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An Honor's Thesis

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Dementia is a clinical condition defined by numerous features in older adults, the most predominant of which is major cognitive impairment (APA, 1994). Dementia patients also commonly suffer from deficits in memory, as well as personality changes. These symptoms are progressive and can suddenly or gradually become severe enough to interfere with the individual's daily activities (Cherry & Plauche, 1996). The sources of dementia include diseases affecting the nervous system, and a number of neurologically-based abnormalities. Examples of dementia-causing diseases include Parkinson's disease, Multi Infarct disease, Cruetzfeld-Jakob disease, Pick's disease, and Alzheimer's disease (Cherry & Plauche, 1996). Parkinson's disease is a degenerative disorder, and although it is not actually categorized as a dementia, many of its symptoms mimic those present in dementia. The disease involves a loss of motor ability (speech is sometimes preserved), and impairments of thinking and memory processes. Patients with Parkinson's tend to live 10-15 years following the appearance of symptoms (Cherry & Plauche, 1996). Multi-Infarct dementia is a vascular dementia that tends to have a sudden onset and stepwise degeneration. The progressive loss of cognitive functioning in this dementia is due to transient ischemic attacks (TIAs) and other damage to the arteries that supply blood to the brain. Cruetzfeldt-Jakob disease is a very rare infectious disease caused by a virus (Cherry & Smith, 1998). Cruetzfeldt-Jakob patients experience severe mental deterioration and usually rapid death. Another rare cause of dementia is Pick's disease, which is similar to Alzheimer's but is different in neurological composition and abnormalities. The beginning symptoms of Pick's disease include disorientation and memory loss, which can then graduate to personality changes

and social manners. In the final stages, the patient is mute, rigid and incontinent (Cherry & Smith, 1998). Finally, Alzheimer's disease, with a prevalence rate of approximately 4 million people in the United States today, is the most frequently occurring of dementia syndromes that affect older adults (ADRDA, 1992).

Ten percent of the United States' population over age 65 are probable Alzheimer's patients. A startling 50% of people in the "oldest-old" (age 85 and above) group have been diagnosed with the disease (Zarit & Zarit, 1998). Due to the amount of recently published research surfacing in medical/psychological literature, the public's awareness about Alzheimer's has grown considerably in the past decades. Despite this recent heightened awareness, the disease is actually quite old. In 100 AD, the first traces of documentation of Alzheimer's symptoms can be linked to Aretaeus of Cappadocia (Cherry & Plauche, 1996). Approximately 17 centuries later, German neurologist Alois Alzheimer noticed what are now called amyloid plaques (accumulated dead proteins) along with neurofibrillary tangles (tangled nerve strands) in the brain of a dementia patient. He became the first to associate observable symptoms with alterations in brain tissue. Upon investigation, other severely demented individuals tended to show comparable changes, and in 1910, a friend of Alzheimer, physician Emil Kraepelin gave the disease its name (Enserink, 1998). Over the years, Alzheimer's disease has also been referred to as senile dementia, presenile dementia, senile dementia of Alzheimer's type, and organic brain disorder (Cherry et al., 1996). Alzheimer attributed the source of the disease to vascular arteriosclerosis. Today that hypothesis has been dismissed, and although the exact cause is not known, genetics, environmental toxins, abnormal proteins, and deficits in neurotransmitters such as acetylcholine are all suspected contributing factors (Cherry & Plauche, 1996; Perrig, Perrig, & Stahelin, 1997).

The onset of Alzheimer's disease is often very subtle. In the early stages, symptoms such as lapses for recently-acquired memories, orientation difficulties, reasoning and judgment impairments, all evolve gradually (Cherry & Plauche, 1996). As time passes, deficits such as aphasia (language difficulties, Mish et al., 1999) are observed in the individual—lexical abilities such as naming objects show deficits (APA, 1994). The onset of conditions such as agnosia (problems recognizing familiar objects, Mish et al., 1999) and apraxia (motor planning problem, Mish et al., 1999) contribute to the patient losing his/her ability to perform familiar tasks (Cherry & Plauche 1996). In later stages, losses in motor activities and patient rigidity set in, accompanied by abnormal sleep cycles (Mace & Rabins, 1999). By this time, changes in the person's personality and behavior are often quite noticeable. In final stages, coherent language ability is lost, as well as ambulatory capability (Cherry & Plauche, 1996). Death follows, usually by a secondary infection such as pneumonia or congestive heart failure. It is only after death that an autopsy may reveal the physiological abnormalities (amyloid plaques and neurofibrillary tangles in the brain which may begin to form 10 to 20 years before symptoms arise) that will confirm the disease's diagnosis (Coleman & Flood, 1987). Despite this, with the information available, probable diagnoses of Alzheimer's disease are currently made.

The provisional diagnosis of Alzheimer's disease involves qualifications of life-disrupting symptoms (similar to most psychological/psychiatric disorders), but more importantly it involves exclusion (Cherry & Plauche, 1996). Further, the individual is never diagnosed with Alzheimer's, instead a provisional diagnosis is made when all other possibilities have been ruled out. Gross cognitive impairment, especially in memory, is a key defining feature of Alzheimer's, however, it is crucial to first eliminate all other potential causes that are known to produce similar impairments, such as physiological conditions, pharmacological drugs and

psychopathologic conditions (ADRDA, 1992; Cherry & Plauche, 1996). Examples of such physiological conditions are normal pressure hydrocephalus, metabolic, endocrine, or electrolyte disturbance, dietary insufficiencies (vitamin B-12 and folate), and alcoholism (Cherry & Plauche, 1996). An important reason to rule these possibilities out, is that the memory dysfunction they cause is usually reversible (Cherry & Plauche, 1996). Because Alzheimer's is a degenerative disease, no deficit in Alzheimer's is reversible. Pharmacological agents that may cause mimicking memory and cognitive degeneration in older adults include both prescribed and over-the-counter medications: antimicrobials, antihyptertensives, analgesics, antihistamines, cardiovascular medications, etc. Again, memory problems and disoriented states caused by drug effects and reactions can often be reversed (Cherry & Plauche, 1996). Psychopathologic conditions such as acute grief, paranoid disorders, and depression can contribute to memory problems (Cherry & Plauche, 1996; Cipolli, Neri, De Vreese & Pinelli, 1996). A good example of a mental disorder which shows symptoms common in early dementia is clinical depression, which can cause apathy, problems concentrating and psychomotor slowing. It would be ill fated/unfortunate to treat the symptoms from any of these three categories as Alzheimer's symptoms which are irreversible and cannot be repaired.

When general dementia is diagnosed, the severity can be assessed by some type of rating scale. The Dementia Rating Scale evaluates cognitive functions including attention, speaking, and memory (Cherry & Plauche, 1996). The Mini Mental State Examination also assesses the level of cognitive impairment: orientation, recall, and language (Folstein, Folstein, & McHugh, 1975). The Global Deterioration Scale rates according to seven stages that describe the aforementioned deteriorations both in regard to normal aging as well as in Alzheimer's (Sheikh

& Yesavage, 1986). Used in conjunction with the GDS at assisting in diagnosis, is the Functional Assessment Staging Test (Reisberg, Ferris, deLeon, Crook, & Haynes, 1987).

The DSM-IV diagnosis of Alzheimer's addresses the presence of memory problems, aphasia, apraxia, agnosia, the severity of conditions, onset, and continual decline, of course, all among the exclusion of other possible triggers (APA, 1994; Cherry & Plauche, 1996). In an attempt to improve the probability of an accurate diagnosis, the National Institute of Neurological and Communicative Disorders and Stroke (NINCDS) joined with the Alzheimer's Disease and Related Diseases Association (ADRDA) on a project to establish better guidelines or criteria for diagnosis. A diagnosis of Alzheimer's disease according to the NINCDS/ADRDA requires meticulous neurophysiological and medical screenings, and ratings of mental state (McKhann et al., 1984). Following these procedures increases accuracy of diagnosis to 90% (in later stages of the disease). The full diagnosing criteria according to the DSM-IV (APA, 1994) and for the NINCDS/ADRDA is shown in Tables 1a and 1b (Cherry & Plauche, 1996); McKhann et al., 1984).

