the production deficiency hypothesis, where older adults are less likely to generate and utilize memory strategies than are younger adults.

In cases where a strategy is adopted, performance can be less than optimal when the strategy is not implemented optimally. A self-efficacy related explanation for this has already been discussed but there is another metamemorial explanation. Strategies may not be used to their fullest potential because of a failure to adequately test the progress or the effectiveness of those strategies. This process of keeping tabs on the contents of one's memory has been called "memory monitoring" and a failure in this aspect of metamemory would preclude any necessary modifications in strategies and inhibit optimal performance (Murphy, variables.

In an extension of this concept, Murphy et al. (1987) conducted a study which used three conditions: the control and the forced time condition were essentially the same as in the previous work, but instead of the third group receiving training in a specific memory strategy, the subjects were given specific directions instructing them to monitor their memories through "self-testing". In this study, both the subjects who were in the forced time condition and the "self-testing" conditions demonstrated significantly higher levels of performance than those subjects in the control group, however, only the self-testing instructions improved recall in the most difficult memory tasks. Furthermore, subjects in the self-testing condition recalled better on tests of short-term maintenance and generalization.

This line of research broadens the conceptualization of the relationship between metamemory and memory in that it shows that metamemory can have an influence beyond simply determining strategy use. These results can not be taken to mean that age differences in performance can be completely explained by deficits in some aspects in metamemory, because in conditions where either strategy use or memory monitoring was equated across age levels, the older adults were still less accurate. However, these data taken with the self-efficacy and the strategy training literature provide strong evidence that the metamemorial influences on memory can not be ignored.

The present study attempted to examine age differences in two types of memory performance tasks: list recall and text recall. It also investigated the possible effects that memory strategy training could have on those age differences

Hypothesis 1

It was hypothesized that on both tasks, the younger adults would perform at a higher level than the older adults would, but that the older adults in the training condition would improve their performance relative to the older adults in the no training condition.

Hypothesis 2

This hypothesis was made in regard to the effects of age and memory training on measures of self-efficacy. It was hypothesized that younger adults would report higher levels of self-efficacy, as well as higher self-efficacy strength. It was expected that giving older adults a specific skill by which they could improve their performance would lead to higher measures of self-efficacy. Therefore, it was further expected that training in memory strategies would be associated with higher self-efficacy for older adults.

Hypothesis 3

It was hypothesized that memory strategy training would be associated with significant differences in patterns of attributions among the older adults. Because the intent of the training was to induce the trained subjects to put forth more effort, and to use the strategies that they were instructed to use, the trained subjects should attribute their performance more to effort and strategies than the non-trained subjects.

Hypothesis 4

This hypothesis stems from the work done by Murphy et al. (1981; 1987). It was hypothesized that training the subjects in memory strategies would cause them to spend more time engaged in study and that this increase in study time would be associated with higher levels of performance.

Hypothesis 5

The final hypothesis was an exploratory hypothesis which examined the possible relationships between performance, self-efficacy, effort, and the subjects' beliefs about memory. It is hypothesized that there will be age differences in the patterns of beliefs, but no specific patterns are predicted.

Method

Subjects

The older subjects for this experiment were 13 women who were recruited through newspaper advertisements asking for women over the age of 65 to participate in a study of memory improvement techniques. The younger subjects were 19 undergraduate women at the University of Richmond. In return for their participation, all participants received $5, and the older subjects received a booklet consisting of information about memory functioning in older adulthood and mnemonic techniques which was adapted from West (1985).

The women were screened for dementia using Kahn's Mental Screening Questionnaire (MSQ; Kahn, Goldfarb, Pollack, & Peck, 1960). The MSQ consists of 10 items which assess orientation to person, time, and place, and are scored as either 0 (correct) or 1 (incorrect). Subjects receiving a score of 3 or above were excluded from the experiment. There was one older subject in the analyses who got one of the MSQ questions wrong.

After the subjects had been tested, younger subjects were randomly selected to form groups of equal size for the analysis.

Background data on education level, occupation, and current health status were collected. The older subjects ranged in age from 65 to 88 with a mean age of 74. All 13 of the older subjects were white and their average number of years of education was 15.46. The younger subjects ranged in age from 19 to 21 with a mean age of 19.77. 12 of the younger subjects were white and 1 was black, and their average number of years of education was 14.92.

Materials

Geriatric Depression Scale

The women completed a 30-item depression scale (Yesavage et al. 1983). Items are scored either 0 or 1 and are summed to yield a total score where higher scores are more indicative of depression. These data were collected to examine the possible influence of depression on self-efficacy and performance.

Self-Efficacy Questionnaire (List)

All subjects completed a self-efficacy questionnaire (Berry, 1986) which consists of a hierarchy of self efficacy tasks ordered from easy (1 to 3 words) to difficult (25 words). The subjects indicated whether or not they could perform the task described (YES-NO) and then provided a confidence rating ranging from 0% (completely uncertain) to 100% (completely certain).

The subjects were asked to consider 5 sample words, and then rate their confidence in their ability to remember a longer list of similar words. Self-efficacy scores were calculated in terms of self-efficacy level (i.e. the number of YES responses provided by the subject) and self-efficacy strength (i.e. the average of the confidence levels provided). The final form of this questionnaire can be found in Appendix A.

Word Stimuli

The lists of words used in the memory task were taken from research done by Berry (1986) and comprised one sample list of 5 words and one performance list of 25 words. The words were typed on white bond paper, covered with clear Contact paper, and cut into 5 X 10.8 cm. cards. The words were presented to all subjects in the same order. A copy of the words can ne found in Appendix F.

Attribution Questionnaire

Assessment of and perceived causes for performance were obtained using a questionnaire designed to evaluate attributions for both list and text on Weiner's (1971) four dimensions (ability, effort, task difficulty, luck) as well as 2 questions designed to assess perceived controllability and strategy use. All questions required responses on 7-point Likert scales. A copy of the final form of this questionnaire can be found in Appendix B.

Text Self-Efficacy Questionnaire

A text SEQ was developed for this study following the task-specific format used in the List SEQ. This questionnaire also consists of a hierarchy of self-efficacy tasks ordered from easy (1 to 10 of the pieces of information or facts) to difficult (150 of the pieces of information or facts).

The subjects indicated whether or not they could perform the task described (YES-NO) and then provided a confidence rating ranging from 0% (completely uncertain) to 100% (completely certain).

The subjects were asked to consider the sample story, and then rate their confidence in their ability to remember a similar, but longer, story. Self-efficacy scores were calculated in terms of self-efficacy level (i.e. the number of YES responses provided by the subject) and self-efficacy strength (i.e. the average of the confidence levels provided). A copy of this questionnaire can be found in Appendix A

Text Stimuli

Two texts were selected from Hultsch, Dixon (????). The texts are controlled for numbers of words, sentences, and propositions (basic units of meaning) and are divided into three tiers. The first tier of the text "A Change in Life" was used as a sample text and all three tiers of the text "A Vacation" which consisted of 148 propositions were used as the performance text for all subjects. A copy of each of the texts can be found in Appendix F.

