1-1-2005

The Effectiveness of Memory Training Programs in Improving the Subjective Memory Characteristics of Healthy Older Adults with Memory Complaints : a Meta-Analysis

Kimilee Y. Wilson
belcher6@marshall.edu

The Effectiveness of Memory Training Programs in Improving the Subjective Memory Characteristics of Healthy Older Adults with Memory Complaints: A Meta-Analysis

A Doctoral Research Project
Presented to the Graduate College of
Marshall University

In Partial Fulfillment of
The Requirements for the Degree
Doctorate in Psychology

By
Kimilee Y. Wilson

Approved by:

Thomas Ellis, Psy.D., ABPP, Committee Chairperson
Steven Mewaldt, Ph.D.
David Trumpower, Ph.D.
Steven Cody, Ph.D.

Marshall University
Huntington, West Virginia

July 2005

ABSTRACT

The Effectiveness of Memory Training Programs in Improving the Subjective Memory Characteristics of Healthy Older Adults with Memory Complaints: A Meta-Analysis

By Kimilee Y. Wilson

The focus of this study was to examine the effectiveness of memory training programs in improving the metamemory (i.e., subjective memory characteristics) of healthy older adults by integrating recent research findings in a meta-analysis. In particular, the following research questions were proposed: (a) How *effective* are memory training programs in improving the subjective memory characteristics of healthy older adults with memory complaints? (b) Which *components* of the memory training programs increase the effectiveness of memory training (in terms of metamemory characteristics)? (c) How do the results of this meta-analysis compare to those reported by Floyd and Scogin (1997)? Studies that met the inclusion criteria were examined thoroughly for the following types of information: type of group (treatment, control, placebo), number of participants included in the study, mean age of participants, type and number of training components utilized, length of training sessions, training modality (i.e., individual versus group), and use of technologies. The weighted average effect size for treatment groups was 0.39. Initially, no significant differences were found between expectancy change conditions and traditional memory training conditions. Furthermore, none of the hypothesized moderator variables were found to significantly contribute to effect size magnitude. However, post-hoc analyses calculated after removing outliers showed significant differences between expectancy change conditions and traditional memory training conditions with the weighted average effect size of expectancy change conditions (d = 0.56) being significantly larger than that of traditional memory training conditions (d = 0.30). Moreover, post-hoc regression analyses revealed that the hypothesized regression model was a significant predictor of the effect size magnitude with two of the hypothesized moderators, multifactorial interventions and use of technology, being the best predictors in the model and another hypothesized moderator, training modality, approaching statistical significance within the model. These results have numerous clinical and practical implications for future research and the development of therapeutic intervention programs.

Acknowledgements

Foremost, I would like to thank God for blessing me with the abilities and resources to accomplish this goal. I am also indebted to my husband Ryan, my parents, my sister, and my extended family and friends for their patience and unending encouragement throughout this journey.

Secondly, I would like to thank my dissertation advisor, Dr. Thomas E. Ellis, and committee members, Drs. David Trumpower and Steven P. Mewaldt, for their knowledge and support throughout the completion of this research project. Indeed, the entire Department of Psychology at Marshall University is worthy of my gratitude.

Lastly, I would like to thank all of my practicum advisors and clients for shaping my clinical skills and arousing my interests in clinical gerontology. I would especially like to thank Dr. Steven Cody and everyone at the Hanshaw Geriatric Center for their commitment to working with the older adult population. I would also like to offer a special thanks to Dr. F. Duke Haddad, whose generosity through the Stephen Cupps Thesis Grant made this process easier.

To everyone who had a part in this accomplishment, thank you, and may God bless you!

Table of Contents

List of Tables

Chapter 1

INTRODUCTION

The number of individuals aged 65 and older is continually growing in the United States. In fact, the U.S Census Bureau (2002) projects that the number of individuals aged 65 and older will approach 20% of the U.S population by the year 2025. As a result, older individuals are increasingly more likely to be heard in their demand for basic human rights such as healthcare, housing, and community services. Furthermore, many professionals and organizations are devoted to helping them in this endeavor to improve their overall quality of life.

For example, numerous national non-profit organizations such as the American Association of Retired Persons (AARP) and the American Society on Aging (ASA) have formed over the past few decades and are committed to improving the physical, emotional, social, economic, and spiritual aspects of the lives of older individuals (Iowa State University, 1999). Another non-profit organization, Little Brother/Friends of the Elderly, is dedicated to alleviating the isolation often experienced by older individuals (ElderWeb, 2004).

Numerous community outreach organizations have also been developed recently to promote the rights of older individuals at the state and county levels. For example, West Virginia has developed a state initiative, Healthy People 2010, that focuses on improving end-of-life care by assisting individuals in making decisions regarding such issues as medical care and nursing home placement (WVU Center for Health, Ethics, and Law, 2001). The Joan C. Edwards School of Medicine, located in Huntington, West Virginia, organized the Hanshaw Geriatric Center in 1988 to provide community health care, including mental heath care, to older individuals. Similarly, many states now have centers within their community health care centers devoted to geriatric care.

Another prominent example of increased public interest in the well-being of older individuals involves the recent proliferation of medications aimed at alleviating sexual dysfunction in older males (e.g., Viagra and Cialis). Indeed, the ageist stereotype that older individuals are asexual is beginning to dissolve (Kingsberg, 2000). Gelfand (2000) attests to the need to improve older individuals' quality of life, particularly their ability to continue expressing their sexuality throughout their later years.

This movement toward combating ageism, or negative prejudices and discriminatory practices against older individuals, has been growing rapidly in the U.S. (Best, Hamlett, & Davis, 1992; Taylor & Yesavage, 1984; Turner & Pinkston, 1993; Weeks, 2002). This growth of public knowledge on ageist beliefs and practices may be largely attributed to the recent literature demonstrating the negative effects of ageist beliefs and practices on older individuals. In discussing the damaging effects that ageist attitudes and practices commonly have on older individuals, Weeks (2002) stated that older individuals often internalize these negative impressions, causing them to form a negative self-image and leading these individuals to expect old age "as an ordeal to be endured" (p. 231).

In addition to the numerous national organizations, community outreach programs, and public interest groups devoted to older individuals, the number of professional journals devoted to this population has also grown in recent years. For example, the *International Journal of Geriatric Psychiatry*, the *Clinical Gerontologist*, the *Journal of Aging and Identity,* and *Aging, Neuropsychology, and Cognition* are just a few examples of the refereed journals now published that specifically target issues pertinent to older individuals. Some of the major topics discussed in these journals include healthcare, relationships, emotional well-being, and cognitive functioning (Weeks, 2002).

Furthermore, many professional training programs now require specific training in the area of gerontology, or the scientific study of aging and problems related to the aging process. For example, most nurses and other healthcare professionals, including nutritionists and occupational therapists, are encouraged to take courses in gerontology in their undergraduate training (Gil & Josman, 2001; Gregorio, Diaz, Casado, & Dementia Group, 2003; Lane et al., 2003). In addition, many psychiatrists and other mental health professionals have the opportunity to take courses on topics such as clinical gerontology in their graduate training.

Psychologists, in particular, are expected to be aware of issues commonly encountered by older individuals and should be able to provide these individuals with competent care. For example, a psychologist should be aware that older individuals are more susceptible to depression due to their increased chances of cognitive decline, losing loved ones, and health problems as they age (Gale & Deprez, 2003; Kingsberg, 2000). A competent psychologist should also be able to assess and diagnose certain mental disorders common in old age, such as Alzheimer's disease, and be able to make appropriate treatment recommendations based on the individual's level of cognitive decline, affective status, and social support network (Blackwell, Sahakian, Vesey, Semple, Robbins, & Hodges, 2004).

For example, Wimberley, Herrera, Kidrowski, Brown, and L'Esperance (2003) developed an assessment protocol to improve the ability of a retirement community to make appropriate recommendations for new residents. Wimberley et al. (2003) first examined the admission criteria for applicants to the Moorings Park Continuing Care Retirement Community (CCRC) in Naples, Florida for its success in determining who to accept versus reject and in assigning new residents to appropriate levels of care (e.g., independent living versus assisted living). They then developed the Moorings Assessment Protocol (MAP), which consisted of several assessment instruments that could identify the applicant's cognitive and affective statuses and physical abilities. Their goal was to effectively identify those applicants with dementia and mild cognitive impairment (MCI) and appropriately refer these individuals to more suitable levels of care (i.e., supervised nursing facilities). The results of this project showed that they could reliably make this distinction between normal older adults and those suffering from dementia and MCI using cutoff scores obtained on the MAP (Wimberley et al., 2003).

The development of additional protocols similar to the one developed by Wimberley et al. (2003) could substantially reduce the current healthcare costs of institutionalized care for older individuals as well as the burden placed on the caregivers of these individuals (Guralnick, Kemele, Stamm, & Greving, 2003; Johnsen, Hughes, Bullock, & Hindmarch, 2003). The development of such protocols necessitates the support of the numerous national organizations and community outreach programs mentioned above. Together, these organizations and programs can to attempt to lower the financial costs and social burden placed on caregivers of older individuals with dementia and other debilitating health problems.

Clearly, older individuals are beginning to receive attention in the public domain as evidenced by the recent increase in national non-profit organizations and community outreach programs devoted to their rights, the current public trend to combat ageist stereotypes and discriminatory practices, and the recent proliferation of refereed journals and training courses devoted to the topic of gerontology. One area that has received much attention in recent years concerns declines in memory associated with age and the needs of older individuals who experience memory decline. The staggering increases in healthcare costs can be attributed to treatment of individuals with age-related illnesses, including Alzheimer's disease. Undoubtedly, these concerns demand attention from the government and general public.

Although changes in memory associated with the aging process are highly variable (Craik, 1994; Craik, Anderson, Kerr, & Li, 1995), research has repeatedly shown that the aging process is associated with declines in memory (Cavallini, Pagnin, & Vecchi, 2003; Craik, 1994; McDougall, 1998; Park & Gutchess, 2002; Stevens, Kaplan, Ponds, Diederiks & Jolles, 1999; Verhaeghen, Geraerts, & Marcoen, 2000). More specifically, many researchers have shown that older individuals show declines in *working memory* (as evidenced by weakened performance on reading span tasks), *short-term memory* (as evidenced by weakened performance on digit span tasks), *long-term memory* (as evidenced by weakened performance on free recall tasks), *processing speed* (as evidenced by weakened performance on digit symbol tasks), and *prospective memory* (as evidenced by weakened performance on tasks requiring the individual to remember to carry out a particular task at a future time), compared to younger individuals (Craik et al., 1995; Park & Gutchess, 2002; West & Craik, 2001).

Moreover, many older individuals are concerned with their memory abilities and make complaints to their healthcare providers when they begin to notice declines in memory functioning (Cavallini et al., 2003; Collins & Abeles, 1996; Craik et al., 1995; Gilewski, Zelinski, & Schaie, 1990; Levy-Cushman & Abeles, 1998; Loewen, Shaw, & Craik, 1990; Poon, Fozard, & Treat, 1978; Turner & Pinkston, 1993; Turvey, Schultz, Arndt, Wallace, & Herzog, 2000). Research has shown that older adults most frequently complain about forgetting names and faces, the location of objects, and appointments (Best et al., 1992; Craik et al., 1995; Poon et al., 1978). Research conducted as early as 1967 showed that as many as 66% of community-dwelling adults age 75 and older expressed concerns about memory loss (Poon et al., 1978). Moreover, the most recent version of the Diagnostic and Statistical Manual of Mental Disorders (DSM) published by the American Psychiatric Association (APA) includes a diagnosis for age-related cognitive decline for individuals who present with complaints of memory decline within normal limits, given the person’s age (APA, 2000; De Vreese, Belloi, Iacono, Fenelli, & Neri, 1998; Levy-Cushman & Abeles, 1998).

As a result, many researchers have begun to investigate the source and severity of these memory declines and have begun to assess various forms of restorative and preventive care in the older adult population (Chute, 2002; West, 1995). For example, many researchers have examined the effectiveness of rehabilitation programs with older individuals who have already been diagnosed with different forms of age-related cognitive decline (e.g., Alzheimer’s disease) (Cavallini et al., 2003; Chute, 2002; Piccolini, Amadio, Spazzafumo, Moroni, & Freddi, 1992; Taylor & Yesavage, 1984;

Werner, 2000). In one attempt, Werner (2000) developed a "memory club" for older individuals who had been diagnosed with mild levels of cognitive decline.

Other researchers have worked to develop programs to prevent and/or help individuals to compensate for cognitive declines associated with normal aging that are intended to target healthy older individuals with superficial memory complaints (Cavallini et al., 2003; Levy-Cushman & Abeles, 1998; Mohs et al., 1998; Troyer, 2001; West, 1995). For example, in her work with aging populations, Troyer (2001) observed that many older individuals are concerned about their ability to remember things, such as names or appointments, and she suspected that many older individuals would benefit from educational training that addresses common "myths about aging." She designed the Memory and Aging Program (MAP) at the Baycrest Center for Geriatric Care, an intervention program focused on teaching mnemonic techniques and other memory strategies to improve healthy older individuals' memory functioning (Troyer, 2001).

Indeed, the aging process is associated with declines in memory functioning, and memory complaints are prevalent in the older population. Therefore, the investigation of these complaints, as well as the study of how older individuals cope with memory declines, is of chief concern for gerontological researchers (De Vreese, Neri, Boiardi, Ferrari, Belloi, & Salvioli, 1996; Levy-Cushman & Abeles, 1998; Park & Gutchess, 2002; Turvey et al., 2000; Verhaeghen et al., 2000; West, 1995).

Two main approaches to combating declines in memory functioning have evolved out of this area of research (De Vreese et al., 1996). Some researchers have investigated the ability of certain *psychopharmacologic agents* to prevent or even counteract declines in memory functioning (Lombardi & Weingartner, 1995). For example, research has shown that an individual in the early stages of Alzheimer's disease may benefit from some of the newer nootropics, such as Aricept or Namenda, designed to delay the progression of this disease. Some researchers also claim that certain psychopharmacologic agents can increase memory functioning in individuals with normal declines in memory associated with aging (De Vreese et al., 1996; Lombardi & Weingartner, 1995). For example, De Vreese et al. (1996) established the beneficial effects of pramiracetam (trademark name Neupramir) on improving memory performance in older adults with age-associated memory decline.