Obviously a cure cannot be formulated for an unknown cause, even still, researchers will try to find answers to the problem of alleviating the tiresome symptoms of Alzheimer's disease. Perhaps success in that area will open the door to a cure. Meanwhile, the focus is on acetocholinesterase inhibitors and anti-inflammatories. Anti-acetocholinesterase inhibits the enzyme that normally destroys acetylcholine after it is released from the presynaptic vesicles into the synaptic cleft. Abnormally low levels of acetylcholine are associated with memory loss in Alzheimer's, so these drugs would work to keep those levels a little higher (Rogers & Friedhoff, 1998). Unfortunately, negative side effects that include damage to the liver and gastrointestinal problems halted some of the first attempts at producing an effective acetocholinesterase

inhibitor. Lesser doses can be tolerated by some people, bringing some relief to individuals for several months, with fewer side effects (Barner & Gray, 1998). Anti-inflammatories, such as ibuprofen and naproxen sodium (which reduce the activation of cytokinesis (Aisen & Pasinetti, 1998), are of interest in the preventative area of medicinal treatment (Stewart, Kawas, Corrada & Metter, 1997). Some studies have shown modest yet significant results that these drugs can deter the disease, or slow its progression once in place. Environmental factors appear to have influence on Alzheimer's as well. For example, one study observed a correlation of higher education and mental activity, with significant resistance to Alzheimer's disease. Snowdon (1997) observed high education and continued mental activity in a study of 678 nuns. The rate of Alzheimer's in the sample was significantly low. It was even found that one nun continued to successfully function without any signs of the disease until her death at age 101, despite the amyloid plaques and neurofibrillary tangles found in her autopsy. Obviously, not all elderly persons can manage to fight off the symptoms of Alzheimer's so successfully. Furthermore, it is important to remember that Alzheimer's affects not only the patient, it affects family and primary caregivers as well.

Helping caregivers manage the symptoms their loved one or friend may be experiencing is important for both parties. Reducing problematic or stressful behaviors and enabling/promoting the patient's maintenance of functional independence are two general goals that can significantly ease the burden of caring for a dementia patient (Alzheimer's Association, 1998). Another is the implementation of a daily schedule/routine/ritual to establish consistency and security in situations that usually cause problems (Mace et al., 1999). When it comes to slowing the degeneration of mental processes, or alternatively building coping strategies for cognitive losses, research is making progress. The area of memory loss is a good example.

Background Information on Memory

The term "memory," refers to the multi-componential process of acquiring, storing and retrieving of information (Butters, Soety, & Becker, 1997). The complexity of memory processing may have to do with its vulnerability to disruption in old age. Thus, in order to understand memory deficits in both normal and pathological aging, it is necessary to recognize the distinctions between some different memory processing systems. Following is an explanation of memory according to the information-processing model (Atkinson & Shiffrin 1968).

Information that enters the brain is briefly recorded in sensory memory (Zacks, Hasher & Li, 1998). This sensory memory involves the brief passage of information from the senses into the central nervous system ("Simplified Model," 1999). Two examples of sensory memory are iconic memory (visual input) and echoic memory (auditory input) (Zacks et al., 1998). Most information passed into the sensory memory is lost when new information enters one of the senses. However, if attention is focused on it, the information may become part of the short-term memory. This area involves the temporary storage (primary memory) and processing of information (working memory) (Cherry & Smith, 1998). From here, information is either forgotten or consolidated through the use of encoding techniques such as repetition and rehearsal, which transfers the information to long-term memory. Long-term memory contains information acquired anywhere from decades ago to the recent past (e.g., 5 minutes ago) ("Simplified Model," 1999). Retrieving information from the long-term memory temporarily places it as active in working memory again. Some divisions of long-term memory include episodic memory, semantic memory, and procedural memory (Butters et al., 1997). Episodic memory involves the ability to remember one's past experiences based on contextual cues; it

reflects memory for information experienced in a specific context. Semantic memory involves the retrieval or recall of information from accumulated knowledge (Cherry & Smith, 1998). Both semantic and episodic memory are thought to be forms of explicit memory, in which the individual must consciously or deliberately try to recall information (Cherry & Smith, 1998). Procedural memory, however, is categorized under implicit memory (unintentional recall of information). Procedural memory is an automatic skill, the knowledge of how to execute certain tasks (Cherry & Smith, 1998; Zacks et al., 1998).

In regard to severity of deficit or decline in memory, aging tends to have varying effects on the different types of memory. Under short-term memory, primary memory shows very small or no age differences on assessments such as the WAIS Forward Digit Span (Cherry & Plauche, 1996; Weschler, 1955). Whereas working memory, tested by reading span (when cued recall the last word in a sentence), consistently shows large age differences. So it appears that aging affects short-term memory not in the passive capacity of the primary memory, but in working memory where the mental processes of storing and processing information occur at the same time (Cherry & Smith, 1998). In long-term memory, episodic memory shows some of the highest age-related differences, and it is often evaluated by free-recall tasks (Cherry & Plauche, 1996). Interestingly enough, when episodic is tested by recognition, the age differences tend to be far smaller. General information tests assessing semantic memory show small age differences (Cherry & Plauche, 1996; Cherry & Smith, 1998). These differences are predominantly due to an increase in time needed to retrieve the information as an individual grows older (Howard, 1996). Studies of procedural or implicit memory, using measures such as word completion tests, have shown extremely small or no age effects (Cherry & Plauche, 1996). To restate, only certain types of memory show age differences, and this information is important to know in attempting

to differentiate a cause. For instance, in general, memory differences are largest when a task involves deliberate processing that is self-initiated. An example of this being: there are no age differences in the recognition of complex pictures. When a picture lacking in semantic and perceptual detail is tested, age differences emerge, implying some sort of inverse relationship between the richness of the encoding context and the processing requirements to encode and later retrieve (Drevenstedt & Bellessa, 1993).

Non-cognitive Factors Affecting memory

It is important to note that there are some non-cognitive factors which may influence the magnitude of age-differences in memory performance. There is data (though somewhat inconsistent) for the correlation between an increase in health problems and age. Lab studies have been likened to homework for school rather than normal everyday memory requirements for adults (Butters et al., 1997). So far research has not pinpointed any other single factor other than aging that significantly affects changes in memory. Thus, the ability to distinguish normal aging from pathological memory aging may prove helpful (Cherry, West, Reese, Santa Maria & Yassuda, 2000).

Normal age-related cognitive memory change is also known as "minimal memory impairment," "age-associated memory impairment," "normal cognitive aging," or "benign senescent forgetfulness (Cherry & Smith, 1998)." Examples of memory loss associated with normal aging include problems with immediate and long-term retention, memory failures due to internal states (such as inattention, fatigue, interference), or due to external factors (information overload or inadequate retrieval cues), or a combination of internal and external factors (Cherry & Smith, 1998). On a more specific level, forgetting where a car was parked, an appointment, a birthday, or where one's keys were put, are all examples of normal memory lapses (Cherry &

Smith, 1998). It should be noted that age-related declines in memory in healthy older adults are not insurmountable; memory lapses should not prevent an older person from living a full and productive life. For example, the person may still in engage in most of the same leisure activities (e.g., reading, playing bridge, taking walks, etc.).

In contrast, memory problems due to pathological aging include: forgetting the names of one's family members or close friends, forgetting where the bathroom at home is, confusion of space and time, and difficulties with familiar tasks or activities (Cherry & Smith, 1998). As stated earlier, deficits in memory due to pharmacological agents, psychopathological or physiological conditions can often be reversed, but dementia-related declines are irreversible (Cherry & Plauche, 1996). Examples of these dementia-related declines can be observed in organic amnesia (selective loss of episodic memory), progressive fluent aphasia (semantic dementia), Alzheimer's disease (all parts of explicit memory affected, some aspects of implicit memory remain intact, at least initially), and subcortical dementia (impairment of implicit memory) (Butters et al., 1997).

