FEATURE TRAINING AND PROPER NAME RECALL IN OLDER ADULTS

by Gregory Scott Clayton

The purpose of the present study was to determine the effects of perceptual feature training with 25 older and 26 younger adults. A multtrial, cued-recall paradigm was implemented to train the use of 8 perceptual features: age, height, weight/body type, race/ethnic group, hair color, complexion/skin tone, facial expression, and detail. Multivariate analyses of variance (MANOVA) did not reveal significant differences between groups during untrained name-recall tasks. While the multitrial paradigm was effective in teaching the features to all subjects, older subjects required significantly more trials to learn the features. The application of features in name-recall tasks did not result in improved performance, probably due to overload in the executive systems. The relationship between neuropsychological assessment performance and naming as well as implications and directions for future research are discussed.
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Chapter 1
Introduction and Review of the Literature

Subjective Memory Complaints

Researchers distribute questionnaires to evaluate subjective memory complaints and self-perceptions of memory functioning in older adults (Gratzinger, Sheikh, Friedman, & Yesavage, 1990). Older adults commonly report troubles with memory functioning and, specifically, forgetting the names of people they know. On a 33 item questionnaire, memory for proper names was rated by far as the task with the highest difficulty by older adults (Zelinski & Gilewski, 2004). In another study, older adults reported that name recall difficulties were the most noticeable and most frustrating decline in cognitive ability (Cohen & Faulkner, 1986). While older adults report trouble recalling other types of information such as medications and telephone numbers, these issues may be addressed with the use of schedules and lists kept in accessible locations for convenient referencing. However, the inability to recall names in daily life places older individuals at a marked disadvantage when initiating social interactions or contributing to conversations. Dynamic neurophysiological changes related to normal aging have been shown to have negative impacts on the executive functioning and memory abilities of healthy older adults. In spite of this, the implementation of specific strategies by older adults has been beneficial in previous studies to improve name recall. The primary objective of the present study was to implement a training paradigm requiring older adults to attend to the physical features of an individual in order to increase name retrieval success.

Name Recall Studies

Studies have been conducted which confirm that older adults perform more poorly than their younger counterparts on name-recall tests. A landmark investigation into the name-recall abilities of 1205 adults ranging in age from 18 to 90 years was conducted by Crook and West (1990). This was the first study to utilize such a large sample size of adults across the lifespan. The data collected
enabled the researchers to confirm reports from older individuals that name-recall abilities do indeed decline with advancing age. The authors found the first perceptible decrease in performance to occur during the 40s. This reduction in ability continued progressively throughout the lifespan. The results of this study revealed age to be the most significant predictor of performance on name recall. There was some association with both gender and scores on standardized vocabulary tests, but no statistical significance. Education level showed no relationship with name recall abilities. The authors suggested that a name-recall task be included in any comprehensive test battery gauging the impact of aging on cognition.

Numerous other studies have been conducted with a range of populations in attempts to determine what aspects of cognition are utilized in name recall, what populations have difficulty with this skill, and what compensatory strategies are useful at improving name recall abilities. Studies have shown memory training programs to be effective in improving performance on name recall abilities. This training has been conducted in isolation or integrated into more extensive instruction for normal aging adults or patients in cognitive rehabilitation programs. Many studies have attempted to assist name recall through associative learning by assigning meaning to names in relation to the facial or bodily features of the target individual studies (Gratzinger et al., 1990; Troyer, Häfliger, Cadieux, & Craik, 2006; Woolverton, Scogin, Shackelford, Black, & Duke, 2001). Some used referents and imagery mnemonics that are provided by the examiner (Hux, Manasse, Wright, & Snell, 2000; Downes, Kalla, Davies, Flynn, Ali, & Mayes, 1997). The use of visual imagery and mnemonics provides an auditory association between the actual name of the person and an imagined object or activity. If the target name were Mike, the imagery statement may be “Imagine Mike talking into a microphone.” These studies typically used only names with a concrete visual representation. Although research has shown that imagery mnemonics can be beneficial in name recall, even healthy college students demonstrated difficulty applying the technique independently.
(Groninger, Groninger, & Stiens, 1995). Nevertheless, older adults can increase memory performance after being instructed to use strategies (Souchay & Isingrini, 2004).

Woolverton, et al. (2001) attempted to address name recall skills of normal older adults within two self-paced memory training programs involving 13 or 24 independent study one-hour sessions spread over 4 to 6 weeks. This study also used a book that explained mnemonic strategies to assist name recall to train normal aging participants between the ages of 60 and 88. Subjects in the shorter program demonstrated no improvement, while those enrolled in the longer curriculum yielded modest improvement in name recall ability. This suggests that participants may benefit more from examiner-guided instruction and that older adults benefit more from longer periods of therapy.

Troyer, et al. (2006) examined the recall abilities of normal younger and older adults dependent on separate encoding conditions. These increasing levels of encoding were physical processing, phonemic processing, and semantic processing. The physical processing condition required participants to state the first letter of the name. The phonemic processing condition asked participants to produce a word that rhymed with the target name. For the semantic processing condition, subjects provided a definition or association of the name. The authors found name recollection to improve with deeper levels of processing. Semantic processing yielded the best retrieval accuracy for both groups.

O’Hanlon, Kemper, and Wilcox (2005) examined the effects of phonologically similar names and occupations on the name recall success of normal younger and older adults. The authors found that names which have similar phonemes, intonation and length are more difficult to retrieve than those which are unrelated. O’Hanlon, et al. concluded that target individuals’ occupations were easier to recall than their proper names. James (2004) and Rendell, Castel, and Craik (2005) also found that both normal younger and older adults recall information about the occupations of individuals with greater accuracy than their proper names. This phenomenon also can be related to
levels of processing. Information that is processed at a deeper level is more likely to be recalled (Craik & Tulving, 1975). Information about a person’s occupation contains semantic associations which the arbitrary labels of proper names do not. This has been referred to as the Baker-baker effect. An individual is more likely to remember that a person is a baker than to recall that another’s name is Baker.

Downes, et al. (1997) demonstrated that subjects benefit when given adequate exposure time prior to and following presentation of a target image to firmly link a presented face-name pairing. Face-name recall tasks with unfamiliar images present subjects with associative learning tasks with two stimulus modalities simultaneously. Subjects have shown higher recall rates when they are able to view the target image for a short period before auditory presentation of an accompanying name. The pre-exposure period should be at least 4 seconds prior to name presentation to establish a more stable representation of a target individual on which to superimpose a name. The post-exposure period should be at least 10 seconds following presentation of the verbal and visual stimuli in order to establish a stable associative link and significantly improve recall (Downes et al., 1997).

The use of visual strategies also helped improve name recall in populations with persistent memory impairment resulting from traumatic brain injury (TBI) (Hux et al., 2000). This study employed repeated training sessions to facilitate improvement. Participants in this study were residents at a rehabilitation facility being treated for memory deficits and possibly other sequelae of TBI. This study involved training and recall of actual names of facial images of staff members at the facility. Contact with those in the image set prior to participation in the study was considered by authors to be incidental and frequently was not factored into data analyses (Hux et al., 2000). Three images were presented five times over a number of sessions during one week. Name recall abilities improved markedly for some patients.
Cognitive Aging

As we progress through the normal aging process, regions of the brain are subject to neuronal loss, loss of mass, and a decrease in production of neurotransmitters (Kelly, Nadon, Morrison, Thibault, Barnes, Blalock, 2006). Recent advances in medical technology including the use of functional magnetic resonance imaging (fMRI) have allowed neuroscientists to monitor decreases in cerebral blood flow and axonal discharge (Cabeza, Anderson, Houle, Mangels, & Nyberg, 2000; Grady, McIntosh, Horwitz, Maisog, Ungerleider, Mentis, Pietrini, Schapiro, & Haxby, 1995). These physical changes are not equivalent in all older adults nor do they produce the same reduction in functioning. However, research has shown that these dynamic neurophysiologic changes may bring about a number of detrimental results even in healthy seniors. Age-related declines in cognitive functioning may result from a selective decline in frontal lobe function. Neuroimaging has linked inefficient frontal lobe functioning with normal aging. Executive functioning plays a key role in all cognitive functions. Some of the processes executive functions direct include initiating, inhibiting, planning, and sustaining and redirecting attention (Souchay & Isingrini, 2004; Stebbins, Carillo, Dorfman, Dirksen, Desmond, Turner, Bennett, Wilson, Glover, & Gabrieli, 2002).

Studies have noted that speed of processing and the abilities to encode new information and retrieve information that was previously stored may be impaired in neurologically normal older adults (Constantinidou & Baker, 2002; Baddeley, Cocchini, Della Sala, Logie, & Spinnler, 1999). Word retrieval abilities decline steadily with advancing age throughout the life span (O'Hanlon, Kemper, & Wilcox, 2005; Barresi, Nicholas, Tabor Connor, Obler, & Alpert, 2000). Older individuals demonstrate more word retrieval failures or tip of the tongue (TOT) experiences than younger adults (Burke, MacKay, Worthley, & Wade, 1991). Evrard (2002) found that older adults exhibit more TOTs for proper nouns than other word categories. Despite the cognitive decline, some areas of cognitive function are preserved in old age. Semantic memory and vocabulary size do not decline in the same manner as speed of processing and word retrieval. Some
studies have even demonstrated that vocabulary scores are higher for older adults than younger (Light, 1991; Light & Burke, 1988). Based on such evidence, word retrieval deficits appear to be attributable to unsuccessful lexical access, not loss of previously stored information.