The other main approach researchers have taken to study aging and memory phenomena has been to assess the ability of *memory training programs* to counteract the memory declines (as evidenced by improved performance on objective memory measures) and/or to modify the beliefs and expectations that older individuals possess concerning their memory (as evidenced by changes in the individuals' scores on subjective memory measures). However, researchers have varied in their approaches to studying memory problems and the effectiveness of memory training programs in improving the memory functioning of older adults (Israel, Melac, Milinkevitch, & Dubos, 1994; Ivgi, Beeri, Rabinowitz, & Davidson, 1999; Piccolini et al., 1992; Troyer, 2001). More specifically, researchers have differed in their selection of participants and adherence to research designs. They have also defined memory constructs differently and used assorted measures to evaluate different aspects of memory. Furthermore, researchers employ different components in their memory training programs. These vast differences among research projects and the limitations posed by the methodological flaws of single studies make it difficult to reach clear conclusions regarding treatment efficacy.

Nevertheless, determining the effectiveness of memory training programs in improving the memory functioning of older adults has numerous clinical and practical implications for future research and the development of therapeutic intervention programs. Therefore, a thorough review of the literature on the topic of memory research in older individuals with memory complaints is warranted. (Due to the psychological nature of this paper, the effectiveness of psychopharmacologic agents will not be emphasized).

Chapter 2

REVIEW OF THE LITERATURE

The scientific literature pertaining to memory and aging is vast and spans many aspects of memory functioning and the aging process. The major issues addressed in this literature review focus on the various *methodological issues* in research examining the effectiveness of memory training programs in improving memory performance and metamemory characteristics of older adults as well as the *clinical implications* of this type of research. The review will address how researchers differ in their selection of participants, the different components of memory intervention programs, the various research designs employed in researching this topic, the various measures used to assess memory constructs and memory functioning, and the results and implications of recent research in this area. The focus of this study was to examine the effectiveness of memory training programs in improving the metamemory (i.e., subjective memory characteristics) of healthy older adults.

Participant Selection

Healthy Older Adults

Researchers have differed in their selection of participants for their research on memory and aging. Many researchers prefer to employ *healthy older adults* (Caprio-Prevette & Fry, 1996; Goodman & Zarit, 1995; Ivgi et al., 1999; Levy-Cushman & Abeles, 1998; Mohs et al., 1998; Rasmusson, Rebok, Bylsma, & Brandt, 1999; Stevens, Kaplan, Ponds, & Jolles, 2001; Troyer, 2001). These participants are usually community-dwelling adults recruited through advertisements at local community and senior centers or newspaper/magazine advertisements (Caprio-Prevette & Fry, 1996; Goodman & Zarit, 1995; Schleser, West, & Boatwright, 1986; Turner & Pinkston, 1993). For example, Mohs et al. (1998) recruited the 142 participants for their study by posting advertisements in various residential facilities and community centers for seniors. Turner and Pinkston (1993) recruited their subjects by advertising a memory training workshop in a magazine for older adults.

Frequently, this preference for healthy older adults leads to the exclusion of participants with *questionable memory impairment*, usually defined as individuals who have been diagnosed with an illness known to interfere with cognitive functioning (e.g., Parkinson's disease) or who score below a certain baseline performance on a standardized measure of cognitive abilities. For example, Troyer (2001) screened participants by administering the Telephone Interview for Cognitive Status (TICS) and a 10-item word-list memory task. If participants failed to perform above cut-off levels on either the TICS or the memory task, they were excluded from the experiment at the outset of the study (Troyer, 2001).

Another common measure used to screen participants for cognitive impairment is the Mini-Mental State Examination (Folstein, Folstein, & McHugh, 1975; Gil & Josman, 2001; Mohs et al., 1998). Individuals who perform below a certain cutoff score (usually a score of 23 or below) or percentile (usually below the 25th percentile) are excluded due to possible cognitive impairment (Folstein et al., 1975; Mohs et al., 1998; Rasmusson et al., 1999).

Because previous studies have shown a relationship between decreased health functioning and various forms of memory impairment, many studies also enforce *medical* *exclusion criteria* (Best et al., 1992; Levy-Cushman & Abeles, 1998; Neely & Bäckman, 1993; Stevens et al., 1999). For example, individuals suffering from a medical condition that has been associated with interference in cognitive functioning such as multiple sclerosis or a history of transient ischemic attacks were excluded from Stevens et al.'s (2001) study on memory performance. Some researchers also exclude participants with considerable vision or hearing loss because this sensory loss may prevent them from correctly filling out the materials necessary to complete the study (De Vreese et al., 1996; Goodman & Zarit, 1995; Riley, 1999).

In addition, many researchers screen participants for *affective disorders* before accepting them as participants in research on aging and memory because depressive symptoms have repeatedly been shown to intensify memory complaints in older adults (Best et al., 1992; Collins & Abeles, 1996; De Vreese et al., 1996; Dellefield & McDougall, 1996; Guralnick et al., 2003; Kalska, Punamäki, Mäkinen-Pelli, & Saarinen, 1999; Levy-Cushman & Abeles, 1998; Rasmusson et al., 1999; Riley, 1999; Scogin, 1985; Taylor & Yesavage, 1984; Turvey et al., 2000). Furthermore, an individual's anxiety level, especially fear relating to memory loss, has been linked to changes in memory abilities and attitudes (Dellefield & McDougall, 1996; Israel et al., 1998; Riley, 1999; Verhaeghen et al., 2000). For example, Verhaeghen et al. (2000) showed that high levels of anxiety often lead to an increase in the number and frequency of memory complaints. Instruments such as the Beck Depression Inventory (BDI), Beck Anxiety Inventory (BAI), and the Geriatric Depression Scale (GDS) are often administered to potential participants during the screening process to prevent this factor from confounding the results of the study (Collins & Abeles, 1996; Israel et al., 1994).

Therefore, researchers often feel compelled to exclude participants with cognitive impairment, poor health, or psychological disorders based on research that has linked these factors with memory impairments and/or increased frequency of memory complaints. In fact, some researchers have created a *screening assessment battery* to screen participants for possible impairments in these areas. For example, Caprio-Prevette and Fry (1996) administered a screening assessment battery consisting of the Mental Status Questionnaire, the Centre for Epidemiological Studies Depression Scale, and the Vocabulary subtest of the Wechsler Adult Intelligence Scale-Revised to each participant before collecting any pretest data. The researchers also collected personal and demographic data regarding medical conditions and mental health treatment history (Caprio-Prevette & Fry, 1996). Likewise, many researchers feel that including participants identified as having possible problems in the areas of cognition, physical health, or mental health would introduce numerous confounding variables into their studies.

Participants with Cognitive Impairment

Although many researchers favor the use of healthy older adults in their research, other researchers have been more interested in investigating the success of memory training programs in restoring different aspects of memory functioning in individuals with *mild to severe levels of cognitive impairment* and therefore have been willing to include individuals evidencing significant levels of cognitive decline as participants in their studies (Cooley & Stringer, 1991; Gil & Josman, 2001; Johnsen et al., 2003; Moulin, Perfect, & Jones, 2000a; Moulin, Perfect, & Jones, 2000b; Moulin, Perfect, & Jones, 2000c; Werner, 2000). For example, Werner (2000) investigated the utility of a memory training program using Jewish participants diagnosed with mild cognitive impairment. Cooley and Stringer (1991) used individuals suffering from various forms of brain damage to show that certain aspects of memory functioning are preserved in these individuals, and Moulin et al. performed a series of studies in 2000 employing participants diagnosed with Alzheimer's disease to investigate different aspects of memory functioning (Moulin et al., 2000a; 2000b; 2000c).

Although the research of different characteristics of memory functioning in individuals suffering from various forms of cognitive impairment is important, it is believed that the inclusion of participants with various forms of cognitive impairment and medical illnesses would introduce numerous confounding factors into the present study. Therefore, the present study of recent research on memory training programs was restricted to the use of healthy older participants.

Intervention Program Components

Although usually referred to collectively as *memory training programs*, the interventions employed in research attempting to improve the memory functioning of older adults vary greatly. For example, some intervention programs have presented the participants with mnemonic techniques to improve their objective memory performance, whereas others have incorporated psychoeducational material and cognitive restructuring techniques involving the use of relaxation/visualization exercises into their intervention programs to modify participants' subjective memory characteristics. Memory training programs also differ in whether they train the participants individually or in a group format, in their use of technologies such as audiotapes and computers in the presentation of the training material, and the length and time of day of training sessions.

Teaching of Mnemonic Techniques

Method of loci

The earliest memory training programs utilized the teaching of *mnemonic techniques*, such as the method of loci, to improve the memory functioning of older individuals (Best et al., 1992; Craik et al., 1995; Piccolini et al., 1992; Taylor & Yesavage, 1984; Treat, Poon, Fozard, & Popkin, 1978; West, 1995; Wolters, Bemelmans, Spinhoven, Theunissen, & van der Does, 1996). For example, Piccolini et al. (1992) taught participants to use the method of loci, in which the person is asked to generate visuospatial images of familiar locations and incorporate the to-be-remembered information into the images.

Mnemonic techniques continue to be a common component of memory training programs. For example, Cavallini et al. (2003) recently investigated the ability of two mnemonic techniques (loci method and strategic training) to improve the memory performance of three groups of participants (adult, younger elderly, and older elderly). Nevertheless, more recent memory training programs have begun to incorporate additional techniques.

Use of imagery

Many memory training programs encourage the participants to use *imagery* in the encoding and retrieval of to-be-learned material because it has proven to be a useful way to maximize *attention* (Best et al., 1992; Craik et al., 1995; Ivgi et al., 1999; Treat et al., 1978; West, 1995). Although the method of loci is one example of a mnemonic technique that heavily relies on imagery, other techniques based on imagery have been created. For example, Ivgi et al. (1999) developed a college course designed to improve the memory performance of older adult participants by instructing them in the use of imagery and other visualization techniques.

Criticism of Mnemonic Techniques

Some researchers, however, have criticized the teaching of certain mnemonic techniques for their *lack of ecological validity*. These researchers argue that most of these techniques are difficult to apply to everyday memory tasks encountered by older individuals (e.g., remembering to take daily medications) (Best et al., 1992; Mohs et al., 1998; Troyer, 2001). Furthermore, research has shown that many participants in memory training programs routinely fail to continue to use the mnemonic techniques they are taught during the course of the study shortly after it has ended (Troyer, 2001; Wolters et al., 1996). Researchers have suggested that teaching the use of external memory aids (i.e., physical reminders such as calendars and notes) may be more beneficial to older individuals with memory complaints than would the teaching of specific mnemonic techniques (Best et al., 1992; Kapur, 1995; Troyer, 2001; West, 1995; Wolters et al., 1996).

Psychoeducation

Researchers have repeatedly shown that older individuals benefit from psychoeducational training that addresses common *myths about aging* and increases general knowledge concerning the aging and memory process (Mohs et al., 1998; Turner & Pinkston, 1993; Troyer, 2001; Wolters et al., 1996). This psychoeducational training is oftentimes referred to in the literature as *pretraining* (Floyd & Scogin, 1997). More specifically, attempting to combat ageist stereotypes can modify negative beliefs that older individuals may have incorporated into their self-images and lead them to develop an increased sense of control over their memory functioning (Levy-Cushman & Abeles, 1998; Mohs et al., 1998; Turner & Pinkston, 1993). Moreover, Best et al. (1992) noted, "Actual memory training may be less important than addressing older adults' self-efficacy expectations, beliefs, and attributions about memory performance" (p. 406).

Therefore, many memory training programs include a component designed to dispel ageist myths and attempt to educate the older adult participants concerning the processes involved in memory (i.e., encoding, storage, and retrieval), the different memory stores (i.e., short-term and long-term memory), specific information pertaining to the memory and aging process, strategies for remembering, and exercises for practicing these strategies (Ivgi et al., 1999; Levy-Cushman & Abeles, 1998). For example, Best et al. (1992) found support for their hypothesis that changing expectations about cognitive abilities by debunking popular negative stereotypes about memory and aging would lead to a decreased incidence of memory concerns in older adults.

Cognitive Restructuring

Caprio-Prevette and Fry (1996) designed a memory training program employing cognitive restructuring techniques and self-instructional attribution training. This program was intended to help older adults identify and challenge maladaptive cognitions pertaining to their memory abilities (Caprio-Prevette & Fry, 1996). For example, participants were asked to identify and record automatic thoughts relating to aging and memory decline as well as the situation in which these thoughts occurred and the feelings associated with these thoughts, classify cognitive distortions (e.g., overgeneralization or catastrophizing), and generate rational responses to each automatic thought (Caprio-Prevette & Fry, 1996). This memory training program also incorporated group activity, role-playing exercises, and the use of index card prompts (Caprio-Prevette & Fry, 1996).

Some memory training programs also incorporate *stress reduction and relaxation exercises* into their intervention programs (Mohs et al., 1998; Neely & Bäckman, 1993; Werner, 2000). For example, Mohs et al. (1998) incorporated the Jacobson Relaxation and Systematic Desensitization technique into their memory training program. Their justification for the introduction of this procedure into their instructional program is based on its association with improved concentration and selective attention processes (Taylor & Yesavage, 1984). Neely and Bäckman (1993) also incorporated breathing exercises and relaxation exercises into their multifactorial memory training program. The positive results of these studies suggest that stress reduction and relaxation exercises are a worthwhile component of memory training programs.

Training Modality

Although some researchers instruct participants in memory training programs individually, most researchers employ a *group format* to promote the use of group discussion as a change agent (Levy-Cushman & Abeles, 1998; Scogin, Prohaska, & Weeks, 1998; Verhaeghen et al., 1992). Many researchers have shown that individuals benefit from the installation of hope and feelings of universality that result from disclosing with others who have similar problems (Yalom, 1995). In fact, some research suggests that memory performance improves even without any formal memory training as long as the participants are provided with the social support in a group format (Mohs et al., 1998).