There are implications, in regard to pathological memory aging, for individual older adults, caregivers, and society. The confusion, anxiety and fear from the losses in orientation abilities must be dealt with by the individual. He may become paranoid or depressed due to feelings of "knowing" that there are strange people in his house, who are touching his things, or wanting to go home to his house (yet he is IN his house). This implies many things for the caretaker(s) in his life as well. They must employ a high level of patience, and understand that it is not the person who is changed, it is his memory. Adaptive living may involve placing numerous cues around the home (e.g., assembling a current status scrapbook of the family and friends, a dry-erase board for date/event orientation, or a note on the hall closet "vacuum and

winter coats"), to help jog the affected individual's memory. It is relevant and necessary for society to be aware of the kind of degeneration that will affect elderly people; for example, an elderly person who has forgotten where she lives may wander the streets looking for her home, and the community needs to know how to react, and best help that person. Although her pathologically based memory declines can not improve, the memory lapses of normal aging can usually be trained to recover.

Memory Interventions

The Universal Decrementalist Perspective regards compensatory strategies and intervention techniques as having limited value (Cherry & Smith, 1998). Although this view is widely acknowledged as false, beliefs like this may thwart or hinder a person's efforts to improve their memory problems. In reality, research has introduced numerous mnemonic techniques in past decades, which consistently prove successful in aiding memory, specifically explicit memory (Cherry & Smith, 1998). A common hypothesis is that the strength of encoding has a direct relationship with successful recall (Butters et al., 1997). Some methods that are high in encoding emphasis include visual imagery (such as method of loci, and face-name mnemonic), the pegword method, verbal organization, the multimodal approach, and indirect memory training (Butters et al., 1997; Cherry & Smith, 1998).

Visual imagery is one of the most studied memory remediation techniques in elderly people (Butters et al., 1997). Use of visual imagery techniques to aid in recall, is documented as early as Aristotle and other Greek scholars of rhetoric (Cherry & Smith, 1998). Modern-day studies suggest that older adults have the ability to produce images that are of competitively similar quality as younger adults (Butters et al., 1997). A distinction within visual imagery that is a common focus of study is that of bizarre versus plausible imagery (Cherry & Smith, 1998).

Some would contest that associations elicited by bizarre imagery are stronger than those elicited by normal everyday thoughts. However, in older adults, the benefit from visual imagery techniques is small, and within that benefit bizarre imagery scores lowest in terms of helpfulness (Butters et al., 1997; Cherry & Smith, 1998).

Method of loci also has its roots with ancient scholars who needed aids in remembering lengthy orations. The method was originally developed from an experience with identifying dead bodies, by poet Simonides (ca.500 B.C.) (Butters et al., 1997); the idea is to use a familiar sequence of spatial locations to associate with items of information to be remembered. The information is then recalled in the proper order by visualizing a specific path to the different locations and accessing their contents. Examples of possible uses include information such as word lists and speeches. The success level of method of loci is high with college students (Cherry & Smith, 1998). Although there is data supporting usage in older adults as well, the technique is less useful for them, and extremely impractical for everyday use (Butters et al., 1997; Cherry & Smith, 1998).

The face-name mnemonic addresses the common problem of forgetting people's names in three steps: 1) identify a prominent feature of the person, 2) convert the name into a concrete image, 3) associate feature with name-image. For example, if "Mrs. Peters" had loud red eyeglasses, the image could be of Peter Rabbit wearing bright red glasses. Again, this technique is successful in older adults, even more so when the imagery used is normal everyday objects (instead of bizarre) (Butters et al., 1997).

Slightly higher in complexity is the pegword method. In this technique, the individual must learn a sequence of rhyming number-word pairs (e.g., One is a nun, two is like glue) (Cherry & Smith 1998). These concrete nouns serve as a "peg" from which items will be

recalled. Next, another word is added and attached to its pegword (e.g., Cake for a nun). The subject mentally goes through the number /rhyme sequence, and the successive pegwords should prompt the added word. This method is successful with college students, but it generally does not work with elderly persons (Cherry & Smith, 1998).

There is scant literature regarding the success of verbal techniques in improving memory deficiencies in the elderly. Improvements in memory due to training in verbal mediation have been observed in young adults (Butters et al., 1997). Although verbal elaborations of older adults are less detailed than those of younger adults, verbal skills and semantic memory decline very little with age; Thus methods to improve elaborations, based on associations of new information with already-known information, would seem worthy candidates for research. However, research has shown inconclusive data regarding whether these techniques prove to be helpful (Butters et al., 1997). For example, first-letter associations (acronyms), words or sentences formed from the first letter of things to be remembered, yield limited success with older adults (Butters et al., 1997).

Multimodal approaches to aiding memory (approaches utilizing visual and tactile stimuli in addition to auditory abilities that are used when processing task instructions) have, in some studies, eliminated or significantly lowered age differences in some memory abilities. Furthermore, age differences have been shown to be highest when the memory task presentation was unimodal, and reduced when bimodal (Butters et al., 1997). One study secured stability at 6 month follow-up after a presentation involving subject elaboration of both visual and verbal modalities (Sheik, Hill, & Yesavage, 1986).

A common focus of research with all mnemonic techniques is improvement. Pretraining, semantic elaboration, and relaxation are possible factors affecting the effectiveness of memory

aid procedures in older adults (Cherry & Smith, 1998). Study of these factors indicates increased success from the addition of pretraining sessions to various memory aid techniques, and as stated earlier, the benefits of pretraining have been observed in immediate recall as long as 6 months after the initial session (Sheik et al., 1986). Similarly, instructions that are more semantically elaborate tend to enhance recall of list items more efficiently than regular, dry instructions (Cherry & Smith, 1997). Visual imagery techniques, which may elicit anxiety in older adults (given that older adults sometimes find it difficult to form complex visual images), can be improved with the addition of relaxation techniques to the memory task procedure (Cherry & Smith, 1998). However, extra training and relaxation are not universal solutions. For example, it may be hard for elderly persons to attend multiple training and trial sessions. Other problems also arise with the efficacy of most mnemonic techniques in use with Alzheimer's disease.

The spaced-retrieval technique is a method of memory intervention that successfully improves recall of simple associations in older people with Alzheimer's disease. The benefits of spaced-retrieval have also been seen in people with neurological disorders (Schacter, Rich, & Stampp, 1985). The technique involves the prompted recall of specific information across time intervals that systematically expand between trials (Cherry, Simmons, & Camp, 1999). In spaced-retrieval, shaping procedures are applied to the encoding and then retention of a piece of information in memory. That information is learned and retained by prompting active recall over longer and longer periods of time. If the individual is unsuccessful at one of the systematically lengthened intervals, the information is restated and the previous interval time (interval length before mistake) is repeated. To illustrate, the piece of information might be the name of an object (e.g., a "mug"). After the participant is given this specific information to remember, immediate recall is solicited. If the name of the object, "mug," is recalled successfully, then the

interval between that recall and the next trial is expanded to 5 seconds. If the 5-second trial is successful, the next interval is increased to 10 seconds (after that, successful expansion moves to 20-second interval, then 40, then 60 seconds, and from there on, the interval increases by 30 seconds per trial). However, if the participant forgets the name of the object, "mug," at the 40-second trial, the next trial will revert to the previous interval of 20 seconds.

The researchers behind the first spaced-retrieval study (Landauer & Bjork, 1978) were curious about whether a certain spacing schedule might work better than any others to help recall a new piece of information in college students. The results of that study indicated that increasingly longer intervals were optimal. Some following studies occurred in the context of home settings (e.g., McKitrick & Camp, 1993), and some researchers such as Riley (1992) applied the technique to study in adults with dementia (as cited in Camp, Bird & Cherry, 2000). In Riley's study, the technique was successful; an older person in the early stages of a dementia, trained himself to use spaced-retrieval to remember new information (Camp et al., 2000). This technique has been found to be generally good for older adults who have problems with more cognitively demanding imagery-based mnemonic methods (Cherry & Smith, 1998), and it has specifically been shown to be helpful with the recalling names of caregivers and objects (Cherry & Simmons-D'Gerolamo, 1999; Camp & Schaller, 1989).