The propositions were scored as present if the gist of its meaning was expressed correctly. Interrater reliability was determined by having each coder function as the standard coder for 4 texts and reliability was checked by each of the other 4 coders. A total of 20 texts were included in the analysis, but of the 2960 possible propositions, only 2944 were used because of data entry problems. Cohen's kappa was calculated on the remaining data, and yielded a coefficient of .74. This was judged to be an acceptable level of interrater reliability.

Posttest Questionnaire

This questionnaire, which was intended to evaluate beliefs about memory, was adapted from a memory complaint questionnaire used by Berry (1986) with additional items constructed to assess beliefs about strategy usage. A copy of this questionnaire can be found in Appendix C.

Strategies Questionnaire

This questionnaire was developed to evaluate the extent to which the subjects used memory strategies, and to provide a format in which the subjects could indicate which strategies they used. The format included a Likert scale on which the subjects were asked to rate "the extent to which they used specific memory strategies to study the words and the story".

The next section of the questionnaire provided a list of memory strategies and asked the subjects to indicate which, if any, they used during the experiment. A copy of this questionnaire can be found in Appendix D.

Procedure

The women were tested individually in a testing room at the

University of Richmond. The study was briefly described as an investigation of memory functioning in older adults and informed written consent was obtained. Next, information on demographic characteristics, health status, mental status, and depressive status were collected in this order. During the List and Text Phases of the experiment, self-efficacy ratings, study and recall times, and memory performances were obtained. The phases of the experiment were counterbalanced so that half of the subjects completed the List Phase first and half of the subjects completed the Text Phase first.

List Phase

Each woman was asked to consider the 5 sample words and to make judgments about her ability to remember similar words. Self-efficacy judgments were made on the List Self-Efficacy Questionnaire. Following the completion of this questionnaire, all subjects were presented with a stack of 25 words and instructed to study as long as necessary in order to remember as many words as possible. Each subject was told that when she was finished studying, she should hand the cards back to the experimenter and recall the words out loud for the experimenter to record. When the instructions were clearly understood, the task began and the experimenter recorded study time, number and order of words recalled, and recall time. All women were prompted for more words ("Any others?") at the end of the initial recall.

List Training

The women who were assigned to the training group were instructed in a technique which was presented to them on a sheet of paper which briefly described the two steps of the technique: categorization and self-testing. The subjects were told that if they used the technique, they would do better on the recall task. The technique was explained, an example was given, and when it was clear that the woman understood fully, the task began.

After the recall part of the task, the subjects provided information about their attributions for their performance on the task on the Word Set Questionnaire.

Text Phase

All the women were asked to consider the sample story in making their ability to remember a similar story. Self-efficacy judgments were made on the Text Self-Efficacy Questionnaire. Following the completion of the questionnaire the women were presented with a story and instructed to study as long as necessary in order to remember as much as possible. Each subject was told that when she finished studying, she should hand the story back to the experimenter and she would be given paper on which she should write down what she recalled. When the instructions were fully understood, the task began. Data was collected using the same procedures as in the List Phase. The experimenter obtained measures of study time and recall time. The memory performance score was obtained later after being coded.

Text Training

Prior to beginning the task, the women assigned to the training group were instructed in the PQRST method which was adapted for this study from West (1985). The women were told that this technique would help them remember the story better. The technique was presented on a sheet of paper which briefly described each step: Preview, Question, Read, State, Test. The technique was explained, an example was given, and then when it was clear that the instructions were fully understood, the task began.

After the recall part of the task, the subjects provided information about their attributions for their performance on the task on the Text Questionnaire.

After both the List and Text Phases of the experiment were completed, all subjects completed the Posttest Questionnaire to provide information about their perceptions of memory and strategy usage. The final task was for the women to complete the Strategies Questionnaire where they were asked to provide information about the strategies they used to complete the List and Text Phases of the experiment.

Results

Manipulation Checks

Before presentation of the results associated with the formally stated hypotheses, it is necessary to evaluate whether the training manipulation actually induced any changes in behavior.

The first investigation which suggests that training did have an effect is a 2 (Age: Old vs. Young) X 2 (Training Group: Training vs. No Training) analysis of variance (ANOVA) which was performed using the total number of strategies used as the dependent variable. This variable was calculated by summing the number of strategies that the subject reported on the Strategies Questionnaire. This ANOVA revealed a significant main effect for training group (F (1,22)=16.75, p<.001) indicating that subjects in the training groups reported using significantly more strategies than the subjects in the no training groups did. This main effect was enhanced by a significant Age X Training interaction effect (F (1,22)=8.27, p<.05). The means associated with this interaction are presented in Table 1. Analysis of the simple effects in this interaction revealed that older subjects in the no training group reported using significantly fewer strategies than the older subjects in the training group or either of the groups of younger subjects. There were no significant differences associated with any of the other comparisons.

A more specific check of the training manipulations involved using a chi square procedure to evaluate which groups of subjects used the trained strategies (i.e. categorization, self-testing, and questioning). There were different patterns of results for each age group.

Neither of the chi square analyses of the use of categorization by type or categorization by first letter were significant for either of the age groups, demonstrating that use of these techniques was not related to training.

The chi square analysis of the use of self-testing was significant for older adults ($X^2(1, \underline{N} = 13) = 4.55$, $\underline{p} < .05$), indicating that trained subjects reported self-testing significantly more often than non-trained subjects.

The self-testing chi square analysis for younger subjects did not reach significance, demonstrating that younger subjects' use of self-testing was not related to training.

The chi square analysis for the use of questioning was significant for both younger subjects ($X^2(1, \underline{N} = 13) = 4.55$, $\underline{p} < .05$) and for older subjects ($X^2(1, \underline{N} = 13) = 9.55$, $\underline{p} < .01$).

These results show that except for the strategy of questioning for text recall, the younger subjects were spontaneously using the trained techniques. However, because the focus of this experiment was to manipulate the strategy use of older adults, the significant differences between training groups indicate that the training manipulation was successful.

List Phase

A 2 (Age: Old vs. Young) X 2 (Training Group: Training vs. No Training) multivariate analysis of variance (MANOVA) was performed to examine the effects of age and training on the dependent variables of performance (i.e. the number of words correctly recalled), self-efficacy level, self-efficacy strength, and study time. In this analysis, neither the multivariate Age X Training Group interaction effect, nor the multivariate Training Group effect reached statistical significance. However, the multivariate main effect for Age did reach significant levels (multi F (5, 18)=11.62, p<.001).

The univariate Age X Training Group interaction was significant for the dependent variable of performance (F (1,22)=5.93, p<.05), but no statistically significant interaction effects for any of the other dependent variables.[1] The means associated with this interaction are presented in Table 2. In regard to performance, the univariate analyses revealed a significant main effect for Training Group (F (1,22)=8.94, p<.01) indicating that the subjects in the training groups performed at significantly higher

[1] Because of the potentially detrimental influence of the lack of power, the univariate effects for the interaction and training effects were analyzed despite the lack of significance of the multivariate effects.

levels than those in the no training groups. The analyses also revealed a strong main effect for Age (F (1,22)=41.75, p< .001) indicating that younger subjects performed significantly better than older subjects.