**Facial Recognition**

Neuroscientists have recently been investigating the foundation of visual perception and facial recognition. There has been a new line of inquiry into the skills our brains are equipped with to distinguish individual faces. Some researchers believe that we are born with an ability to discern particular curved contours that form the basis for our ability to differentiate people (Bower, 2001). Others contend that newborns do not possess the visual acuity to perceive more than blurred blobs (Nelson, 2001; Dannemiller 2001). However, newborns will gaze longer at a picture of their own mother than a female stranger (Pascalis, de Schonen, Morton, Deruelle, & Fabre-Grenet, 1995). In addition, newborns possess the ability to imitate facial expressions of those with whom they interact only a few hours after birth (Bower, 2001). Furthermore, studies have shown that infants who are only days old prefer to gaze at images of attractive faces longer than unappealing countenances (Slater, Bremner, Johnson, Sherwood, Hayes, & Brown, 2000). It is quite amazing that humans are able to distinguish the subtle differences in the same basic structure among various faces in infancy. Regardless of whether the skill is innate or learned, facial recognition is a facility that is demonstrated within a week of birth (Pascalis et al., 1995).

Cognitive functioning involves the integration of different neural structures and regions into networks to accomplish tasks successfully. Advances in medical imaging have allowed neuroscientists to zero in on task-specific cognitive activity. fMRI is a noninvasive method for observing neural activity that has been used to map the object vision pathway in the human brain. The representations of faces and other objects are processed in extensive, overlapping areas in the temporal lobes and the limbic system (Haxby, Gobbini, Furey, Ishai, Schouten, & Pietrini, 2001). The inferior temporal lobes house the fusiform gyri. Researchers have
conducted experiments using fMRI to witness this cortical region spiking intensely in neural activity during facial image processing. This has led some scientists to label one section of the right fusiform gyrus the “fusiform face area.” (Kanwisher, 2006; Bokde, Lopez-Bayo, Meindl, Pechler, Born, Faltraco, Teipel, Möller, & Hampel, 2006; McCarthy, Puce, Gore, & Allison 1997). Damage to the right temporal area can impact a person’s capacity to differentiate persons and objects. Right temporal damage can even result in prosopagnosia, or the inability to recognize faces.

While fMRI allows viewing of regional cerebral blood flow (rCBF), it does not grant the specificity provided by depth electrodes in measuring the electrical discharges of individual neurons. Researchers have recently mapped certain areas of the temporal lobe in which specific cells fire in response to particular images. The specificity of locations in the brain to particular objects and people was strengthened by a small study on patients with pharmacologically intractable epilepsy (Quiroga, Reddy, Kreiman, Koch & Fried, 2005). Eight patients were implanted with chronic depth electrodes in neurons in the hippocampus, amygdala, entorhinal cortex, and parahippocampal gyrus to localize the focus of seizure onset. Activation of these neurons in these structures in the medial temporal lobe (MTL) was measured in response to visual stimuli of different famous faces and landmarks. The authors discovered a remarkable specificity of function in the selective activation of these neurons. Most of the MTL cells observed did not respond to the majority of images viewed by the patient. In one subject, a single neuron responded only to images of former U.S. president Bill Clinton. In another, one neuron fired more intensely in response to images of popular U.S. actress Jennifer Aniston. The findings of the study suggest that neurons in the MTL encode an abstract representation of a certain object or person. The small, distinctive population of this study prevents generalization of the results, but the results are consistent with other findings.

Interacting neural regions are a requirement for normal cognitive operation. Bruce and Young (1986) postulated a multistage sequence of
processes that must occur to generate the appropriate name when presented with a familiar face. Name generation is dependent on successful structural encoding of visual information and the activation of face recognition units and person identity nodes. Recognition is established and association is made with knowledge of personal identity. Name retrieval is then carried out to complete the identification of the familiar individual. When faces were presented in a naming task, the initial neural activation occurred in the medial temporal poles bilaterally, two regions on the medial surface of the frontal cortex, and the medial parietal lobe (Tempini, Price, Josephs, Vandenberge, Cappa, Kanpur, & Frackowiak, 1998). More than 95% of the population is left hemisphere dominant for language and Broca's area (Brodmann Area 44; BA 44) in the left inferior frontal gyrus has been firmly established as the pre-motor coordinator of language (Owens, 2001). Imaging revealed the processing of biographical information involved the left temporoparietal cortex (BA 39) and the left extrasylvian temporal regions (BA 39, 21, and 38; Tempini et al., 1998). When compared with previous findings, it was noted that semantic knowledge of objects and biographical information involved the same regions (Price, Moore, Humphreys, & Wise, 1997; Mummery, Patterson, Hodges, & Price, 1998). During retrieval of proper names, rCBF increased to the left temporoparietal junction, the temporal poles bilaterally, and the posterior cingulate cortex (Tempini et al., 1998). When presented with the image of a person, individuals will be unable to retrieve the correct name in the absence of other information about that person. If only a select number of neurons fire in response to visual stimuli of a certain individual, increasing the amount of semantic information that is linked to those cells could increase the likelihood of successful name retrieval.

**Language Production**

Cognitive aging researchers have long attempted to explain the age-linked changes that occur in the brain and how they affect cognitive performance. The traditional core of these studies has focused on attention, memory and language. Investigations into the effects of aging on activities of daily living (ADLs),
personality changes, meta-cognitive functioning, and the neural networks underlying memory tasks are just some of the additional areas to which research has expanded. Burke, MacKay and James (2000) expressed distress over the deficiencies in the theoretical ideas being proposed to explain cognitive operations. These authors find the concept of memory systems, which are the basis of language comprehension and production, particularly vague in the pervasive use of the term “processing resources.” It would be easier to treat a range of neurocognitive disorders with knowledge of an exact route. Although technology has enabled us to identify regions and even neurons that are activated during specific tasks, our breadth of knowledge has not reached the point where we can speak to neural networks with the same invariability with which we explain chemical equations. While some may bemoan the lack of theories that accurately and fully summarize all relevant findings, we need to continue to postulate strategies to assist those with memory troubles.

The Node Structure Theory is a theoretical model of cognition and specifically language functioning (NST; MacKay & Burke, 1990). Semantic information is stored on neurons, or nodes. It is theorized that we are able to create links or pathways to these nodes by the information that is associated with each bit of information. These pathways which connect the nodes are strengthened each time we access the target datum. The dynamic physiological changes of aging, along with infrequency of use, result in a weakening of connections between units, or nodes, within the lexical processing system (Kelly et al., 2006).

NST helps explain why name recall is such a difficult task for older adults. The NST is an interactive-activation paradigm that uses nodes to represent meaning (semantic nodes) and sounds (phonological nodes). Language production is dependent on word retrieval through convergent semantic priming upon a lexical node followed by divergent priming on the phonological syllable nodes which represent the oral form of the word. The dynamic changes which affect the brain as a result of normal aging increase the likelihood that a link
between nodes could be weakened or damaged. Those nodes with the fewest number of linkages, or sources of activation, will be at greater risk for impaired access. Common nouns and other word categories receive priming from significantly more sources than proper nouns. In name recall, the link between face recognition and name recall is a single source of priming. Thus the recall of a certain proper name is more susceptible to impaired activation than other word finding tasks. Age related word retrieval difficulties compound this problem. By linking physical features with names, we may provide a richer description of visual attributes to augment the verbal data, thereby increasing the amount of semantic association related to the linguistic record. Enhancing the amount of information associated with the proper name increases the connections within that network and could ease retrieval of names.

**Memory**

Memory and learning abilities have been linked by several studies to name recall performance (Burke et al., 1991; Woolverton et al., 2001; Troyer et al., 2006). And there are several processes which underlie memory performance in the daily performance of functional activities. A basic understanding of the memory system is required to explain the rationale of the compensatory strategy suggested by this study. Memory impairments can interfere with many aspects of life. Several theoretical models of memory have been developed over the last fifty years (Burke, MacKay, & James, 2000). Older memory models divided the memory process into three basic phases: encoding, storage and retrieval. Encoding refers to the initial processing of the information. Storage refers to the process of saving information for future use. And retrieval refers to the acts of locating and pulling information from storage. Encoding, storage, and retrieval are interactive processes. The organization of information during these processes allows material to be arranged efficiently. Problems during the first two stages result in information being stored in an unorganized or inefficient way that makes retrieval more difficult. Better performance on recognition tasks than spontaneous recall could be an indication of inefficient encoding, unorganized
storage or a breakdown in retrieval. The failure to employ useful strategies to encode and retrieve semantic information contributes to poor name recall performance (Schweich, Van der Linden, Bredart, Bruyer, Nelles, & Schills, 1992).

Recent models of memory suggest that this cognitive function involves a number of interconnected systems (Squire, 1992). Although cognitive psychologists and neuropsychologists have expanded upon the basic three stage memory model, the three stages outlined above serve key functions in the working memory system. This working memory model consists of two separate subsystems, the phonological loop and visuospatial sketchpad, which process and store auditory and visual information respectively (Baddeley & Hitch, 1974). The central executive system networks with these systems and long-term memory. The central executive system controls higher level cognitive functioning. This system is responsible for creating a mental representation of the present situation and drawing attention to the most significant features (Shimamura, 1995). Different types of attention are called into play by higher level executive functioning; sustained, alternating, selective, and divided. The capacity of the executive system is also dependent on age, mood, fatigue, and arousal level (Eimer, 1997). Working memory is a particular cognitive function revealed to decline as a result of normal aging (Baddeley et al., 1999).