The primary aim of this study was to employ the spaced-retrieval training procedure in aiding probable Alzheimer's disease patients to learn name-face-detail associations (e.g., identify a target photograph, "This is Karri, and she is a teacher"). This study was designed to extend Hawley and Cherry's (in press) findings of success with remembering name-face associations trained via spaced-retrieval to adding a detail about the target person. We expected to further

reveal the range of use of spaced-retrieval in recall of associations in Alzheimer's disease patients.

Our second aim was to determine whether the name-face-detail training would transfer to a real person. The participants were trained using spaced-retrieval to learn a name-face-detail association of a real person through the use of photos. A transfer trial was be included to verify whether the learning applied to the real person in the photo.

METHOD

Participants and Individual Differences

Four persons with probable Alzheimer's disease from an adult day care center served as participants for the study. Tables 2 and 3 report the individual differences measures taken regarding demographic and health characteristics. Individual difference measures are described next. The Mini-Mental State Exam (MMSE) provided a measure of cognitive impairment (Folstein et al., 1975). The maximum possible score for the MMSE is 30, and the samples scores ranged between 9 and 19. The Geriatric Depression Scale (GDS) indicated whether the participant was showing signs of depression, and if so, the extent of severity (Sheik & Yesavage, 1986). A GDS score between 6 and 10 indicates mild depression, and the sample ranged from 2 to 4 (normal range). To determine a deficiency in general intellectual functioning and verbal ability, participants were scored on the short form of the WAIS vocabulary test (Jastak & Jastak, 1965). The sample's range on this exercise was from 1 to 18, the maximum possible score was 40 (sample's scores indicate impairment). To assess participants' immediate and secondary memory: The Wechsler Adult Intelligence Scale (WAIS, Wechsler, 1955) Forward Digit Span (FDS) (maximum score was 9, sample ranged 4 to 6.5), and Backward Digit Span (BDS) (maximum score was 8, sample ranged 2 to 3.5) measures indicated deficits in short-term and

working memory; Secondary memory was assessed through the Subject-Performed Task measure (SPT, Cherry & Simmons-D'Gerolamo, 1999). This particular measure involved the presentation of 10 inanimate objects, each of which participants were asked to perform an action with. They were then asked to free recall the objects and actions. If an item was not recalled, participants were cued with the object to elicit a description of what they did with the object. Participant responses to this were scoring on a "strict" basis (answers correct if response mirrored original instructions verbatim) and also on a lenient basis (answers not verbatim but correct in meaning, either verbally or physically repeating action with item). Table 4 reports the participants' scores on this task. Free recall scores were extremely low, regardless of strict or lenient methods of scoring, but responses improved when the objects were presented for a recognition cue.

Baseline Measures of Memory

At each training session, two secondary memory tasks were administered: the prospective nametag task and the shirt color task. The former provided a baseline measure of memory ability in performing a straightforward association (a motor motion to a verbal cue). The shirt-color naming task provided a baseline measure of 24- or 48- hour delayed recall of one piece of information.

Prospective Nametag Task. The participants (and experimenter) were given a nametag to be worn at each session. Participants were asked to return their nametag at the end of each session, when they heard the experimenter say, "We are finished for the day." Before moving on, participants had to repeat these instructions, demonstrating their comprehension of the task. This task was scored as follows: If the cue phrase elicited the handing back of the nametag, 4 points were scored. If additional cuing was needed, partial credit was recorded. If participant

responded after 2 repetitions, 3 points were score. If response occurred after 3 repetitions plus investigator touching own tag, 2 points were scored. 1 point was scored if response occurred after 4 repetitions and investigator removal of own tag. If participant had to be asked for the tag, no points were recorded. A total score from all 9 days was calculated for each person.

Shirt-color Naming Task. As previously mentioned, the shirt-color naming task provided a baseline measure of 24- or 48- hour delayed recall of one piece of information (the experimenter's shirt color in the previous training session). This answer always involved a plain, solid-colored shirt. Participants were told at the end of each session to remember what color the experimenter's shirt was. If participants did not spontaneously report the piece of information at the following session, there were cued. This task was evaluated as either pass (score 1 point) or fail (score 0 points).

Materials

Eight photographs of faces, taken from a church directory, and an additional target photograph were the experimental stimuli. The photographs were of adults ranging in age from 20 years to 50 years. Although race was held constant (to deter the possibility of memory-recall based on race), gender was varied to keep task difficulty lower. To provide for easy handling, the pictures were laminated and mounted on photo-sized pieces of foam board.

Spaced-Retrieval Training Sessions

Each session began with the experimenter casually chatting with the participant, to establish a rapport and ensure the participant was comfortable. Following, a 3 x 3 matrix was positioned on the table, facing the participant. The photographs were presented individually, along with the corresponding name, and the person's occupation, until the 9 photos were on the matrix. The sound of a beeper was then introduced to ensure participant ability of hearing the

sound. The participants were told to choose the "correct" photograph, give the person's name and occupation, and hand the picture to the experimenter on cue: "When my beeper sounds, I want you to hand me the picture of Karri the teacher, and tell me her name is Karri and she is a teacher." To score a correct target response, a visual cue of choosing the right photograph, a motor response of giving it to the experimenter, and a verbal response of the name and occupation had to occur. All 4 responses had to be demonstrated for the trial to be considered successful. The positioning of the target photo on the matrix was varied after each recall trial. Training was conducted for a maximum of 30 minutes.

The spaced-retrieval technique was used to help form the association between the beeper sound and the selection of the target photo amongst the distracter photos. A handheld stopwatch was used to control the retention interval schedule, as designed by Cherry and Simmons-D'Gerolamo (1999): The first interval was 5 seconds. If the trial was successful, the following intervals were 10, 20, 40 and 60s. If the 60 s trial was successful, the intervals increased by 30 s as long as recall was successful. At 180 s, if recall/retention was successful, the intervals increased by 60 s. At 360 s, successful recalls warranted interval expansions of 120 s.

Measures of Memory for Trained Name-Face-Detail Association

Immediate Recall/Recognition Task. At the end of each spaced-retrieval training session, immediate recall was tested by asking the participant to recall the name of the target person whom they had been trained on that day. If the task was unable to be performed, then all nine pictures were placed in front of the subjects and they were asked to choose the photograph that they worked with that day. This step was included to demonstrate the ability of immediate recognition.

Delayed Recall. In addition, delayed recall was measured at the beginning of each session by asking participants which picture they had worked with in the previous session. This determined whether the participants could remember the target picture from the previous session 24-48 hour delayed recall). However, here the target picture was not shown for recognition after delayed recall, as this might have affected the final recognition measure through extra exposures to the target beyond the initial spaced-retrieval training session.

Final Recall/Recognition. Final delayed recall and recognition were measured at the session following each completed week of spaced retrieval training sessions (sessions 6 and 9). This determined whether the participants were able to recall/recognize the target photograph used in the previous week. If unsuccessful, the participant was presented with the 9 pictures and then asked to identify the person they had been trained on.

Live Person Transfer Task

This measure was administered during session 6 and session 9, to determine whether the name-face-detail target photo association trained with spaced-retrieval would transfer to a real person. The live target entered the room, gave the experimenter a written phone message and they took a seat at the testing table. Recall task #1 involved the experimenter giving the participant a chance to spontaneously recognize the live person target.

If spontaneous recognition did not occur, the experimenter would say, "This is my friend, do you know her name and occupation?" (Recall task #2) Recognition task #1 took place as the experimenter further prompted, " Her picture is on the board. Would you hand me her picture?" If the participant still did not recognize the target photo, the experimenter took the target photo and gave it to the participant, saying, " Take another look at the picture. Now can you tell me

her name and occupation?" (Recognition task #2) These tasks were scored as either a pass or fail.

Final Face Recognition Task

On the final sessions of the experiment, participants were given a chance to give the name and occupation of all the photos used in the training sessions. This task served as a manipulation check of whether participants remembered the distracter pictures exposed in passing during spaced-retrieval training. In addition to the 9 photographs, 9 new photos not yet seen by the participants were placed before them. The experimenter then asked to be handed the photos the participant had seen before in any of the training sessions.

