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Adult age differences in vocabulary acquisition as a function of individual differences in working memory and prior knowledge

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ADULT AGE DIFFERENCES IN VOCABULARY ACQUISITION
AS A FUNCTION OF INDIVIDUAL DIFFERENCES IN
WORKING MEMORY AND PRIOR KNOWLEDGE

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(ABSTRACT)

Older adults often complain of cognitive difficulties, such as the inability to learn new information or recall previously learned information. Previous research shows that many older adults do have difficulties with certain learning tasks. However, not all older adults experience these difficulties. Some recent research has shown that, contrary to popular belief, older adults can learn new information under certain task conditions. The purpose of this investigation was to examine how older adults, compared against younger adults, learn new vocabulary under two different learning task conditions. Each participant engaged in two vocabulary learning tasks: a paired-associate task and a contextual task. Previous research has shown that both working memory and existing vocabulary knowledge are used when learning unfamiliar words. Participants also were given two measures of each individual difference factor (working memory and vocabulary knowledge), as well as an inductive reasoning measure. In confirmation of hypotheses, younger adults had higher scores on the working memory measures and the inductive reasoning task. To the contrary, older adults had higher scores on the measures of existing vocabulary knowledge. Older and younger adults did not significantly differ on scores assigned to definitions given in the contextual task. However, younger adults outperformed older adults in the paired-associate task. In addition, the measures of existing vocabulary knowledge accounted for more variance in the contextual task. Conversely, the working memory measures and the inductive reasoning task accounted for more variance in the paired-associate task. These conclusions are encouraging to those working with older adults. It appears that under certain conditions that focus on older adults' strengths, new information can be learned and cognitive deficits can be overcome.

DEDICATION

I wish to dedicate this dissertation to my grandparents: Wilfred and Cecelia Laumann, and Robert and Roberta Towner. These are the people who originally inspired my interest in older adults. They are all wonderful examples of successful aging. In particular, I wish to recognize my Grampy Towner. He did not always understand why I chose to remain in school so long or what exactly I was studying, but his constant, quiet support was the backdrop upon which I could always lean. Grampy, I am sorry that you cannot join in the celebration of my completion, but I know that your pride is shining down on me. I will have a burger and a beer in your honor!

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My family also deserves special thanks. My dad and stepmother have always been ready with an encouraging word and, because of their experiences in graduate school, they have been extremely empathetic. My mom and stepfather have also contributed greatly with their patience and support. I can attribute my perseverance to their example. Finally, I would never have been able to complete this process without my future husband, Michael, standing behind me with assurance and placing confidence in me.

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Older adults often complain of cognitive declines, such as the inability to learn new names or remember previously learned names. Indeed, research shows that many older adults have difficulties with certain learning tasks and exhibit lower learning scores compared to younger adults (e.g., Arenberg & Robertson-Tchabo, 1977; Hultsch & Dixon, 1990; Kausler, 1991; Service & Craik, 1993). Presumably, aging leads to memory deficits that can impair our learning processes due to deficiencies in working memory and speed of processing (Salthouse, 1991). However, not all older adults experience these difficulties. Recent research by Laumann (1996) has shown that, contrary to popular belief, older adults can learn new information and, under some task conditions, may show even more learning than younger adults. The term “learning” here is used in a broader sense than in the monistic behavioral sense of simple association. Learning implies the acquisition of knowledge and skills that can later be used for adaptation to changing environments. Learning is usually inferred from a change in performance on a laboratory task after a study, or acquisition, period.

Employing this broader definition of learning still does not clear up the difficulty scholars have had distinguishing between the concepts of learning and memory, perhaps because the two are so obviously related. This distinction has become so blurred that even a recent Handbook of the Psychology of Aging chapter entitled “Learning and Memory in Aging” failed to clearly define and distinguish the differences in these concepts (Hultsch & Dixon, 1990). Typically, learning suggests improvements on a task due to progressive practice, whereas repeated practice is not necessary for the formation of a memory (Kausler, 1991). Even this distinction becomes unclear, however, when considering certain laboratory tasks. For example, if a participant is asked to learn (or remember) a short list of six words presented once, and later recalls four of the six words correctly, is this a demonstration of learning or memory? If the list is then presented

again for another study trial and the participant correctly recalls all six words, is this learning or memory?

Craik (1977) framed the distinction within changing theoretical perspectives and the different tasks typically employed by those perspectives. According to this framework, learning is the formation of new associations between stimulus and response elements presented several times and is usually studied from an associationist perspective. With a shift to studying human cognition from an information processing perspective, a shift also appeared in the focus and method of study. The focus of study from this perspective is the factors which affect the participant's memory for materials presented in a single study trial. Even with this further clarification, the distinction remains uncertain (Kausler, 1991). In order to incorporate the broader definition of learning (acquisition of knowledge and skills that can later be used), the present study investigated age differences apparent in both associationist studies and information processing studies.

The broad purpose of the present research was to examine the learning process at different points in the adult life span and across different task conditions. This approach should help us to better understand how adults of different ages learn. In addition, further exploration into the conditions under which adults of different ages successfully acquire new information is needed. Kausler felt that it is "essential that we discover the extent to which learning proficiency is affected by human aging and that we understand the reasons why it is so affected" (1991, p. 190). The information gained about variables that influence and enhance learning could be used to design materials and interventions to facilitate learning in different age groups. For example, some conditions that have been shown to enhance learning performance for older adults are

distinct organization of materials and specific instruction on cognitive strategies (Cavanaugh, 1997; Kausler, 1991).

To address this broad research goal, two studies which investigated vocabulary learning in adults were examined: Service and Craik (1993) and Laumann (1996). Service and Craik found that older adults did not learn as many vocabulary words as younger adults in a paired-association task. Laumann (1996), using a unique semantic contextual task, found that older adults were better at learning the meaning of words than younger adults. Literature on the following topics was reviewed first in order to understand the specifics of the two contradicting studies: age differences in paired-associate vocabulary learning, in working memory, in acquiring vocabulary from semantic context, and in prior knowledge base. In addition, the “selective optimization with compensation” model of cognitive aging was employed as a theoretical explanation of the contradictory age differences in vocabulary acquisition given differing task conditions (Baltes, 1993).

Age differences in paired-associate vocabulary learning

Paired-associate tasks have been the prototypical task utilized in verbal-learning research. In this type of task, lists of word pairs are presented in a stimulus and response format. The participants’ assignment is to learn to respond with the correct response, when its stimulus is presented alone (cued-recall). At first glance, this type of task may not seem ecologically valid outside of a formal school environment. However, there are many real-life instances in which one is required to make and remember an association, for example identifying a name with a face or a sports team with a city or region. Because this type of learning does occur throughout the lifespan, it is important to investigate age differences in this area (Kausler, 1991). Older adults

commonly display deficits in learning in studies employing paired-associate tasks (Arenberg & Robertson-Tchabo, 1977; Kausler, 1991; Salthouse, 1982; Salthouse, Kausler, & Sauls, 1988).

Early studies on age differences in paired-associate learning often failed to take attributes other than age into consideration. The conclusion that older adults were deficient in paired-associate performance had to be qualified by taking education level and verbal ability into consideration. In an attempt to disentangle cohort effects from age differences, Salthouse et al. (1988) used large samples of younger adults who were not in college, as well as college student younger adults, as comparisons to middle-aged and older adults' performance on a paired-associate task. In this task, participants were given two trials to study lists of eight pairs of nouns. The experience of being in college was an advantage to learning, as this group of young adults had the highest percentage of correct responses. However, even when compared to noncollege young adults, middle-aged and older adults exhibited deficits in learning. That is, their percentages of correct responses after the second study trial were significantly lower than the percentages of college and noncollege younger adults. Therefore, age-related variables other than education level contributed to age differences.

Service and Craik (1993) used a traditional paired-associate task to assess learning of new words in younger and older adults. Participants in the Service and Craik study were told to learn lists of eight word pairs consisting of a familiar English word and an unknown foreign (meaningless, novel) word. Participants were told that word pairs were not synonyms. After the lists were presented, the participants were asked to recall the correct foreign word (response), when cued with its paired English word (stimulus). Participants were given four learning trials with the list. Results indicated a main effect of age, with younger participants learning more

word-pairs. In this study learning was measured by mean number of correct responses given on the fourth trial.