**Categorization**

Categorization is a fundamental cognitive process. Some argue that this process is the foundation of all other intellectual activities including memory, communication, thought, and human perception. The method in which we organize new information has a significant impact on our ability to remember. The visual recognition and categorization of everyday objects involves two pathways which are specialized to process different types of information (Constantinidou & Kreimer, 2004). The passive recognition pathway, which includes facial recognition, is routed through the temporal lobes and serves to distinguish if an object is something that has been seen previously. The passive
A previous study indicated that older adults use fewer features to describe objects compared to younger adults (Popplewell, 2006).

**Aging Population**

Improvements in pharmaceuticals and surgical procedures have contributed to an increase in lifespan in the United States. Americans are living longer with a resultant shift in the population. The percentage of people 65 or older in the United States increased from 4 percent in 1900 to about 12 percent in 2003. In 1900, only about 3 million of the nation's people had reached 65. By 2003, the number of senior citizens had increased to about 36 million. The first baby boomers celebrated their 60th birthdays in 2006. The National Institute on Aging (NIA), a component of the National Institutes of Health, predicted in 2005 that the segment of the U.S. population age 65 and over would double in size within the next 25 years to 72 million people (He, Sengupta, Velkoff, & DeBarros, 2005). By 2030, nearly 25% of Americans will be 65 years of age or older. The increase in population age is reflected in most other developed countries in the world. In 2000, 14% of Europeans were over 65. Roughly 7% of the world population was over 65 years in 2000. That proportion is expected to increase to 12% by 2030. We need to address the challenges faced by this growing aging population.

**Rationale of the Study**

Several quality of life questionnaires have cited that one of the major complaints of older adults is difficulty recalling names of persons they have known for years, as well as problems learning and remembering new names. Name recall studies have confirmed the presence of this deficit. Older people who have a difficult time recalling names may have trouble in social situations when attempting to initiate or contribute to conversations. This weakness can leave them feeling awkward around friends and acquaintances and may put those still in the professional realm at a distinct disadvantage.
Given the impact of name recall ability, attention should be directed to making training more effective and more accessible. This study proposed that by increasing the semantic information linked to the image of a person, the connections leading to the semantic node containing the proper name would increase, resulting in more successful name recall. Tasks that employ recognition of visual information generate a greater improvement in performance compared to those relying on free recall (Constantinidou & Baker, 2002).

Statement of Purpose

The purpose of the present study was to determine if training older adults to identify perceptual features of individuals would enable them to maximize name-recall performance at a later time. A multitrial, cued-recall paradigm was implemented to measure the effects of feature training on memory performance of older adults. The experimental task involved viewing computer slideshows, describing images and recalling names assigned to the persons represented on the slides.
Chapter II

Methods

Subjects

This study involved 51 adult subjects assigned to two distinct groups. Subjects were individuals from the greater southwestern Ohio and southeastern Indiana area. Subjects were recruited by personal referral as well as through flyers seeking volunteers for a study designed to improve memory for names. Group 1 consisted of 26 normal younger adult males and females ages 18 to 50. Group 2 consisted of 25 normal older adult males and females ages 60 to 85. Subjects from the two groups were matched for gender and number of years of education.

Individuals responding to flyers were given more detailed information about the experiment by telephone. Information pertaining to inclusion and exclusion criteria was provided to the respondents at this time. If the prospective candidate met such criteria and continued to express interest in participating in the study, an appointment was arranged to complete the training and testing. Each participant was assessed, trained and tested during one or two sessions lasting a total of approximately two to three hours. Participants completing the complete battery during one session were given a ten to fifteen minute break near the midpoint of testing. Training and testing was conducted in the participants’ homes or at the Speech and Hearing Clinic at Miami University in Oxford, Ohio. Each subject who completed all experimental procedures was paid $20 for their time and/or fuel costs.

Inclusion and Exclusion Criteria

Inclusion Criteria for Younger Adult Subjects

1. Adult males and females between 18 and 50 years of age.
2. Adults for whom English was their primary language.
3. Negative history for each of the following: uncorrected vision or hearing impairment, neurological or psychiatric disorder, cognitive or learning disabilities.
4. Score of 25 or higher on the Mini Mental State Exam (MMSE; Folstein, Folstein, & McHugh, 1975).

**Inclusion Criteria for Older Adult Subjects**
1. Adult males and females older than 60 years of age.
2. Adults for whom English was their primary language.
3. Negative history for each of the following: uncorrected vision or hearing impairment, neurological or psychiatric disorder, cognitive or learning disabilities.
4. Score of 25 or higher on the MMSE.

**Exclusion Criteria for All Subjects**
1. A medical history positive for a neurological insult, disorder, organic brain disease or loss of consciousness.
2. Cognitive or learning disability.
3. Uncorrected vision.
4. Uncorrected hearing impairment.
5. Speech or language disorder.
7. Active or current substance abuse.

**Procedures**

Procedures for all conditions were consistent for all participants in both groups involved in the study. All subjects completed a written consent to participate in a memory study. Cognitive, vision, and hearing screenings were completed during the testing encounter prior to administration of other assessment and training tools. Participants completing testing in one session were given a ten to fifteen minute break near the midpoint of testing to avoid mental fatigue. All subjects were tested by the graduate student who developed this testing protocol. No participants required extended or additional breaks for unforeseen reasons.

The primary purpose of the present study was to ascertain if feature training would improve the proper-name-recall abilities of older adults. This study
employed a multtrial training paradigm utilizing cued recall to assess this particular area of memory performance similar to that implemented by Constantinidou and Kreimer (2004). This design is also used during the initial levels of the Categorization Program (CP) developed by Dr. Fofi Constantinidou at the Neurocognitive Disorders Lab at Miami University (Constantinidou, Thomas, Scharp, Hammerly, & Guitonde, 2005). The CP is a hierarchical training program which incorporates research in human cognition from several disciplines. The training is designed to improve cognitive abilities amongst patients with TBI enrolled in rehabilitation. As in the CP, cueing hierarchies were used in this study to help train the participants to apply the features to each image.

**Standard Measures**

Cognitive, vision, and hearing screenings and subtests from neuropsychological assessments were administered to each subject. In order to screen for cognitive decline and the presence of depression, all subjects will be required to score 25 or higher (out of 30) on the Mini Mental State Examination (Folstein, Folstein, & Hughes, 1975). Hearing and vision screenings were used to establish that participants have normal hearing acuity sufficient for conversational speech and visual acuity and perception adequate to allow for recognition and discrimination of pictures of people. Each participant’s hearing was screened at an intensity level of 40 dB HL for 1000 Hz. All subjects passed the screening in at least one ear. Each participant’s vision was screened by having them read aloud five words printed in 10-point font (Constantinidou, 1995). The subjects were required to correctly read all five words aloud in order to pass the screening.

Standardized neuropsychological assessments which test memory and other cognitive abilities were administered to all subjects between experimental conditions. Subjects were evaluated for memory and learning capacity using the Digit Span Subtest of the Wechsler Memory Scale, 3rd edition (WMS-III; Wechsler, 1997) and the California Verbal Learning Test, 2nd edition (CVLT-II; Delis, Kramer, Kaplan, & Ober, 1987). The reverse sequence portion of the Digit
Span Subtest is particularly useful for assessing working memory. The CVLT-II consists of repeated presentations of a semantically related supraspan word list with immediate and delayed recall tasks. The Controlled Oral Word Association Test (COWAT; Benton & Hamsher, 1976) was used to assess verbal fluency and free recall, as well as to gauge how subjects organized their thinking. The Faces I and Faces II Subtests from the WMS-III were used to measure visual processing abilities. The Boston Naming Test (BNT; Kaplan, Goodglass, & Weintraub, 2001) was used to assess word-finding abilities. Scores from these subtests from standardized assessments were utilized to compare particular memory skills with name recall performance.

Order of Test Administration for All Subjects

1. MMSE
2. Hearing screening
3. Vision screening
4. Ishihara test for colorblindness
5. Beck Depression Inventory
6. Condition 1 Part A Unprompted Image Presentation
7. Digit Span Forwards and Backwards
8. Condition 1 Part B Recognition and Recall
9. CVLT-II Immediate Recall
10. Condition 2 Part A Spontaneous Description Image Presentation
11. COWAT
12. Condition 2 Part B Recognition and Recall
13. CVLT-II Delayed
14. WMS-III Faces I
15. Scheduled Break
16. WMS-III Faces II
17. Condition 3 Perceptual Feature Training
18. Condition 4 Part A Feature Application
19. Spatial Span Forwards and Backwards
20. Condition 4 Part B Recognition and Recall

21. BNT

Experimental Tasks

Conditions

This study consisted of four experimental conditions.

Condition 1, Part A - Unprompted Image Display

Prior to the images being displayed, subjects were told that they may be asked later to recall some information about the person depicted such as their name. During Part A of Condition 1, a computer slideshow was presented to each subject. The slideshow contained images of 10 different target individuals. An exposure duration of 25 seconds per image slide was used for both groups.

Condition 1, Part B - Recognition and Recall

Part B consisted of image recognition and name recall tasks which were answered concurrently. The participants were asked if they were shown the image during Part A of the condition. During Part B, images were displayed for up to 15 seconds to allow the participants to determine if they had been shown the image and, if so, the name of the person presented. Sound clips were played to ask subjects “Have you seen this person before?” as the slides were displayed. All sound clips were introduced by the same announcer. Acceptable responses were verbalized as “Yes, this is John,” “Yes, that is Karen,” or simply “No.” If a subject responded simply “Yes,” the examiner asked the subject to state the name of the target individual. All responses were recorded on a data sheet. Responses were scored as correct or incorrect. For recognition, subjects received one point for each image correctly identified as previously presented with a maximum of 20 points. Errors in detection were classified as “misses” and images that were incorrectly identified were classified as “false-alarm errors.” For name recall, subjects received one point for each name correctly stated with a maximum of 10 points. Only exact matches to the target name were scored as correct. Inaccurate name responses were recorded. The tester provided
feedback regarding the accuracy of responses during Part B only at the request of the participant.