Nevertheless, contradictory findings regarding the advantage of group training over individually-administered memory training exist (Scogin & Prohaska, 1992; Scogin et al., 1998). Initially, Scogin and Prohaska (1992) compared a self-taught memory training program to an attention-placebo condition and a delayed-training control condition. They found that the self-taught memory training program and the attention-placebo group made similar gains in memory performance, and both made significantly more gains than the delayed-training control condition. In a direct comparison of self-taught memory training and group memory training, Scogin et al. (1998) found no evidence for differential efficacy. These researchers concluded that the best approach might be to ask potential participants in memory training programs for their preference for self-administered versus group training (Scogin et al., 1998).

Length and Time of Day of Training Sessions

Researchers have shown that older adults' optimal performance is weakened when training sessions last longer than 90 minutes in duration (Riley, 1999; Verhaeghen et al., 1992). As a result, most researchers present their training materials in sessions lasting no longer than 90 minutes (Best et al., 1992; De Vreese et al., 1996; Levy-Cushman & Abeles, 1998; Riley, 1999). For example, De Vreese et al. (1998) and Dellefiled and McDougall (1996) presented their memory training programs in 90-minute sessions.

However, some researchers have chosen to lengthen training sessions to as long as 120 minutes. For example, Verhaeghen et al. (1993) trained their participants in sessions lasting from 75 to 150 minutes, with a median of 2 hours, to maximize the amount of material that could be presented in each training session. Werner's (2000) memory club met twice weekly for 4 hours. Moreover, Turner and Pinkston (1993) required participants to attend a two-day interactive memory workshop. Although the participants were given frequent breaks between lectures, the four lectures that were presented lasted 4½ hours cumulatively, and films and discussion groups were also included in the workshop (Turner & Pinkston, 1993).

In addition, the results of preliminary research indicate that the timing of testing affects the performance of older adults. Hasher, Zacks, and Rahhal (1999) found that older adults' optimal performance depends on their circadian arousal patterns. More specifically, older adults tend to perform better on cognitive tests in the morning times, and their performance is likely to be suboptimal in the afternoon or evening times (Hasher et al., 1999). However, very few researchers report the time of day that their memory training programs were held in their studies. As a result, inclusion of this factor in a meta-analytic study is impracticable, but researchers are advised to report this factor in future studies.

Use of Technologies

As advances in technology continue to be made, researchers have begun to incorporate its use in memory training programs. More specifically, many researchers routinely present training material via audio- or videotape to decrease variability between groups (Glisky, 1995; Rasmusson et al., 1999; Rebok, Rasmusson, Bylsma, & Brandt, 1997). Furthermore, researchers have recently begun to employ computers to instruct their participants in various memory strategies and exercises. For example, Rasmusson et al. (1999) designed a study comparing participants who were instructed through the use of audiotapes (e.g., *Mega Memory* tapes) to participants who received computer-based training that provided both instruction and practice exercises in memory strategies such as spatial memory for picture pairs. The researchers concluded, “Future memory interventions may have even greater impact on memory performance if approaches or technologies are combined” (Rasmusson et al., 1999, p. 654). Used alone, however, the use of certain technologies, especially commercially-sold audiotapes, have been shown to be largely unsuccessful in enhancing the memory of older adults (Rebok et al., 1997).

Evidence for a Multifactorial Intervention Program

Some researchers rely on a single intervention technique such as the teaching of mnemonics to enhance the memory performance of their older adult participants. However, most current researchers include a combination of two or more of the above-mentioned techniques. For example, Wolters et al. (1996) used both psychoeducation and mnemonic training techniques. Caprio-Prevette and Fry (1996) investigated the effectiveness of a multifactorial memory training program based on cognitive restructuring compared to a traditional mnemonic training program incorporating visualization techniques. These researchers found that participation in the multifactorial memory training program based on cognitive restructuring resulted in greater sustained gains in memory performance than participation in a traditional memory training program (Caprio-Prevette & Fry, 1996). Neely and Bäckman’s (1993) multifactorial program included mnemonic training, exercises aimed at increasing attention, and relaxation training.

In fact, some research has shown explicit support for a *multifactorial intervention program* (Mohs et al., 1998; Neely & Bäckman, 1993; Scogin, 1985). For example, Mohs et al.’s (1998) experiment showed that the combination of mnemonic techniques, psychoeducation, and cognitive restructuring resulted in more improvement on a broad area of cognitive tasks compared to the teaching of mnemonic techniques alone. Other researchers have also found support for a multifactorial approach (Rasmusson et al., 1999). However, some researchers have questioned the evidence supporting a multifactorial approach.

Common Factors

Some researchers have suggested that any of the intervention techniques would work as well as any of the others in improving the memory performance of older adults, due to the *common factors* present in the different techniques. Namely, these researchers have speculated that the *social stimulation* involved in the presentation of any of the above-mentioned techniques is the mediating variable that serves as the change agent in increasing the memory performance of the older adult participants (Ivgi et al., 1999; Stevens et al., 1999; Stevens et al., 2001).

For example, Ivgi et al. (1999) compared the efficacy of a memory training course to that of a general academic course in altering the memory performance of healthy older adults. Although Ivgi et al. found significant differences between the two groups on measures of subjective memory characteristics, they failed to find a significant difference between the two groups on objective memory measures. They hypothesized that the comparable improvements on objective memory measures might be due to the social stimulation (e.g., attending group/class meetings, discussing group/class material with others, etc.) received by the members of both groups.

In a direct attempt to test the social stimulation hypothesis, Mohs et al. (1998) incorporated a control group whose members received active social support in their experiment. Because the control group did not make significant gains in self-efficacy beliefs and memory performance, as did the experimental group, the researchers concluded that the improvements "must be attributed to the combination of education about memory, training in relaxation and memory enhancement techniques and feedback incorporated into the memory enhancement program" (Mohs et al., 1998, p. 192), thereby discounting the social stimulation hypothesis and corroborating the need for a multifactorial approach to memory training. Furthermore, Floyd and Scogin (1997) found a significant difference in effect sizes between the combined mnemonic training and psychoeducational group and the groups receiving only one type of intervention (i.e., mnemonic training or psychoeducation) in their meta-analysis, again suggesting that a multifactorial approach is warranted.

The *quality of the therapeutic relationship* between the professional conducting the memory training and the older adult participants also appears to be a common factor in memory training programs. Israel et al. (1994) commented, "The psychotherapeutic relationship developed during the course of MTP (memory training program) appeared essential to its success" (p. 166). Indeed, many researchers have asserted the importance of the therapeutic relationship as a change agent in various therapeutic techniques (Yalom, 1995). However, increased reliance on technologies such as videotapes and computers to train participants in memory training programs raises important issues concerning the researcher's knowledge of and belief in the effect of the therapeutic relationship as a change agent.

Clearly, researchers have different conceptions about what formulates a successful memory training program. Although some researchers are convinced that any of the above-mentioned techniques would work as well as any of the others, most researchers agree that a multifactorial approach is favorable.

Research Design

Researchers also differ in their *research designs* used to study the effectiveness of memory training programs. Although most researchers have adhered to a quasi-experimental research design, others have employed the case study or a naturalistic design, and some have adhered to a strict experimental design. Moreover, others have performed meta-analyses to integrate the results of others' findings.

Case Study/Naturalistic Design

Few researchers have utilized the *case study* or *naturalistic design* in their research on aging and memory, but the use of these designs has been documented in the literature. For example, Taylor and Yesavage (1984) addressed the costs and benefits of a memory training program with older adults through a longitudinal case study design. The researchers calculated the costs incurred by running a memory training program for 35 older individuals and weighed these costs against the benefits, which included delayed admission to nursing facility placement. Furthermore, Werner (2000) included two case studies of individual participants in her description of the effectiveness of a memory training program for older individuals.

Due to the difficulty of recruiting participants for research on memory and aging, other researchers have favored a naturalistic design. For example, Ivgi et al. (1999) performed a naturalistic study in which they compared the performance of older adults enrolled in a memory training program to that of a group of older adults enrolled in a general academic course. Nevertheless, most researchers choose not to design studies such as these due to the many methodological problems they entail.

Experimental Design

Some researchers have been able to conduct a true experiment in their study of aging and memory phenomena. However, most of the researchers strictly adhering to an *experimental design* have focused on single aspects of memory processes in aging, such as validating a specific test to assess certain aspects of memory functioning in individuals with a specified diagnosis. Shaddock and Carroll (1997) employed an experimental design when they examined the effects of adding contextual meanings to the to-be-learned material on the accuracy of metamemory judgments. Wolters et al. (1996) designed an experiment to examine the immediate and long-term effectiveness of a 10-week memory training program with older individuals. They found that, although their memory training program produced immediate improvements in the memory performance of participants, these improvements had lessened 2 months following the termination of the program.

Israel et al. (1994) performed a double-blind randomized trial to investigate the efficacy of a combined treatment (i.e., drug therapy and a memory training program incorporating cognitive therapy) with healthy older adults with memory complaints. They administered a battery of memory tests to a group of 162 patients complaining of memory problems to their general practitioners in Grenoble, France. They then administered piracetam, a psychotropic drug thought to selectively act upon “memory functioning and learning, cortical wakefulness, and behavior” (p. 156) and trained these participants according to a memory training model. Another group received a placebo and the memory training (i.e., placebo-control group). The results of this experiment showed that the combination of drug treatment and memory training intervention was more beneficial than memory training alone. However, future research is needed to examine the benefits of drug therapy alone.

Although conducting a tightly controlled experiment is the first choice of most researchers, certain obstacles often interfere with the implementation of this type of research design. For example, researchers may have difficulty assigning participants to groups randomly because of the voluntary nature of the participation in most memory training programs. Therefore, many researchers rely on quasi-experimental research designs.

Quasi-Experimental Design

The majority of the research on the effectiveness of memory training programs in improving the memory functioning of older adults has been *quasi-experimental* in nature due to numerous confounds (e.g., attrition) introduced into the study (Schleser et al., 1986; Scogin et al., 1998; Turvey et al., 2000; Werner, 2000). For example, Ivgi et al.'s (1999) study was quasi-experimental partly because they decided to utilize self-selected groups and enforced no inclusion/exclusion criteria. Gil and Josman (2001) used a quasi-experimental design to assess the ability of the Contextual Memory Test (CMT) to differentiate between healthy older adults and individuals with Alzheimer's disease. Furthermore, Moulin et al. (2000a; 2000b; 2000c) performed a series of quasi-experiments to show that metamemory monitoring in patients with Alzheimer's disease is intact. Cavallini et al. (2003) used a quasi-experimental design to confirm the association between aging and memory decline and also to support the hypothesis that these memory declines are most apparent when the memory task places high demands on the working memory capacities of the older adult participant.

Longitudinal Studies

Although most of the research establishing the value of memory training programs has been *longitudinal* in nature, the length of the studies varies greatly. Some researchers have tested only the short-term success of the memory training programs, whereas others have followed up with their participants as many as 3½ years after the memory training program ended to assess its long-term effectiveness in maintaining improvements in memory functioning.

For example, Troyer (2001) examined participants for improvement in memory abilities immediately following the participants' completion of an education and intervention program. However, Mohs et al. (1998) reexamined participants 3 months and 6 months following the termination of the memory training program. Wolters et al. (1996) followed up on participants 2 months following their participation in a memory training program. Neely and Bäckman (1993) extended the follow up of the participants in their multifactorial memory training program to 3½ years after the completion of the program to show that the gains resulting from the training were maintained over long periods of time.

Although reliance on quasi-experimental research designs leaves researchers unable to make causal connections between variables, the results of quasi-experimental research has clearly added to the body of scientific knowledge on memory and aging over the past few decades. Furthermore, many times the results of quasi-experimental research lead to the development of an experiment to test causal hypotheses suggested by the quasi-experimental research.

Meta-Analysis

Whereas many researchers have preferred to perform their own research on aging and memory, some researchers have reviewed others' research to integrate the findings in a meta-analysis. The *meta-analysis* is a favorable alternative to other ways of analyzing data, such as statistical significance testing, because it integrates findings from multiple studies and employs the use of confidence intervals (Schmidt, 1996). Moreover, Schmidt (1996) has argued that the method of meta-analysis is superior to power analysis because the cost of conducting a study with adequate power would be unreasonable in most cases. Schmidt (1996) asserts, "Any individual study must be considered a data point to be contributed to a future meta-analysis" (p. 456).

Thus far, two major meta-analyses have been conducted evaluating the effectiveness of memory training programs on the memory functioning of older adults. Each will be discussed in detail below.

Verhaeghen, Marcoen, and Goossens (1992)

The first meta-analysis was conducted in 1992 by Verhaeghen et al. The researchers focused on the malleability of memory functioning in old age and the ability of mnemonic training techniques (e.g., loci method) to improve the *objective memory performance* of older adults. They hoped to determine (a) whether mnemonic techniques are effective in improving the objective memory performance and (b) what variables might increase their effectiveness (e.g., type of mnemonic or use of pretraining).

Verhaeghen et al. (1992) concluded that teaching mnemonic techniques to older individuals with memory complaints is beneficial in improving their performance on objective memory measures (research question a). More specifically, they reported a weighted average effect size of 0.66, indicating that the teaching of mnemonic techniques is moderately effective in improving older adult's objective memory performance.

By performing regression analyses, they examined what variables might increase their effectiveness (research question b). They concluded that the age of participants and the duration of sessions negatively impacted the magnitude of the effect size (meaning that *older* older adults benefit less from mnemonic training and that longer sessions result in fewer memory gains) and that the use of pretraining and group format presentation of the training positively impacted the magnitude of the effect size (meaning that participants who received pretraining and were trained in a group format made significantly more gains than those who did not receive pretraining and who were trained individually). Therefore, the researchers suggested that memory intervention programs are likely to be most effective when they include younger older adults, the use of pretraining, a group format presentation, and relatively brief training sessions.

Floyd and Scogin (1997)

The second meta-analysis was conducted by Floyd and Scogin (1997). Their analysis differed from that of Verhaeghen et al.'s in that the researchers' focus shifted from techniques designed to improve the objective memory performance of older adults to the ability of this type of training to improve the *subjective memory characteristics (i.e., metamemory)* and *mental health* of older adults. The researchers hoped to determine (a) whether memory programs are effective in modifying the subjective memory characteristics of older adults, (b) what variables might increase their effectiveness, (c) how their results compared with the previous meta-analysis conducted by Verhaeghen et al. (1992), and (d) the effect of memory training programs on aspects of mental health, especially depression.