One explanation for the age differences found in paired-associate tasks has focused on the effort required by these tasks to form some association between the stimulus-response and retain that association to an essentially meaningless word for later recall.

Age differences in working memory

In a paired-associate task, participants need to keep stimulus-response pairs organized, remember which response belongs to which stimulus, and then use a strategy to remember the relationships. Because of this effort involved, paired-associate tasks rely heavily on working memory (Service & Craik, 1993). Working memory is generally defined as a construct that contains both processing and storage components (Baddeley, 1981). “The concept of working memory refers to the processes and structures involved in simultaneously holding information in mind and using that information (often in combination with further incoming information) to solve a problem, make a decision, or learn some new concept” (Craik & Jennings, 1992, p. 56). Presumably, learning new vocabulary under paired-associate conditions actively utilizes working memory because it requires that information about a stimulus be stored as an association is made to its correct response. To the extent that working memory is critical to learning new associations, it would be expected that older adults would have difficulties learning under paired-associate conditions because they typically exhibit deficits on working memory tasks (see, e.g., Craik & Jennings, 1992).

A number of researchers have identified age differences in the functioning of working memory (e.g., Craik, Morris, & Gick, 1990; Dobbs & Rule, 1989; Salthouse, Babcock, & Shaw, 1991; Wingfield, Stine, Lahar, & Aberdeen, 1988). Tasks that test the functioning of working

memory are more complex than passive repetition span tasks. Craik and Rabinowitz (1984) proposed that short-term memory tasks lie on a continuum from those tapping primary memory, which involve passive holding and repetition of a small amount of information, to those tapping working memory, which are complex tasks involving simultaneous storage and further processing. Therefore, working memory tasks must “demand simultaneous storage of recently presented material and processing of additional information” for later recollection or use (Hultsch & Dixon, 1990, p. 261). Wingfield et al. (1988) employed a variety of tasks that increased in complexity to examine which aspects of short-term memory were most affected by age. These researchers gave groups of older adults and younger adults three memory tasks: a digit span task, thought to be a more pure measure of primary memory; a word span task, which increases in difficulty because the stimuli are now verbal; and a sentence span task, similar to reading span (Daneman & Carpenter, 1980) and thought to tap working memory because participants must hold the last word of each sentence in mind for later recall (storage component) while reading the next sentences aloud (processing component). They found no age differences in digit span, slight age differences in word span, and significant age differences in the reading span task. Their results confirmed the hypothesis that age effects are more obvious as tasks become more complex, that is, as they move along the continuum from primary memory to working memory.

Extensive research has been completed looking at age differences in working memory. Most of this research has supported the interpretation that age differences become present and/or increase with task complexity (Craik et al., 1990; Dobbs & Rule, 1989; Gick, Craik, & Morris, 1988; Laumann, 1996; Salthouse, Babcock, & Shaw, 1991; Wingfield et al., 1988). Although the details of exactly which components (processing or storage) of working memory are affected by

age are somewhat controversial (e.g., compare Salthouse et al., 1991, with Craik et al., 1990), cognitive aging researchers generally agree that there are large and reliable age-related declines in performance on tasks designed to require active use and manipulation of information (Salthouse, 1991; Salthouse & Babcock, 1991).

Given that working memory deficits may create a disadvantage for older adults trying to learn new vocabulary in paired-associate task conditions, the results of Service and Craik (1993) are not surprising.

Age differences in learning vocabulary from context

Intuitively, we might expect that knowledge is not always acquired in a paired-associate manner, but rather embedded within some context. For example, learning that the professional football team, the Steelers, play in Pittsburgh, Pennsylvania may be more than a mere paired-association task. For some it may contain contextual information. For instance, for those who know the history of Pittsburgh as a big iron mining and steel producing city, this information would place the Steelers – Pittsburgh pair within a context, and therefore be easier to learn and remember. Many researchers have examined this idea that “knowledge is situated, being in part a product of the activity, context, and culture in which it is developed and used” (Brown, Collins, & Duguid, 1989, p. 32). These researchers propose that many laboratory studies of vocabulary, and the education system in general, have focused too much on rote memorization of word meanings, rather than the entire learning process which must include the context.

Previous research on children, young adults, and older adults has shown that much vocabulary learning does take place, not in a paired-associate manner, but rather, within a context (Daneman & Green, 1986; Laumann, 1996; Miller & Gildea, 1987; Sternberg, 1987; Sternberg & Powell, 1983). That is, many word meanings are inferred from cues in the

surrounding prose text or conversation in which the novel word is encountered. An individual's lexicon is so large that it is highly unlikely that a person intentionally studied the meanings of all the words that he or she knows. We have all had the experience of coming across an unfamiliar word in the context of reading or conversation. To understand a novel word, we piece together a meaning for it from the surrounding information. By picking out details from the context that we think are relevant, we construct a meaning of the unfamiliar word. The meaning of the novel word has thus been inferred from the context in which it occurred.

In a recent study (Laumann, 1996), older adults and college students gave definitions for rare, novel words that appeared in short passages containing context cues (see Appendix A for examples). They were instructed to use any relevant information from the reading passage in constructing their definitions. Contrary to original predictions, older adults received higher scores on the definition task than the college students, even with education level controlled. Perhaps, under these conditions, older adults were better at learning vocabulary from context than younger adults. This finding may have been a result of the specific conditions of this vocabulary task. In learning situations that more closely mimic everyday experiences of older adults, their accumulated knowledge and experiences help them to learn better than less experienced younger participants (Hess & Pullen, 1996).

Age differences in prior vocabulary knowledge

One reason older adults give better definitions may be their strong accumulated knowledge of word meanings. Researchers have proposed that we use what knowledge we already have in order to learn and incorporate new information. The literature indicates that an individual's knowledge base increases throughout the life span (Kausler, 1991). We know that, with age, people have had more opportunities to increase their vocabulary. They have increased

exposure to new words because they have more experiences, both work-related and pleasurable, reading more and having more conversations (Salthouse, 1988). Numerous studies have demonstrated that older adults have a strong knowledge base in vocabulary (e.g., Kaufman, 1990; Kaufman, Reynolds, & McLean, 1989; Kausler & Puckett, 1980; Salthouse, 1991; Salthouse, 1993; Smith & Earles, 1996) and show little if any declines in vocabulary until the last decades of life.

Since the organization of one's vocabulary can influence learning, it is important when examining vocabulary acquisition to determine whether age differences in lexical organization exist. The way knowledge of word meanings is organized may affect how it can be used in acquiring new, related knowledge, such as in learning new vocabulary. After a thorough review of the relevant literature, Light (1991) concluded that "neither the organization of concepts nor the characteristics of semantic activation varies with age" (p. 342). Younger and older adults encode and organize information similarly, although older adults may be slightly slower to access that information (Bowles, 1994). Thus, there is no reason to hypothesize that age would lead to difficulties in learning new words as a function of existing knowledge. The organization of this existing vocabulary knowledge may help in learning new vocabulary.

Thus, the resource of a large, organized vocabulary base may be an advantage for older adults in learning new vocabulary (Laumann, 1996). This is in contrast to the evidence of age-related decrements from research on paired-associate tasks and working memory deficits that may be a disadvantage for older adults.

Selective Optimization with Compensation

Baltes' (1993) "selective optimization with compensation" model of cognitive aging may help to explain the discrepant findings of Service and Craik (1993) and Laumann (1996). In his

model, Baltes uses a customary “dual-process categorization” of intelligence to help explain differences in learning that may occur across the adult life span (1993, p. 581). His model makes a distinction between the “mechanics” of cognition and the “pragmatics” of cognition. Using more familiar terminology, the mechanics of cognition are similar to fluid intelligence, which include flexible, innate reasoning abilities dependent on the neurophysiology of the brain (Baltes, 1993). Mechanics can be operationalized by measuring the speed and accuracy of basic processes. Because mechanics are contingent on biology, the developmental trajectory indicating losses in mechanics with age is not surprising.