Condition 2, Part A – Spontaneous Description Image Display

Prior to the images being displayed, subjects were again told that they may be asked later to recall some information about the person depicted such as their name. However, prior to image presentation, subjects were asked to describe the person presented to the examiner. Presentation of the images proceeded as in Part A of Condition 1. If the subject did not attempt to describe the image presented, the examiner asked the participant to do so. The examiner recorded which features the subjects used to describe the target individuals. Participants received one point for each feature which matched those outlined in Condition 3 below.

Condition 2, Part B - Recognition and Recall

Procedures were the same as Condition 1, Part B.

Condition 3 - Perceptual Feature Training

A multistrial training paradigm was employed during Condition 3. Subjects were trained to use eight perceptual features to describe the persons represented in the images. These eight features were: age, height, weight/body type, complexion/skin tone, facial expression, hair color, race/ethnic group, and detail. These eight features were initially presented auditorily and accompanied PowerPoint slides which the examiner displayed to the subject as he presented the list.

Following each presentation of the characteristics by the examiner, the subjects were asked to recall the eight perceptual features. If the subject was having difficulty with this task, the examiner implemented a 2-tier cueing hierarchy as needed. The first level of the cueing hierarchy was to list the features that the subject already named (e.g., the examiner stated “You said age, race/ethnic group, height, and hair color.”). If the subject was still unable to recall all eight features, the examiner then progressed to Level 2 of the cueing hierarchy by providing the feature(s) that were omitted. Subjects were allowed up
to five training trials to learn the eight perceptual features. Training was discontinued after subjects were able to recall the eight features during 2 of 3 trials without the second level of the cueing hierarchy or after the fifth trial.

During feature training, subjects could earn a maximum of 40 points. For each trial, subjects earned one point for each feature named without cueing or with only Level 1 of the cueing hierarchy. Subjects were awarded full credit, 8 points each, for all trials beyond those needed to complete training requirements. Points were not awarded for features which required Level 2 of cueing. Scoring was carried out by recording the number of training trials and cues needed to meet pass criteria. The steps of the cueing hierarchy are outlined in Appendix A.

Prior to the start of Part A of Condition 4, one dual image was shown to each subject. The examiner applied the set of eight features to describe a target individual. Furthermore, the examiner described how responses should be phrased to all participants. Subjects were asked to name each feature as it was applied. Satisfactory descriptions of attributes included the target name in the following form, “Jerry’s build is slim.” For age, participants were asked to estimate an approximate age for the person depicted. Acceptable responses contained a statement, such as “Jerry’s age is 33 years old,” or a close approximation like “Jerry’s age is in his early 30s,” “Jerry’s age is around 33 years old,” “Jerry’s age is about 35 years old.” Specific estimates in feet and inches were required for height responses. Replies framed as “Jerry’s height is about six feet” or “Jerry’s height is 5 feet 10 inches” were model responses for the height feature. Subjects were able to state a specific weight in pounds for the target individual or describe body type with an adjective such as thin, lean, slender, wiry, fit, muscular, broad-shouldered, burly, stocky, chunky, or fat. Complexion or skin tone was described with terms such as light, fair, pale, tan, bronze, or dark. Acceptable responses for facial expression included happy, sad, angry, and bored. Hair color could be classified as blonde, brunette, auburn, red, white, grey or the person may be described as bald. Race or ethnic group could be classified as white, Caucasian, African American, black, Asian, Native
American, etc. Detail referred to a distinctive physical attribute, an article of clothing or other item the person in wearing, carrying or using. Detail could also refer to the person’s occupation or profession if that is evident in the image presented. “A detail about Jerry is that he wears glasses,” “A detail about Jerry is that he uses a cane,” and “A detail about Jerry is that he is a fireman” are examples of appropriate responses for detail.

**Condition 4, Part A - Feature Application Task**

During the application task, subjects were instructed to apply the same set of eight perceptual features trained in the previous condition to a new set of 10 images. Subjects earned one point for each feature applied for a maximum of 80 points. The subjects were only allowed one trial to apply the features to this set. The cueing hierarchy was employed at this time as indicated in Constantinidou and Kreimer (2004). In addition to the two levels described above in feature training, a third tier of cueing was added during the application phase of the study. In the third level of cueing, the examiner provided an example of the missing feature if the subject was unable to supply a correct response. Points were not awarded for features which required Levels 2 or 3 of cueing. If a subject used the same feature twice, only one point was allocated for answering that particular feature. The examiner noted how often the target name was repeated during the feature application process.

**Condition 4, Part B - Trained Recognition and Recall**

As in Condition 1, Part B. In addition, intrusion of names that were presented in earlier conditions was noted.
<table>
<thead>
<tr>
<th>Level of Research</th>
<th>Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Condition 1</strong></td>
<td><strong>Part A</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Part B</strong></td>
</tr>
<tr>
<td><strong>Condition 2</strong></td>
<td><strong>Part A</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Part B</strong></td>
</tr>
<tr>
<td><strong>Condition 3</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Condition 4</strong></td>
<td><strong>Part A</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Part B</strong></td>
</tr>
<tr>
<td><strong>Neuropsychological Assessments</strong></td>
<td></td>
</tr>
</tbody>
</table>
Stimuli

Image selection and editing

The images that were selected for use as stimuli in this study were downloaded from photo album websites, such as Flickr, which allow amateur and professional photographers to openly display their work. All images selected for use in this study were labeled as “public” by the creators of the images when they were posted on these sites. These pictures were cropped to isolate one person per image and edited to create images with similar size and lighting conditions. All images contained full body representations of the target individuals with their faces turned toward the camera. The pictures contained males and females from a wide range of ages and ethnic groups in a variety of settings. The persons depicted were seated or standing with a neutral facial expression or smiling. All images were in color and free of objectionable content. Famous faces, including actors, musicians, and politicians, were excluded from all sets of images to reduce the chance of prior exposure to any stimuli. These criteria were applied to all sets of pictures used for training and testing conditions.

Name selection

First names were assigned to each person presented in the image sets for the experimental tasks. The 500 most common male and female names for each decade from the 1930s through the 1990s were obtained from the website of the United States’ Social Security Administration (www.ssa.gov). These lists were analyzed and names not appearing in the top 500 for all decades were excluded. The lists from each decade were then compiled and ranked according to overall frequency. For males and females respectively, 121 names and 119 names met these criteria. Names appearing on the list which are homonyms (i.e. Katherine and Catherine) were used no more than one time. Specific names were used no more than once in the study. However, different versions of the same root name, (i.e., James and Jimmy or Katherine and Kate) may have been selected if both names appeared on the compiled lists of male and female names. Actual names
used in each presentation set are listed in Appendix B. These criteria for name selection were developed to provide roughly uniform exposure to familiar names for subjects of all ages. Furthermore, the use of unusual names may have increased recall likelihood and acted as another independent variable.

**Image Grouping**

All images that meet selection criteria were sorted by gender and age. The author estimated the age of each individual depicted and conferred with two other reviewers to place the images in the appropriate age group. For each gender, the images were placed in 7 groups for ages 10-19 years, 20-29 years, 30-39 years, 40-49 years, 50-59 years, 60-69 years, and over 70 years. Six presentation sets of 10 images were selected from the above age-gender groups for use during Conditions 1, 2 and 4 of the study.

These six sets of images, each containing 10 different persons, were organized and numbered Set 1 through Set 6. Arrays containing 10 images were used in each presentation set during Part A of Conditions 1, 2 and 4. Recall sets used during Part B of these conditions were composed of the 10 images from the presentation set and ten images from a distracter set. The distracter set consisted of the images from the subsequent set which were not presented during Part A of the condition. Therefore, sets 1 and 2, 2 and 3, 3 and 4, 4 and 5, 5 and 6, and 6 and 1 were combined. Each set was viewed only once. The assorted sequences of the six photo sets were rotated through the conditions and presented/distracter sets to counterbalance the chance that the face-name associations of one set of photos were easier or more difficult to learn. The recall rate for each photo set was calculated with the other results and there was no correlation between presentation set and name-recall.

**Auditory and Visual Presentation**

All images were displayed on a 15 inch computer screen using a timed slideshow presentation program. Prior to the first slideshow being displayed, each subject listened to a brief passage on the computer speakers at 65 dB HL and 75 dB HL. Then, each subject then selected a preferred sound level for the
test administration. There were a total of 61 separate image slides utilized in the conditions containing one unique person presented in a dual image format. Blank slides with a dark background were inserted between slides containing images as a visual buffer between each target. This blank screen was displayed for 2 seconds before the ensuing image was presented. Names were presented only in an auditory modality simultaneously with a dual visual representation of each target individual. On the left half of each slide was a full body depiction of the target individual in a contextual setting. On the opposite side was an enlarged perspective of the face from the full-body image. Appendix C provides an example of the images displayed on the computer screen.

Sound clips were played to introduce the target first name as each new presentation slide containing images was displayed. All sound clips were introduced by the same announcer and phrased as “This is Target Name.” The subject responded by repeating the announcement with the correct target name. If the participant requested a reiteration or stated the wrong name, the administrator repeated the phrase with the target name and noted the request. The subject then stated the phrase with the appropriate name.