General Procedures

Training sessions were conducted in a secluded area at the adult day-care center. Nine training sessions were conducted over a four-week period, held on three alternate days of the week or on three consecutive days of the week[a]. Sessions were conducted as follows:

Day 1: Informed consent was obtained. Three individual difference measures were administered: FDS, MMSE, and the GDS. Nametag task also administered.

Day 2: Shirt color and nametag tasks administered. The three remaining individual difference measures were collected: BDS, SPT and vocabulary measure.

Day 3-5: Prospective nametag and shirt-color tasks administered. Spaced-retrieval trials (described later) conducted up to 30 minutes began, responses were recorded on prepared sheet. Following training, immediate recall and recognition of the target photograph was elicited. The procedures of days 4 and 5 were the same as day 3, except for the addition of the delayed recall measure at the beginning of the sessions.

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[a] Hawley and Cherry (in press) determined that scheduling training on alternate vs. consecutive days of the week did not produce an identifiable change in spaced-retrieval effects.

Day 6: Prospective nametag and shirt-color task administered. The final delayed recall and recognition task for the target photograph was administered, followed by the live person transfer task (described later). Then spaced-retrieval trials started again for the same target photo (responses recorded on a prepared sheet), and at the end of the session, immediate recall and recognition of the target photo were tested again.

Day 7-8: Prospective nametag and shirt-color tasks administered. The delayed recall task was given, followed by spaced-retrieval trials (responses recorded on prepared sheet). At the end of the session, immediate recall and recognition of the target photo was tested.

Day 9: Prospective nametag and shirt-color tasks administered. The final delayed recall task was given here, then the final face recognition task (described later) followed by the presentation of the live person transfer task. Participants completed a demographic questionnaire were debriefed and presented with a "Certificate of Appreciation and Participation" for completing the program.

RESULTS

Baseline Measures of Memory

Prospective Nametag Task. The results for the prospective nametag task are noted in Table 5. Total scores were calculated for the individual participants by summing the nametag task scores across all the sessions (36 is the highest possible score). Participants' scores range from 0 to 7 points, as follows: S1 = 0 points, S3 = 0 points, S4 = 4 points, S5 = 7 points. Overall, participants were unable to remember what to do when they were first cued to return their nametags. S1 and S3 were never able to remember how to respond to the cues. Furthermore, those who did correctly respond in one or more sessions (S4 and S5) did not remember to return their nametags until several cues had been given.

This performance on the prospective nametag task supports the concept that mere repetition of material is not enough to result in significant memory benefits for older adults with pathological memory impairment. Spaced-retrieval training is needed to observe such benefits in memory.

Shirt Color Naming Task. Participants were given a score of 1 if they were able to remember the color of the experimenter's shirt worn in the previous session, and a score of 0 was recorded if they were unsuccessful. None of the participants were able to successfully complete this task in any of the 9 sessions. This deficit in memory is comparable to the memory deficits observed in the Subject Performed Task (Table 4). These findings also support the insufficiency of mere repetition of material to benefit older adults with pathological memory impairment. As with the nametag task, it is evident that spaced-retrieval training is needed to benefit impaired memory.

Spaced Retrieval Trials

General Impressions of Performance. Table 6 reports the trial successes (i.e., number correct), partial successes, failures and longest interval duration across all trials and training sessions. All participants improved on the name-face-detail association overall across sessions with spaced-retrieval training. The average number of failed trials tended to decrease between session 1 and session 6. Additionally, the longest duration showed an overall increase throughout the sessions. In other words, all participants were able to correctly retain the name-face-detail association for increasingly longer retention intervals across training.

A correct response consisted of 4 elements: selecting the target photo, handing it to the experimenter, providing the correct name, and providing the correct job. A response was scored as correct only if all 4 elements were successfully completed. If at least one of the elements was

present it was considered a partially correct trial. Table 7 consists of the proportion scores of partially correct items for each participant. These scores were derived by dividing the number of partially correct trials within session by the total number of failed trials within session. During the first three sessions of spaced retrieval training all participants showed an increase in their proportion scores, with the exception of S4, who had no failed trials in session 3. Sessions 3 through 6 also resulted in improvement in proportion scores for S1 (S3's scores and levels of impairment were highly variable across sessions; scores for S4 and S5 are misleading because the number of failed trials was extremely low, therefore having 0 partially correct trials is less significant, see table 6).

Table 8 contains the breakdown of each area in which individual participants made errors in partially correct trials for each session. The table further discriminates in how many cases of partially correct trials was each element solely responsible for the failing of the trial. Note that providing the correct name for the target photo was not only frequently missed in a partially correct trial, but it also was commonly solely responsible for the failure of a trial. Conversely, providing the correct job was missed less frequently and trials were never failed because of forgetting just the job (except in S3 sessions 4, 5 and 6, in which performance was rather poor overall). Another interesting observation noted only in S1 was the substitution of the correct target name for the name on the experimenter's nametag, a situation which occurred numerous times throughout training.

Table 9 reports the participants' individual performances on the live person transfer task. S5 was the only person to recall the target name or job in the week 1 transfer task (free recalled job only). Most participants were able to recognize the target picture after week one even though they could not remember her name or job (S3 and S4 were also able to provide the correct job).

After week 2, though other participants still could not make a complete transfer, S5 not only asked if the person's picture was on the board, but also correctly provided the name and job. A more detailed analysis of each participant's performance follows.

S1: Detailed Analysis. S1 received spaced-retrieval training for two weeks on an alternate day schedule (M, W, F). In session 1, S1 longest time interval was 40 s. In session 5, S1 reached and successfully passed a retention interval of 60 s (session 6 had a longest duration of 40 s again). In both week 1 and 2 of the live person transfer task, S1 was unable to recall the target person, successfully recognized the target picture, but ultimately could not recall the live target's name or job.

S2: Detailed Analysis. Only preliminary individual difference measures (no spaced-retrieval training) were completed with S2, due to attrition.

S3: Detailed Analysis. S3 received spaced-retrieval training for two weeks on an alternate day schedule (M, W, F). In session 1, S3 passed a time interval of 5 s. In session 6, S3's retention had increased to 20 s. S3 showed improvement in her longest time duration over all sessions.

In week 1 of the live person transfer task, S3 was unable to recall the target person. However, S3 did recognize the target picture, and although she did not remember the target's name, she did remember the target's job. In the second transfer task, S3 was unable to recall or recognize the target person or picture. S3's deterioration on this measure may be due to the general variability of her impairment/condition on a session to session basis. This performance is interesting because in the final delayed recognition task, which occurred almost immediately before the second transfer task, S3 indicated the target photo when all 9 photos were presented for recognition.

S4: Detailed Analysis. S4 received spaced-retrieval training for two weeks on a consecutive day schedule (T, W, Th). Session 3 was moved back a day due to patient absence, reflecting a 48-hour delay instead of 24 hours. In session 1, S4 reached a longest time interval of 60 s. By session 5, the longest time interval increased to 360 s (it remained at 360 s in session 6 as well). S4 showed improvement in longest duration across sessions.

In both weeks 1 and 2 of the live person transfer task, S4 was unable to recall the target but recognized the target's picture. In both weeks, S4 could not provide the target's name or job at all in the transfer task.

S5: Detailed Analysis. S5 received spaced-retrieval training for two weeks on a consecutive day schedule (T, W, Th). S5 was absent for session 6, and S5 went on into the final transfer task day with out a make –up session being conducted. In session 1, S5 reached a longest time interval of 90 s. By session 5, the longest time interval increased to 480 s. S5 showed improvement in longest time interval across sessions.

In week 1 of the live transfer task, S5 was able to recall the target's job. In week two S5 asked if the target's photo was on the board, and then provided the correct name and job. S5 showed the most outstanding improvement and success of all the participants.