On the other hand, the pragmatics of cognition are more similar to crystallized intelligence, and include such items as facts and skills acquired over time, and are often measured using vocabulary tests. This type of intelligence is thought to reflect the impact of one’s experience within an education system and culture. Therefore, pragmatics can be expected to increase through the life-span. Indeed, the ideal life-span trajectory of pragmatics displays “evidence for stability and positive change in persons who reach old age without specific brain pathology” (Baltes, 1993, p. 580).

Baltes’ theory goes beyond conventional classifications of intelligence with the addition of the concept of compensation. His theory is that older adults, who must deal with varying degrees of loss in functioning, use strengths in other areas to offset these losses, or compensate for them. According to the dual-process categorization of cognition, older adults, who inevitably face declines in the abilities relevant to the mechanics of cognition, compensate by emphasizing their strong pragmatics of cognition, thereby optimizing their performance. In relation to learning, the processes involved may change, or shift in importance, over the adult life span. That is, adults of different ages may learn differently, according to their unique strengths and

weaknesses. According to this model, younger adults would be expected to rely on strong mechanics in learning, and thereby do very well on a paired-associate task. Conversely, older adults would rely on strong pragmatics, and do better on a learning task that emphasizes their experience.

This brief literature review highlighted the fact that much previous research has used traditional verbal-learning techniques, such as paired-associate tasks, to assess age differences in verbal learning (Service & Craik, 1993). One study that used a different approach to measure learning found age differences favoring older adults, contrary to previous research (Laumann, 1996). Two abilities relevant to learning vocabulary are working memory and vocabulary knowledge (Daneman & Green, 1986). The research on these two abilities has demonstrated age discrepancies, in that younger adults are better at working memory tasks, while older adults have a stronger existing vocabulary. It is not apparent exactly which aspects of these two abilities or aspects of differing task conditions are contributing to age differences in research examining knowledge acquisition. Further research in these areas is needed to understand age differences in learning.

Statement of Problem

The purpose of this research was to examine how older adults, compared with younger adults, can learn new information, regardless of anecdotally reported learning difficulties. Vocabulary tasks can be employed as a way to assess this learning. In a paired-associate vocabulary learning task, older adults did not learn as many word pairs as younger adults (Service & Craik, 1993). This type of task emphasizes the mechanics of cognition (working memory). From Baltes' model, one can predict that older adults would not do well on this type of task because they have deficits in this area. However, Laumann (1996) provided evidence that

older adults can learn new vocabulary, given a contextually rich learning task. A more ecologically valid vocabulary task (in context) emphasizes the pragmatics of cognition. In terms of Baltes' model, older adults faced with deficits in the abilities relevant to the mechanics of cognition (working memory) compensate by emphasizing the pragmatics. By this theory, older adults can be expected to rely heavily on their existing vocabulary knowledge to acquire new vocabulary.

The present study expanded on previous research by providing a within-subject comparison of different learning conditions. This study directly compared vocabulary learning in a vocabulary-in-context task and a paired-associate task among adults of different age groups. This should lead to better understand how adults of different ages learn and how we can emphasize strengths to facilitate learning. This study also attempted to confirm previously reported findings of Laumann (1996), as well as investigate the implications of Baltes' model. In support of predictions following from Baltes' model, existing vocabulary knowledge (pragmatics) contributed more to extracting word meaning from context than did working memory (mechanics) for the older adults (Laumann, 1996). Apparently, older adults were selectively optimizing their performance by compensating for reduced mechanics using pragmatics. However, Laumann's (1996) hypotheses concerning younger adults' reliance on mechanics were not supported. Other researchers (Daneman & Green, 1986) have shown that working memory capacity was strongly related to novel word definition production among college students. Laumann (1996) did not find that younger or older participants relied on mechanics (working memory) to define novel words. Thus, further research into the relations among age, learning conditions, vocabulary acquisition, and related intellectual abilities was needed.

Research hypotheses

Based on Baltes' model and the findings of Service and Craik (1993) and Laumann (1996), the following predictions were made:

1. Older adults display higher scores on tests of pragmatics of cognition than younger adults.

Two standard vocabulary tests, a recall and a forced recognition task, were used to assess pragmatics. It was hypothesized that older adults' scores on these tests would be higher than younger adults' scores.

2. Younger adults display higher scores on tests of mechanics of cognition than older adults; mechanics was operationalized using working memory span tasks with verbal stimuli.

Younger adults were expected to out-perform older adults on these span tasks.

3. Older adults do better on a learning task that allows their rich vocabulary knowledge base (pragmatics) to assist in the learning than on a task that emphasizes mechanics. Consistent with Laumann (1996) older adults have higher vocabulary-in-context learning scores than younger adults.

4. Younger adults do better on a learning task that emphasizes cognitive mechanics over pragmatics. That is, younger adults do better on the paired-associate learning task than the older adults.

5. In addition, older participants' learning performance is enhanced more than younger adults' performance by a task that allow them to take advantage of their experiences. When comparing the learning between the two age groups, older adults exhibit a greater increase in learning scores in the vocabulary-in-context task than young adults.

6. The paired-associate learning task scores are more related to the mechanics of cognition than the pragmatics. That is, the scores of the paired-associate learning task are more highly

correlated with working memory span scores than with vocabulary test scores. In addition, the working memory predictor tasks account for more variance in the paired-associate task than the vocabulary-in-context task.

7. Conversely, the vocabulary-in-context learning task scores are more related to the pragmatics of cognition than the mechanics. The vocabulary-in-context learning task have higher correlations with the vocabulary test scores than the working memory span scores. The vocabulary knowledge predictors also account for more variance in the pragmatics based learning task, the vocabulary-in-context task.

Method

Participants

A total of 64 individuals participated, 32 older adults and 32 younger adults, with 16 males and 16 females in each age group. The younger adults, ranging in age from 18 to 26, ($M = 21.41$, $SD = 2.21$) were recruited from undergraduate psychology classes at West Virginia University. They received course credit for their participation in this study. The older adults, with ages ranging from 61 to 90, ($M = 72.54$, $SD = 7.47$) were healthy, community-dwelling individuals from the Morgantown, West Virginia area. They were paid \$10.00 for their participation. The older and younger adults did not significantly differ in their self-perceived health on a five-point scale (1 = excellent and 5 = poor), $M = 2.09$ ($SD = 0.96$), and $M = 1.94$ ($SD = 1.01$), respectively, $t(62) = 0.63$, $p > .05$. The age groups also did not significantly differ in years of education, $t(62) = 1.44$, $p > .05$, in partial control for typical cohort effects in cognitive studies. The older adults had an average of 15.16 years ($SD = 3.16$) of formal education, whereas the younger adults had an average of 14.28 years ($SD = 1.33$).

Design

Each participant engaged in two learning tasks. The variables comprised a 2 (age: old, young) x 2 (gender) x 2 (order: task given first) x 2 (learning task: paired-associate, vocabulary-in-context) mixed model design, with age, gender, and order of learning task as between-subject variables and learning task as the within-subject variable. Determination of which learning task was administered first to each participant was counterbalanced across age (Reese, 1997), but not gender.

Materials

Demographic questionnaire. This basic questionnaire was designed to measure demographic characteristics of the participant, such as age, gender, years of formal education, self-perceived health compared to others in same age group, listing of medications a participant is taking, as well as the last time those medications were taken. (See Appendix B for questionnaire.)

Each participant completed two vocabulary learning tasks -- a paired-associate vocabulary task and a vocabulary-in-context task. The order of these two tasks was counterbalanced.

Paired-Associate vocabulary task. For this task, ten rare, novel words were paired with similar length infrequent, but familiar, recognizable words. The novel words were taken from Daneman and Green's (1986) study and were calibrated in difficulty to the novel words used in the Vocabulary-in-Context task (see below). These pairs were used in a five-trial paired-associate task. Each trial used the same pairs presented in mixed random orders (see Appendix C for pairs and orders). During the study time, the experimenter presented the word pair visually, read each one aloud, and requested that the participant do the same, resulting in an approximate

two second exposure to each pair during each trial. Following the study time, participants were presented with the rare, novel word pair member (stimulus) and asked to supply the common word match (response). The number of correct responses out of ten on the fourth trial was used as the raw learning score on this task because pilot studies indicated that this would not result in floor or ceiling effects. These learning scores were transformed to have a mean of zero and a standard deviation of one in the combined groups in order to compare performance across the two different learning tasks.