Image sets were presented in successive order for each participant to counterbalance for any factors that might have caused certain set(s) to be easier or more difficult to describe or recall. For example, during Condition 1, the first subject was administered Presentation Set 1-A for Part A and Recall Set 1-2 for image recognition and name recall during Part B. During Condition 2, Presentation Set 3-A was administered for feature application and Recall Set 3-4 for Part B. The second subject began Part A of Condition 1 with Set 2-B and proceeded accordingly. Ensuing participants were administered the image sets in successive order.

**Dependent Variables**

The dependent variables consisted of the following:

1. Subtests from standard neuropsychological assessments that measure memory, verbal learning, and other cognitive abilities.
2. Name recall scores on Conditions 1, 2, and 4 of the study developed for this experiment to measure improvement on proper name retrieval relating to feature training.

3. Scores for feature naming and application on Conditions 3 and 4 of the study to assess the ability to utilize categorization skills explained during the training portion of Condition 3.

4. Image recognition on Conditions 1, 2, and 4 of the study developed for this experiment to measure improvement on visual recognition relating to feature training.

**Research Questions**

1. Will there be a difference in the untrained proper name recall abilities of younger and older adults?

2. Will there be a difference in the untrained visual recognition abilities of younger and older adults?

3. Will all subjects demonstrate improvement in their name recall abilities after the feature training as measured by improved scores on recall between Part B of Condition 1 and Part B of Condition 4?

4. Will older and younger adults demonstrate improvement in their visual recognition abilities after the feature training as measured by improved scores on recognition between Part B of Condition 1 and Part B of Condition 4?

5. Will there be a significant difference in the learning patterns of younger and older adults across training of the perceptual features?

6. Will there be a relationship between performance on the name recall tasks and performance on the subtests from standard neuropsychological tests that assess memory, verbal learning, and other cognitive abilities for both groups?

**Research Hypotheses**

1. There will be a difference in the spontaneous proper name recall abilities of younger and older adults.
2. There will not be a difference in the spontaneous visual recognition abilities of younger and older adults.

3. Older and younger adults will demonstrate improvement in their name recall abilities after the feature training as measured by improved scores on recall between Part B of Condition 1 and Part B of Condition 4.

4. Older and younger adults will demonstrate improvement in their visual recognition abilities after the feature training as measured by improved scores on recognition between Part B of Condition 1 and Part B of Condition 4.

5. Younger adults will demonstrate a greater increase in name recall abilities in their name recall abilities after the feature training as measured by improved scores on recall between Part B of Condition 1 and Part B of Condition 4.

6. There will be a significant difference in the learning patterns of younger and older adults across training of the perceptual features.

7. There will be a relationship between the performance on the name recall and recognition tasks and performance on the subtests from standard neuropsychological tests that assess memory, verbal learning, and other cognitive abilities for both groups.

Data Analyses

Analyses of variance and correlation procedures were used to answer the research questions ($\alpha = .05$). Univariate comparisons were completed as needed.
Chapter III
Results

Descriptive Statistics

Subjects

Twenty five older adult subjects from Southwestern Ohio and Southeastern Indiana were included in the experimental group for this study (Group 2). The subjects were pair-matched for gender and number of years of education as closely as possible with 26 younger adult subjects (Group 1) from the same area. The ages of the younger adult subjects ranged from 18 to 50 with a mean age of 34.23 (SD=10.48) and the ages of the older adult subjects ranged from 60 to 85 with a mean age of 69.04 (SD=7.94). The years of education for both groups ranged from 12 to 19 years with a mean of 14.50 years (SD=2.45) for the younger adult subjects and 14.16 years (SD=2.66) for the older adult subjects. There was no significant difference between the groups for education, F(1, 51)= .762, p = .637.

Feature Training and Name Recall Performance

All subjects were administered the same experimental tasks, the same battery of neuropsychological assessment subtests, as well as screening instruments. All subjects completed the testing in one or two sessions. The experimental tasks consisted of 4 conditions. During Part A of Conditions 1, 2, and 4, subjects were presented with 10 paired head and full-body images accompanied by auditory name presentation of each individual on a computer. In Part B of these conditions, subjects were tested on recognition and name recall as they were presented with the same 10 slides and 10 distracter slides.

During Condition 1A, subjects were simply asked to repeat the names given to the individuals presented and attend to the images as they were displayed. During Condition 2A, subjects were asked to repeat the names given and spontaneously describe the persons depicted. Condition 3 consisted of up to five repeated trials of feature training to learn a set of 8 perceptual features. During Condition 4A, subjects were asked to repeat the names given and apply
the 8 features learned in Condition 3 to each individual presented. Table 2 outlines the design of the experimental tasks.

Table 2

Experimental Design

<table>
<thead>
<tr>
<th>Condition</th>
<th>Part A</th>
<th>Part B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unprompted Image Display</td>
<td>Recognition and Recall</td>
</tr>
<tr>
<td>Condition 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Part B</td>
<td>Recognition and Recall</td>
<td></td>
</tr>
<tr>
<td>Condition 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Part A</td>
<td>Spontaneous Description</td>
<td></td>
</tr>
<tr>
<td>Part B</td>
<td>Recognition and Recall</td>
<td></td>
</tr>
<tr>
<td>Condition 3</td>
<td>Feature Training</td>
<td>Trials 1 through 5</td>
</tr>
<tr>
<td>Condition 4</td>
<td>Part A</td>
<td>Feature Application Task</td>
</tr>
<tr>
<td></td>
<td>Recognition and Recall</td>
<td></td>
</tr>
</tbody>
</table>

Table 3 presents the name recall scores for both groups across conditions. Figure 1 provides a graphic representation of name recall performance for both groups across the conditions.

Table 3

Name Recall Scores across Conditions

<table>
<thead>
<tr>
<th></th>
<th>Group 1</th>
<th></th>
<th>Group 2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Younger Adults</td>
<td>Older Adults</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N=26</td>
<td>N=25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condition 1B</td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td></td>
<td>6.04</td>
<td>2.32</td>
<td>5.36</td>
<td>2.80</td>
</tr>
<tr>
<td>Condition 2B</td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td></td>
<td>6.38</td>
<td>2.79</td>
<td>4.44</td>
<td>3.42</td>
</tr>
<tr>
<td>Condition 4B</td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td></td>
<td>3.92</td>
<td>2.30</td>
<td>2.32</td>
<td>2.29</td>
</tr>
</tbody>
</table>

Table 4 presents the recognition scores for both groups across conditions. Figure 2 provides a graphic representation of recognition performance for both groups across the conditions.
Table 4

Recognition Scores across Conditions

<table>
<thead>
<tr>
<th></th>
<th>Group 1</th>
<th></th>
<th>Group 2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Younger Adults</td>
<td></td>
<td>Older Adults</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N=26</td>
<td></td>
<td>N=25</td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>Condition 1B</td>
<td>19.96</td>
<td>0.20</td>
<td>19.76</td>
<td>0.52</td>
</tr>
<tr>
<td>Condition 2B</td>
<td>20.00</td>
<td>0</td>
<td>19.80</td>
<td>0.41</td>
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<tr>
<td>Condition 4B</td>
<td>19.96</td>
<td>0.20</td>
<td>19.92</td>
<td>0.28</td>
</tr>
</tbody>
</table>

Subjects from both groups incorrectly applied names from presentation sets in Part A to images in Part B. Some names were mistakenly applied to images from the same set, Within Set Intrusions. Other names presented in Part A of Conditions 1 and 2 were used inaccurately in Part B of subsequent conditions, Previous Set Intrusions. Table 5 presents this data.
Table 5

*Presented Name Intrusions across Conditions*

<table>
<thead>
<tr>
<th></th>
<th>Group 1</th>
<th></th>
<th>Group 2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Younger Adults</td>
<td></td>
<td>Older Adults</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N=26</td>
<td>Mean</td>
<td>N=25</td>
<td>Mean</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td></td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>Condition 1B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within Set Intrusions</td>
<td>0.77</td>
<td>0.91</td>
<td>0.68</td>
<td>1.07</td>
</tr>
<tr>
<td>Condition 2B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within Set Intrusions</td>
<td>0.46</td>
<td>0.51</td>
<td>0.24</td>
<td>0.52</td>
</tr>
<tr>
<td>Condition 4B</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Within Set Intrusions</td>
<td>0.62</td>
<td>0.80</td>
<td>0.96</td>
<td>1.17</td>
</tr>
<tr>
<td>Condition 2B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Previous Set Intrusions</td>
<td>0.31</td>
<td>0.68</td>
<td>1.16</td>
<td>1.28</td>
</tr>
<tr>
<td>Condition 4B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Previous Set Intrusions</td>
<td>0.77</td>
<td>1.03</td>
<td>0.80</td>
<td>1.26</td>
</tr>
<tr>
<td>Condition 1B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Intrusions</td>
<td>0.77</td>
<td>0.91</td>
<td>0.68</td>
<td>1.07</td>
</tr>
<tr>
<td>Condition 2B</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Total Intrusions</td>
<td>0.77</td>
<td>0.90</td>
<td>1.40</td>
<td>1.50</td>
</tr>
<tr>
<td>Condition 4B</td>
<td></td>
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</tr>
<tr>
<td>Total Intrusions</td>
<td>1.44</td>
<td>1.39</td>
<td>1.76</td>
<td>1.48</td>
</tr>
</tbody>
</table>

During Condition 2A, subjects were asked to spontaneously describe the individuals in the presentation sets. Table 6 presents the total number of features used as well as the number of study features later instructed in Condition 3 used by each group.
Table 6
*Spontaneous Features Used in Condition 2A*

<table>
<thead>
<tr>
<th>Feature Used</th>
<th>Group 1</th>
<th></th>
<th>Group 2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Younger Adults</td>
<td>N=26</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Study Features Used</td>
<td>13.73</td>
<td>5.94</td>
<td>21.25</td>
<td>11.01</td>
</tr>
<tr>
<td>Total Features Used</td>
<td>47.92</td>
<td>24.15</td>
<td>61.20</td>
<td>28.56</td>
</tr>
</tbody>
</table>

*Feature Training*

Condition 3 involved training the subjects to use eight perceptual features to describe people. The subjects were taught eight perceptual features: height, weight/body type, complexion/skin tone, hair color, age, facial expression/mood, race/ethnic group, and detail. During Feature Training, subjects were administered up to five training trials to learn the eight features. The eight perceptual features were presented auditorily and visually as the examiner read the features as they were presented on PowerPoint slides. Following presentation, the subjects were asked to recall the eight perceptual features. If the subject was unable to recall any of the eight features the examiner cued the subject by listing the features already named, Level 1 of the cueing hierarchy. If the subject was still unable to recall all eight features, then the examiner provided the missing feature(s), Level 2 of the cueing hierarchy. Training was discontinued if subjects were able to recall the eight features across two consecutive trials without Level 2 of the cueing hierarchy.