The researchers compiled a total of 27 research studies that met their inclusion criteria. Altogether, 1,150 participants with a mean age of 70.6 years were included in the study. The researchers then calculated effect sizes for the following category variables: memory measures, mental health measures, depression measures, other measures, and overall measures (an average of the previous four measures). Pre- to posttest improvements were calculated using Cohen's *d* statistic (i.e., standardized mean difference), and a correction for small sample size was made to prevent bias in effect size due to this factor. The effect sizes were then classified according to the following experimental conditions: mnemonic training, expectancy modification (i.e., psychoeducation), combined mnemonic training and expectancy modification, placebo (e.g., unstructured practice), or no-treatment control.

The results showed that the effect size for the overall measures category (i.e., every category but the no-treatment control) was significantly different from the control condition. However, no other effect size differences were significant. A follow-up analysis showed a significant difference in effect sizes between the combined mnemonic training and expectancy modification group and the control group for memory measures. Fail-safe *N*s were then computed for each significant effect size to determine the stability of these findings. The results suggested that both findings were relatively stable.

After determining that memory programs are generally efficacious in modifying the subjective memory characteristics of older adults (research question a), the researchers examined what variables might increase their effectiveness (research question b) by correlating participant and experimental variables and effect sizes for memory and overall measures. They concluded that only the use of pretraining (an experimental variable) resulted in a significant increase in effect size and suggested that future memory intervention programs include the use of pretraining.

In comparing how their effect sizes compared with those of the previous meta-analysis conducted by Verhaeghen et al. (1992) (research question c), the researchers found that their average effect size (d_{++} =. 19) was lower than that for objective measures (d_{++} = .66), indicating that subjective measures are not as responsive to memory training programs as are objective measures. Lastly, in evaluating the effect of memory training programs on aspects of mental health (research question d), the researchers concluded that measures of mental health are not responsive to memory training programs.

Strengths and Weaknesses of Meta-Analysis

Analogous to any research design, the meta-analytic design has its strengths and weaknesses. For example, a meta-analysis is always limited by the number and quality of the studies included in the analysis and the method of statistical analysis employed (Kazdin, 2003). Moreover, the results reported in meta-analytic studies are descriptive in nature and are therefore unable to suggest causal relationships. These and other threats to internal and external validity must not be overlooked.

Meta-analytic methods have numerous strengths, however. Meta-analytic techniques have gained much support over the past few decades since statistical significance testing and power analysis have come under scrutiny by investigators. Unfortunately, few meta-analyses have been conducted on memory and aging. Therefore, the present meta-analysis was conducted to attempt to integrate the work of previous researchers in this area. This study differed from previously conducted meta-analyses by focusing on more recent research and investigating the impact of specific methodological factors, such as type of intervention, on the effectiveness of the memory training program.

Memory Measures

Researchers investigating memory training programs have used a variety of dependent *measures*. These measures can be broadly categorized as either objective or subjective.

Objective Measures

Commonly Used Measures

Well-known *objective memory measures* include components of the Mini-Mental State Exam (MMSE), Wechsler memory subtests (e.g., paired-associate learning task), California Verbal Learning Test (CVLT), the Rivermead Behavioral Memory Test (Rasmusson et al., 1999), and the Rey-Osterreith Complex Figure (Cooley & Stringer, 1991; Ivgi et al., 1999). Numerous researchers have employed one or more of these popular measures. However, numerous other objective memory measures exist. For example, Stevens et al. (2001) utilized the Groningen Fifteen Words Test, a delayed recall task consisting of 15 word items, as their memory measure.

Reliability and Validity Issues

Ecological validity.

Most of the popularly used objective memory measures have reasonably high reliability and validity estimates that have been well documented in the literature (Folstein et al., 1975). However, most of these measures have been criticized for their lack of ecological validity (Cavallini et al., 2003; Goodman & Zarit, 1995; Shaddock & Carroll, 1997; Stevens et al., 2001). In fact, researchers began to identify the need for ecologically valid measures as early as 1978 (Poon et al., 1978). Some researchers have criticized many objective memory measures as invalid in assessing the real-world memory abilities of older individuals.

For example, Goodman and Zarit (1995) argued, “Traditional experimental memory measures lack practical applications for the elderly” (p. 40). They criticized traditional measures such as the paired-associate task on the Weschler Memory Scale, which requires the examinee to memorize semantically unrelated word pairs, for failing to capture “real life cognitive competence” (Goodman & Zarit, 1995, p. 40).

As a result, cognitive psychologists have recently attempted to develop more *ecologically valid* measures. For example, Goodman and Zarit (1995) investigated two cognitive measures with a sample of women aged 75 or older to assess their ecological validity. One of the measures was the Memory in Reality (MIR) test in which the individual has to remember where an object has been placed. Although this measure was not shown to have high ecological validity (Goodman & Zarit, 1995), this attempt reflects the current trend in research on memory and aging to develop ecologically valid measures. Some researchers have suggested that a prose recall task might be an ecologically valid memory measure (Goodman & Zarit, 1995). However, research confirming its validity has yet to be reported in the literature.

Subjective Measures

The correlation between performance on objective and subjective measures of memory is relatively low (Floyd & Scogin, 1997; Knight & Godfrey, 1995; McDonald-Misaczak, Hertzog, & Hultsch, 1995). Any assumptions about the effectiveness of memory training on the subjective memory characteristics (e.g., satisfaction with memory and awareness of deficits) of older adults based on their performance on objective memory measures are, therefore, unwarranted. However, only within the past few decades have researchers begun to investigate the effects of memory training on subjective memory characteristics of older adults (Treat et al., 1978; Verhaeghen, Van Ranst, & Marcoen, 1993). This led to the development and revision of measures designed to assess subjective memory characteristics (Gilewski et al, 1990; Knight & Godfrey, 1995).

Commonly Used Measures

Metamemory in Adulthood (MIA) Questionnaire.

The main *subjective memory measure* employed in the studies reviewed is the Metamemory in Adulthood (MIA) Questionnaire, which consists of 108 items and seven subscales. This measure was developed by Dixon, Hultsch, and Hertzog (1988). The seven subscales covered include (a) Strategy (i.e., knowledge and use of memory strategies), (b) Task (i.e., knowledge of basic memory processes), (c) Capacity (i.e., beliefs regarding one's own memory capacities), (d) Change (i.e., perceived change in memory capacity), (e) Anxiety (i.e., relationship between anxiety and memory performance), (f) Achievement (i.e., one's motivation to perform well on memory tasks), and (g) Locus (i.e., perceived sense of control over memory skills). Participants rate the 108 statements on a 5-point Likert scale.

Reliability and validity issues.

The MIA is reportedly the most widely used subjective memory measure in current research (Gilewski et al., 1990; McDougall, 1998; Stevens et al., 1999; Verhaeghen et al., 2000). This measure has been administered to more than 10 samples, including more than 2,000 participants, and validated with another popular metamemory questionnaire, the Memory Functioning Questionnaire (MFQ) (Dixon et al., 1988). Furthermore, internal consistency reliability scores of the MIA are reportedly high and range from .71 to .93. The predictive validity between the MIA and performance on certain cognitive measures such as verbal comprehension tasks on intelligence tests has also been established (Dixon et al., 1988). Dixon et al. (1988) reported that they found "low to moderate correlations between MIA scales and measures of intellectual abilities" in a study they conducted in 1986 (p.673).

Moreover, the results of a longitudinal study of the stability of metamemory over time suggested that metamemory scores on the MIA are highly stable (McDonald-Misaczak et al., 1995). Some researchers have also attempted to establish the ecological validity of this measure. For example, Jonker, Smits, and Deeg (1997) administered the MIA and other measures (including behavioral observations) in the homes of their participants and found that metamemory scores predict memory performance in real-world settings.

Memory Functioning Questionnaire (MFQ).

Another subjective memory measure includes the Memory Functioning Questionnaire (MFQ). The MFQ is a 64-item questionnaire that resulted from an attempt to improve the Memory Questionnaire's (MQ) ability to assess the memory complaints of older adults (Gilewski et al., 1990). It was designed to evaluate memory complaints by examining (a) General Frequency of Forgetting, (b) Seriousness of Forgetting (i.e., perception of how critical memory failures are), (c) Retrospective Functioning (i.e., perception of present memory functioning relative to past memory functioning), and (d) Mnemonic Usage (Gilewski et al., 1990; Israel et al., 1994; Mohs et al., 1998). Internal consistency reliability scores of the MFQ are reportedly high and range from .83 to .94 (Gilewski et al., 1990).

Memory Controllability Inventory (MCI).

The Memory Controllability Inventory (MCI) is yet another example of a metamemory questionnaire. The MCI is a 20-item questionnaire that was designed to assess self-efficacy beliefs concerning memory (Caprio-Prevette & Fry, 1996; Lachman, Bandura, Weaver, & Elliot, 1995). This measure examines four subjective scales, which include (a) Present Ability, (b) Potential Improvement, (c) Effort Utility, and (d) Inevitable Decrement. The MCI is most often used in combination with other measures. For example, Rasmusson et al. (1999) administered both the MFQ and the MCI, and Caprio-Prevette and Fry (1996) administered the MCI in combination with the MIA.

Other questionnaire measures.

Additional subjective memory measures exist, although their use is not reported as frequently in the literature and they are frequently used in combination with other questionnaire measures. For example, De Vreese et al. (1996) employed the Sehulster Metamemory Scale (SMS) in combination with the MFQ. The SMS consists of 60 items assessing the individual's beliefs about his/her memory performance in everyday life. Rebok et al. (1997) employed the Everyday Memory Questionnaire (EMQ) in combination with the MIA and MFQ. The EMQ consists of 35 items that evaluate different types of memory errors that may occur during activities such as (a) speech, (b) reading and writing, (c) remembering faces and places, (d) performing specific actions, and (e) learning new things (Rebok et al., 1997).

However, these less well-known measures are sometimes the only subjective measure employed in research on memory. For example, Levy-Cushman and Abeles (1998) employed the Memory Assessment Clinics Self-Rating Scale (MAC-S), which includes 21 Ability items and 24 Frequency of Occurrence items, to assess the subjective memory complaints of their subjects. Schleser et al. (1986) employed the Memory Self-Efficacy Scale (MSES) and the Metamemory Inventory (MI), two subjective measures that are seldom reported in the literature. The MSES consists of 30 items concerning memory performance that the participants rate according to their beliefs about how likely they are to be able to perform each task (Schleser et al., 1986). The MI consists of over 50 items and is composed of 5 subscales, including scales measuring memory problems, attitudes about memory abilities, expectancy of memory decline, memory strategies, and knowledge about memory tasks (Schleser et al., 1986).

Limitations of Questionnaire Measures

Undoubtedly, the majority of these questionnaire measures appear valid and reliable. However, limitations can quickly be identified. For example, a single questionnaire measure is unlikely to capture all of the aspects of the construct of metamemory. Moreover, some of these subjective memory measures may be tapping into constructs loosely related to that of metamemory (e.g., the MIA's Anxiety subscale) Some researchers have argued that questionnaire measures such as the MIA are inherently invalid because the majority of these measures are highly correlated with the self-efficacy beliefs of the test taker and are therefore unlikely to reflect accurate measures of actual memory performance (Jonker et al., 1997; Rasmusson et al., 1999).

The response format of the questionnaire is also open to criticism. First, the individual must be able to read and comprehend the question. Next, the individual must choose an answer to the question, many of which ask about low-frequency behaviors (e.g., making shopping lists). Answers are not only likely to be affected by the individual's ability to estimate the occurrence of his or her behavior but might also be affected by social desirability factors and education levels (Gale & Deprez, 2003; Goodman & Zarit, 1995; Guralnick et al., 2003; Poon et al., 1978; Riley, 1999; Stevens et al., 2001; Treat et al., 1978).

Use of Multiple Measures

As a result of the limitations of questionnaire measures, some researchers have begun to include other measures in their research. Examples of these measures include task-specific predictions of memory performance known as "judgments of learning" (JOL), and confidence ratings following encoding of information, referred to as "feeling of knowing" (FOK) (Moulin et al., 2000a; Moulin et al., 2000b; Scogin et al., 1998).

In a JOL task, the participant is asked to rate how likely he or she is to recall an item later, after the information has been encoded but before the participant is tested for recall of the information (Shaddock & Carroll, 1997). This judgment is then examined for accuracy (Moulin et al., 2000a). The FOK task is similar to the JOL task except that this subjective rating is made subsequent to the retrieval of the to-be-remembered material (Moulin et al., 2000b).

Although these subjective measures also have limitations, the combination of these measures with the questionnaire measures is likely to permit researchers to increase their confidence in the conclusions and generalizations that can be made based on their findings. Otherwise, researchers must place qualifiers on the utility of their instruments. For example, Dixon et al. (1988) commented, “We do not consider the MIA to be a screening device for actual memory problems. It is instead a measure of knowledge, beliefs, and affect about memory which may be useful for both normal and clinical aging research” (p. 673).

Relationship between Performance on Objective and Subjective Measures

As stated above, the relationship between performance on objective and subjective measures of memory is modest at best (Floyd & Scogin, 1997; Gilewski et al., 1990; Stevens et al., 2001). As a result, two types of inaccuracy may occur. On the one hand, older individuals may fail to recognize memory declines when they have occurred. On the other hand, older individuals may perceive memory declines when no objective memory impairment can be identified (Turvey et al., 2000). However, accurate metamemory judgments are needed to function safely and efficiently in everyday life. Older individuals who fail to recognize memory declines when they have occurred may continue to engage in everyday activities (e.g., driving) that could be dangerous to themselves or others. Older individuals who perceive memory declines when none exists may limit their everyday activities unnecessarily and/or seek superfluous evaluations or treatment (Turvey et al., 2000).

Consequently, the memory abilities of older individuals with memory complaints are not necessarily weakened. Nevertheless, these individuals appear to have attitudes and expectations about their memory abilities that influence them to seek treatment (Gilewski et al., 1990; Scogin, 1985). An understanding of the relationship between objective and subjective memory is important because “diagnostic and treatment decisions are in part based upon the quality and quantity of elders’ complaints about their memory” (Scogin, 1985, p. 79). Therefore, developing strategies to assist older individuals with memory complaints through either increasing their awareness about their existing memory deficits or decreasing their unwarranted concerns about their memory is a worthy scientific cause. “Although these perceptions may not be veridical estimates of actual memory skills or competence, they nevertheless have a substantial impact on behavior in everyday memory-demanding situations” (Stevens et al., 2002, p. 139).