Vocabulary-in-Context task. To assess new vocabulary learning in context, participants read 10 passages, taken from 24 originally developed by Daneman and Green (1986). Each passage contained a real, but uncommon word not in current usage. To ensure the novelty of the target word, participants were asked if they could identify the word before beginning each passage. No participant was familiar with any of the ten target words. Daneman and Green designed these passages to be one page stories that described a scenario and contained numerous cues as to the meaning of the novel word. (See Appendix A for passages.) The instructions were to try to piece together the meaning of the target word based on details supplied throughout the story passage. Participants were asked to read each passage aloud to the experimenter to ensure task adherence.

Immediately after reading each passage, participants were asked to supply as precise a definition of the target word as possible. Two raters independently scored the definition responses for each of the ten words on a 0, 1, or 2 point system, based on the scoring system developed by Laumann (1996). A score of 0 was given to definitions that were completely incorrect, a score of 1 for a definition that incorporated at least one element of the meaning, and a score of 2 for a definition that incorporated all elements of the actual word meaning (see

Appendix D for scoring manual). Cohen's kappas were computed for each word to measure the scoring agreement between the raters. These values ranged from 0.75 to 0.92, $\bar{M} = 0.86$. Total scores were transformed to have a mean of zero and a standard deviation of one in the combined group to compare learning on this task and the paired-associate task..

Participants completed two tasks to assess working memory capacity: alphabetic span and reading span (Daneman & Carpenter, 1980). Generally, span tests start with an easy load of information (i.e., only a few things to remember) which the participant must repeat. The load is systematically increased until the participant is no longer able to repeat the information in the required order. Age differences have been found using both of the selected working memory span tasks (e.g., Craik, 1986; Craik et al., 1990; Laumann, 1996; Light & Anderson, 1985; Wingfield et al., 1988).

Alphabetic span test. An alphabetic span test was administered. For this task, the participant was asked to recall each list of presented nouns in alphabetic order. For example, given the words "brick," "apple," and "candy," the correct response would be "apple, brick, candy." This word span task used 66 two-syllable nouns, four to six letters in length, with high concreteness ratings (Friendly, Franklin, Hoffman, & Rubin, 1982) (see Appendix E for list of nouns used in this task). These nouns were then divided into non-alphabetized lists and given to each participant in the same randomized order. The experimenter started by reading three nouns to the participant and asked the participant to repeat the words in alphabetical order. If the participant recalled the three words in correct alphabetic order, a second trial with three different nouns was given. If these were recalled in the correct order, the experimenter then read four different nouns. The number of nouns per set continued to increase (up to eight) as long as the participant was able to recall the words correctly for at least one of the two trials per set. The

participant's score on this task was the number of words in the last trial with all words correctly recalled.

Reading span test. This test included 42 unrelated English sentences, each ending in a different word. Sentences from Salthouse and Babcock (1991) were used. The sentences were fairly short, between six and ten words in length, and ended with common words found in a child's dictionary. The sentences are included in Appendix F. Each sentence was typed on a card and the cards were arranged to include three trials each of two, three, four, and five sentence sets. Blank cards were inserted at the beginning of each new set. The experimenter presented one card at a time to the participant. The participant read the sentence aloud and then a new sentence was presented. This continued until a blank card, signifying the end of a set, was presented. The participant was then asked to recall the last word of each sentence from the preceding set in serial order. The experimenter continued presenting sets with an increasing number of sentences until all of the two-sentence sets were presented. If a participant correctly recalled the last words of at least one two-sentence trial in serial order, then the three-sentence sets were presented, and so on. A participant was assigned a reading span score between two and five, depending on how many sentences were in the last set from which he or she correctly recalled the last words in serial order.

Two vocabulary tests were administered to measure participants' prior vocabulary knowledge: WAIS-R vocabulary subtest (Wechsler, 1981), and a multiple choice synonym vocabulary test (Gardner & Monge, 1977). Age differences have been found using each of these tests (Kaufman, Reynolds, & McLean, 1989; Laumann, 1996; Park & Shaw, 1992).

WAIS-R vocabulary subtest. The WAIS-R vocabulary subtest was administered according to the guidelines in the testing manual (Wechsler, 1981). This is a recall test of

vocabulary, for which the participants were asked to supply definitions to 35 words of increasing difficulty. (See Appendix G for instructions and examples and Wechsler (1981) for complete word list). The experimenter recorded the participants' definitions verbatim. The definitions were given a score of 0, 1, or 2 depending on the content of the definition, not the expression (for examples of scoring, see Wechsler, 1981).

The average reliability coefficient reported for the WAIS-R vocabulary test, across ages 16-74, is 0.96, obtained using the split-half technique corrected by the Spearman Brown formula (Wechsler, 1981). In order to determine whether the reliability of this test varies with age, different age groups have been tested. The reliability coefficients for the age groups used in this study are: for 18- to 19-year olds, 0.96; for 20-to 24-year olds, 0.94; and for 65- to 69-, and 70- to 74-year olds, 0.96 and 0.85 respectively. Based on the published reliability coefficients, this test appears to measure vocabulary knowledge consistently across different age groups. Validity of the WAIS-R as an overall measure of general intelligence is respectable. However, information on the validity of the vocabulary subtest is not available.

Synonym vocabulary test. This 30-item forced-choice recognition vocabulary test required that participants pick a synonym for each given word from five choices. Participants were given one point for each correct choice for a total of 30 possible points (Gardner & Monge, 1977). Similar to the WAIS-R subtest, the words in the synonym test increased in difficulty. A copy of this test is included in Appendix H.

Letter Sets test. A task measuring inductive reasoning ability, which is involved in forming hypotheses to fit a set of data, was included to indicate possible links between extracting meaning from the vocabulary-in-context passages and inductive reasoning. This test was used as an additional check of the construct validity of the vocabulary-in-context task. Each item in the

Letter Sets test (Ekstrom, French, Harman, and Derman, 1990) included five sets of four letters each. The participant's task was to find the rule that relates four of the sets to each other and to mark the one that does not fit the rule. This test is timed, allowing 7 minutes for the first 15 items and an additional 7 minutes for the second set of 15 items. (See Appendix I for the instructions for Letter Sets test.) The individual's score on this test was the number of items correct minus 1/5 of the incorrectly answered items to discourage guessing.

Procedure

As the participant entered the laboratory, he or she was greeted by an experimenter and told that the purpose of the study was to examine adult age differences in vocabulary learning. After reading and signing the consent form, the participant and the experimenter together filled out the demographic questionnaire. Each participant was then given the vocabulary-in-context task and the paired-associate vocabulary task. The order of these two tasks was counterbalanced within each age group, but not across gender. The predictor tasks (the two vocabulary knowledge tests, the two working memory tasks, and the inductive reasoning task) followed in that set order to minimize fatigue. One of the older male participants refused to complete the paired-associate task. Three different older male participants and one older female participant did not complete the Letter Sets test. As a consequence, some analyses include slightly different numbers of observations. Time was allotted at the end of testing for answering any questions the participants had about the experiment. The session took approximately one and a half hours.

Results

Descriptive information on the participants, including mean task performance and standard deviations, by age and gender, on the two learning tasks and the five predictor measures thought to be related to vocabulary learning are presented in Table 1. *t*-test values, and

significance levels, comparing the means of the two age groups on the five predictor tasks are also presented in Table 1, showing that all expected age differences in performance on the predictors were significant. As expected, older adults scored significantly higher on the measures of pragmatics of cognition, but the younger adults scored significantly higher on the measures of mechanics of cognition. As can be seen in the table, older adults performed significantly better than the younger adults on the measures of prior vocabulary knowledge, or pragmatics of cognition, that is, the WAIS-R vocabulary subtest and the synonyms test. However, the older participants did not perform as well as younger adults on the Letter Sets task, or the working memory tasks (alphabetic span and reading span), shown to indicate mechanics of cognition. Interestingly, although the Letter Sets test was originally included to examine relations of inductive reasoning to the vocabulary-in-context task, this measure showed a higher correlation with the paired-associate task (see Table 3).