During feature training trials, the subject could earn a total of 40 points, one point for each feature across five training trials. If training was discontinued after two consecutive trials without Level 2 of the cueing hierarchy, the subject received credit, eight points, for each trial not administered. If the examiner administered Level 2 of the cueing hierarchy by providing the missing feature(s),
the subject did not receive a point for that feature. Table 7 outlines performance on Condition 3.

Table 7

*Feature Training Scores in Condition 3*

<table>
<thead>
<tr>
<th></th>
<th>Group 1</th>
<th></th>
<th>Group 2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Younger Adults</td>
<td>Older Adults</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N=26</td>
<td>N=25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Total Score</td>
<td>38.38</td>
<td>1.67</td>
<td>37.32</td>
<td>2.38</td>
</tr>
<tr>
<td>Level 1 Cues Needed</td>
<td>2.35</td>
<td>1.87</td>
<td>3.80</td>
<td>3.58</td>
</tr>
<tr>
<td>Level 2 Cues Needed</td>
<td>1.65</td>
<td>1.67</td>
<td>2.68</td>
<td>2.38</td>
</tr>
<tr>
<td>Trials Needed</td>
<td>3.08</td>
<td>0.93</td>
<td>3.72</td>
<td>1.10</td>
</tr>
</tbody>
</table>

*Application of features*

During Features Application in Condition 4A, subjects were asked to describe the ten individuals in the presentation set using the eight perceptual features trained in Condition 3. After repeating the name of the person presented, the subjects used the eight features to describe each person. The subject earned one point for each feature applied without Level 2 of the cueing hierarchy. A total of 80 points were possible for Features Application in Condition 4A, eight points for each feature recalled across the ten individuals in the presentation set.

If the patient was unable to recall all eight features to describe a target individual, the cueing hierarchy was implemented. The examiner listed the features described to cue the subject to recall missing features. If the subject was still unable to recall the feature, the subject was provided with the missing feature and asked the subject to apply that feature. If the subject had difficulty applying the feature, he was cued with an example of feature use. The amount of cueing required within the younger adult group and the older adult group was
obtained to determine if there was a difference between groups in the level of support needed. Table 8 provides the mean scores and the number of cues needed to recall the eight perceptual features during Features Application administration. A higher score on Level 1 and Level 2 indicates that the subjects within the group required more assistance to recall the perceptual features.

Table 8

<table>
<thead>
<tr>
<th>Feature Application Scores in Condition 4A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
</tr>
<tr>
<td>Younger Adults</td>
</tr>
<tr>
<td>N=26</td>
</tr>
<tr>
<td>Total Score</td>
</tr>
<tr>
<td>Level 1 Cues Needed</td>
</tr>
<tr>
<td>Level 2 Cues Needed</td>
</tr>
</tbody>
</table>

Research Questions and Inferential Statistics

Research Question 1: Will there be a difference in the untrained proper name recall abilities of younger and older adults?

A one-way between-groups analysis of variance (ANOVA) with an alpha level of 0.05 was performed to compare the performance of older adult subjects and young adult subjects on a name recall task in Condition 1B following unprompted image display (SPSS, Version 15.0 for Windows). The results indicate no significant difference for untrained proper name recall between the groups, $F (1, 51) = .891, p=.350$.

Research Question 2: Will there be a difference in the untrained visual recognition abilities of younger and older adults?

A one-way between-groups analysis of variance (ANOVA) with an alpha level of 0.05 was performed to compare the performance of older adult subjects and young adult subjects on a image recognition task in Condition 1B following
unprompted image display (SPSS, Version 15.0 for Windows). The results do not indicate significant difference for untrained image recognition between the groups, F (1, 51) = 3.372, p=.072.

Research Question 3: **Will all subjects demonstrate improvement in their name recall abilities after the feature training as measured by improved scores on recall between Part B of Condition 1 and Part B of Condition 4?**

Both younger and older adults demonstrated a decline in name recall performance from Condition 1B to Condition 4B. All subjects demonstrated a decline of 2.57 from a mean of 5.71 in Condition 1B (SD=2.56) to a mean of 3.14 in Condition 4B (SD=2.41). Younger adults (Group 1) exhibited a mean loss of 2.12 from a mean of 6.04 in Condition 1B (SD=2.32) to a mean of 3.92 in Condition 4B (SD=2.30). Older adults (Group 2) presented a mean loss of 3.04 from a mean of 5.36 in Condition 1B (SD=2.80) to a mean of 2.32 in Condition 4B (SD=2.29).

A two-way mixed (between-within) analysis of variance (ANOVA) with an alpha level of 0.05 was performed to compare the performance of all subjects on a name recall task in Condition 1B following unprompted image display with performance on a similar name recall task in Condition 4B following feature training and application (SPSS, Version 15.0 for Windows). The within-subjects tests results indicate a significant difference for proper name recall performance following training, F (1, 49) = 36.591, p=.001. The between-subjects group effect was also significant, F (1, 49) = 4.602, p=.037. The interaction effect between group and recall was not significant, F (1, 49) = 1.177, p=.283.

Research Question 4: **Will older and younger adults demonstrate improvement in their visual recognition abilities after the feature training as measured by improved scores on recognition between Part B of Condition 1 and Part B of Condition 4?**

Older adults demonstrated an increase in visual recognition performance from Condition 1B to Condition 4B, while younger adults showed no change in
performance for the same tasks. Older adults (Group 2) presented a mean gain of 0.16 from a mean of 19.76 in Condition 1B (SD=0.52) to a mean of 19.92 in Condition 4B (SD=0.28). Younger adults (Group 1) exhibited no change in performance with a mean of 19.96 and a SD=0.20 in both Condition 1B and Condition 4B.

A two-way mixed (between-within) analysis of variance (ANOVA) with an alpha level of 0.05 was performed. The within-subjects tests results did not indicate a significant difference for image recognition following training, $F(1, 49) = 1.708, p=.197$. The between-subjects group effect suggest some association, but no statistical significance, $F(1, 49) = 3.269, p=.077$

**Research Question 5:** Will there be a significant difference in the learning patterns of younger and older adults across training of the perceptual features?

A one-way between-groups analysis of variance (ANOVA) with an alpha level of 0.05 was performed to compare the total points earned by older adult subjects and young adult subjects during feature training in Condition 3 (SPSS, Version 15.0 for Windows). The results indicate no significant difference for total points earned in Condition 3, $F(1, 51) = 3.203, p=.080$.

A one-way between-groups analysis of variance (ANOVA) with an alpha level of 0.05 was performed to compare the Level 1 cueing needed by older adult subjects and young adult subjects during feature training in Condition 3 (SPSS, Version 15.0 for Windows). The results indicate no significant difference for Level 1 cueing needed in Condition 3, $F(1, 51) = 3.334, p=.074$. However, older subjects required more learning trials to learn the 8 features, $F(1, 51) = 5.075, p=.029$.

**Research Question 6:** Will there be a relationship between performance on the name recall tasks and performance on the subtests from standard neuropsychological tests that assess memory, verbal learning, and other cognitive abilities for both groups?

One-tailed correlations were performed between the name-recall tasks in
Part B of Conditions 1, 2 and 4 and the neuropsychological subtests for all subjects. These scores are shown in Table 9 below. The strongest correlations existed between segments of the California Verbal Learning Test and the Unprompted Name Recall task in Condition 1B. The Pearson Correlation for this experimental task and the CVLT Short Delay Free Recall Correct was .523, .577 with the CVLT Long Delay Free Recall Correct, and .543 with the CVLT Long Delay Cued Recall Correct. The Free Recall segments of the CVLT involve recalling a list of 16 words learned auditorily following delays which include distracter tasks.