Examination of the simple effects involved in the Age X Training Group interaction for performance revealed that the younger subjects performed at a consistently high rate with no significant differences between training groups. The analysis of the performance of the older subjects had a different pattern of results. Both groups of older subjects performed at rates which were significantly lower than either of the groups of younger subjects. In addition, the older subjects in the training condition exhibited a rate of performance which was significantly higher than that of the older subjects in the no training condition.

This interaction effect is consistent with the effect which was predicted in Hypothesis 1, that younger subjects would consistently perform at a higher level than would older subjects, but that training would enhance performance for older subjects.

Supplementing the univariate main effect of age on performance, were the significant effects of age on both measures of self-efficacy. Younger subjects reported significantly higher levels of self-efficacy than did older subjects (F (1,22)=8.06, p<.01). The mean level of self-efficacy reported by the younger subjects was 7.98 whereas the mean level of self-efficacy reported by older adults was 6.00. There was also a significant age main effect for self-efficacy strength indicating that younger subjects were more confident in their reporting of their self-efficacy (F (1,22)=11.15, p<.004). Older adults reported a self-efficacy strength of 47.23 % whereas the younger adults reported self-efficacy strength of 70.58%.

The results regarding self-efficacy provide partial support for Hypothesis 2. There were significant age differences in self-efficacy, demonstrating that younger subjects report higher self-efficacy levels and self-efficacy strength, but there did not appear to be any association between memory strategy training and either measure of self-efficacy.

To investigate Hypothesis 3, another MANOVA was performed again using the independent variables of age and training group with the subjects' responses on the seven attribution questions from the Word Set Questionnaire as the seven dependent variables (performance evaluation, ability, effort, circumstances beyond the subjects' control, use of strategies, task difficulty, and luck).

There were no significant multivariate effects for age or training group and the multivariate interaction effect also failed to reach significance. The univariate analysis of the Age X Training Group interaction effect revealed a significant interaction for responses attributing performance to effort (F (1,22)=7.28, p<.05). The means associated with this interaction are presented in Table 3. Analysis of the simple effects in this interaction showed that the older subjects who received training were more likely to attribute their performance to effort than older subjects who had not received training. No other groups were shown to be significantly different from each other.

The MANOVA also revealed a significant interaction effect for responses attributing performance to the strategies used in completing the task (F (1,22)=6.80, p<.05). The means associated with this interaction are also presented in Table 3. The results of the simple effects tests demonstrated that older subjects who received training reported attributing their performance to the strategies they used significantly more than did either older or younger subjects who received no training.

The analysis of the univariate main effects for age revealed a significant effect in regard to performance evaluation (F (1,22)=8.27, p<.01), indicating that younger subjects rated their performance higher than did the older adults. The mean rating of performance by the older adults was 4.59 and the mean rating of performance by younger adults was 6.27.

The results from the attributions to effort and strategies appear to support Hypothesis 3. The older subjects who received training reported attributions which were significantly different from the attributions of the older subjects who received no training. The older subjects in the training group were significantly more likely to attribute their performance to the effort they had expended and to the strategies they used to complete the task.

Text Phase

The results of the text phase of the study were also analyzed using a 2 (Age: Old vs. Young) X 2 (Training Group: Training vs. No Training) multivariate analysis of variance (MANOVA). The results of the multivariate Age X Training interaction did not reach significance, and although the analyses were performed, there were no interaction effects at the univariate level.[2] Similarly, the analyses found neither multivariate nor univariate main effects for the independent variable of training group.

In contrast to the lack of significance found for the interaction and training effects, once again there were strong main effects for age. There were significant multivariate age differences (multi $F(5,18)=11.69$, $p<.001$) which were followed by univariate analyses with age as the independent variable and performance, self-efficacy level, self-efficacy strength, and study time as the dependent variables. These analyses yielded a significant age effect for the variable of performance (F

[2] Again, because of the lack of statistical power, the univariate effects were analyzed in spite of the lack of multivariate significance.

(1,22)=34.80, $p<.001$), indicating that younger subjects remembered higher numbers of propositions during text recall. The results show that younger subjects correctly recalled an average of 86.43 propositions whereas the older subjects correctly recalled an average of 37.55 propositions.

These results partially support Hypothesis 1 in that they clearly demonstrate the age differences in recall performance. However, in this phase of the study, the training was not associated with increased rates of performance among the older subjects.

Hypothesis 2 received no support from these results because there was no significant Age X Training Group interaction effect, and there were no significant main effects for either Age or Training Group.

To analyze the support for Hypothesis 3, a MANOVA was performed with Age and Training Group as the independent variables and subjects' responses to each of the seven attribution questions on the Story Questionnaire as the dependent variables. As in the List portion of this section, these dependent variables can be described as performance evaluation, ability, effort, circumstances beyond the subjects' control, strategy usage, task difficulty, and luck.

None of the multivariate or the univariate effects reached significance, indicating that with the limited statistical power available, there were no significant differences in patterns of attributions among the groups. Therefore, for the Text phase of this study, neither training nor age was associated with differences in attributional patterns, and Hypothesis 3 received no support.

Composite Analyses

In order to assess the support for the hypotheses on a level which could encompass memory and beliefs about memory for both list and text, composite scores were calculated and analyzed. Measures of performance and self-efficacy for list and text were converted into z-scores and then averaged to yield composite scores for performance (SCORE), and self-efficacy strength (SE)[3]. These composite scores were then analyzed using a 2 (Age: Old vs. Young) X 2 (Training Group: Training vs. No Training) MANOVA with SCORE and SE as the dependent variables.

None of the multivariate nor the univariate effects for the interaction between age and training group, or for the main effects of training reached significance. Once again, the independent variable of age produced a strong multivariate effect (multi $\underline{F}$ (3,20)=22.92, $\underline{p}<.001$). Univariate analyses were then performed using age as the independent variable and SCORE and SE as the dependent variables. There was a

[3] Self-efficacy strength was selected because it has been shown to be the more sensitive predictor of behavior.

significant main effect for SCORE (F (1,22)=56.40, p<.001) which demonstrated that using overall measures of performance, younger subjects performed better than older subjects did. The pattern of means associated with this relationship is presented in Figure 1. However, this age effect was not complemented by a training effect for older subjects and thus theses results provide only partial support for Hypothesis 1.

Significant age differences were also found for the dependent variable of SE (F (1,22)=4.79, p<.05), again demonstrating that older subjects have less confidence in their abilities than younger subjects do. The pattern of means associated with this relationship is presented in Figure 2. But, because this age difference was not complemented by a training effect for older subjects, Hypothesis 2 was also only partially supported.

Hypothesis 3 was investigated using composite attribution scores. To calculate these measures, the subjects' responses to each of the attribution questions were converted to z-scores and then composite attribution scores were calculated by averaging the z-scores of each type of item across List and Text.