A mixed factor analysis of variance, with age, gender, and task order as between subject variables, and type of learning task as a within subject variable was conducted to examine performance on the two learning tasks, paired-associate and vocabulary-in-context. The results of the ANOVA are presented in Table 2. Significant main effects of age and gender were evident. However, task order, that is, which learning task was administered first or second, was not significant in any effect. In addition, the expected interaction between age group and task condition was significant. Individual means were compared with LSD tests using the pooled within-subjects error term from the ANOVA. The means of each age group on the learning tasks are graphed in Figure 1. Contrary to original hypotheses based on Laumann (1996), older and younger adults' performance did not significantly differ on the vocabulary-in-context learning task ($t(62) = 1.096, p > .05$). However in confirmation of hypotheses, younger adults out-

Table 1. Means and Standard Deviations on the Learning Tasks and the Predictor Tasks by Age Group and Gender

Task	Younger (N = 32)			Older (N = 32)			t	df
	Male (N=16)	Female (N=16)	Combined	Male (N=16)	Female (N=16)	Combined		
PA	6.63 (2.99)	8.37 (1.67)	7.50 (2.54)	3.47 ^a (2.88)	4.63 (3.50)	4.06 (3.21)	-----	-----
VIC	7.81 (3.12)	10.13 (3.40)	8.97 (3.42)	9.56 (2.92)	10.00 (3.86)	9.78 (3.38)	-----	-----
Alpha Span	4.75 (0.86)	4.81 (0.75)	4.78 (.079)	3.75 (1.06)	3.88 (0.62)	3.81 (0.86)	-4.69**	62
Reading Span	4.00 (0.52)	4.25 (0.58)	4.13 (0.55)	3.63 (0.62)	3.31 (0.70)	3.47 (0.67)	-4.27**	62
WAIS - R	48.13 (7.14)	46.38 (7.76)	47.25 (7.39)	55.00 (7.72)	50.62 (11.56)	52.81 (9.92)	2.54**	62
Synonym	12.31 (3.96)	12.13 (3.56)	12.22 (3.70)	19.75 (6.93)	19.44 (6.75)	19.59 (6.73)	5.43**	62
Letter Sets	17.40 (6.06)	18.61 (5.39)	18.01 (5.68)	13.62 ^b (4.17)	11.65 ^a (5.56)	12.56 (4.97)	-3.92**	58

**p < .01

a N = 15

b N = 13

Table 2. Analysis of Variance Table of Factors Related to Performance on Learning Tasks

Between-Subjects Effects	SS	df	MS	F	Partial Eta ²
Age Group	4.687	1	4.687	4.705*	0.079
Gender	6.361	1	6.361	6.385*	0.104
Order	0.277	1	0.277	0.278	0.005
Age Group X Gender	0.541	1	0.541	0.543	0.010
Age Group X Order	1.690	1	1.690	1.697	0.030
Gender X Order	1.719	1	1.719	1.726	0.030
Age Group X Gender X Order	2.424	1	2.424	2.433	0.042
Error	54.793	55	0.996		
Within-Subjects Effects					
Task	0.002	1	0.002	0.004	0.000
Task X Age Group	12.724	1	12.724	18.378**	0.250
Task X Gender	0.015	1	0.015	0.022	0.000
Task X Order	0.152	1	0.152	0.220	0.004
Task X Age Group X Gender	0.233	1	0.233	0.336	0.006
Task X Age Group X Order	0.001	1	0.001	0.001	0.000
Task X Gender X Order	0.003	1	0.003	0.005	0.000
Task X Age Group X Gender X Order	1.063	1	1.063	1.535	0.027
Error	38.080	55	0.692		

*p<.05, **p<.01

Note: Partial Eta² represents the estimated amount of variance in the learning task accounted for by each respective effect in the table.

performed the older adults on the paired-associate learning task ($t(61) = -4.894, p < .01$). The results due to the interaction confirmed that older adults' learning was enhanced by a learning task that emphasizes the pragmatics of cognition and provides a rich context ($t(60) = -2.977, p < .01$).

Correlation and regression analyses were conducted to determine the degree of importance of age and other associated variables in the vocabulary learning process. Correlations between learning task scores and the predictor measures are presented in Table 3. In support of expectations, the predictor measures thought to indicate mechanics, alphabetic span and reading span, were positively correlated with scores on the paired-associate learning task. As reported earlier, contrary to original assumptions, the Letter Sets test correlated with the paired-associate task score, not the vocabulary-in-context task score. It was therefore included with the measures of mechanics in further analyses. Those tasks thought to measure pragmatics, WAIS-R vocabulary subtest and synonym test scores, were positively correlated with scores on the vocabulary-in-context learning task. In addition, the pragmatic tasks did not significantly correlate with the paired-associate task scores, nor did the mechanics tasks significantly correlate with vocabulary-in-context performance. This pattern of correlations also lends construct validity to the learning tasks.

A series of hierarchical multiple regression models using the five predictors and the standardized scores on the learning tasks, separately, were calculated to determine the variance accounted for in each learning task by the various intelligence measures. The hierarchical method was chosen to determine the increment of variance due to the selected intelligence measures. Predictors were selected based on the pattern of correlations with the learning tasks, as well as the theoretical basis of mechanics and pragmatics of cognition. The paired-associate

Figure 1. Learning Task Performance as a Function of Age

Table 3. Correlations Between Learning Tasks and Predictor Measures

	PA Score	Alphabetic Span	Reading Span	Letter Sets	VIC Score	WAIS-R Vocab.	Synonym Test
PA Score	1.000	.429**	.499**	.492**	0.168	0.046	-0.043
Alphabetic Span	.429**	1.000	.380**	.437**	0.156	0.041	-0.067
Reading Span	.499**	.380**	1.000	.445**	0.228	0.056	0.01
Letter Sets	.492**	.437**	.445**	1.000	0.221	0.083	-0.136
VIC Score	0.168	0.156	0.228	0.221	1.000	.475**	.346**
WAIS-R Vocab.	0.046	0.041	0.056	0.083	.475**	1.000	.738**
Synonym Test	-0.043	-0.067	0.01	-0.136	.346**	.738**	1.000

**p<.01

models are presented in Table 4. The models for vocabulary-in-context are presented in Table 5. As expected, the mechanics tasks (alphabetic span, reading span, and Letter Sets), entered as one block, accounted for more variance in the paired-associate learning task than in the vocabulary-in-context task. On the contrary, existing vocabulary test scores (WAIS-R and synonyms), entered as one block, accounted for more variance in the vocabulary-in-context task than in the paired-associate task. Finally, the continuous age variable was entered last into each regression model. Although the measures of mechanics accounted for significant variance in the paired-associate task, there was significant additional variance of 8.8% ($p < .05$) due to age that was not captured by the predictor measures in the paired-associate models.

Discussion

The results confirmed the predictions concerning relationships between different classifications of cognition and age. Older adults displayed higher scores on tests of pragmatics of cognition than younger adults. That is, the older participants had higher scores on the measures of existing vocabulary knowledge, the WAIS-R vocabulary subtest and the synonym test. Conversely, younger adults scored higher on tests of mechanics of cognition than older adults, as measured with working memory tasks. The younger participants did better on the alphabetic span and the reading span tasks. Again, the results of the Letter Sets test were interesting. Originally it was thought that inductive reasoning would be related to the inference skill assumed to underlie the participants' strategy used to extract word meanings in the vocabulary-in-context task. However, inductive reasoning has traditionally been considered part of cognitive mechanics (Baltes, 1993). Given that consideration, the fact that the Letter Sets test was highly correlated with the other measures of mechanics (working memory span tasks), and that younger participants' scores on this task were higher, is more sensible.