Test Batteries

Many researchers have decided to employ a battery of tests that combine objective and subjective memory measures (Knight & Godfrey, 1995; Piccolini et al., 1992; Poon et al., 1978). For example, the Contextual Memory Test (CMT) was designed to assess both objective and subjective aspects of memory (Gil & Josman, 2001). This standardized test includes measures of (a) immediate and delayed recall and recognition, (b) self-awareness and memory ability, (c) self-efficacy beliefs, (d) use of strategies, and (e) use of contextualization (i.e., background) in encoding material. Normative data reveals an alternate form reliability estimate from .73 to .81.

Most researchers agree that the *use of multiple measures* is warranted (Poon et al., 1978). However, no matter how many measures are employed, the data collected is useless unless the measures accurately reflect the constructs they propose to measure.

Metamemory: The Construct

A measure is always limited by how well it reflects the construct of interest (i.e., construct validity). Indeed, how researchers operationally define their constructs is of chief importance in scientific research. Unfortunately, this is also an area of frequent disagreement for most researchers.

Interest in studying *metacognitive processes* arose during the cognitive revolution of twentieth century. The term *metamemory*, or the practice of monitoring and reflecting upon one's own memory processes, was first coined by Flavell in 1971 (Kalska et al., 1999; O'Shea, Saling, & Bladin, 1994). Bandura's work on self-efficacy beliefs in the 1970s also impacted the development of the construct and measures of metamemory.

Initial research on metamemory focused on metamemory deficits in individuals suffering from different types of cognitive disorders. For example, Cooley and Stringer (1991) were among the first to demonstrate that memory and metamemory were independent because they were able to show that these two factors could be dissociated reliably in a sample of 23 brain-damaged patients. Specific attention to the metamemory characteristics of older individuals has grown over the last decade (O'Shea et al., 1994; Turvey et al., 2000; Verhaeghen et al., 2000).

The basic definition of metamemory usually includes the assessment of one's own memory abilities as well as knowledge of one's own memory processes in general (Craik et al., 1995). Some researchers also incorporate a use of that memory knowledge (i.e., involving executive functioning tasks) into their definition (Jurado, Junqué, Vendrell, Treserras, & Grafman, 1998). “Metamemory is an individual’s knowledge, perceptions, and beliefs about the functioning, development, and capacities of his or her own memory and the human memory system” (McDougall, 1998, p. 24). Other researchers have criticized this definition for not distinguishing between knowledge about memory and the processes underlying the use of this knowledge (O’Shea et al., 1994).

Some researchers have attempted to *localize* metamemory. Researchers have suggested that metamemory abilities are mediated by the frontal lobes (Jurado et al., 1998; Souchay, Isingrini, Pillon, & Gil, 2003). However, these attempts at localization have largely failed because research on individuals with damaged frontal lobes shows that these individuals appear to retain metamemory functioning, as evidenced by their continued ability to make accurate task-specific predictions of memory performance (O’Shea et al., 1994).

Some researchers have suggested *cultural differences* in metamemory judgments (Park & Gutchess, 2002). Although researchers have shown that differences in cognition become less apparent between Eastern and Western cultures as individuals age, Park and Gutchess (2002) theorized that differences in *metamemory characteristics* persist in old age. These researchers hypothesized that older adults in Western cultures might be more aware of their memory deficits and thereby work to enhance their metamemory judgments due to the individualistic/achievement-orientation of their culture. Conversely, they theorized that older individuals in Eastern cultures would be less attuned to their memory deficits and thereby make less realistic metamemory judgments due to the collectivist-orientation of their culture. Although these researchers have found some support for this hypothesis, the theory has yet to gain support from other researchers.

Research on the construct of metamemory grew out of the cognitive revolution of the twentieth century. The construct has undergone numerous theoretical shifts over the past few decades, and researchers continue to disagree on certain aspects of this abstract concept. Nevertheless, most agree that metamemory is a *multifaceted construct* that is worthy of continued scientific attention secondary to its association with older adults' quality of life (Caprio-Prevette & Fry, 1996; Craik et al., 1995; Fabre, Massé-Biron, Chamari, Varray, Mucci, & Préfaut, 1999; Goodman & Zarit, 1995; Loewen et al., 1990; Moulin et al., 2000a). For the purpose of the present paper the following definition of metamemory was employed: a self-appraisal of memory functioning and development involving one's knowledge, attitudes, and beliefs.

Summary of Metamemory Research

Current Findings and Implications

The concern many older individuals have for their memory is clearly valid. Research has repeatedly shown that declines in memory abilities occur with age. However, research also suggests that these memory concerns can be intensified by internalized ageist stereotypes and other factors affecting older individuals' satisfaction with memory and awareness of their personal strengths and weaknesses. Fortunately, researchers have shown that these stereotypical beliefs can be altered, and an individual's subjective memory experience can be modified to reflect his/her memory abilities more accurately (De Vreese et al., 1996; Levy-Cushman & Abeles, 1998; McDougall, 1998; Mohs et al., 1998; Turner & Pinkston, 1993). For example, the results of a study on coping with memory declines in aging performed by McDougall (1998) suggested that, “Interventions like memory training can increase elders’ sense of control and locus, and thus reduce anxiety about memory, making the quality of life better” (p. 36).

The evaluation of subjective impressions of memory impairment “plays an essential role when assessing the efficacy of intervention” (De Vreese et al., 1996, p. 11). If memory training programs are effective in improving the subjective memory characteristics of older adults, the clinical implications for both *preventive* and *restorative/compensatory care* are manifold (Ruff, 2003; West, 1995). These programs could help prevent the *loss of autonomy* often experienced by older adults with memory problems (Fabré et al., 1999). The training might help older individuals suffering some form of memory impairment to make better decisions regarding their ability to drive or cook, for example, and thereby lead to a decreased incidence of injuries and accidents (Turvey et al., 2000). Conversely, the training might provide concerned older individuals with intact memory abilities the confidence to continue to live their lives as independently as possible.

Individuals with significant memory decline could also benefit by their participation in memory training programs. “Metamemory plays a significant role in the rehabilitation of individuals with memory deficits. The awareness of personal strengths and limitations, as well as the knowledge of task requirements and available strategies are prerequisites for successful performance in everyday life” (Gil & Josman, 2001, p. 310).

Clearly, the implications for *preventive* and *restorative/compensatory care* are dependent on the success of memory training programs in enhancing the memory functioning and metamemory characteristics of older adults (Levy-Cushman & Abeles, 1998; Ruff, 2003; West, 1995). An individual with memory deficits and accurate metamemory judgments is more likely to choose an appropriate memory strategy than one who is unaware of his/her memory deficits and, therefore, unaware of his/her need for intervention (Gil & Josman, 2001). For example, an individual aware of his/her deficits would be more likely to ask another individual to remind him/her of something (e.g., when to take prescribed medications) as opposed to someone oblivious to his/her deficits (Stevens et al., 2001). Conversely, an individual with realistic expectations about his/her memory abilities (and with no objective memory impairment) would be more likely to attempt tasks such as living independently or continuing employment than one who possesses negative beliefs and attitudes about his/her memory abilities.

Limitations of Metamemory Research

Unfortunately, the results of the current research on older adults are mixed. Most researchers agree that metamemory is a *multifaceted construct* that is best measured by the use of *multiple measures*. Researchers also tend to agree that the effectiveness of memory training programs is maximized through the inclusion of many different training components (especially psychoeducational material) that are presented in a group format with some reliance on current technologies.

However, the *methodological flaws* of any single study and the *methodological variations* between the numerous studies conducted over the past three decades prevents any firm conclusions. Moreover, metamemory is loosely correlated with both objective memory performance and affective status (Levy-Cushman & Abeles, 1998). Individuals with negative self-perceptions about memory tend to score lower on objective memory measures and are more likely to be suffering from depression than someone with positive self-perceptions about memory (Levy-Cushman & Abeles, 1998; Gilewski et al., 1990). These confounds limit the generalizability of research results to date by preventing causal connections from being made. Justifiable conclusions can only be made by integrating the work of various researchers and examining different methodological variables.

Purpose of this Study

The purpose of this study is to *integrate the recent research findings in the area of metamemory research*. In particular, the following research questions have been raised by this review of the literature: (a) How *effective* are memory training programs in improving the subjective memory characteristics of healthy older adults with memory complaints? (b) Which *components* of the memory training programs increase the effectiveness of memory training (in terms of metamemory characteristics)? (c) How do the results of this meta-analysis compare to those reported by Floyd and Scogin (1997)?

Chapter 3

METHOD

Rationale for Conducting a Meta-Analysis

As set forth in the literature review, meta-analytic studies are necessary to integrate the findings of researchers who have been unable to reach conclusive findings secondary to the methodological flaws and inadequate power of single studies. In the present meta-analysis, an attempt was made to assimilate the results of recent research on the effectiveness of memory training programs in improving the subjective memory characteristics of healthy older adults. Because numerous memory training programs have been conducted and evaluated since 1997 (the year that the only other meta-analysis on this specific topic was published), the completion of another meta-analysis incorporating the results of *recent research* was warranted.

Data Collection

Search Method

Research studies were collected through a thorough search of the following popular research databases: *PsychLit*, *Medline,* and *Dissertation Abstracts International* using keywords such as memory training programs, cognitive training, metamemory, subjective memory, aging, older adults, elderly, etc. Studies that were suggested by their inclusion in the references section of other studies were also considered for inclusion in the meta-analysis. Studies used in the meta-analyses conducted by Verhaeghen et al. (1992) and Floyd and Scogin (1997) were considered for inclusion in the present meta-analysis if they met selection criteria. However, the focus of the present meta-analysis was on recent research. To ensure focus on recent research and to prevent undue overlap from studies included in the meta-analyses conducted by Verhaeghen et al. and Floyd and Scogin, only studies published after 1990 were included in the present meta-analysis. Approximately one-third of the studies analyzed in Floyd and Scogin's (1997) meta-analysis were published after 1990.

A total of 16 research articles with 17 studies meeting the inclusion criteria were located and incorporated into the present meta-analysis. Six of these research articles were included in the meta-analysis performed by Floyd and Scogin (1997). The 17 studies employed a total of 1,163 research participants whose average age was 71.0 years. It should be noted that all of the articles located were published in refereed journals, as this researcher was unable to locate unpublished material despite numerous written requests to prominent researchers in this area of research.

Inclusion/Exclusion Criteria

Due to the immense variability in research on memory training, certain inclusion/exclusion criteria were applied to potential studies to be included in the present meta-analysis. More specifically, the following criteria had to be met for a study to be considered for inclusion in this meta-analysis.

Use of Healthy Older Adults

As discussed in the literature review, numerous confounding variables are introduced into a study by allowing older adults with various forms of cognitive impairment (e.g., dementia), health problems associated with cognitive disturbance (e.g., history of transient ischemic attacks), and affective disorders (e.g., depression) to participate in experiments assessing the usefulness of memory training. Therefore, only studies employing healthy older adults were considered for inclusion in the present meta-analysis. Studies that did not report any attempts to screen participants for possible impairment (by using instruments such as the MMSE, for example) were not included.

Research Design

Researchers differ in their choice of research designs. Due to the confounding variables introduced by case study/naturalistic designs, only true experiments and quasi-experimental designs were considered for inclusion in the present meta-analysis. Moreover, experiments and quasi-experiment had to meet certain requirements. These requirements included adequate description of treatment group(s) and any attention-placebo or delayed-training control group(s) examined in the study, use of reliable measures, and use of appropriate statistics.

Training Components

Researchers use a variety of intervention techniques (e.g., mnemonic training and psychoeducation) to improve the memory performance of older adults. Studies were considered for inclusion in the present meta-analysis only if the researchers incorporated at least one intervention aimed at improving the subjective memory characteristics of their participants.

Memory Measures

Researchers measure the effects of memory training programs in multiple ways, using a variety of measures. To be considered for inclusion in the present meta-analysis, the researcher must have included pre- and post-test results of at least one measure assessing subjective memory characteristics of their participants (e.g., MIA or MFQ). Exceptions to this include studies that already reported effect size values or those which reported statistics that allowed the calculation of an effect size by other statistical means (e.g., *F* value).

Reporting of Adequate Statistics

Studies had to report adequate statistical information to allow for the calculation of the effect size to be considered for inclusion. For example, studies not reporting the number or mean age of participants would not permit certain analyses of the data and were, therefore, disregarded.

Initially, 20 studies were located to be included in this meta-analysis. However, due to the absence of needed statistical information, 3 of these studies had to be excluded, resulting in 17 studies that met all inclusion criteria.

Examination of Data Variables

Studies that met the above inclusion criteria were examined thoroughly for the following types of information: number of participants included in the study, mean age of participants, type of group (treatment, placebo, control), type and number of training components utilized, length of training sessions, training modality (i.e., individual versus group), and use of technologies. The mean age of participants was coded as a continuous variable. Type of group was coded as a categorical variable. All other variables were coded in a dummy format because the following hypotheses had been derived based on the literature review: (a) Multifactorial approaches are more effective than single intervention approaches, (b) Training sessions lasting 90 minutes or less are more effective than those lasting longer than 90 minutes, (c) Group format is more effective than individual presentation of material, and (d) Use of technologies is more effective than absence of technologies.

Coding of Training Component Variables

The number of training components utilized in the memory training was coded as a dummy variable (a score of 0 meaning only one technique and a score of 1 meaning more than one technique). The type of training intervention was coded as a categorical variable. The following categories were established: (1) expectancy change (i.e., any technique presenting material to the participants that was intended to increase their knowledge concerning memory processes and how they relate to aging and/or reduce anxiety about memory loss in addition to training in any of a variety of mnemonic techniques; (2) traditional memory training (i.e., any technique clearly involving training in the strategic use of memory aids, such as imagery or location, but providing no psychoeducational material aimed at changing participants' expectations or beliefs about their memory); (3) placebo (i.e., material presented that does not teach a specific memory aid technique or provide information pertaining to aging and memory processes); and (4) control (i.e., no treatment provided or wait-list control group).