Explicit Memory for the Target Person

Immediate Recall/Recognition. At the conclusion of the spaced-retrieval training sessions, participants were asked to free recall the target person. If they were unable to do so, the pictures were then laid out to allow for recognition, and then participants were asked about the target information a second time. The results for each participant are reported in Table 10. In the first week, only S4 was unable to successfully recall either the target name or job. All other participants were able to at least free recall the target job at some point during the week,

and S5 was able to correctly recall both the target name and the target job on day 5. However, S4 was able to recognize the picture, name and job once, upon presentation of the pictures in week 1. During week two, S1 was only able to recognize the correct picture and provide the target job at that point. S3 surprisingly free recalled both the correct name and job on Day 7, but then was unable to do so on day 8. Again, S4 was more successful with recognition, and made improvements from the week before. S5 successfully free recalled the target name and job for day 7 and was absent on day 8.

Overall, the participants were very successful with picking out the target photo amidst the distracter photos, and several were often then able to give at least the target job as well (S1 and S4 specifically). These data suggest that although the participants may not have been able to access it during free recall, the knowledge of the target person may have been present. Similar results occurred in the SPT, in which participants also recalled more successfully when a cue was present (vs. free recall) (See Table 4).

Delayed Recall. The results of the delayed recall task are reported in Table 11. The performance overall on this task was poor. Only S4 and S5 were ever able to successfully recall the target; S4 was partially correct on day 7, and S5 was correct on Day 7. All other participants failed to recall the target in this task on all four days. These data are similar to the findings both of the SPT and of the immediate recall task: Participants failed to remember a target when tested by mere free recall.

Final Recall/Recognition. The scores on the final delayed recall/recognition task can be found in Table 12. S5 was the only participant to successfully recall target information in this task (recalled job in days 6 and 9). However, the other participants were able to recognize the target among the other eight distracter pictures, with the exception of S1 who only recognized

the target picture on day 9 (and was then able to supply the target job as well). Again, it appears that participants were able to retain knowledge of the target person with spaced retrieval training, but could not free recall it.

Final Face Recognition Task

On day 9, the final face recognition task was administered, in which 18 pictures were laid before the participants, 9 original stimuli used in the spaced retrieval task (1 target picture , 8 distracters), and 9 new pictures never used before in any aspect of the spaced retrieval training. Participants were asked to pick out the photos they had seen before. The results can be found in Table 13. All the participants were able to identify more original photos (hits) than incorrectly selecting new distracter photos (false alarms). They also correctly rejected new distracters (correct responses) more often than rejecting original photos (misses), suggestive of some memory for the pictures used in the task (other than the trained picture). All of the participants selected the target as a photo they had seen before, usually within the first several selections.

GENERAL DISCUSSION

The findings of this extension study reinforce the usefulness of spaced-retrieval as a memory intervention for recall in older adults with probable AD. In support of a first aim of this research, these data suggest that spaced-retrieval can be utilized to aid the forming of a name-face-detail association, as well as the recall of such material (Cherry et al., 1999; Camp, Bird and Cherry, 2000). Furthermore, in support of the second aim of the research, the data indicates that through spaced-retrieval, this association transfers to the live target person, in some cases.

Spaced Retrieval Effects

This study extended Hawley and Cherry's (in press) research of the spaced-retrieval technique for use in learning and retaining name-face associations by adding a contextual detail

to the name-face-association, namely the target person's occupation. An adapted version of Cherry et al.'s (1999) method was used with the participants to train the face-name-detail association. The results of the current study suggest that the benefits of spaced-retrieval can extend to the addition of a detail to the association. The possible real-world applications of this finding are exciting, the most obvious of which is the use of spaced-retrieval to help AD adults retain knowledge such as information about family members or friends.

It is interesting to also note the spaced retrieval effects within sessions and across sessions. In general, the participants improved on individual length of retention both within each session, and across the weeks of training. All participants ended the training with increased longest durations than originally observed in the beginning sessions. For example, S4's longest duration in session 1 was 60 s, in contrast with session 5 in which he successfully passed trial durations of 360 s. An interesting trend was seen in S3, who tended to reach a peak of retention within each session and then quickly regressed to lower durations. With the exception of S3 (who's performance was extremely variable from session to session), the number of failed trials for each participant decreased from session 1 to session 6. For example, S1 improved from 23 failed trials in session 1, to 11 failed trials in session 6, and S5 decreased from 7 failed trials to 1 in session 5. These data further support the benefits experienced from previous training sessions. In this study the participants worked with photos of people previously unknown to them. In future work using spaced-retrieval, research could be conducted using photos of friends or family members, and further, the added detail could potentially be a hobby or personal interest. Such alterations in the training could be more specifically beneficial to the individual participants.

Live Transfer of Spaced-Retrieval Training Association

The results of this study provided modest evidence that name-face-detail associations can be transferred to a live person. S5 was able to identify the live target person by supplying the name and job at the conclusion of training. The other participants were able to recognize the live person's picture amidst the distracter photos. S3 was also able to provide the target job after selecting the live target's photo. These data are encouraging because the transfer from picture to live person is critical for maximum application and benefit of spaced-retrieval training in the lives of AD patients. For example, an AD patient may ultimately be able to have a conversation with a granddaughter that he/she can recognize, and further, even talk about the child's favorite sport. Such an occurrence might never have been available to part of the AD population until now. This study warrants some exploration involving the addition of more training sessions for participants. The inclusion of a detail to the name-face association may necessitate extra sessions to form a strong retention and to improve recall of the target information.

Informal Observations

Informal observations of each participant now follow, to offer additional information about the participants and to present possibilities for further study. In general, AD patients can be extremely variable in regard to their day to day functioning/abilities. Mood and behavior can also be erratic, thus this segment of observations is offered to illustrate how such variables may have affected some of the study's results.

S1 was a friendly gentleman, who seemed to be very appreciative of the attention he received during sessions. He liked to talk about his life and ask about mine (i.e., birthdays, education, jobs). Frequently these sort of distractions resulted in failed trials and exercises such as the nametag task. He was always concerned with behaving politely in front of, "such a pretty

lady." (Similar comments noted in the presence of investigator as well as live target person.) Due to this, in the transfer tasks he responded in a nervous manner, often appearing to be too distracted to even attempt to recall information that was worked on in training. Another issue was a possible cohort effect involving the target name; S1 would always comment, "Karri (female target name) is a man's name, isn't it?" Further, sometimes when S1 got off track during trials he would look for male pictures with the name Karri until he was reminded of the correct instructions. An interesting situation arose starting on day 6 (session 4): during training S1 would look at my nametag at some point while waiting for the beeper to go off, at which point he would pick up the target picture and say, "This is [investigator's name] and she is a teacher." This occurred only with S1 even though the nametag size and placement on the investigator was the same with every participant. Although S1 was unable to recall the association in both live transfer tasks, he did show improvement on other tasks. Occasionally when waiting for the beeper cue, he would ask for the target's name, which indicates that he was aware that he would need that information soon. On day 4, S1 not only recognized the picture he had been working with amidst the distracter photos, but also correctly provided the target job. This occurred frequently when the pictures were laid out before him for recognition. He also commented during the final face recognition task that he was looking for the pictures of teachers.

S3's level of ability was extremely inconsistent across sessions, as well as within sessions. For example, although S3 never scored any points on the nametag task, some days she could take off the nametag herself, and other days I would have to do it for her (because she couldn't process learning that she was wearing a nametag, with the request to return it) During trials, she would sometimes repeat the directions to herself while waiting for the beeper cue, "Where's Karri the teacher, hand me Karri the teacher," and moment later she would be

completely oblivious to anything that was going on. As levels of disorientation would rise, S3 might pick up the beeper or a pencil and say, "This is Karri and she's a teacher," or choose the correct picture and say, "She's a beeper." As mentioned earlier, an interesting within session trend was that S3 would hit a peak of successful duration in every session and then quickly decline until it was useless to continue the session. A noteworthy event was on Day 7 during the explicit control task, when S3 free recalled both the target name and job. S3 was able to provide the job upon target picture recognition on several other occasions, but minutes later would have no knowledge of the target at all. In session 6, S3 did comment during the live transfer that although she did not know the name or job of the live person, she had seen her before. This could either be evidence of an access problem to knowledge that was actually present, or as a defense mechanism (a reaction commonly noticed in adult dementia).