Table 4. Hierarchical Regression Models of Performance on Paired-Associate Task with Predictors Added at Each Step

Step	Predictors	Cumulative R ²	R ² Change	F Change	df ₁	df ₂
1	WAIS-R Voc. Synonyms	0.031	0.031	0.886	2	56
2	Alpha Span Reading Span Letter Sets	0.320	0.289	7.499**	3	53
3	Age (in mos.)	0.408	0.088	7.753*	1	52

*p<.05

**p<.01

Table 5. Hierarchical Regression Models of Performance on Vocabulary-In-Context Task with Predictors Added at Each Step

Step	Predictors	Cumulative R ²	R ² Change	F Change	df ₁	df ₂
1	Alpha Span Reading Span Letter Sets	0.072	0.072	1.450	3	56
2	WAIS-R Voc. Synonyms	0.249	0.177	6.362**	2	54
3	Age (in mos.)	0.273	0.024	1.763	1	53

**p<.01

Contrary to original hypotheses, older adults did not perform significantly better than younger adults on the vocabulary-in-context task. However, in support of original predictions, younger adults did display higher learning scores on the paired-associate task. Also, the expected interaction was significant, showing that older adults' learning scores increased more than the younger adults' in the conditions of the vocabulary-in-context task. Presumably, one reason for this interaction is that the vocabulary-in-context task was designed in such a way as to reduce the constraints on cognitive mechanics which are present in other verbal learning tasks. So the older adults were able to take advantage of the information present in the passage context, rather than relying on their working memory. The passages contained more "environmental support" than paired-associate tasks (Craik, 1986).

The correlational findings also supported the assumptions. The tasks of mechanics of cognition, alphabetic span and reading span, were significantly correlated with the paired-associate task and conversely, the tests of pragmatics of cognition, WAIS-R subtest and synonym test, were significantly correlated with the vocabulary-in-context task. Additional construct validity was evidenced by the fact that the mechanics tasks did not correlate with vocabulary-in-context, nor did the pragmatics tasks correlate with paired-associate. Regression analyses also confirmed expectations. Mechanics, as measured by two working memory tasks and an inductive reasoning task, accounted for significant variance in the paired-associate task, but not in the vocabulary-in-context task. Also, pragmatics, as measured by two vocabulary knowledge tasks, accounted for significant variance in the vocabulary-in-context task, but not in the paired-associate task.

This investigation provides more evidence to the idea that the learning process is different across the adult life-span. Older and younger adults appear to use different resources for

learning. It looked as though younger adults relied more on their mechanics of cognition. Because of this it is not surprising that they performed so well on the paired-associate task, which significantly correlated with the measures of mechanics. Older adults scores on tests of mechanics of cognition were not as high, and they did not perform as well on the paired-associate task. Therefore, it is also not surprising that past verbal-learning researchers, using paired-associate tasks that rely heavily on mechanics, report age differences. This did not indicate, however, that older adults cannot learn. The fact that older adults' learning was enhanced under contextually rich task conditions suggests that they relied on a different resource than the younger adults. Based on Baltes' model and the regression results, it appeared that older adults were compensating for compromising mechanics by utilizing their strong vocabulary knowledge and past experience to perform well on the vocabulary-in-context task (Salthouse, 1988).

Although the majority of the hypotheses were confirmed, this investigation was not without certain shortcomings. Firstly, Laumann's (1996) result that older adults performed better than younger adults on a vocabulary-in-context task was not confirmed. Surprisingly, the younger participants in this investigation performed statistically as well as the older participants on the vocabulary-in-context, whereas in the 1996 study they did not score as high. Demographic characteristics, as well as performance on the predictor measures, of the samples in the two studies were virtually identical. The only difference in this version of the task was that there were fewer words to be defined (i.e., fewer passages to read). Perhaps, participants need more experience within the task (i.e., more words and passages) in order for the age differences to be significant. Moreover, the difference of the sample sizes between the two studies may have been

sufficient enough to pick up effects. Eighty participants engaged in the vocabulary-in-context task in the 1996 study, whereas only 64 participated in this investigation.

Also, the regression models did support predictions, in that mechanics accounted for significant variance in paired-associate and pragmatics accounted for significant variance in vocabulary-in-context. However, age was also a significant predictor for performance on the paired-associate task. That is, age accounted for an additional significant amount of variance in paired-associate performance, beyond mechanics. Apparently, there is another age-related resource significant in predicting learning on the paired-associated task that was not measured. Salthouse (1993) argues that speed of processing accounts for a large amount of age-related variance on most verbal ability tasks. The Letter Sets test was the only timed measure included in this investigation. It was also entered into the regression model as one of the mechanics predictors, but significant variance remained unaccounted for by all these predictor measures of the paired-associate task. However, a direct measure of processing speed was not included in this investigation, so perhaps this variance could not be captured according to Salthouse's argument .

Furthermore, perhaps the way the constructs of mechanics and pragmatics were measured left much unaccounted variance. The most simple version of the reading span test (Daneman & Carpenter, 1980) was used in this study. Participants were only asked to read the next sentence aloud while maintaining the last words for repetition at the end of each set. Other researchers have found more prominent age differences using more taxing versions of this task, such as requiring participants to answer questions about the content of sentences in addition to holding last words in memory (Salthouse & Babcock, 1991). Perhaps, additional, or more discriminative, measures of working memory are needed to accurately measure the construct of mechanics. Also, the Letter Sets test was included as a measure of pragmatics because inductive reasoning

was thought to be related to the inference skill so integral to the vocabulary-in-context task. However, the Letter Sets induction task is based on symbolic stimuli, whereas the vocabulary-in-context task includes phonologically meaningful, elaborate context cues to word meanings, so it was not tapping the inference skill. More precise measures of this inference skill should be considered in future research.

In addition to the tasks used to measure the constructs, the particular characteristics of this sample limit the generalizability of these findings. Older adults in this study were highly educated, presumably because they reside in a small, university town. The older participants and younger participants amount of education also did not significantly differ, which is not usually the case in studies of intelligence in adulthood (Schaie & Willis, 1996), although it provided a nice control. It would be interesting to expand this investigation to include additional comparison groups such as: older adults from more urban, or more rural, areas, younger adults not enrolled in college, and adults in varying occupational pursuits.

The conclusions of this study are encouraging for older adults and those who work with older adults. Given certain conditions, like a rich context that focus on older adults' strengths, for example prior knowledge, new information can be acquired. Also, using more ecologically valid tasks, like reading passages, appears to be more beneficial for older adults' learning than rote memorization like that stressed in a paired-associate task and other traditional laboratory tasks (Hess & Pullen, 1996). This information is potentially useful for those working on cognitive training and instruction targeted toward older individuals (Willis, 1987; Willis, 1990). Further research into situated learning and designing other task conditions that are favorable for older adults to acquire new information is needed.

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Appendix A: Passages and Novel Words Used in Vocabulary-in-Context Task

As the election approached, George Adams appeared to be moving closer towards a probable victory. However, probable victories were not valued by George Adams. He was a man who dealt only with certainties. To achieve this he would stop at nothing. People saw him as unscrupulous and shrewd. However, he had not always been this way. Somewhere along the line in his career he had learned that you had to fight your way to the top and since then there had been no turning back. He showed little concern for the victims of his schemes. He had nothing personal against John Mead. He merely saw the destruction of this man's career as a necessary step in furthering his own career. To accomplish this he decided a roorback would serve him well. He had knowledge that John Mead had at one time gone to see a psychiatrist. This information George Adams carefully disclosed at an informal gathering of friends. He omitted to mention that the psychiatrist had been a friend of John Mead's and that Mead had only asked the psychiatrist for advice on a financial matter. George Adam's version of the truth, however, had grave implications. A week later, upon being told his own story by one of his new supporters, George Adams grinned silently to himself. He was now a step closer to his goal.

roorback: A dirty rumor which is used against a political opponent

Joan had been lying out on the beach all afternoon. She had come outside soon after lunch and had started to look for a good spot. She soon found one -- secluded and quiet, with a good view of the rocks and the water, but with a little bit of privacy as well. She had taken her lotion, her book, and her towel, and had settled herself comfortably. This was her first day of vacation and she intended to relax. She had planned to spend a few hours on the beach and then return to the house to get ready for the party that night. But she had fallen asleep and stayed out longer than she had intended, and now she was worried. When she got inside she saw that the worry was justified. She put cream on her face and shoulders and hoped for the best. But when she woke up the next morning, she saw a number of patches of blype on her pillow. She ran to the mirror, but this only confirmed what she had expected. She knew that she would look terrible for days to come if she did nothing about it, so she decided to sit out in the sun a little each day in the hopes that an improvement would result. Even if it worked, it was a depressing and unfortunate start to her holidays.