The length of the training session, training modality (individual versus group format), and use of technologies were coded as dummy variables. A score of 0 reflects sessions longer than 90 minutes in duration and a score of 1 reflects sessions less than or equal to 90 minutes. Similarly, a score of 0 indicates an individual training format and a score of 1 indicates a group format presentation. With regard to use of technologies, a score of 0 indicates no use of technologies and a score of 1 indicates use of at least one type of technology (e.g., audiotape, videotape, or computer) in the presentation of training material.

Calculation of Effect Size

Cohen's (1977) *d* statistic (standardized mean difference) was employed as the standard measure in calculating the effect size. This statistic allows for the comparison of pre- to post-treatment gains of treatment and control groups. The use of this statistic also allows for a simple comparison of the results to those of the previous meta-analysis performed by Floyd and Scogin (1997).

A repeated measures effect size (appropriate with a single-group pretest-posttest design) was employed in the vast majority of the studies included in this meta-analysis (Morris & DeShon, 2002). The effect size calculation for an independent-groups posttest design was employed in 3 studies that failed to report statistics that allowed for the calculation of the repeated measures effect size (Morris & DeShon, 2002). Also, one study already reported a repeated measures effect size in the results section of the article. All *d* values were corrected for small sample size to counter the effects of this confounding variable (Rosenthal, 1991).

Initially, effect sizes were calculated for treatment versus placebo/control groups. Effect sizes were then calculated for the specific type of training technique. The types of training recognized included expectancy change and traditional memory training. Effect sizes were also calculated for the two most popularly used subjective memory measures, the MIA (4 studies) and MFQ (8 studies), to examine whether these measures assess different aspects of metamemory that may be unequally responsive to memory training programs.

Regression Analyses

To examine the effects of certain variables on the magnitude of the effect size, regression analyses were conducted. A least squares approach was used in which each observation is weighted to account for variance in sample size and an error sum of squares statistic is calculated to examine the goodness of fit of the regression model. It should be noted that regression analyses were conducted instead of between-condition comparisons because it was hypothesized that the combination of the hypothesized variables would explain effect size variance better than the individual variables.

Research Questions

The first research question concerned the relative effectiveness of memory training programs in improving the subjective memory characteristics of older adults. This question was addressed by comparing pre- to post-test differences between treatment conditions, which were calculated using Cohen's *d* statistic. A homogeneity statistic was calculated to determine the significance of between-condition differences. If the average effect size between treatment conditions is significantly different from each other (with the treatment condition making significantly higher post-treatment gains on subjective memory measures), the researcher can confidently conclude that memory training programs are effective in improving the subjective memory characteristics of older adults.

A secondary analysis of the data examined whether various subjective memory measures assess different aspects of metamemory that may be unequally responsive to memory training programs. Effect sizes were calculated for the two most popularly used subjective memory measures, the MIA and MFQ. Other memory measures were not considered in this secondary analysis due to their limited occurrence in the literature.

The second research question concerned the influence of certain components of memory training programs (e.g., type of intervention, length of training sessions, training modality, use of technology) on the effect size magnitude. This question was addressed through regression analyses to determine whether the combination of these variables was significantly related to performance on subjective memory measures. Variables that significantly contributed to the variance of the effect size magnitude were considered to influence treatment outcome.

The third research question concerned the relationship between the results of the present meta-analysis with the meta-analysis conducted by Floyd and Scogin (1997). This question was addressed by comparing the average effect sizes for the treatment conditions included in both meta-analyses.

Chapter 4

RESULTS

Training Effectiveness

Treatment v. Placebo/Control Conditions

The effect sizes for pre- to post-test scores of treatment conditions for each study are reported in Table 1. The effect sizes for pre- to post-test scores of placebo/control conditions for each study that employed such a condition are reported in Table 2. The weighted average effect size for the entire sample of treatment conditions (k = 26) was 0.39, a value that is significantly different from zero (95% confidence interval: 0.29 to 0.49). The weighted average effect size for the entire sample of placebo/control conditions (k = 10) was -0.10, a value that is not significantly different from zero (95% confidence interval: -0.27 to 0.07). The total homogeneity statistic was significant ($Q_T(35) = 138.60$, $p < .05$), indicating significant differences in training effectiveness across conditions. The between homogeneity statistic was also significant ($Q_B(1) = 24.35$, $p < .05$), indicating a significant difference in effectiveness between the treatment and placebo/control conditions.

Expectancy Change v. Traditional Memory Training Conditions

To examine the variability within the treatment conditions, follow-up analyses calculating weighted average effect sizes for expectancy change conditions versus traditional memory training conditions were conducted. This analysis of the data revealed the following: The weighted average effect size for the entire sample of expectancy change conditions (k = 15) was 0.39, a value that is significantly different from zero (95% confidence interval: 0.27 to 0.51). The weighted average effect size for the entire sample of traditional memory training conditions (k = 11) was also 0.39, a value that is significantly different from zero (95% confidence interval: 0.23 to 0.55). The total homogeneity statistic was significant ($Q_T(25) = 103.17$, $p < .05$), indicating significant differences in training effectiveness among conditions. However, the between homogeneity statistic was not significant ($Q_B(1) = .01$, $p > .05$), indicating nonsignificant differences in training effectiveness between the two conditions and significant differences within conditions.

Fail-safe Ns

Fail-safe *N*s were calculated for all effect sizes found to be significant thus far. For the treatment conditions (*k* = 26), the fail-safe *N* was 2,336, which indicates that this finding was a relatively stable one. For the expectancy change conditions (*k* = 15), the fail-safe *N* was 976, indicating that this finding was a relatively stable one. For the traditional memory training conditions (*k* = 11), the fail-safe *N* was 277, again indicating that this finding was a relatively stable one. For the placebo/control conditions (*k* = 10), the fail-safe *N* was 1.25, indicating that the stability of this finding is questionable.

Responsiveness of Subjective Memory Measures

MIA v. MFQ

To determine whether various subjective memory measures assess different aspects of metamemory that may be unequally responsive to memory training programs, effect sizes were calculated for the two most popularly used subjective memory measures, the MIA and MFQ. The weighted average effect size for the entire sample of conditions employing the MIA (k = 5) was 0.25, a value that is significantly different from zero (95% confidence interval: 0.07 to 0.43). The weighted average effect size for the entire sample of conditions employing the MFQ (k = 11) was 0.40, a value that is significantly different from zero (95% confidence interval: 0.23 to 0.57). The total homogeneity statistic was significant ($Q_T(15) = 76.01$, $p < .05$), indicating significant heterogeneity among conditions. However, the between homogeneity statistic was not significant ($Q_B(1) = 1.55$, $p > .05$), indicating nonsignificant differences in the responsiveness of subjective memory measures between the two conditions.

Fail-safe *N*s were calculated for these two conditions as well. For the studies employing the MIA (*k* = 5), the fail-safe *N* was 39, which indicates that this finding was a relatively stable one. For the studies employing the MFQ (*k* = 11), the fail-safe *N* was 289, indicating that this finding was also a relatively stable one.

Summary statistics for all effect size calculations reported thus far are provided in Table 3.

Moderator Analysis

Regression analyses were conducted to examine the effects of certain variables (e.g., type of intervention, length of training sessions, training modality, use of technology) on the magnitude of the effect size. A least squares approach was used in which each observation is weighted to account for variance in sample size and an error sum of squares statistic is calculated to examine the goodness of fit of the regression model. It should again be noted that regression analyses were conducted instead of between-condition comparisons because it was hypothesized that the combination of the hypothesized variables would explain effect size variance better than the individual variables. Table 4 provides data on how each study was coded according to the above variables.

The results of the regression analysis that was performed are presented in Table 5. As one can easily see from examining Table 5, none of the predicted moderators proved to be a significant predictor of the effect size magnitude. Furthermore, the R^2 value ($R^2(21) = .149$, $p > .05$) was nonsignificant, indicating that this grouping of variables was unable to explain a significant amount of the variance in the effect size magnitude. Therefore, no additional statistical examination was needed.

Comparison of Results to Previous Meta-Analysis

The weighted average effect size for subjective memory measures reported by Floyd and Scogin (1997) was 0.19 (95% confidence interval: 0.11 to 0.27). The repeated measures weighted average effect size found in the present study was 0.39 (95% confidence interval: 0.29 to 0.49). Because the confidence intervals for the two effect sizes do not overlap, it can be concluded that these effect sizes are significantly different from each other, with the effect size found in the present study being significantly higher than the one reported by Floyd and Scogin (1997).

Post-hoc Analyses

Upon reexamination of the data, certain characteristics of the output became apparent. Most notably, certain effect sizes in the treatment conditions had extreme values. Therefore, effect sizes values that were more than two standard deviations above or below the average effect size value (greater than 1.59 or less than –0.55) were eliminated, leaving a total of 34 effect size values (24 treatment effect sizes and 10 placebo/control effect sizes). The same calculations as described above were then repeated to examine whether removal of these outliers had a significant effect on between condition comparisons. Results were as follows:

Treatment v. Placebo/Control Conditions

After removing the two outliers, the weighted average effect size for the treatment conditions (k = 24) was 0.46, a value that is significantly different from zero (95% confidence interval: 0.36 to 0.56). The total homogeneity statistic was significant ($Q_T(33) = 83.59$, $p < .05$), indicating significant differences in training effectiveness across conditions. The between homogeneity statistic was also significant ($Q_B(1) = 6.47$, $p < .05$), however, indicating a significant difference in effectiveness between the treatment and placebo/control conditions. The fail-safe *N* for the treatment conditions (*k* = 24), was 2,202, which indicates that this finding was a relatively stable one.

Expectancy Change v. Traditional Memory Training Conditions

To reexamine the variability within the treatment conditions, post-hoc analyses calculating weighted average effect sizes for expectancy change conditions versus traditional memory training conditions were conducted. This reanalysis of the data revealed the following: The weighted average effect size for the expectancy change conditions (k = 14) was 0.56, a value that is significantly different from zero (95% confidence interval: 0.43 to 0.69). The weighted average effect size for the traditional memory training conditions (k = 10) was 0.30, a value that is significantly different from zero (95% confidence interval: 0.13 to 0.47). After removing the outliers, the total homogeneity statistic was significant ($Q_T(23) = 41.89$, $p < .05$), indicating significant heterogeneity in training effectiveness among conditions. The between homogeneity statistic was also significant ($Q_B(1) = 5.37$, $p < .05$), indicating significant differences in training effectiveness between the two conditions. For the expectancy change conditions ($k = 14$), the fail-safe *N* was 1,262, indicating that this finding was a relatively stable one. For the traditional memory training conditions ($k = 10$), the fail-safe *N* was 121, again indicating that this finding was a relatively stable one.

MIA v. MFQ

The weighted average effect size for the conditions employing the MIA (k = 4) was 0.63, a value that is significantly different from zero (95% confidence interval: 0.41 to 0.85). The weighted average effect size for the conditions employing the MFQ (k = 11) was 0.40, a value that is significantly different from zero (95% confidence interval: 0.23 to 0.57). The total homogeneity statistic was significant ($Q_T(14) = 32.27$, $p < .05$), indicating significant variability among conditions. However, the between homogeneity statistic remained nonsignificant even after removing outliers ($Q_B(1) = 2.57$, $p > .05$), indicating nonsignificant differences in the responsiveness of subjective memory measures between the two conditions. Fail-safe *N*s were calculated for these two conditions as well. For the studies employing the MIA, ($k = 4$), the fail-safe *N* was 110, which indicates that this finding was a relatively stable one. For the studies employing the MFQ ($k = 11$), the fail-safe *N* was 289, indicating that this finding was also a relatively stable one.

Moderator Analysis

Regression analyses were conducted again to reexamine the effects of certain variables (e.g., type of intervention, length of training sessions, training modality, use of technology) on the magnitude of the effect size after controlling for outliers. The results of the post-hoc regression analysis that was performed are presented in Table 6. By removing outliers from the data, the regression model proved to be a significant predictor of the effect size magnitude with two of the hypothesized moderators, multifactorial interventions and use of technology, being the best predictors in the model and another hypothesized moderator, training modality, approaching statistical significance within the model. The R^2 value ($R^2(19) = .461$, $p < .05$) was significant, indicating that this grouping of variables was able to explain a significant amount of the variance in the effect size magnitude.

Chapter 5

DISCUSSION

The interpretation of the findings in this meta-analysis is weakened by certain methodological limitations. Above all, this meta-analysis is limited by the type, number, and quality of the studies included in it. For example, because this meta-analysis only examined studies employing healthy older adults, the results cannot be generalized to work with older adults with varying forms of cognitive, medical, or psychological impairments. In a clinical setting, it is apparent that few older adults present with such clear-cut problems and are more likely to present with one or more types of cognitive, medical, or psychological impairment(s). Furthermore, if additional studies were included in this meta-analysis, the differences between hypothesized conditions might have been made more apparent.

Another limitation involves the fact that the present meta-analysis did not compute effect sizes for posttest scores at follow-up intervals. This weakness opens the results up to criticism concerning the long-term maintenance of treatment gains. Future research will need to address these issues of generalizability and long-term maintenance of treatment gains. However, taking these and other limitations into account allows for a more comprehensive understanding of the clinical implications of the above results.

The pre- to post-test effect size for training conditions ($d = 0.39$) is significantly larger than that for placebo/control conditions ($d = -0.10$). According to Cohen's (1997) suggested interpretation of effect size values, an effect size of 0.39 is a small effect size. As a result, it can be concluded that older adults benefited more from memory training in general than from placebo/control treatments.

Note also that the average effect size for treatment groups was heterogeneous, suggesting that different kinds of treatment might be unequally effective. The pre- to post-test effect sizes for expectancy change (d = 0.56) and traditional memory training groups (d = 0.30) were significant after removing outliers from the data. The significant difference between these two groups indicates that expectancy change conditions are indeed superior to traditional memory training programs, as expected.

Results of regression analyses performed after removing outliers revealed a significant influence of the hypothesized moderator variables on effect size magnitude. The hypothesized model was able to account for a significant amount of the variance in the effect size magnitude. More specifically, multifactorial interventions and those using technology had a significant positive impact on effect size magnitude, and group training modality approached statistical significance. As a result, researchers are encouraged to incorporate these components into future memory training programs.