These composite scores were analyzed using a MANOVA with each of the seven attribution questions as a dependent variable and age and training group as the two independent variables. No multivariate effects were significant, and among the univariate effects, only one significant effect emerged. The analysis showed a significant main effect of age for responses to the performance evaluation question (F (1,22)=6.38, p<,05). These results showed that younger subjects had more positive perceptions of their performance than the older subjects did.

Hypothesis 4 stated that being given memory strategies to use would increase the amount of effort (study time) the subjects put forth and would be related to higher levels of performance. This hypothesis was also examined using composite scores. The study times for the List and Text phases of the study were converted to z-scores and then averaged to yield one overall score (TIME).

The relationships between the variables of training group, TIME and SCORE appear to be quite different for each age group. For the younger subjects, training group was not significantly correlated with TIME (r=-.15, p>.05), but TIME was significantly correlated with SCORE (r=.81, p<.01). Hypothesis 4 receives more support from the examination of this relationship in regard to the older subjects about which it was originally developed. In this case, training group is significantly correlated with TIME (r=.62, p<.05) and TIME is significantly correlated with SCORE (r=.58, p<.05).

The relationship between the means associated with this hypothesis are presented in Figure 3. Although the interaction between age and training group did not reach significance, this could be a consequence of the lack of power. The pattern of means presented seems to indicate that training had little effect on the amount of time that younger adults studied, but also that training was associated with increased study time for older adults.

These results provide support for Hypothesis 4 because, for older subjects, training was associated with longer study time than subjects who received no training, and study time was subsequently associated with higher levels of performance than were exhibited by subjects who studied for shorter periods of time.

The final hypothesis was an exploratory investigation of the relationships between the composite measures of performance (SCORE) and self-efficacy (SE) and the items on the Posttest Questionnaire which assessed general beliefs about memory. It was expected that younger subjects would report different patterns in their beliefs about memory than would the older subjects, but the nature of these differences were not specifically stated. The correlation coefficients for these relationships are presented in Table 4.

The correlation matrix reveals that there were significant relationships between age and some of the perceptions about memory. Age was significantly correlated with the item which asked subjects to assess the quality of their memory compared to others their age (r=.45, p<.05). This indicates that older subjects report that the older subjects reported that their memory was better than other people their age. Age was also significantly correlated with the belief that forgetting in older adults is a result of their failing to put in enough effort (r=.50, p<.05). This relationship shows that increasing age is associated with ascribing forgetting in older adults to lack of effort.

As is evident in the table, actual performance (SCORE) was correlated with subjects' perceptions of the quality of their memory (r=.65, p<.05) and assessments of the quality of their memory compared to others in the same age group (r=.62, p<.05) but only for younger subjects. Similarly, self-efficacy (SE) was significantly correlated with the perception that memory can be improved if proper techniques are learned and used efficiently (r=.74, p<.01) for younger subjects.

There were also many correlations between the individual items on the questionnaire which were only significant for younger subjects. Subjects' perceptions of the quality of their memory were positively correlated with assessments of the quality of their memory compared to others in the same age group (r=.90, p<.01), negatively correlated with the amount of worry about memory ($r=-.80$, $p<.01$), and negatively correlated with anxiety experienced in memory situations ($r=-.65$, $p<.05$). These relationships indicate that younger subjects who rate their memory positively, also report that their memory is better than others their age, that they don't worry about their memory, and that they rarely experience anxiety in memory-related situations.

Correlations between individual items which were significant only for older subjects generally had to do with anxiety and avoiding memory situations. Avoidance was significantly negatively correlated with perceived quality of memory ($r=-.59$, $p<.05$) and quality of memory compared to others in the same age group ($r=-.61$, $p<.05$) revealing that older people who have negative perceptions about the quality of their memory report avoiding memory situations. Negative perceptions about the quality of memory compared to others was also correlated with anxiety ($r=-.75$, $p<.01$).

In addition to these different patterns of effects, there were items which were correlated in both age groups. Perceptions about the importance of memory were significantly correlated with the perceived difficulty of improving memory for both younger subjects ($r=.60$, $p<.05$) and older subjects ($r=.65$, $p<.05$). This relationship indicates that people who report that their memory is important to them also report that it is difficult to improve memory.

Discussion

Before discussing the effects which did emerge from the present analysis, it seems appropriate to acknowledge some of the possible explanations for some effects which were hypothesized but failed to emerge. The most obvious problems with the statistical analyses stemmed, at least in part, from a lack of power. A sample size of 26 simply is not large enough to support all of the effects that might result from this study.

Examination of the means in many of the analyses provides tentative support for the existence of trends in the appropriate, hypothesized directions. For example the study time data appear to constitute an age by training group interaction, but the actual effect fails to reach significance. The same is true for training-related increases in self-efficacy strength for older adults. A larger sample size would provide a much more accurate picture if the effects of both age and the experimental manipulations.

In light of the lack of power, the effects that did emerge are surprisingly large. This evidence lends support to the idea that with a larger sample size, the existing effects would become even more pronounced, and other effects might emerge.

The findings of this analysis in regard to age differences in the number of strategies used tend to support the production deficiency hypothesis. The older adults who were not specifically asked to use memory strategies did not do so to the extent that the corresponding group of younger adults did. This finding suggests that older adults failed to spontaneously produce memory strategies, and is consistent with the literature supporting the production deficiency hypothesis (Hartley & Anderson, 1986; Hulicka & Grossman, 1967; Mitchell & Perlmutter, 1986; Perlmutter, 1978).

It is difficult to evaluate the helpfulness of the memory strategies which the trained subjects reported using in relation to the age groups because of the existence of a ceiling effect in word recall performance for younger subjects. This effect comes about because the present study was originally designed to assess training-related differences in performance among only older adults. Due to unforeseen difficulties in recruiting older subjects, the age differences aspect of the study was added, and because the study was already in progress, all experimental procedures remained the same. The intent of this consistency was experimental control, but an incidental result was that the List recall task was too easy for the younger subjects. This produced the ceiling effect for recall performance and makes interpretation of the effects of training difficult. It is possible that with a procedure which was designed to equate task difficulty across age levels (e.g. by determining pre-training baseline performance) the younger trained subjects could have improved their performance relative to the non-trained younger subjects, as well as demonstrated more pronounced age differences. However, with the study in its present form, any speculation about training effects for younger subjects would be conjectural, at best.

There is one finding which suggests that this type of training would have had little, if any, effect on the the performances of the younger subjects. Based on the chi square analyses, there is reason to believe that the younger no-training subjects were using the same strategies as the subjects in the younger training group. Because the training manipulation was unable to produce significant differences in behavior, this provides reason to suspect that any differences between the subjects in each of the training groups would have been based on individual abilities and produce little difference in the means of the two groups. It is possible that a training manipulation could be developed that would produce differences in younger subjects' behavior by finding a technique which was not spontaneously used by the younger subjects, but it is unlikely that with such a brief training period, that a more complex technique could have such effective results for the older subjects.