blype: A piece of skin that peels off after a sunburn

Mike had picked up his license the day before. Then he had packed and prepared all evening. He had made sure that he had enough food and clothing to last him for five days, as well as all the first aid supplies he might possibly need. Then he had checked his equipment. Satisfied, he had gone to bed. Arising early the next morning, he climbed into his car and drove north. Twelve hours later he arrived at his destination. He was surprised at how energetic he felt, considering the long day he'd just had. He didn't feel tired at all. He opened up the cabin and unpacked everything. After a late supper, he checked his equipment. He was eager to get started. This was something he did for enjoyment and not for the food it provided, and he looked forward to that enjoyment. Mike felt restless and impatient, unable to wait. He knew that it would be dangerous to go out now. He would not be able to clearly distinguish what he was aiming at or where he was going. But he decided to go anyway. He would rather ghoom than wait until the normal starting time. He gathered all the necessary equipment and went outside. He felt very happy as he started on his way. But soon he began to feel uncertain of the direction he was going, and unsure of his footing. He decided that, after all, this was not such a good idea, and he turned back.

ghoom: To hunt in the dark

Jackie stared ahead incredulously. Here she was face to face with Ken Smith for the first time after a four year separation. They had run into each other on campus quite accidentally, neither of them even suspecting that they were both attending the same university in London. They were thrilled by their reunion. As teenagers they had been neighbors. Jackie and Ken shared a very special relationship and had wanted to get married at the time. However, both their parents disapproved. When Ken's father got a promotion which entailed moving to Philadelphia, both families saw this as a lucky break. Their parents thwarted any efforts they made to keep in touch. Jackie believed that nothing could stand in the way of the type of closeness she and Ken had shared. She believed that a simple reunion would be sufficient to re-establish this closeness. Jackie continued to dream up ways to reunite herself with Ken -- none of which worked. Fate, however, provided her with what she hoped would be an anacampserote. It was ironic that her parents should unwittingly help to bring this about. Jackie had never wanted to continue her education beyond high school and had only gone to university upon the insistence of her parents. Had she not attended university she would perhaps never have been permitted the opportunity to re-establish her relationship with Ken. Jackie could not believe how lucky she had been.

anacampserote: Something which can bring back a lost love

Rick, Eliza, and Daisy were walking through the pasture. All around them were cornfields and more pastures, and off in the distance stood a barn and a house. They headed in that direction. Rick and Eliza talked animatedly to each other and ignored Daisy, but she didn't seem to notice, shambling along behind them, munching at the grass as she went. Finally they neared the edge of the pasture. Without pausing, Rick and Eliza went through the grike. They continued on to the house, still talking happily, but Daisy could no longer follow, and this disturbed her. She wanted to go with them. She tried to walk through as well, but found that she could not. She looked for another exit, but found none. All around her was a thick impregnable barrier. She stared unhappily around her for a few minutes, but she soon forgot what had upset her, and she turned her attention once again to food. She turned around and, moving slowly as she usually did, went to join the others of her own kind and spend yet another night in the pasture. Maybe Rick and Eliza would come back the next day to see her.

grike: A narrow opening in a fence that allows people through but does not allow farm animals through

Janet had always managed to keep in touch with her high school friends. Whenever she came home for a weekend in Pittsburgh she would call up her friends who were still in town. It distressed her that she had been unable to get in touch with her friend, Linda. Each time she had called, the phone was either busy or there was no answer. So, when she returned to Chicago, she set aside a few minutes during a coffee break at work so that she could finally get in touch with her friend. With pen and paper in hand she set to work. Within a matter of minutes she was licking the stamps and off it went. Several days went by and Janet was disappointed not to have heard from her friend. The following day she picked up her mail and quickly sorted through it in the hope of finding something from Linda. But, there was nothing from Linda. To her surprise though she discovered the reason for Linda's delay in response. Linda had yet to hear from Janet. Janet went off to the typewriter to set things straight. She placed the nixie in the newly typed envelope. This way Linda would know that Janet had in fact mailed it earlier. Had it not been for the typed label she had placed on the left hand corner originally, Janet might still be wondering why she had not heard back from Linda. "Oh well," Janet sighed, "at least this time I will finally be able to contact Linda."

nixie: A letter so badly addressed that it cannot be delivered

Robert had been here for ten years. He had been a construction worker before, with a wife and two kids, but he hadn't been happy with that. And so he had taken a risk, hoping that his dishonest actions would improve his situation. But things hadn't worked out, he had been caught, and he had ended up here. There were a lot of things he missed -- the ability to go where he wanted, the company of his family. He disliked it, but he had learned to live with it. In some ways, he recognized that he deserved it. And things weren't all bad. There were ways to get some of the things he enjoyed, things that he wasn't supposed to have. He always had a pack of cigarettes and a bottle of whiskey stashed away among his things. He used the chummage to get these things. Men were almost always reluctant to give this to him, but they recognized the need to have someone who would help them learn the ropes, and so they agreed. He was usually valuable to them for at least two weeks, by which time they had learned enough about the way things were done to survive on their own. And there were always quite a few of them being brought in to live there. He suspected that the authorities knew what was going on but ignored it because they were helpless to stop it. He could have made quite a profit if he hadn't enjoyed his vices so much.

chummage: Money demanded by an old prisoner of new ones

Tom was exhausted. Coming home after a long, hard swimming practice he headed straight for his room with the intention of taking a short nap. In spite of the sun shining in from the window overhead he fell asleep quite easily. Soon, however, his parents, who had just returned from shopping, woke him up. Tom looked up and sleepily viewed his parents, as they moved his new desk into his room. Mrs. Johnson, after stepping back to look at the desk, suggested moving it closer to the window so that Tom would get the maximum amount of light. Tom remarked that then they would have to eliminate the ruelle and he didn't want to do that. Mrs. Johnson said that she didn't see why this should make such a big difference. "Besides," she added, "then you won't be able to get up on the wrong side in the morning." Tom said he liked being able to sleep with his legs hanging over the edge on either side. He finally gave in saying that he could probably get used to the change. Tom got up and they made the necessary moves. After all the commotion Tom was wide awake. Rather than returning to finish his nap he decided to put his things into the new desk.

ruelle: A space between the bed and the wall

Cecilia, Tracy, and Sonja weren't the closest of friends. It would have seemed odd to anyone who knew these three to see them sitting at a table together at 'Mingles'. In fact these three girls rarely had any time to spare to talk to other women. They tended to view them as the 'enemy'. Yet, here they were on a Saturday night at 'Mingles'. They were disappointed to say the least. Usually these girls would have spent the evening dancing and having their drinks bought for them. They never had any difficulty in attracting a fair deal of attention. Their conversation tonight remained at a shallow level as each anxiously waited for things to pick up. Then they would go their own ways without the slightest regard for each other. Their present boredom was their own fault though. The deciding game of the AFC Conference Championship finals was on tonight. Had they remembered this earlier they could have anticipated the spaneria and shown up later. But as it was they had to carry on an awkward conversation while desperately waiting for the game to end.

spaneria: Scarcity of men

The teacher finally managed to break up the fight. She looked at the two boys. John had fallen hard on the pavement and scraped his arm, and it was bleeding badly. Mark had taken a punch in the face that must have hurt a lot. It looked like he was having trouble breathing. He probably couldn't smell anything anymore. And there was a lot of blood. The teacher took them both in to the school nurse. The nurse looked at Mark first, and assured him that nothing was broken. She cleaned the wound carefully. Because the bleeding hadn't stopped, she decided to do something more, both to stop the bleeding and to keep the wound from getting infected. When she was finished, Mark looked at himself in the mirror and complained that he looked ridiculous. But he promised to leave it on for two days. Then he left. The nurse then asked John to come in, and she worked on his arm. Again she needed to apply something to stop the bleeding. When John went outside he looked around for Mark. The other kids were busy teasing Mark, and when John came out they started teasing him too. He replied that his arm might look funny, but at least he didn't have to get an accipiter like Mark's. Covering his face to hide the thing that John had teased him about, Mark ran home. His mother scolded him for fighting, but didn't send him back to school.

accipiter: A bandage worn around the nose

Appendix B: Demographic Questionnaire

1. Your age in years and months: _____
2. Your sex: M F
3. Years of formal schooling: (H.S. = 12) _____
4. Please rate your health (1=excellent, 5=poor): 1 2 3 4 5
5. What is your native language? That is, what language was spoken in your home when you were a child?