Further statistical analyses were conducted to determine if Group 1 (Older subjects) or Group 2 (Younger subjects) contributed more to these correlations. Group 1 had much stronger correlations between performance on the neuropsychological subtests and the experimental tasks. These scores are shown in Table 10 below. Again, the strongest correlations existed between segments of the California Verbal Learning Test and the Unprompted Name Recall task in Condition 1B. Correlations for Group 1 did not exceed .390 between any segment of the CVLT and any name recall task and did not exceed .550 for any subtest and any name recall task.
Table 9

*Significant Correlations between Name Recall Tasks and Neuropsychological Subtests for All Subjects*

<table>
<thead>
<tr>
<th></th>
<th>Name Recall</th>
<th>Condition 1B</th>
<th>Condition 2B</th>
<th>Condition 4B</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVLT Immediate Trial 5 Correct</td>
<td>Pearson Correlation</td>
<td>.470(**)</td>
<td>.449(**)</td>
<td>.258(*)</td>
</tr>
<tr>
<td></td>
<td>Significance (1-tailed)</td>
<td>.000</td>
<td>.000</td>
<td>.034</td>
</tr>
<tr>
<td>CVLT Short Delay Free Recall Correct</td>
<td>Pearson Correlation</td>
<td>.523(**)</td>
<td>.377(**)</td>
<td>.430(**)</td>
</tr>
<tr>
<td></td>
<td>Significance (1-tailed)</td>
<td>.000</td>
<td>.003</td>
<td>.001</td>
</tr>
<tr>
<td>CVLT Short Delay Cued Recall Correct</td>
<td>Pearson Correlation</td>
<td>.492(**)</td>
<td>.397(**)</td>
<td>.365(**)</td>
</tr>
<tr>
<td></td>
<td>Significance (1-tailed)</td>
<td>.000</td>
<td>.002</td>
<td>.004</td>
</tr>
<tr>
<td>CVLT Long Delay Free Recall Correct</td>
<td>Pearson Correlation</td>
<td>.577(**)</td>
<td>.392(**)</td>
<td>.353(**)</td>
</tr>
<tr>
<td></td>
<td>Significance (1-tailed)</td>
<td>.000</td>
<td>.002</td>
<td>.006</td>
</tr>
<tr>
<td>CVLT Long Delay Cued Recall Correct</td>
<td>Pearson Correlation</td>
<td>.543(**)</td>
<td>.379(**)</td>
<td>.364(**)</td>
</tr>
<tr>
<td></td>
<td>Significance (1-tailed)</td>
<td>.000</td>
<td>.003</td>
<td>.004</td>
</tr>
<tr>
<td>Digit Span Forward Total Correct</td>
<td>Pearson Correlation</td>
<td>.287(*)</td>
<td>.449(**)</td>
<td>-.049</td>
</tr>
<tr>
<td></td>
<td>Significance (1-tailed)</td>
<td>.021</td>
<td>.000</td>
<td>.365</td>
</tr>
<tr>
<td>Digit Span Backward Total Correct</td>
<td>Pearson Correlation</td>
<td>.290(*)</td>
<td>.452(**)</td>
<td>.147</td>
</tr>
<tr>
<td></td>
<td>Significance (1-tailed)</td>
<td>.019</td>
<td>.000</td>
<td>.151</td>
</tr>
<tr>
<td>Digit Span Total Correct</td>
<td>Pearson Correlation</td>
<td>.343(**)</td>
<td>.535(**)</td>
<td>.053</td>
</tr>
<tr>
<td></td>
<td>Significance (1-tailed)</td>
<td>.007</td>
<td>.000</td>
<td>.356</td>
</tr>
<tr>
<td>Faces II Total Correct</td>
<td>Pearson Correlation</td>
<td>.251(*)</td>
<td>.424(**)</td>
<td>.448(**)</td>
</tr>
<tr>
<td></td>
<td>Significance (1-tailed)</td>
<td>.038</td>
<td>.001</td>
<td>.000</td>
</tr>
<tr>
<td>COWAT Adjusted Score</td>
<td>Pearson Correlation</td>
<td>.453(**)</td>
<td>.307(*)</td>
<td>.112</td>
</tr>
<tr>
<td></td>
<td>Significance (1-tailed)</td>
<td>.000</td>
<td>.014</td>
<td>.217</td>
</tr>
<tr>
<td>BNT Correct</td>
<td>Pearson Correlation</td>
<td>.485(**)</td>
<td>.371(**)</td>
<td>.310(*)</td>
</tr>
<tr>
<td></td>
<td>Significance (1-tailed)</td>
<td>.000</td>
<td>.004</td>
<td>.013</td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.01 level (1-tailed).
* Correlation is significant at the 0.05 level (1-tailed).
Table 10

*Significant Correlations between Name Recall Tasks and Neuropsychological Subtests for Group 2 - Older Subjects*

<table>
<thead>
<tr>
<th></th>
<th>Name Recall</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Condition 1B</td>
<td>Condition 2B</td>
<td>Condition 4B</td>
</tr>
<tr>
<td>CVLT Imm 5 C</td>
<td>Pearson Correlation</td>
<td>.709(**)</td>
<td>.491(**)</td>
<td>.344(*)</td>
</tr>
<tr>
<td></td>
<td>Sig. (1-tailed)</td>
<td>.000</td>
<td>.006</td>
<td>.046</td>
</tr>
<tr>
<td>CVLT Imm Tot C</td>
<td>Pearson Correlation</td>
<td>.677(**)</td>
<td>.566(**)</td>
<td>.390(*)</td>
</tr>
<tr>
<td></td>
<td>Sig. (1-tailed)</td>
<td>.000</td>
<td>.002</td>
<td>.027</td>
</tr>
<tr>
<td>CVLT SD Free C</td>
<td>Pearson Correlation</td>
<td>.629(**)</td>
<td>.531(**)</td>
<td>.424(*)</td>
</tr>
<tr>
<td></td>
<td>Sig. (1-tailed)</td>
<td>.000</td>
<td>.003</td>
<td>.017</td>
</tr>
<tr>
<td>CVLT LD Free C</td>
<td>Pearson Correlation</td>
<td>.766(**)</td>
<td>.583(**)</td>
<td>.330</td>
</tr>
<tr>
<td></td>
<td>Sig. (1-tailed)</td>
<td>.000</td>
<td>.001</td>
<td>.054</td>
</tr>
<tr>
<td>COWA Adj Scr</td>
<td>Pearson Correlation</td>
<td>.655(**)</td>
<td>.488(**)</td>
<td>.130</td>
</tr>
<tr>
<td></td>
<td>Sig. (1-tailed)</td>
<td>.000</td>
<td>.007</td>
<td>.268</td>
</tr>
<tr>
<td>Dig Span FW Tot</td>
<td>Pearson Correlation</td>
<td>.569(**)</td>
<td>.467(**)</td>
<td>.025</td>
</tr>
<tr>
<td></td>
<td>Sig. (1-tailed)</td>
<td>.002</td>
<td>.009</td>
<td>.453</td>
</tr>
<tr>
<td>Dig Span BW Tot</td>
<td>Pearson Correlation</td>
<td>.421(*)</td>
<td>.604(**)</td>
<td>.238</td>
</tr>
<tr>
<td></td>
<td>Sig. (1-tailed)</td>
<td>.018</td>
<td>.001</td>
<td>.126</td>
</tr>
<tr>
<td>Dig Span Total</td>
<td>Pearson Correlation</td>
<td>.546(**)</td>
<td>.572(**)</td>
<td>.129</td>
</tr>
<tr>
<td></td>
<td>Sig. (1-tailed)</td>
<td>.002</td>
<td>.001</td>
<td>.270</td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.01 level (1-tailed).

* Correlation is significant at the 0.05 level (1-tailed).
Chapter IV
Discussion

The present study was an investigation of the proper-name-recall abilities of community-dwelling older adult volunteers for memory research. The purpose of the present study was to investigate whether incorporating perceptual features during the initial exposure to people would facilitate name-recall performance after delay. A multitrial, cued-recall paradigm was implemented to measure the effects of feature training on the memory performance of older adults. The experimental tasks involved viewing computer slideshows, describing images and recalling names assigned to the persons represented on the slides. In addition, this study examined the differences in name-recall performance between the two groups of subjects: younger adults and older adults.

The present study implemented a multitrial paradigm in order to teach participants eight perceptual features. All subjects benefited from the training and were able to implement the features to describe images of people. These results are consistent with studies by Constantinidou and Kreimer (2004) and Constantinidou and Popplewell (2006) which demonstrated improved use of features after similar training in order to describe objects. However, in the present study, feature training was used in order to improve name-recall abilities. It was hypothesized that the explicit use of primary features would facilitate name retrieval at a later time. The results suggest that the explicit use of features failed to facilitate name retrieval and, possibly, served as an interference mechanism during retrieval. The explicit requirement of the experimental task to use the features during information encoding might have resulted in a divided attention task. The use of features did not affect retention or recognition performance regarding visual information as participants' recognition performance was similar across conditions.

Name Recall Following Description

During Condition 2, subjects were cued to spontaneously describe the images in the presentation set. Younger subjects were better able to recall
names after implementing this strategy. Conversely, older adults declined in name-recall performance in Condition 2B following spontaneous description. The possible divided attention state while describing images in the presentation set may have taxed the executive functioning of older adults. This may have led to inefficient encoding of semantic information. Both groups were successful in encoding visual information as shown by improved recognition scores for both groups. During Part A of Condition 4, subjects described the people in the presentation set using the eight trained features. Name-recall performance for both groups declined in Condition 4B. The addition of a recall task while encoding new semantic information apparently exceeded the limits of executive functioning of both groups during the feature application task. In spite of this, older adults improved again on the recognition task.

In the present study, it seems that the tasks became more complex from Condition 1A to Condition 2A to Condition 4A and may have increased the load on the divided attention mechanism. The executive system governs purposeful cognitive behavior and is responsible for attending to the current situation (Shimamura, 1995). This system needs to be flexible enough to switch attention to different parts of the environment. However, the executive system is limited in the number of mental events to which it can attend at one time and research has shown that age-related differences exist pertaining to the role of attention in memory encoding. Memory performance is better following full-attention tasks than when attention is divided during encoding (Anderson, Craik, & Naveh-Benjamin, 1998). Simply, divided attention interrupts encoding processes. It appears that the increasing complexity of experimental Conditions 2 and 4 resulted in divided attention states consisting of a memory task and secondary task. During Part A of Conditions 2 and 4, the memory task was recalling the name assigned to each image and the secondary task was to describe the images presented. Both secondary tasks in these conditions involved directing more attention to the visual information presented. Research has found that when the secondary task is emphasized, secondary task performance improves.
while memory task performance declines (Anderson, Craik, & Naveh-Benjamin). Consequently, image recognition scores for both groups were stable or improved when emphasis was placed on the visual information while memory task performance involving recalling the semantic information of the proper names suffered.