S4 was a gentleman who had served in radio communication during, "the war," thus his hearing was very poor. The beeper had to be held against his ear for him to be able to hear it. This handicap caused some discrepancy in whether a trial had been failed or not; S4 would sometimes respond to the beeper cue correctly with the exception of target name, offering "Sherri" or "Terri." The tasks were scored as fail because S4 did also provide the correct name just as often. It is possible that he "heard" the instructions with an unintelligible name, and offered what he thought it sounded like. Unlike S1 and S3, S4 had a better overall performance on the nametag task. Starting on Day 6 (session 4) S4 had very few failed trials, and progressed to much higher intervals. A unique result of this improvement to higher amounts of time between beeper cues was that S4 would fall asleep. When the beeper sounded S4 would immediately sit up and sound off, "Karri and she's a teacher." Similar to other participants, S4 tended to recall/recognize the target job more successfully than the target name. Finally, in the

live person transfer tasks S4 reminded me of S1 by reacting with slightly nervous, and overly complimentary tone (ie, when asked for the live target's job, he would respond with, "beauty operator" or "movie star," chuckle, and wait for a response). It is reasonable to assume that this behavior was a distraction that inhibited any active attempt to access the association worked on in training.

S5 was a pleasant lady, who constantly expressed her appreciation for being chosen to help with the project (S5 would often inquire at the end of sessions, "Did I help you?"). Although she scored noticeably lower than the other participants on several individual measures (possibly due to a lower education level), S5 performed significantly better and improved more on the spaced retrieval trials than any other participant. This culminated in the study's only successful live person transfer of the target name-face-job association acquired during spaced-retrieval training. S5 uniquely developed a strategy starting in Session 3 (when the time intervals between trials were becoming lengthy), which she shared with me; She said that she liked to watch the timer when we were "waiting," because, "It helps keep [S5] focused." S5 was the only participant to have an observable strategy for the trials, which probably played a role in her success. This would be something interesting to address in methodology of future research (ie, either specifically instruct clients to use (or prohibit the use of)such a strategy within the trial instructions to participants).

CONCLUSION

The results of this study are consistent with the findings of current and past research regarding the use of the spaced-retrieval technique with AD impairment. The training improved retention of the target association for each participant, a benefit that was evident in passed versus failed trials within sessions, as well as across sessions 1 through 6. Such findings replicate

research by Cherry et al. (1999) and Hawley and Cherry (in press). Confirmation of the possibility to add a detail to the name-face association is extremely encouraging. Even more exciting is the success in transferring the three part association to a live person, a result which opens doors to several useful directions for future research.

One limitation of this study to acknowledge involves the variations in scheduling that occurred. Across participants, the homogeneity of the delays between sessions was sometimes sacrificed to accommodate absences/illness. Such variations in training schedules could potentially cause irregularities in data. Another limitation to point out is that the association was successfully transferred to a live person by only one participant out of four, however, these data are promising because of future directions they may suggest in this area of research

In conclusion, the results found in this study have the potential to greatly benefit both AD patients and their caregivers. With spaced-retrieval training older adults with probable AD could begin to successfully recall the names of people in their lives. Additionally, having access to an extra piece of information to facilitate a conversation or interaction with those people is a bright prospect for an otherwise bleak future. Ultimately, spaced-retrieval could be used by caregivers in the patient's living environment, possibly resulting in benefits such as higher patient self-esteem, as well as less frustration and stress for caregiver and patient. Exploration is needed to further identify how far the technique can successfully extend in benefiting learning, retention and recall.

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Table 1a

DSM-IV Criteria for the Diagnosis of Dementia of the Alzheimer Type

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A. The development of multiple cognitive deficits including:
   1. Memory impairment
   2. One or more of the following:
      a. aphasia
      b. apraxia
      c. agnosia
      d. disturbance in executive functioning

B. Cognitive deficits cause significant impairment in social or occupational functioning and represent a significant decline from a previous level of functioning.

C. Gradual onset and continuing cognitive decline

D. Cognitive deficits are not due to any of the following:
   1. other central nervous system conditions
   2. systemic conditions that are known to cause dementia
   3. substance-induced conditions

E. The deficits do not occur exclusively during the course of a delirium

F. The disturbance is not better accounted for by another Axis I disorder

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Note. From *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., DSM-IV; American Psychiatric Association, 1994).

Table 1b

NINCDS-ADRDA Criteria for the Diagnosis of the Alzheimer Type

1. The dementia syndrome as established by clinical examination and confirmed by neuropsychological tests
2. Deficits in two or more areas of cognition
3. Progressive worsening of memory and other cognitive functions
4. No disturbances of consciousness
5. Onset between the ages of 40 and 90 and most often after age 65
6. Absence of systemic disorders or other brain diseases that could account for the progressive deficits in memory and cognition

Note. From McKhann et al., 1984.

Table 2

Summary of Demographic and Health Characteristics (caregiver-reported)

Measure	S1	S3	S4	S5
	Participants			
Age	87	86	79	77
Gender[a]	1	2	1	2
Race[b]	1	1	1	2
Marital Status[c]	2	2	2	4
Years of education[d]	6	4	4	1
Occupation level[e]	4	3	4	1
No. of chronic diseases[f]	3	2	6	5
No. of hospital stays in past year[g]	1	1	1	0
No. of physician visits in past year[h]	3	1	2	2
No. of physician prescribed Medications[i]	4	2	4	4

Note. [a] 1 = male, 2 = female. [b] 1=white, 2=black. [c] 1 = single, 2 = married, 3 = divorced, 4 = widowed. [d] 1 = less than 7th grade, 2 = 7th-9th grade, 4 = high school degree, 5 = partial college or specialized training, 6 = college degree, 7 = graduate degree. [e] 1= unskilled, 2 = semi-skilled, 3 = skilled, 4 = semi professional, 5 = professional. [f] higher scores reflect more health problems. [g-i] 1 = none, 2 = 1-3, 3 = 4 to 6, 4 = over 6.

Table 3

Summary of Health and Social Activity Characteristics (self-reported)

	Participants			
Measure	S1	S3	S4	S5
Self – perceived health[a]	2	2	3	3
Health prevents activities[b]	2	2	1	2
Health compared with others[c]	1	2	1	1
No. of times per week for visitors[d]	4	1	1	2
No. of activities at SFH per week[e]	1	2	1	3
No. of community activities outside home[f]	2	2	2	2
No of hours per week spent outside home[g]	2	3	3	2

Note. All ratings were made on a 3-5 point Likert scale. [a]1 = excellent to 4 = poor. [b]1 = not at all to 3 = a great deal. [c]1 = better to 3 = poorer. [d]Higher scores reflect increased number of times. [e,f]Higher scores reflect more activities. [g]Higher scores reflect more time.

Table 4

Summary of Individual Difference Measures

Measure	Participants S1	S3	S4	S5
Age	87	86	79	77
MMSE[a]	15	9	19	16
GDS[b]	2	3	2	4
Vocabulary[c]	17	1	18	4
FDS[d]	4.0	6.5	6.0	5.5
BDS[d]	3.0	2	2.5	3.5
Subject Performed Tasks[e]				
Free Recall				
Correct (S)	0	0	0	0
Correct (L)	0	0	1	1
Guesses	0	0	0	0
Cued Recall				
Correct (S)	0	0	6	8
Correct (L)	6	4	4	1
Guesses	0	0	0	0

Note. [a]Mini-Mental State Exam (MMSE, Folstein, Folstein, & McHugh, 1975). [b]Geriatric Depression Scale (GDS, Sheikh & Yesavage, 1986). [c]Vocabulary Score, Short-Form of the WAIS Vocabulary test (Jastak & Jastak, 1965). [d]Forward Digit Span (FDS) and Backward Digit Span (BDS) from the WAIS (Wechsler, 1955). [e]Subject-Performed Tasks (SPT) (Cherry, Moore, & Kelley, 1996).