In conclusion, the weighted average effect size for subjective memory measures reported by Floyd and Scogin (1997) was 0.19. This effect size is significantly less than the one calculated in the present meta-analysis (d = 0.39). More recent memory training programs may have incorporated the findings of past researchers on how to increase the effectiveness of these training programs, resulting in larger overall effect sizes in the present meta-analysis. In fact, review of the articles employed in the present meta-analysis attests to this postulation. For example, many of the researchers cited past research findings on multifactorial interventions, use of technology, length of training sessions, and training modality as influencing their decision to use a particular training format. Nevertheless, it should be noted that both represent a small effect size. As such, although this difference is statistically significant, the difference may not be clinically significant. Regardless, the results of both of these meta-analyses are worthy of clinical attention. It is to the clinical arena to which we now turn.

Because the majority of older adults express concerns about their memory and memory training programs have been shown to be an effective way to reduce these complaints, the incorporation of memory training programs into the medical, clinical, and social arenas has numerous practical implications. For example, successful participation in a memory training program may prolong an individual's ability to live independently and delay an individual's admission to a supervised living setting (e.g., nursing facility), thereby reducing national healthcare costs. As a result, medical and mental health professionals should begin to increase their knowledge base concerning memory training programs, and community leaders and organizations should begin to integrate memory training programs into residential facilities and community/senior centers in their communities.

Undoubtedly, modifying an older adult's beliefs and expectations about his/her memory abilities is a worthwhile endeavor that can result in far-reaching effects not only for the individual but also for his/her family and/or caregivers and community. Future research should focus on further examining variables that influence the effectiveness of memory training programs, including research on factors within the individual that influence treatment efficacy. Applied research is also needed to ensure that memory training programs are incorporated into real-world situations. By doing so, future researchers/practitioners will be working to improve the quality of life of future generations of older adults.

References

References marked with an asterisk indicate studies included in the meta-analysis.

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed. Text rev.). Washington, DC: Author.

*Best, D., Hamlett, K. W., & Davis, S. W. (1992). Memory complaint and memory performance in the elderly: The effects of memory-skills training and expectancy change. *Applied Cognitive Psychology, 6* (5), 405-416.

Blackwell, A. D., Sahakian, B. J., Vesey, R., Semple, J. M., Robbins, T. W., & Hodges, J. R. (2004). Detecting dementia: Novel neuropsychological markers of preclinical Alzheimer's disease. *Dementia and Geriatric Cognitive Disorders, 17,* 42-48.

*Caprio-Prevette, M. D., & Fry, P. S. (1996). Memory enhancement program for community-based older adults: Development and evaluation. *Experimental Aging Research, 22,* 281-303.

*Cavallini, E., Pagnin, A., & Vecchi, T. (2003). Aging and everyday memory: The beneficial effect of memory training. *Archives of Gerontology and Geriatrics, 37,* 241-257.

Chute, D. L. (2002). Neuropsychological technologies in rehabilitation. *Journal of Head Trauma Rehabilitation, 17* (5), 369-377.

Cohen, J. (1997). *Statistical power analysis for the behavioral sciences* (Rev. ed). San Diego, CA: Academic Press.

Collins, M. W., & Abeles, N. (1996). Subjective memory complaints and depression in the elderly. *Clinical Gerontologist, 16* (4), 29-54.

Cooley, E. L., & Stringer, A. Y. (1991). Self and observer predictions of memory performance in a brain-damaged sample. *Archives of Clinical Neuropsychology, 6*, 355-362.

Craik, F. I. M. (1994). Memory changes in normal aging. *Current Directions in Psychological Science, 3* (5), 155-158.

Craik, F. I. M., Anderson, N. D., Kerr, S. A., & Li, K. Z. H. (1995). Memory changes in normal ageing. In Baddeley, A. D., Wilson, B. A., & Watts, F. N. (Eds.), *Handbook of memory disorders* (pp. 211-241). New York: John Wiley & Sons.

*De Vreese, L. P., Belloi, L., Iacono, S., Finelli, C., & Neri, M. (1998). Memory training programs in memory complainers: Efficacy on objective and subjective memory functioning. *Archives of Gerontology and Geriatric Research, (Suppl. 6)*, 141-154.

*De Vreese, L. P., Neri, M., Boiardi, R., Ferrari, P., Belloi, L., & Salvioli, G. (1996). Memory training and drug therapy act differently on memory and metamemory functioning: Evidence from a pilot study. *Archives of Gerontology and Geriatric Research, (Suppl. 5)*, 9-22.

*Dellefield, K. S., & McDougall, G. J. (1996). Increasing metamemory in older adults. *Nursing Research, 45* (5), 284-290.

Dixon, R. A., Hultsch, D. F., & Hertzog, C. (1988). The Metamemory in Adulthood (MIA) Questionnaire. *Psychopharmacology Bulletin, 24* (4), 671-688.

ElderWeb. (2004). Little Brother/Friends of the Elderly. Retrieved March 15, 2004, from http://www.elderweb.com/orginfo.php

Fabre, C., Massé-Biron, J., Chamari, K., Varray, A., Mucci, P., & Préfaut, C. (1999).

Evaluation of quality of life in elderly healthy subjects after aerobic and/or mental training. *Archives of Gerontology and Geriatrics, 28*, 9-22.

Floyd, M. & Scogin, F. (1997). Effects of memory training on the subjective memory functioning and mental health of older adults: A meta-analysis. *Psychology and Aging, 12* (1), 150-161.

Folstein, M. F., Folstein, S. E., & McHugh P. R. (1975). Mini Mental State: A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatry Research, 12* 189-198.

Gale, J. A., & Deprez, R. D. (2003). A public health approach to the challenges of rural mental health service integration. In Stamm, B. H. (Ed.), *Rural behavioral health care: An interdisciplinary guide* (pp. 95-108). Washington, DC: American Psychological Association.

Gelfand, M. M. (2000). Sexuality among older women. *Journal of Women's Health & Gender-Based Medicine, 9* (Suppl. 1), S-15-S-20.

Gil, N., & Josman, N. (2001). Memory and metamemory performance in Alzheimer's disease and healthy elderly: The Contextual Memory Test (CMT). *Aging Clin. Exp. Res., 13* (4), 309-315.

Gilewski, M. J., Zelinski, E. M., & Schaie, K. W. (1990). The Memory Functioning Questionnaire for assessment of memory complaints in adulthood and old age. *Psychology and Aging, 5* (4), 482-490.

Glisky, E. L. (1995). Computers in memory rehabilitation. In Baddeley, A. D., Wilson, B. A., & Watts, F. N. (Eds.), *Handbook of memory disorders* (pp. 557-575). New York: John Wiley & Sons.

Goodman, C. R., & Zarit, S. H. (1995). Ecological measures of cognitive functioning: A validation study. *International Psychogeriatrics*, *7* (1), 39-50.

Gregorio, P. G., Diaz, S. P. R., Casado, J. M. R., & Dementia Group. (2003). Dementia and nutrition: Intervention study in institutionalized patients with Alzheimer's disease. *Journal of Nutrition, Health & Aging, 7* (5), 304-308.

Guralnick, S., Kemele, K., Stamm, B. H., & Greving, A. M. (2003). Rural geriatrics and gerontology. In Stamm, B. H. (Ed.), *Rural behavioral health care: An interdisciplinary guide* (pp. 193-202). Washington, DC: American Psychological Association.

Hasher, L., Zacks, R. T., Rahhal, T. A. (1999). Timing, instructions, and inhibitory control: Some missing factors in the age and memory debate. *Gerontology*, *45*, 355-357.

Iowa State University. (1999). Elderly/Disabled Organizations and Programs. Retrieved March 15, 2004, from http://www.exnet.iastate.edu/Pages/housing/links_org-prog.html

Israel, L., Melac, M., Milinkevitch, D., & Dubos, G. (1994). Drug therapy and memory training programs: A double-blind randomized trial of general practice patients with age-associated memory impairment. *International Psychogeriatrics, 6* (2), 155-170.

Ivgi, M., Beeri, M. S., Rabinowitz, J., & Davidson, M. (1999). A naturalistic study comparing the efficacy of a memory enhancement course to a general academic course. *International Psychogeriatrics, 11* (3), 281-287.

Johnsen, S., Hughes, S., Bullock, R., & Hindmarch, I. (2003). Prediction of the rate of decline in cognitive function in Alzheimer's disease: A model based on simple demographic data and widely used rating scales. *Dementia and Geriatric Cognitive Disorders, 16*, 276-282.

Jonker, C., Smits, C. H. M., & Deeg, D. J. H. (1997). Affect-related metamemory and memory performance in a population-based sample of older adults. *Educational Gerontology, 23* (2), 115-128.

Jurado, M. A., Junqué, C., Vendrell, P., Treserras, P., & Grafman, J. (1998). Overestimation and unreliability in "feeling-of-doing" judgments about temporal order of performance: Impaired self-awareness following frontal lobe damage. *Journal of Clinical and Experimental Neuropsychology, 20* (3), 353-364.

Kalska, H., Punamäki, R. L., Mäkinen-Pelli, T., & Saarinen, M. (1999). Memory and metamemory functioning among depressed patients. *Applied Neuropsychology, 6* (2), 96-107.

Kapur, N. (1995). Memory aids in the rehabilitation of memory disordered patients. In Baddeley, A. D., Wilson, B. A., & Watts, F. N. (Eds.), *Handbook of memory disorders* (pp. 533-556). New York: John Wiley & Sons.

Kazdin, A. E. (2003). Methodology: General lessons to guide research. In Kazdin, A. E. (Ed.), *Methodological issues and strategies in clinical research* (3^{rd} ed.) (pp. 877-887). Washington, DC: American Psychological Association.

Kingsberg, S. A. (2000). The psychological impact of aging on sexuality and relationships. *Journal of Women's Health & Gender-Based Medicine, 9* (Suppl. 1), S-33-S-38.

Knight, R. G., & Godfrey, H. P. D. (1995). Behavioural and self-report methods. In

Baddeley, A. D., Wilson, B. A., & Watts, F. N. (Eds.), *Handbook of memory disorders* (pp. 393-410). New York: John Wiley & Sons.

Lachman, M. E., Bandura, M., Weaver, S. L., & Elliot, E. (1995). Assessing memory control beliefs: The Memory Controllability Inventory. *Aging and Cognition, 2*, 67-84.

*Lachman, M. E., Weaver, S. L., Bandura, M., Elliot, E., & Lewkowicz, C. J. (1992). Improving memory and control beliefs through cognitive restructuring and self-generated strategies. *Journal of Gerontology: Psychological Sciences, 47* (5), P293-P299.

Lane, P., Kuntupis, M., MacDonald, S., McCarthy, P., Panke, J. A., Warden, V., et al. (2003). A pain assessment tool for people with advanced Alzheimer's and other progressive dementias. *Home Healthcare Nurse, 21* (1), 32-37.

*Levy-Cushman, J., & Abeles, N. (1998). Memory complaints in the able elderly. *Clinical Gerontologist, 19* (2), 3-24.

Loewen, E. R., Shaw, R. J., & Craik, F. I. M. (1990). Age differences in components of metamemory. *Experimental Aging Research, 16* (1), 43-48.

Lombardi, W. J., & Weingartner, H. (1995). Pharmacologic treatment of impaired memory function. In Baddeley, A. D., Wilson, B. A., & Watts, F. N. (Eds.), *Handbook of memory disorders* (pp. 578-601). New York: John Wiley & Sons.

McDonald-Misaczak, L., Hertzog, C., & Hultsch, D. F. (1995). Stability and accuracy of metamemory in adulthood and aging: A longitudinal analysis. *Psychology and Aging, 10* (4), 553-564.

McDougall, G. J. (1998). Gender differences in coping and control with memory aging.

Journal of Women and Aging, 10 (1), 21-40.

*Mohs, R. C., Ashman, T. A., Jantzen, K., Albert, M., Brandt, J., Gordon, B., et al. (1998). A study of the efficacy of a comprehensive memory enhancement program in healthy elderly persons. *Psychiatry Research, 77*, 183-195.

Morris, S. B., & DeShon, R. P. (2002). Combining effect size estimates in meta-analysis with repeated measures and independent-groups designs. *Psychological Methods, 7* (1), 105-125.

Moulin, C. J. A., Perfect, T. J., & Jones, R. W. (2000a). The effects of repetition on allocation of study time and judgments of learning in Alzheimer's disease. *Neuropsychologia, 38*, 748-756.

Moulin, C. J. A., Perfect, T. J., & Jones, R. W. (2000b). Evidence for intact memory monitoring in Alzheimer's disease: Metamemory sensitivity at encoding. *Neuropsychologia, 38*, 1242-1250.

Moulin, C. J. A., Perfect, T. J., & Jones, R. W. (2000c). Global predictions of memory in Alzheimer's disease: Evidence for preserved metamemory monitoring. *Aging, Neuropsychology, and Cognition, 7* (4), 230-244.

Neely, A. S., & Bäckman, L. (1993). Long-term maintenance of gains from memory training in older adults: Two 3½-year follow-up studies. *Journal of Gerontology: Psychological Sciences, 48* (5), 233-237.

O'Shea, M. F., Saling, M., & Bladin, P. F. (1994). Can metamemory be localized? *Journal of Clinical and Experimental Neuropsychology, 16* (4), 640-646.

Park, D. C., & Gutchess, A. H. (2002). Aging, cognition, and culture: A neuroscientific perspective. *Neuroscience and Behavioral Reviews, 26*, 859-867.

Piccolini, C., Amadio, L., Spazzafumo, L., Moroni, S., & Freddi, A. (1992). The effects of a rehabilitation program with mnemotechniques on the institutionalized elderly subject. *Archives of Gerontology and Geriatrics, 15*, 141-149.

Poon, L. W., Fozard, J. L., & Treat, N. J. (1978). From clinical and research findings on memory to intervention programs. *Experimental Aging Research, 4* (4), 235-253.

*Rasmusson, D. X., Rebok, G. W., Bylsma, F. W., & Brandt, J. (1999). Effects of three types of memory training in normal elderly. *Aging, Neuropsychology, and Cognition, 6* (1), 56-66.