Despite the problem of the ceiling effect, these results to the processing deficiency hypothesis. In fact, because the younger subjects' performances were restricted by the maximum level of recall, these results may provide a conservative estimate of the actual age differences in performance. Nevertheless, it is apparent that even with benefit of training, the older adults' levels of performance do not reach those of the younger adults.

The problems of power and ceiling effect notwithstanding, the results of this part of the analysis make an important contribution to the research on cognitive training in older adulthood. In contrast to many other studies of cognitive skills training which utilize extensive, time-consuming procedures in their training manipulations (Hill et al. 1988; Scogin, Storandt, & Lott, 1985; Yesavage & Jacob, 1984; Zarit, Gallagher, & Kramer, 1981; Zarit, Cole, & Guider, 1981), this study effectively demonstrated that training-related increases in performance can be achieved in a single-session, brief strategy manipulation. The development of quick, effective memory interventions is a major focus of this field and the present results demonstrate that it may be possible.

Of course, the generalizability of the performance improvements of this sample of older adults must be viewed with caution because, as is the case with most volunteer studies of cognitive training, the sample of older adults is hardly representative. The sample was self-selected, as well as highly educated, a combination which sets them apart from the general elderly population and may lend itself to success on laboratory tasks. An interesting test of the findings of this study would involve replication of the methods using a more random sample.

There was a strong age effect for text recall which can be explained in terms of a production deficiency or a processing deficiency hypothesis. One variation of the production deficiency hypothesis which has been applied to text recall has been that older adults choose to process either the gist or the details of the text (Cohen, in Light & Burke 1988, pp171-190). There appears to be support for this difference in the present study. The chi square analyses also revealed that younger subjects were trying to remember the details of the text significantly more than the older subjects were. This makes a difference in scoring because although it was not necessary to recall the text verbatim, the closer the recall was to the original structure of the text, the higher the number of propositions that were scored. Therefore, if the older subjects were not even attempting to remember details, they were at a disadvantage in terms of scoring.

The fact that an interaction between age and training did not emerge for text recall could be explained by a number of circumstances.

Little research has been done in the area of training text recall. Consequently, it was difficult to know what types of training techniques would be effective in this type of manipulation. It is possible that the technique used by the older adults in the training group was not helpful in improving performance because attempting to apply this new strategy while trying to encode a text may be too taxing on their working memory.

It is also possible that the trained older adults did not actually use the technique, but simply reported using it. There was no manipulation check other than the self-report format of the Strategies Questionnaire and the subjects in the training group may have marked the "questioning" strategy because they knew that they were "supposed"to have used it.

It may also be possible that because text recall is a more naturalistic task than free recall of unrelated nouns, the subjects may bring more individual differences into this type of task. There are certain to be more specific expectations, based on the subjects' histories and experience with text recall. As a result, it may be more difficult to experimentally manipulate this type of situation.

The results of the analyses of the self-efficacy variables in the List section of the experiment demonstrate the expected age differences in self-efficacy strength which were stated in Hypothesis 2. These findings are consistent with the findings of Rebok and Balcerak (1989) which used a moderately similar method of determining self-efficacy level and strength. However, although the Rebok and Balcerak study assessed both self-efficacy level and strength, it does so using a single measure of each and so is not as sensitive as the measure used in the present study.

The support for training-related increases in self-efficacy in the List phase of the experiment is one effect which could possibly be magnified through the testing of more subjects and attaining higher statistical power. As was mentioned earlier, the pattern of means associated with the effect for self-efficacy strength indicates a slight increase across training groups among older subjects. Whether or not this effect would become significant with more power remains to be seen.

It is conceivable that the age X training interaction might never become significant as is the case in other studies (Hill et al. 1988; Lachman, Weaver, Bandura, Elliott, & Lewkowicz, 1992; Rebok & Balcerak, 1989). It is possible that after decades of developing a system of beliefs, memory training, no matter how effective in producing performance increases, may not be powerful enough to enhance self-efficacy.

Other studies have found that manipulations which directly target negative beliefs about memory are more effective than training alone in enhancing self-efficacy (Lachman et al.,1992). That is a possibility for future research stemming from this study. Another possibility is to allow for the measurement of within-subjects increases in self-efficacy by using a repeated-measures design with more than one trial. This would allow for actual mastery experiences which are important in building a sense of control over memory functioning (Bandura, 1989).

The fact that no significant age differences emerged in the analysis of the Text self efficacy measures could reflect the fact that there really are no age differences associated with confidence in text recall. However, the present study made a contribution to the text recall literature by applying the format of a task-specific self-efficacy questionnaire to that type of task and the results of brand new measures should be accepted cautiously. These results, based on such a small sample size should be evaluated carefully before concluding that no age differences exist.

One possibility of a problem with the construction of the instrument is that in an effort to make the scale task-specific, each item asks the subject to evaluate their ability to remember a specific number of "pieces of information or facts". Describing the partitioning of the story in this way may have been confusing for some subjects because it is unclear what exactly constitutes a "piece of information". In fact, some of the subjects filled out the questionnaire by converting the number of facts to a percentage of the number of facts in the entire text. Rewording the items to place an emphasis on ascending percentages of the entire text may be a better way of retaining the task-specific nature of the scale, while making it easier to understand.

Hypothesis received support in the List part of the experiment in that there were significant age X training condition interactions for attributions to effort and strategies. The analysis of this interaction revealed that training was associated with more performance attributions to effort and strategies for older adults. This is an important finding because training was able to elicit changes in patterns of attributions. It is possible that providing older adults with strategies with which to approach a task, given that these strategies were also associated with enhanced performance, may provide them with evidence that they can exercise some control over their memory by using strategies (Bandura, 1989).

Attributions to effort and strategy use fall in the internal unstable section of Weiner's (1971) attributional model. The findings of the present study are divergent with the findings of the Lachman et al. (1992) study in which it was found that memory skills training alone was not sufficient to change control beliefs.

The changes in attributions are important because according to

Bandura's model, those performance attributions are what subsequently affects self-efficacy expectations. If, as these results indicate, it is possible to break the cycle of negative beliefs about memory through brief training manipulations, this is an important step toward designing effective interventions for older adults with memory problems.

The lack of results to support Hypothesis 3 in the Text phase of the experiment could be due to any of the problems with the text training which have already been described. It seems logical that if the training manipulation was not effective, that there would be no corresponding changes in patterns of attributions. Perhaps if this part of the experiment were refined to the point where the training were more effective, changes in attributions would be apparent.

Because the patterns of results were so different for the List and Text phases of the experiment, the composite scores lose some of the individual effects, but at the same time, provide insight on an entirely different level. The word recall interaction, and the training group effects were lost, and the variable which yields the strongest effects was age.

The examination of Hypothesis 4 revealed different patterns of association between the variables of performance, study time, and training group for each age group. For the younger subjects, the training was not accompanied by an increase in study time, but the two were correlated for the older adults. This could reflect the idea that the younger adults were more effective at determining the appropriate amount of study time for the task. In contrast, providing the older subjects with memory strategies was significantly associated with longer study times. There is no way of knowing whether efficient use was made of that time, and it is possible that the increase was associated with the fact that the working memory of the older adults was confronted with the task of encoding stimuli while also incorporating the new strategy and that this could have slowed down the processing.