Encoding new information is a resource-demanding task under executive control. Encoding is also a more attention-demanding task for older adults (Whiting & Smith, 1997). As a result, when a secondary task is included with a memory task, deficits in memory task performance should appear earlier in older adults. Consistent with this assumption, the secondary task costs first appeared in the decreased performance during Condition 2 for older adults with the inclusion of a description strategy, an additional resource-demanding, executive-controlled operation. However, younger adults were able to successfully utilize this compensatory strategy to enhance semantic memory performance. Secondary task costs did not appear for younger adults until a recall task was combined with the description strategy during the name-encoding process in Part A of Condition 4.

Further evidence of divided attention costs were revealed as several subjects from both groups produced within-set name intrusions during feature application in Condition 4A. For example, the names of the individuals in Presentation Set E included Amy, Edwin and Carrie. While applying the trained features to Carrie, a subject produced a sequence similar to the following: “Carrie’s height is tall. Carrie’s build is slim. Carrie’s hair color is brunette. Amy’s mood is happy.” At this point, the examiner stopped the subject and indicated that the target name was Carrie. Following administration of the entire testing protocol, the subjects were informed of the purpose of the testing. Many subjects stated that the effort required to recall the eight features during Condition 4A prevented them from focusing their attention on the name of the target individual, despite the fact that they were continually repeating that name. While the Node Structure Theory and the effects of rehearsal suggest that repeating the target
name should facilitate recall, the addition of the recall task appears to have interfered with the potential benefits of linking the name with the visual information.

As stated above, older subjects performed nearly as well as younger adults during Part B of Condition 1. This followed encoding which included a rehearsal of repeating the name for each person in the presentation set of Part A. However, rehearsal alone has been shown in other research to aid only in short-term memory enhancement (Klatzy, 1988). The goal of this study was to improve long-term memory. Successful use of applying the eight perceptual features in this study would likely have resulted in encoding at a deeper level. This deeper level of processing should result in more successful retrieval from long-term memory (Craik, 2002).

Subject 2, one of the study participants who had experience in using perceptual features, performed superiorly during the name-recall tasks in this study. He was a 30-year-old male detective for a large, urban police department. He recalled 10 out of 10 names successfully during Conditions 1 and 2, yet he was only able to recall 7 of 10 names during Condition 4. During spontaneous description in Condition 2A, Subject 2 described each individual presented with the same set and order of features. For example, a typical description proceeded as “female, Latino, about 5 foot 5, slim build, dark hair, light complexion, dark pantsuit…” After all conditions were completed, Subject 2 was asked how he felt his police training factored into his performance. He explained that he was instructed to use a “top down” description method as part of his training. This method had become second nature to him and allowed him to focus on the salient features of citizens he encountered. He stated that he utilized this method during the first condition as well. The elevated performance of this subject on name-recall tasks suggests that additional training and utilization of the perceptual features may indeed increase proper name recall once the list of features had been learned sufficiently.

Neurophysiological changes related to normal aging have been shown to
have negative impacts on the executive functioning and memory abilities of healthy older adults. Crook and West found age to be the most significant predictor of performance on name recall, as older adults performed more poorly than their younger counterparts (1990). Older adults reported on quality-of-life questionnaires that memory for proper names is the word retrieval task with the highest difficulty (Zelinski & Gilewski, 2004). Older adults also stated that name recall difficulties were the most noticeable and most frustrating decline in cognitive ability which contributed to negative experiences in both social and professional contexts (Cohen & Faulkner, 1986).

Older adults can increase memory performance after being instructed to use strategies (Souchay & Isingrini, 2004). Previous studies have shown that imagery mnemonic training has been beneficial to older adults in facilitating proper-name-recall success (Hux et al., 2000; Downes et al., 1997). These studies typically used mnemonics provided by the examiner. The present study sought to instruct subjects to use the feature application strategy independently to allow for greater generalization to functional tasks.

Repeated training of memory strategies has been found to produce more significant improvement in the ability of older adults to use these methods successfully (Woolverton et al., 2001). By providing additional training sessions to learn to use the eight features, older adults may be able to implement them effectively without taxing the executive system. Repeated training trials either directed by examiner or completed independently may allow this method to be generalized. This could enable more successful encoding as evidenced by the performance of Subject 2. Younger subjects were better able to recall names after they were cued to describe the people in the presentation set in Condition 2. This also suggests that the use of description or categorization at encoding results in a deeper level of processing and leads to more successful retrieval.

Clinical Implications

The results of this study contribute to the literature on normal-aging memory performance and offer guidance for all health care professionals who
instruct patients on the use of compensatory strategies. The results suggest that divided attention can impair successful strategy application. Compensatory strategies that tax executive functioning or attention resources may necessitate extended training before they can be successfully implemented by clinical populations, particularly older patients. Information collected from Subject 2 suggests that repeated training sessions and practice employing strategies may enhance procedural memory and result in more successful strategy use. Because the population of this study consisted of normal adults, training should be even more extensive for patients with brain injuries or neurological disorders. Research should be conducted with the target population to determine the efficacy of potential treatment methods to establish that the outcomes confirm the underlying theories. This allows us to make more valid conclusions about the effectiveness of our proposed treatments.

Limitations

The primary limitation of this study is that the design prevented subjects from demonstrating name-recall skills in real-life settings. Accordingly, a possible criticism could be that the stimuli selected are not representative of natural settings. The use of still images with the examiner’s voice presenting names could be replaced with video clips of individuals introducing themselves. These constraints could limit the findings to the constructs of the study tasks.

Future Research

As stated previously, the present study could be modified to increase the number of training trials to learn to implement the eight perceptual features. Training could be distributed over a number of sessions that would allow subjects to learn the features, practice applying them, and return a few days later for additional practice. A printed list of features could be used by subjects during the practice sessions. The use of a provided list of features during application would eliminate the recall task during encoding of new semantic information. Future studies could also yield information concerning the number of sessions required for the features to be stored in implicit memory or the usefulness of patients
completing independent study sessions between examiner-guided sessions.

As stated above, changes could be made regarding the presentation sets. The audio clips accompanying pictures could consist of different male and female voices introducing names (i.e. “Hi, my name is George.”). This would replace the recordings of the examiner presenting the names to create a more realistic interaction. Another option to replicate a more lifelike interaction would be the use of video clips rather than pictures. Short video clips in the presentation set could provide additional information by enabling subjects to view the mannerisms of target individuals in addition to hearing each individual’s voice.

During presentation of all sets of individuals in Part A of Conditions 1, 2 and 4, the computer message that named the target individuals began 4 seconds after the images were displayed. As stated in the Introduction, the purpose of this method was to allow a pre-exposure period to establish a more stable representation of the target individual on which to superimpose a name (Downes et al., 1997). At least three subjects, one from Group 1 and two from Group 2, spontaneously voiced independently applied names to the individuals in the presentation sets before the computer named the person displayed. These subjects were asked not to state a name until the computer message played. However, other subjects were not asked if they had instinctively associated names with the individuals displayed prior to presentation of the computer message. This confounding information may have affected successful retrieval of the target name. In the future, the pre-exposure period could be reduced and subjects could be directed to wait for the given name prior to presentation of the images in order to limit the possibility of independent naming.
References


Test (2nd ed.). San Antonio, TX: The Psychological Corporation.


Appendix A
Feature Training Cueing Hierarchy

**No cueing needed**
Step 1. Examiner presented list of 8 features auditorily and visually to the subject. Subject was able to recall all 8 features without assistance. Subject received 8 points, 1 point for each feature named without Level 2 of the cueing hierarchy.

**Cueing Level 1 needed**
Step 1. Examiner presented list of 8 features auditorily and visually to the subject. Subject was able to recall 7 or fewer features.
Step 2. Examiner proceeded to Level 1 of the cueing hierarchy by listing the feature(s) the subject had already named. Subject was then able to recall remaining features. Subject received 8 points, 1 point for each feature named without Level 2 of the cueing hierarchy.

**Cueing Level 2 needed**
Step 1. Examiner presented list of 8 features auditorily and visually to the subject. Subject was able to recall 7 or fewer features.
Step 2. Examiner proceeded to Level 1 of the cueing hierarchy by listing the feature(s) the subject had already named. Subject was still unable to recall all 8 features.
Step 3. Examiner proceeded to Level 2 of the cueing hierarchy by listing the remaining feature(s). Subject received 1 point for each feature named without Level 2 of the cueing hierarchy.
Appendix B

Assigned Names

<table>
<thead>
<tr>
<th>Presentation Sets</th>
<th>A</th>
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<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
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<td>Carmen</td>
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<td>Patrick</td>
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</tbody>
</table>
Appendix C

Computer Screen Example
Figure 1

Name Recall Performance across Conditions

![Name Recall Performance across Conditions](image)
Figure 2

Recognition Performance across Conditions

Recognition Scores

Mean

Younger Adults

Older Adults

Condition

1B 2B 4B
Figure 3

_Total Name Intrusions across Conditions_

![Graph showing total name intrusions across conditions for younger adults and older adults](image)