*Rebok, G. W., Rasmusson, D. X., Bylsma, F. W., & Brandt, J. (1997). Memory improvement tapes: How effective for elderly adults? *Aging, Neuropsychology and Cognition, 4* (4), 304-311.

Riley. K. P. (1999). Assessment of dementia in the older adult. In Lichtenberg, P. A. (Ed.), Handbook of assessment in clinical gerontology (pp. 134-166). New York: John Wiley and Sons, Inc.

Rosenthal, R. (1991). *Meta-analytic procedures for social research.* (Rev. ed.). Newbury Park, CA: Sage Publications.

Ruff, R. (2003). A friendly critique of neuropsychology: Facing the challenges of our future. *Archives of Clinical Neuropsychology, 18*, 847-864.

Schleser, R., West, R. L., & Boatwright, L. K. (1986). A comparison of recruiting strategies for increasing older adults' initial entry and compliance in a memory training program. *International Journal of Aging and Human Development, 2 4* (1), 55-66.

Schmidt, F. (1996). Statistical significance testing and cumulative knowledge in psychology: Implications for training of researchers. In Kazdin, A. E. (Ed.), *Methodological issues and strategies in clinical research* (3rd ed.) (pp. 437-460). Washington, DC: American Psychological Association.

Scogin, F. (1985). Memory complaints and memory performance: The relationship reexamined. *Journal of Applied Gerontology, 4* (92), 79-89.

*Scogin, F., & Prohaska, M. (1992). The efficacy of self-taught memory training programs for community-dwelling older adults. *Educational Gerontology, 18*, 751-766.

*Scogin, F., Prohaska, M., & Weeks, E. (1998). The comparative efficacy of self-taught and group memory training for older adults. *Journal of Clinical Geropsychology, 4* (4), 301-314.

Shaddock, A., & Carroll, M. (1997). Influences on metamemory judgments. *Australian Journal of Psychology, 49* (1), 21-27.

Souchay, C., Isingrini, M., Pillon, B., & Gil, R. (2003). Metamemory accuracy in Alzheimer's disease and frontotemporal lobe dementia. *Neurocase, 9* (6), 482-492.

Stevens, F. C. J., Kaplan, C. D., Ponds, R. W. H. M., Diederiks, P. M., & Jolles, J. (1999). How ageing and social factors affect memory. *Age and Ageing, 28*, 379-384.

Stevens, F. C. J., Kaplan, C. D., Ponds, R. W. H. M., & Jolles, J. (2001). The importance of active lifestyles for memory performance and memory self-knowledge. *Basic and Applied Social Psychology, 23* (2), 137-145.

Taylor, L. L., & Yesavage, J. A. (1984). Cognitive retraining programs for the elderly: A case study of cost/benefit issues. *Clinical Gerontologist, 2* (4), 51-63.

Treat, N. J., Poon, L. W., Fozard, J. L., & Popkin, S. J. (1978). Toward applying cognitive skill training to memory problems. *Experimental Aging Research, 4* (4), 305-319.

*Troyer, A. K. (2001). Improving memory knowledge, satisfaction, and functioning via an education and intervention program for older adults. *Aging, Neuropsychology, and Cognition, 8* (4), 256-268.

*Turner, M. L., & Pinkston, R. S. (1993). Effects of a memory and aging workshop on negative beliefs of memory loss in the elderly. *Educational Gerontology, 19* (5), 359-373.

Turvey, C. L., Schultz, S., Arndt, S., Wallace, R. B., & Herzog, R. (2000). Memory complaint in a community sample aged 70 and older. *Journal of the American Geriatrics Society, 48* (11), 1435-1441.

U.S. Census Bureau. (2002). National population projections: Projected resident population of the United States as of July 1, 2025. Retrieved March 15, 2004, from http://www.census.gov/population.www/projections/np_p3.pdf

Verhaeghen, P., Geraerts, N., & Marcoen, A. (2000). Memory complaints, coping, and well-being in old age: A systematic approach. *The Gerontologist, 40* (5), 540-548.

Verhaeghen, P., Marcoen, A., & Goossens, L. (1992). Improving memory performance in the aged through mnemonic training: A meta-analytic study. *Psychology and Aging, 7,* 242-251.

*Verhaeghen, P., Van Ranst, N., & Marcoen, A. (1993). Memory training in the community: Evaluations by participants and effects on metamemory. *Educational Gerontology*, *19* (6), 525-534.

Weeks, D. J. (2002). Sex for the mature adult: Health, self-esteem and countering ageist stereotypes. *Sexual and Relationship Therapy*, *17* (3), 231-240.

Werner, P. (2000). Assessing the effectiveness of a memory club for elderly persons suffering from mild cognitive deterioration. *Clinical Gerontologist, 22* (1), 3-14.

West, R. L. (1995). Compensatory strategies for age-associated memory impairment. In Baddeley, A. D., Wilson, B. A., & Watts, F. N. (Eds.), *Handbook of memory disorders* (pp. 481-500). New York: John Wiley & Sons.

West, R., & Craik, F. I. M. (2001). Influences on the efficiency of prospective memory in younger and older adults. *Psychology and Aging, 16* (4), 682-696.

Wimberley, E. T., Herrera, A., Kidrowski, B., Brown, D., & L'Esperance, L. (2003). A cognitive and physical performance assessment of retirees entering a continuing care retirement community: The Moorings Assessment Protocol. *American Journal of Alzheimer's Disease and Other Dementias, 18* (2), 73-78.

Wolters, G., Bemelmans, K. J., Spinhoven, P., Theunissen, I., & van der Does, A. J. W. (1996, May/June). Immediate and intermediate-term effectiveness of a memory training program for the elderly. *The Journal of Cognitive Rehabilitation*, 16-22.

WVU Center for Health, Ethics, and Law. (2001). West Virginia Healthy People 2010 Objectives. Retrieved March 15, 2004, from http://www.wvdhhr.org/bph/hp2010/objective/29.htm

Yalom, I. D. (1995). The theory and practice of group psychotherapy (4th ed.). New York: Basic Books.

Table 1
Effect Sizes for Treatment Conditions

Study	*n*	*d*	95% CI for *d* Lower	Upper
Best et al.(1992)				
expectancy change	13	0.83	0.02	1.64
memory training	14	0.13	-0.62	0.88
Caprio-Prevette & Fry (1996)				
cognitive restructuring	56	-0.78	-1.13	-0.43
traditional memory training	61	0.54	0.18	0.91
Cavallini et al. (2003)				
loci mnemonic and strategic training	40	0.55	0.10	1.00
De Vreese et al. (1998)				
memory training SMC	39	0.16	-0.29	0.60
memory training AACD	20	0.25	-0.38	0.88
De Vreese et al. (1996)				
memory training	10	0.80	-0.12	1.72
Dellefield & McDougall (1996)				
memory training	73	0.37	0.03	0.70
Lachman et al. (1992)				
combined cogn. restructuring & memory skills	21	1.12	0.48	1.77
cognitive restructuring	21	0.63	0.01	1.26
Levy-Cushman & Abeles (1998)				
mood and memory training	88	0.30	0.00	0.60
Mohs et al. (1998)				
memory enhancement program	68	0.61	0.26	0.96
Rasmusson et al. (1999)				
microcomputer-based training	13	-0.24	-1.00	0.52
memory course	10	0.38	-0.52	1.28
audiotape training	12	0.08	-0.72	0.89
Rebok et al. (1997)				
memory improvement tapes	21	0.81	0.17	1.44
Scogin & Prohaska (1992)				
self-taught memory training	16	0.16	-0.54	0.86
Scogin & Prohaska (1998)				
combined self-taught plus group	21	1.15	0.51	1.80
self-taught memory training	19	0.20	-0.44	0.84
group memory training	19	0.77	0.11	1.44
Troyer (2001)				
memory education and intervention program	36	0.39	-0.08	0.86
Turner & Pinkston (1993) Experiment 1				
memory and aging workshop	27	1.49	0.91	2.07
Turner & Pinkston (1993) Experiment 2				
memory and aging workshop	17	0.89	0.18	1.60

Table 1 (continued)
Effect Sizes for Treatment Conditions

Study	*n*	*d*	95% CI for *d* Lower	Upper
Verhaeghen et al.(1993)				
memory training program	81	0.10	-0.21	0.41

Note: CI stands for confidence interval. *n* is the number of participants in the designated group. *d* is the effect size adjusted for small sample size bias. SMC stands for subjective memory complainers, and AACD stands for age-associated cognitive decline.

Table 2

Effect Sizes for Placebo/Control Conditions

Study	*n*	*d*	95% CI for *d* Lower	Upper
Best et al. (1992)				
art discussion control group	15	-0.02	-0.73	0.70
evaluation control	7	*id*	*id*	*id*
Cavallini et al. (2003)				
control group	20	*id*	*id*	*id*
De Vreese et al. (1996)				
control group	5	0.31	-0.96	1.57
Dellefield & McDougall (1996)				
control group	60	-0.05	-0.41	0.31
Lachman et al. (1992)				
memory practice	21	0.13	-0.48	0.74
control group	21	-0.30	-0.89	0.30
Mohs et al. (1998)				
video control group	74	-0.45	-0.76	-0.13
Rasmusson et al. (1999)				
wait-list control group	11	-0.23	-1.05	0.60
Rebok et al. (1997)				
control group	11	*id*	*id*	*id*
Scogin & Prohaska (1992)				
attention placebo	17	0.45	-0.24	1.14
delayed training control group	23	0.12	-0.47	0.70
Troyer (2001)				
control group	24	*id*	*id*	*id*
Turner & Pinkston (1993) Experiment 2				
wait-list control group	17	0.38	-0.31	1.07

Note: CI stands for confidence interval. *n* is the number of participants in the designated group. *d* is the effect size adjusted for small sample size bias. *id* stands for insufficient data available to calculate repeated measures effect size.

Table 3

Summary of Effect Size Statistics

Measure	*k*	*d*	95% CI for *d* Lower	95% CI for *d* Upper
Total sample				
Training conditions	26	0.39	0.29	0.49
Placebo/control conditions	10	-0.10	-0.27	0.07
Training conditions				
Expectancy change conditions	15	0.39	0.27	0.51
Traditional memory training conditions	11	0.39	0.23	0.55
Subjective memory measure				
Studies employing MIA	5	0.25	0.07	0.43
Studies employing MFQ	11	0.40	0.23	0.57

Note: CI stands for confidence interval. k is the number of effect sizes; *d* is the weighted average effect size; MIA refers to Metamemory in Adulthood Questionnaire; MFQ refers to Memory Functioning Questionnaire.

Table 4

Coding of Study Variables

Study	Group Type	Multi-factorial	Length of Sessions	Training Modality	Use of Technology
Best et al.(1992)					
expectancy change	EC	no	≤ 90 min.	group	no
memory training	TMT	no	≤ 90 min.	group	no
Caprio-Prevette & Fry (1996)					
cognitive restructuring	EC	yes	> 90 min.	group	no
traditional memory training	TMT	yes	> 90 min.	group	no
Cavallini et al. (2003)					
loci mnemonic and strategic train.	TMT	no	≤ 90 min.	group	no
De Vreese et al. (1998)					
memory training SMC	EC	yes	≤ 90 min.	group	no
memory training AACD	EC	yes	≤ 90 min.	individual	no
De Vreese et al. (1996)					
memory training	EC	yes	≤ 90 min.	individual	no
Dellefield & McDougall (1996)					
memory training	EC	yes	≤ 90 min.	group	no
Lachman et al. (1992)					
combined cognitive restructuring & memory skills	EC	yes	≤ 90 min.	group	yes
cognitive restructuring	EC	no	≤ 90 min.	group	yes
memory skills training	TMT	no	> 90 min.	group	no
Levy-Cushman & Abeles (1998)					
mood and memory training	EC	yes	≤ 90 min.	group	no
Mohs et al. (1998)					
memory enhancement program	EC	yes	≤ 90 min.	group	no
Rasmusson et al. (1999)					
microcomputer-based training	TMT	no	≤ 90 min.	individual	yes
memory course	TMT	yes	≤ 90 min.	group	no
audiotape training	TMT	no	≤ 90 min.	individual	yes
Rebok et al. (1997)					
memory improvement tapes	TMT	yes	≤ 90 min.	individual	yes
Scogin & Prohaska (1992)					
self-taught memory training	TMT	yes	≤ 90 min.	individual	no
Scogin & Prohaska (1998)					
combined self-taught plus group	EC	yes	> 90 min.	group	no
self-taught memory training	TMT	yes	≤ 90 min.	individual	no
group memory training	EC	yes	> 90 min.	group	no
Troyer (2001)					
memory education and intervention program	EC	yes	> 90 min.	group	no

Table 4 (continued)
Coding of Study Variables

Study	Group Type	Multi-factorial	Length of Sessions	Training Modality	Use of Technology
Turner & Pinkston (1993) Experiment 1					
memory and aging workshop	EC	yes	> 90 min.	group	yes
Turner & Pinkston (1993) Experiment 2					
memory and aging workshop	EC	yes	> 90 min.	group	no
Verhaeghen et al.(1993)					
memory training program	TMT	no	> 90 min.	group	no

Note: EC stands for expectancy change. TMT stands for traditional memory training. Multifactorial refers to more than one training component being utilized.

Table 5

Regression of Selected Moderator Variables on Effect Size in Training Conditions

Predictor	B	*B*	*p*
Regression model (Q_E = 7.71 , df = 25)			
Multifactorial intervention	0.0934	0.084	0.694
Length of training sessions ($\leq$90 min.)	-0.2200	-0.191	0.410
Group training modality	0.3030	0.246	0.303
Use of technology	0.3360	0.239	0.246

Note: Q_E is the statistic for error sum of squares.

Table 6

Post-hoc Regression of Selected Moderator Variables on Effect Size in Training Conditions

Predictor	B	*B*	*p*
Regression model (Q_E = 3.84 , df = 23)			
Multifactorial intervention	0.382	0.434	*0.026
Length of training sessions (≤90 min.)	-0.181	-0.205	0.293
Group training modality	0.350	0.397	**0.053
Use of technology	0.406	0.439	*0.026

Note: Q_E is the statistic for error sum of squares.
*indicates significance at the .05 level.
** indicates a value approaching statistical significance