However, this possibility is overshadowed by the fact that the increased study time was also associated with increased performance. These results are consistent with the Murphy et al. studies (1981) where inducing older adults to study longer was associated with increases in performance. It is also consistent with the metamemorial theory that younger adults are more efficient at evaluating the demands of the task at hand and allocating appropriate amounts of effort, because regardless of training, younger subjects put forth about the same amount of effort, whereas the older subjects put forth more effort after training. This could be a demonstration of a deficiency in metamemory either of task assessment, or memory monitoring, but the present study was not sensitive enough to distinguish between the two.

The primary focus of the investigation of general memory beliefs was, again, on the beliefs of the older subjects, but these results did not reveal many strong relationships. This could be a problem of power, because there were many correlations in the moderate range which might reach significance with a larger sample size.

Examining the present results shows that the items on which the older subjects showed a correlation, but the younger subjects did not, were related primarily to avoidance of memory situations and anxiety experienced in memory situations. This could be viewed as support for the self-efficacy theory of Bandura, which states that people with low self efficacy may avoid challenging tasks and when faced with those tasks experience intrusive cognitive arousal which precludes organized analytic processing. However, the posttest items which measure anxiety and avoidance are not correlated with the composite self-efficacy score. This could be a function of the possible problems with the measurement of text self-efficacy. When the raw correlation matrix is examined, anxiety is moderately, yet not significantly correlated with both measures of list self-efficacy for older adults. Therefore, the apparent lack of association with the composite score could be a problem with power and the text self-efficacy measurement.

The positive correlation between age and the item asking the subjects to compare their memory to that of others in their age group is an interesting one. It indicates that older subjects rate their memory as better than others their age whereas younger subjects rate their memory as worse than others their age. This finding appears to be inconsistent with the low levels of self-efficacy which were found for older adults. However, there was a moderate correlation in the opposite direction between age and the item asking subjects to rate their own memory. When phrased this way, younger subjects rate the quality of their memory more positively than do older adults.

The fact that older adults rate their memory negatively, but still feel that they are better than others their age may be related to the negative perceptions of the elderly as a group. It could be that these older women have negative beliefs about the abilities of others in their age group and that they feel superior. Actually, it is quite possible that the women included in the study do have abilities which are superior to those of the majority of the elderly population. As was mentioned earlier, the women in this study are certainly not a representative sample, as they are highly motivated and have high levels of formal education. This large degree of education could, in part, explain the negative evaluations of the older adults' own memory functioning. Lachman and Leff (1989) found that older adults with a large amount of formal education were more likely to demonstrate a loss in perceived control. They concluded that it was possible that people with higher levels of education have higher expectations for themselves and may be more sensitive to perceived changes in abilities.

Summary

In summary, despite the problems with power and measurement, the present study was able to achieve significant findings which support most of the major hypotheses. These results can be interpreted in an adaptation of Bandura's model. The older adults came into the study with negative perceptions about the elderly as a group and about their memory self-efficacy. A training manipulation was successful in increasing the amount of effort (study time) the subjects expended, which was correlated with higher levels of performance. The instruction in the use of memory strategies appeared to not only provide the older adults with techniques which they may not have otherwise used (production deficiency), but also provided them with a sense of control over their memory functioning, which was reflected in the types of attributions that they made. Whether or not these attributions would carry over to subsequent increases in self-efficacy was not assessed and is left to future researchers.

It did not appear that training had any effect on subjects' beliefs about memory in general. It may be that a manipulation specifically aimed at improving beliefs about memory is needed to produce lasting generalizable effects. However, this study contributes to the literature on cognitive training because it was demonstrated that at least some changes in performance and attributions were effected in a brief training manipulation.

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Table 1

Mean Total Number of Strategies Used by Age and Training Group

	Age	
Training Condition	Young	Old
No training	5.00 (1.16)	6.00 (1.55)
Training	3.17 (1.47)	6.43 (1.13)

Table 2

Mean Number of Words Correctly Recalled By Age and Training Group

Training Condition	Age	
	Young	Old
No training	24.29 (0.95)	24.83 (0.41)
Training	15.50 (3.73)	20.86 (3.24)

Table 3

Mean List Performance Attributions to Effort and Strategy Use By Age and Training Group

Training Condition	Age: Young	Age: Old
Effort		
No Training	5.43 (0.79)	4.67 (1.37)
Training	5.00 (1.10)	6.29 (0.48)
Strategy Use		
No Training	6.00 (1.00)	4.17 (1.47)
Training	5.33 (1.21)	5.86 (0.90)

Table 4

Correlation Matrix For Posttest Questions and Composite Scores for Older and Younger Subjects

	SCORE	SE	TIME	1	2	3	4	5	6	7	8	9	10	AGE
SCORE	1.00	.44	.81 **	.65 *	.11	-.53	.62 *	-.02	.25	.30	.34	-.11	-.47	-.82 **
SE	.24	1.00	.23	.43	.46	-.40	.43	.33	-.52	.19	.74 **	-.22	-.35	-.41
TIME	.58 *	-.07	1.00	.47	-.10	-.34	.53	.02	.40	.05	.19	-.09	-.46	-.13
POSTQ1	-.10	.24	-.05	1.00	.31	-.80 **	.89 **	.18	-.07	.47	.03	-.21	-.65	-.39
POSTQ2	-.07	-.12	-.47	-.12	1.00	.05	.09	.50	-.60 *	.60 *	.06	-.38	-.30	-.00
POSTQ3	-.40	-.48	-.12	-.16	.55	1.00	-.78 **	-.05	.08	-.13	-.25	.18	.52	.27
POSTQ4	-.16	.03	-.02	.31	-.34	.11	1.00	.25	.12	.44	.16	.09	-.48	.45 *
POSTQ5	-.34	-.24	-.36	-.33	.18	.39	.35	1.00	-.42	.29	.41	-.04	-.20	-.16
POSTQ6	-.15	.04	-.18	-.08	-.17	-.31	-.09	-.18	1.00	-.12	-.38	.48	.39	.50 *
POSTQ7	.04	-.14	-.35	-.04	.65 *	.36	-.30	.22	-.06	1.00	-.15	.11	-.24	.22
POSTQ8	-.26	-.27	.09	.10	-.18	.17	.06	-.47	.16	-.31	1.00	-.14	-.20	-.09
POSTQ9	.12	-.08	.09	-.59 *	.14	.05	-.61 *	.20	.15	.51	-.24	1.00	.68 *	.07
POSTQ10	.20	-.13	.28	-.48	.25	.14	-.75 **	-.08	-.12	.48	-.13	.85 **	1.00	-.08

$p<.05$ * $p<.01$ **

Note: the correlations presented below the main diagonal are those associated with older subjects, those above the main diagonal are those associated with younger subjects.The correlations presented in the AGE column were calculated on the entire sample.