Table 5

Summary of Nametag Task

	Participants			
	S1	S3	S4	S5
Day 1	0	0	0	*
Day 2	0	0	**	0
Day 3	0	0	1	2
Day 4	0	0	0	*
Day 5	0	0	*	1
Day 6	0	0	1	3
Day 7	0	0	*	0
Day 8	*	0	1	**
Day 9	*	0	1	1
Total	0	0	4	7

Note. Score is based on maximum score possible of 36. *=interruption resulted in lost data. **=Subject was absent, data not collected.

Table 6

Summary of Spaced-Retrieval Task Performance

		S1	S3	S4	S5	Mean
Session 1						
	FT	23	11	4	7	11
	PC	15	7	1	4	7
	CT	23	3	9	10	11
	TT	46	14	13	17	22
	LD	40	5	60	90	49
Session 2						
	FT	16	12	3	6	9
	PC	14	9	3	6	8
	CT	15	8	10	11	11
	TT	31	20	13	17	20
	LD	20	10	120	90	60
Session 3						
	FT	9	14	0	4	7
	PC	7	10	0	4	5
	CT	11	5	9	11	9
	TT	20	19	9	15	16
	LD	40	20	180	120	90
Session 4						
	FT	17	14	1	1	8
	PC	16	11	0	0	7
	CT	17	3	12	11	11
	TT	34	17	13	12	19
	LD	10	10	300	240	140
Session 5						
	FT	8	11	1	1	5
	PC	7	6	1	0	4
	CT	11	6	12	14	11
	TT	19	17	13	15	16
	LD	60	10	360	480	228
Session 6						
	FT	11	16	1	*	9**
	PC	10	10	0	*	7**
	CT	13	7	12	*	11**
	TT	24	23	13	*	20**
	LD	40	20	360	*	140**

Note. FT=Failed Trials; PC=Partially Correct failed trials; CT=Correct Trials; TT=Total number of Trials; LD=Longest Duration achieved successfully in each session (in seconds). *= Subject was absent, no trials run. **=Due to S5 loss of data, mean obtained by dividing sum of scores by 3 instead of 4.

Table 7

Proportion of Partially Correct Failed Trials

	S1	S3	S4	S5
Session 1	0.65	0.64	0.25	0.57
Session 2	0.88	0.75	1.00	1.00
Session 3	0.78	0.71	None Failed	1.00
Session 4	0.94	0.79	0	0
Session 5	0.75	0.55	1.00	0
Session 6	1.00	0.63	0	*

Note. Proportion obtained by dividing partially correct trials by failed trials. * = Subject was absent, no trials run.

Table 8

Distribution of Errors in Partially Correct Trials

		S1	S3	S4	S5
		# / OE	# / OE	# / OE	# / OE
Session 1					
	H	4/0	1/0	0/0	2/1
	P	2/0	1/0	1/0	3/1
	N	15/4	7/1	1/0	0/0
	J	8/0	5/0	1/0	1/0
	PC	15	7	1	4
Session 2					
	H	2/0	6/3	0/0	0/0
	P	1/1	4/1	2/2	2/2
	N	13/7	2/1	1/1	4/4
	J	6/0	1/0	0/0	0/0
	PC	14	9	3	6
Session 3					
	H	1/1	6/1	0/0	0/0
	P	0/0	7/3	0/0	2/1
	N	6/1	2/0	0/0	3/2
	J	5/0	4/0	0/0	0/0
	PC	7	10	0	4
Session 4					
	H	0/0	4/0	0/0	0/0
	P	1/0	5/0	0/0	0/0
	N	16/12	6/1	0/0	0/0
	J	3/0	6/3	0/0	0/0
	PC	16	11	0	0
Session 5					
	H	0/0	3/1	0/0	0/0
	P	1/1	1/0	0/0	0/0
	N	6/6	4/1	1/1	0/0
	J	0/0	3/1	0/0	0/0
	PC	7	6	1	0
Session 6					
	H	0/0	4/0	0/0	*
	P	2/0	5/1	0/0	*
	N	11/5	4/0	0/0	*
	J	5/0	6/4	0/0	*
	PC	11	10	0	*

Note. H = handing the target photo to the experimenter; P=selecting the target picture; N = providing target name; J =providing the target job; PC=number partially correct trials in the session; # = in how many partially correct trials the factor was failed; OE =number of trials were failed from this factor as the only error. * = Subject was absent, trials not run.

Table 9

Transfer Task Performance

Task	**S1**		**S3**	
	Week 1	Week 2	Week 1	Week 2
Recall Question 1	0	0	0	0
Recall Question 2				
Name/Job	0/0	0/0	0/0	0/0
Recognition Question 1	1	1	1	0
Recognition Question 2				
Name/Job	0/0	0/0	0/1	0/0

Task	S4		S5	
	Week 1	Week 2	Week 1	Week 2
Recall Question 1	0	0	0	0
Recall Question 2				
Name/Job	0/0	0/0	0/1	0/1
Recognition Question 1	1	1	--	1
Recognition Question 2				
Name/Job	0/0	0/0	--	1/1

Note. 0 = failed task and 1 = passed task.

Table 10

Summary of Immediate Recall Task

	Participants			
	S1	S3	S4	S5
(N,J Free Recall)/(N, J, P Recognition)				
<u>Week 1</u>				
Day 3	(0,0)/(0,0,0)	(0,0*)/(0,0,1)	(0,0)/(0,0,0)	(0,1)/(!,-,1)
Day 4	(0,1)/(0,-,1)	(0,1)/(0,1,1)	(0,0)/(#,1,1)	(0,0)/(0,0,1)
Day 5	(0,0)/(0,0,0)	(0,0)/(0,0,1)	(0,0)/(0,0,0)	(1,1)/(-,-,-)
<u>Week 2</u>				
Day 6	(0,0)/(0,1,1)	(0,0)/(0,0,0)**	(0,0)/(#,1,1)	(0,1)/(0,-,1)
Day 7	(0,0)/(0,1,1)	(1,1)/(-,-,-)	(0,1)/(0,-,1)	(1,1)/(-,-,-)
Day 8	(0,0)/(0,1,1)	(0,0)/(0,0,0)	(0,0)/(0,1,1)	***

<u>Note</u>. N = target name; J = target job; P= target picture. Ss were scored 0 if they failed to correctly recall or recognize the N,J or P, whereas a score of 1 indicates success on the task. * = S3 remembered it had been a "pretty lady." **= Subject extremely distracted. ***= Subject was absent, no data collected. ! =Interruption occurred. #= S4 provided "Terri" rather than "Karri."

Table *11*

Summary of Delayed Recall Task

	Participants			
	S1	S3	S4	S5
Delayed Free Recall (N/J)				
Day 4	0/0	0/0	0/0	0/0
Day 5	0/0	0/0	0/0	0/0*
Day 7	0/0	0/0	0/1	1,1
Day 8	0/0	0/0	0/0	**

Note. N= Target name; J = Target job. Scores of 0 indicate the Ss did not name the target person/target her job; a score of 1indicates the Ss did name the target person/target job. * = Subject commented that it had been a "lady's picture." ** = Subject was absent, no data collected.

Table 12

Summary of Final Delayed Recall Task

	Participants			
	S1	S3	S4	S5
(N, J Free Recall)/(N,J,P Recognition)				
Day 6	(0,0)/(0,0,0)	(0,0)/(0,1,1)	(0,0)/(0,0,1)	(0,1)/(0,-,0)
Day 9	(0,0)/(0,1,1)	(0,0)/(0,0,1)	(0,0)/(0,0,1)	(0,1)/(0,-,1)

Note. Scores reflect free recall/recognition scores for the target picture. N = Target Name. J = Target job. P = Target picture. Scores of 0 indicate Ss could not recall/recognize the target person, whereas a score of 1 indicates Ss could recall/recognize the target person.

Table 13

Summary of Final Face Recognition Task

	Participants			
	S1	S3	S4	S5
Old Items				
Hits	6	4	7	4
Misses	3	5	2	5
New Items				
False Alarms	2	0	0	1
Correct Responses	7	9	9	8

Note. Entries are based on a total of 9 facial pictures used in S-R training ("old items") and 9 distracter faces ("new items").