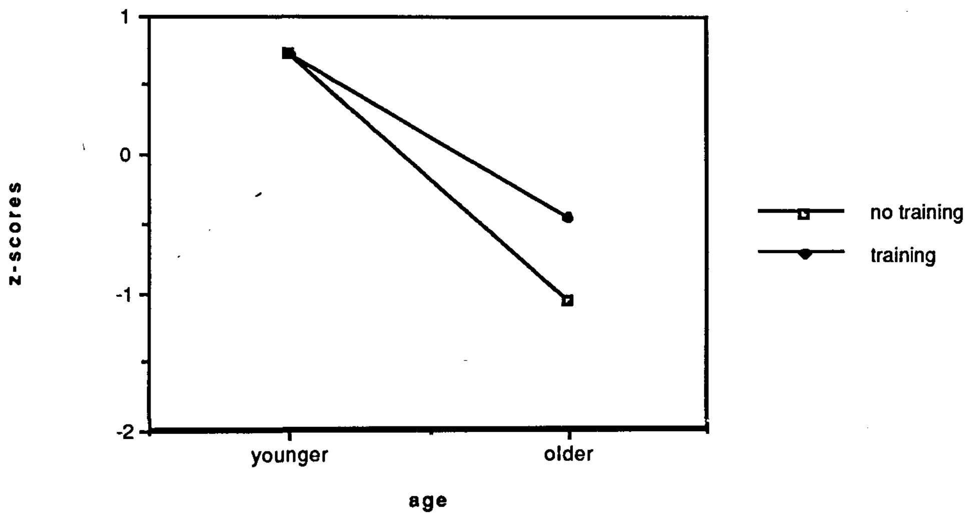
1
0
-1
-2
z-scores
younger
older
age
no training
training

Figure 1. Effects of age and training condition on composite performance scores.

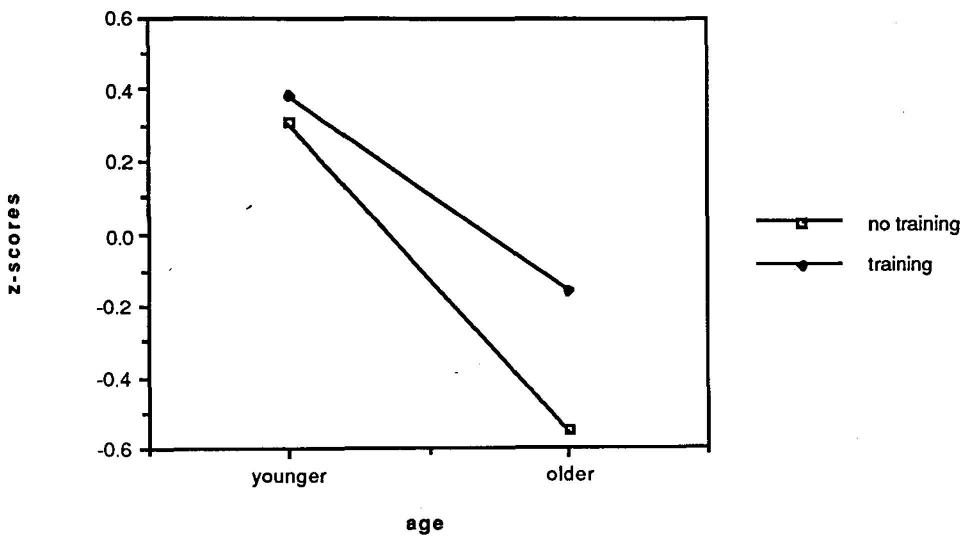
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
z-scores
younger
older
age
no training
training

Figure 2. Effects of age and training condition on the composite measure of self-efficacy for older and younger subjects.

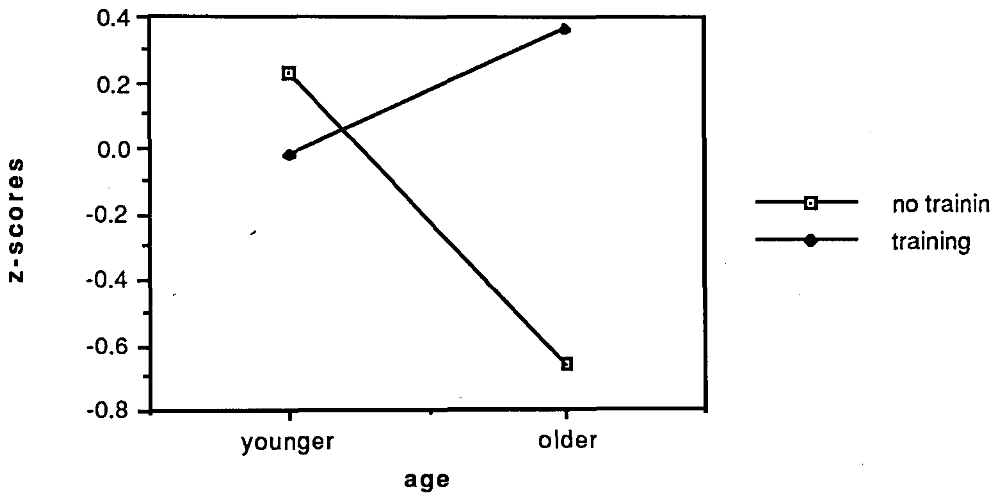
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
z-scores
younger
older
age
no trainin
training

Figure 3. Effects of age and training condition on the composite measure of time for older and younger subjects.

Appendix A

MEMORY QUESTIONNAIRE

For each statement below, I want you to tell me NO or YES to indicate whether or not you can perform the task described in that statement. If you answer YES, then I want you to also tell me how sure or certain you are about performing that task. You can state your certainty by giving me a percentage ranging from 10%, which is completely uncertain, to 100%, which is completely certain. The values between 10% and 100% represent confidence levels somewhere between complete certainty and complete uncertainty. An answer of NO does not require a "percent certainty" statement. Do you understand?

If I studied a set of 25 words for as long as I wanted, I could remember 1 to 3 of the words, if tested for recall immediately after studying the set.

NO YES 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

If I studied a set of 25 words for as long as I wanted, I could remember 4 to 6 of the words, if tested for recall immediately after studying the set.

NO YES 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

If I studied a set of 25 words for as long as I wanted, I could remember 7 to 9 of the words, if tested for recall immediately after studying the set.

NO YES 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

If I studied a set of 25 words for as long as I wanted, I could remember 10 to 12 of the words, if tested for recall immediately after studying the set.

NO YES 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

If I studied a set of 25 words for as long as I wanted, I could remember 13 to 15 of the words, if tested for recall immediately after studying the set.

NO YES 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

If I studied a set of 25 words for as long as I wanted, I could remember 16 to 18 of the words, if tested for recall immediately after studying the set.

NO YES 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

If I studied a set of 25 words for as long as I wanted, I could remember 19 to 21 of the words, if tested for recall immediately after studying the set.

NO YES 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

If I studied a set of 25 words for as long as I wanted, I could remember 22 to 24 of the words, if tested for recall immediately after studying the set.

NO YES 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

If I studied a set of 25 words for as long as I wanted, I could remember all of the words, if tested for recall immediately after studying the set.

NO YES 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

MEMORY QUESTIONNAIRE

For each statement below, I want you to tell me NO or YES to indicate whether or not you can perform the task described in that statement. If you answer YES, then I want you to also tell me how sure or certain you are about performing that task. You can state your certainty by giving me a percentage ranging from 10%, which is completely uncertain, to 100%, which is completely certain. The values between 10% and 100% represent confidence levels somewhere between complete certainty and complete uncertainty. An answer of NO does not require a "percent certainty" statement. Do you understand?

When answering the following questions, keep in mind that the sample story I just showed you has about 50 to 60 pieces of information or facts.

If I read and studied a story with 150 pieces of information or facts for as long as I wanted, I could remember 0 to 9 of the pieces of information or facts, if tested for recall immediately after reading the story

NO YES 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

If I read and studied a story with 150 pieces of information or facts for as long as I wanted, I could remember 10 to 19 of the pieces of information or facts, if tested for recall immediately after reading the story

NO YES 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

If I read and studied a story with 150 pieces of information or facts for as long as I wanted, I could remember 20 to 29 of the pieces of information or facts, if tested for recall immediately after reading the story

NO YES 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

If I read and studied a story with 150 pieces of information or facts for as long as I wanted, I could remember 30 to 39 of the pieces of information or facts, if tested for recall immediately after reading the story

NO YES 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

If I read and studied a story with 150 pieces of information or facts for as long as I wanted, I could remember 40 to 49 of the pieces of information or facts, if tested for recall immediately after reading the story

NO YES 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

If I read and studied a story with 150 pieces of information or facts for as long as I wanted, I could remember 50 to 59 of the pieces of information or facts, if tested for recall immediately after reading the story

NO YES 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

If I read and studied a story with 150 pieces of information or facts for as long as I wanted, I could remember 60 to 69 of the pieces of information or facts, if tested for recall immediately after reading the story

NO YES 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

If I read and studied a story with 150 pieces of information or facts for as long as I wanted, I could remember 70 to 79 of the pieces of information or facts, if tested for recall immediately after reading the story

NO YES 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

If I read and studied a story with 150 pieces of information or facts for as long as I wanted, I could remember 80 to 89 of the pieces of information or facts, if tested for recall immediately after reading the story

NO YES 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

If I read and studied a story with 150 pieces of information or facts for as long as I wanted, I could remember 90 to 99 of the pieces of information or facts, if tested for recall immediately after reading the story

NO YES 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

If I read and studied a story with 150 pieces of information or facts for as long as I wanted, I could remember 100 to 109 of the pieces of information or facts, if tested for recall immediately after reading the story

NO YES 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

If I read and studied a story with 150 pieces of information or facts for as long as I wanted, I could remember 110 to 119 of the pieces of information or facts, if tested for recall immediately after reading the story

NO YES 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

If I read and studied a story with 150 pieces of information or facts for as long as I wanted, I could remember 120 to 129 of the pieces of information or facts, if tested for recall immediately after reading the story

NO YES 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

If I read and studied a story with 150 pieces of information or facts for as long as I wanted, I could remember 130 to 139 of the pieces of information or facts, if tested for recall immediately after reading the story

NO YES 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

If I read and studied a story with 150 pieces of information or facts for as long as I wanted, I could remember 140 to 149 of the pieces of information or facts, if tested for recall immediately after reading the story

NO YES 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

If I read and studied a story with 150 pieces of information or facts for as long as I wanted, I could remember all of the pieces of information or facts, if tested for recall immediately after reading the story

NO YES 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Appendix B

STORY QUESTIONNAIRE

Please answer the following questions by circling a number on each scale.

How would you describe your performance on the task you just completed?

1	2	3	4	5	6	7
very poor						very good

To what extent was your performance due to your natural memory ability?

1	2	3	4	5	6	7
not at all						completely

To what extent was your performance due to the amount of effort you put in?

1	2	3	4	5	6	7
not at all						completely

To what extent was your performance due to circumstances beyond your control?

1	2	3	4	5	6	7
not at all						completely

To what extent was your performance due to the strategies you used to complete the task?

1	2	3	4	5	6	7
not at all						completely

To what extent was your performance due to the difficulty of the task?

1	2	3	4	5	6	7
not at all						completely

To what extent was your performance due to luck?

1	2	3	4	5	6	7
not at all						completely

Appendix C

POSTTEST QUESTIONNAIRE

Please answer the following questions by circling a number on each scale.

Please rate the quality of your memory on the following scale

1	2	3	4	5	6	7
Terrible						Excellent

How important is your memory ability to you?

1	2	3	4	5	6	7
Not very Important						Very Important

How much do you worry about your memory?

1	2	3	4	5	6	7
Almost Never						Almost Always

How is your memory compared to others your age?

1	2	3	4	5	6	7
Much Worse						Much Better

Forgetting in older adults is the result of the natural aging process.

1	2	3	4	5	6	7
Disagree						Agree

Forgetting in older adults is the result of their failing to put in enough effort.

1	2	3	4	5	6	7
Disagree						Agree

How difficult do you think it is for a person your age to improve their memory?

1	2	3	4	5	6	7
Extremely easy						Extremely difficult

Memory can be improved if proper techniques are learned and used efficiently.

1	2	3	4	5	6	7
Disagree						Agree

Do you ever avoid situations that require you to use your memory?

1	2	3	4	5	6	7
Almost Never						Almost Always

Do you ever feel anxious or nervous in situations that require you to use your memory?

1	2	3	4	5	6	7
Almost Never						Almost Always

Appendix D

Please answer the following question by circling a number on the scale:

To what extent did you use specific memory strategies to study the words and story?

1	2	3	4	5	6	7
not at all						a great deal

Below is a list of common memory strategies. Please indicate which, if any, you used during this experiment by placing a check mark next to the description.

_____ categorization by type - putting words or ideas into categories according to the type of item or idea to remember them.

_____ rehearsal - repeating the words or ideas to yourself until you remember them.

_____ details (verbatim) - trying to remember the exact wording and phrasing of the passage.

_____ recall readiness - testing yourself in your head while you studied.

_____ categorization by first letter - putting words or ideas into categories according to their first letters to remember them.

_____ gist - trying to remember the main themes of the story.

_____ method of loci - associating ideas or objects with places in your home and then "walking" through your home to remember the ideas or objects.

_____ questioning - developing questions about the story and then reading to answer your questions.

_____ elaboration - creating a story or a sentence out of a list of words in order to remember them.

If you used any other strategies or techniques to remember during the experiment, please briefly describe them in the space below.

Appendix E

Preview-look over story

Question-make up questions

Read-read carefully

State-state main ideas

Test-answer your questions

<u>C</u>ategorize- group similar words

<u>S</u>elf-test- test yourself in your head