If your native language is not English, at what age did you learn English?

Do you speak, write or read any other languages?

6. Please list any medication you are now taking, and the time you last took them. Consider these categories:

Antihypertensives _____	Antibiotics _____
Analgesics _____	Cough/cold _____
Antidiarrheals _____	Laxatives _____
Sedatives _____	Antidepressants _____
Others _____	

7. How much do health troubles stand in the way of your doing things you want to do? Circle one.

Not at all

A little (some)

A great deal

8. Do you think that your health is better, the same as, or worse than most people your age?

Much better

Better

The same

Worse

Much worse

9. Are you currently retired or are you still working?

Student

Working

Homemaker

Unemployed

Retired

If you are retired, when did you retire?

10. Please rate the amount of reading you do in a normal week:

(1=a lot, 5=little or none): 1 2 3 4 5

11. Please indicate what types of materials you read.

12. Please rate how challenging and/or technical your reading materials are (1=very challenging, 5=easy reading): 1 2 3 4 5

Appendix C: Paired-Associate word pairs and orders

Paired Associate Word Pairs and Order

Trial One

dippoldism -- shortage
 lagniappe – gallop
 holmgang – merchandise
 ucalegon – longevity
 agio – ballroom
 apocope – compliant
 groak – relish
 grangerism – radish
 qualtagh – handicap
 benedick – spectator

Trial Three

dippoldism – shortage
 grangerism – radish
 holmgang – merchandise
 agio – ballroom
 benedick – spectator
 ucalegon – longevity
 groak – relish
 apocope – compliant
 lagniappe – gallop
 qualtagh – handicap

Trial Two

lagniappe – gallop
 agio – ballroom
 ucalegon – longevity
 groak – relish
 dippoldism – shortage
 qualtagh – handicap
 grangerism – radish
 benedick – spectator
 holmgang – merchandise
 apocope – compliant

Trial Four

ucalegon – longevity
 benedick – spectator
 groak – relish
 dippoldism – shortage
 homgang – merchandise
 agio – ballroom
 qualtagh – handicap
 apocope – compliant
 grangerism – radish
 lagniappe – gallop

Appendix D: Vocabulary-In-Context Scoring Manual

1. Roorback A dirty rumor (1) which is used against a political opponent (2); 1 point given for rumor, gossip, white lie or politics, elections

Zero-point answers:

Planning or scheme
 Giving part of information to purposely mislead someone
 Something sent out to be circulated
 Unscrupulous behavior
 Stepping stone
 Scandalous

One-point answers:

Political “backhand”
 Rumor
 Mud slinging
 A slanderous remark about someone
 Dirty gossip

Two-point answers:

Rumor to stab political opponent in back
 Telling half-truths about other political candidates

2. Blype A piece of skin (1) that peels off after a sunburn (2); 1 point given for skin or sun

Zero-point answers:

Goo, melted cream, cosmetics
 Pus from blisters
 Oozing liquid
 A secretion
 Dried, creamy blotches
 White spots

One-point answers:

Sunburn, discomfort from being in sun
 Skin from blisters
 Flakes, peelings, patches, or pieces of skin
 Water from blisters caused by sunburn
 Burned, dead skin

Two-point answers:

Sunburn, peeling, skin
 Peeled skin from over exposure to the sun
 Sunburned skin that has fallen off
 Patches of dry skin caused by the sun

-
3. Ghoom To hunt (1) in the dark (2); 1 point given for the idea of hunting or for darkness, early morning, etc.

Zero-point answers:

Be ready, get a head start
 Rush
 Start early, ahead of time
 Take a chance
 To take risks
 To get lost, wander

One-point answers:

Find your way in the dark
 Go hunting early
 Hunting (for pleasure)

Two-point answers:

Hunting in the evening shadows (not light)
 Night-time hunting
 To go out hunting at night
 Going out hunting in the dark
 Hunting, shooting in the dark

4. Anacampserote Something which can bring back (1) a lost love (2); 1 point given for the concept of vehicle or object used to get together or love, relationship

Zero-point answers:

Scheming, planning
 Opportunity, possibility
 Second chance
 Dream
 Unexpected meeting
 Feeling of hope
 Act of fate, circumstance

One-point answers:

Reunion
 Reunited
 Method of reunion
 Re-establish relationship
 Something to do with a love affair

Two-point answers:

An opportunity to renew old affairs

Something to help her plans to be married to him
 The fate that had drawn the couple back to one another

5. Grike A narrow opening in a fence (1) that allows people through but does not allow farm animals through (2); 1 point given for the idea of an opening in a barrier (gate) or for the idea of animals being barred

Zero-point answers:

Hedge, bush
 Swamp or bog, wetlands
 Barrier or fence
 Grassy area, meadow
 Hay, weeds, or tall grass

One-point answers:

Going through the gate
 Exit or opening in a fence
 Gate in a fence
 Narrow passageway for people to fit
 Can't cross a grate-like structure

Two-point answers:

A special gate for people but will exclude large animals
 Cow couldn't get over the fence and the people did

6. Nixie A letter (1) so badly addressed that it cannot be delivered (2); 1 point for the idea of letter, note or for being returned

Zero-point answers:

excuse, explanation
 copies of a previous letter
 mail
 return address or postmark

One-point answers:

the note, letter
 wrong address on envelope
 an envelope which was returned
 a retyped letter

Two-point answers:

letter returned for correct address
 an undelivered letter, returned to sender
 incorrectly addressed letter, not deliverable

-
7. Chummage Money (1) demanded by an old prisoner of new ones (2); 1 point given for the concept of money or prison

Zero-point answers:

dishonesty, being sly
personality
friendship, charm, “chums”
connections
using friendship to get the things he wanted
knowledge of situation where people are new

One-point answers:

other prisoners’ help
spare money, change
extra money he had
people who are in prison and make friends to get favors in return
trading his expertise of jail system to get what he wanted

Two-point answers:

There were none reported.

8. Ruelle A space (1) between the bed and the wall (2); 1 point given for the idea of space, room or for side of bed

Zero-point answers:

view
bookcase, nightstand, other pieces of furniture
bed rail, or headboard
morning light from window
blinds to let in sunlight

One-point answers:

space
move bed up against the wall
personal room to move around
the space between objects in the room

Two-point answers:

space on either side of the bed
space beside the bed
space between the bed and the wall
room on both sides of his bed
walking space between his bed and the window

-
9. Spaneria Scarcity (1) of men (2); 1 point given for the idea of sparse, few or for the idea of men, customers

Zero-point answers:

the situation of being bored
the crowd
a distraction
boredom, time lapse, lifelessness
lack of activity

One-point answers:

slowing down of people, quiet time
few amount of customers in the bar

Two-point answers:

few people
scarcity of men
lull in activity, absence of people, especially men

10. Accipiter A bandage (1) worn around the nose (2); 1 point given for the concept of bandage (compress, stop bleeding, etc.) or for the word 'nose'

Zero-point answers:

one who tries to assist or help
something, a cast, on his arm
a sting
to look ridiculous, strange, or awkward
a brace or splint on the arm
blood filled scar
stitches

One-point answers:

a medical gadget used to stop bleeding
a bandage, covering, wrap
a patch on the nose
a device used to put pressure on a body part to stop bleeding
a nose guard
broken nose, swollen puffy face

Two-point answers:

pressure bandage to stop nose bleed
some kind of bandage for his nose
a big bandage that the teacher had put on his nose

type of bandage on the nose to stop the bleeding
what you put on a person's nose to stop the bleeding

Appendix E: Nouns Used in Alphabetic Span Task

Three Word Sets

ORGAN
PARTY
FARMER

COFFEE
ANSWER
DESIGN

Four Word Sets

NEEDLE
MARKET
CHERRY
BEGGAR

HANDLE
LILY
BARREL
MARBLE

Five Word Sets

POWDER
TUNNEL
SERIES
INSECT
HERO

JACKET
RECORD
PALACE
OLIVE
MAYOR

Six Word Sets

JEWEL
SIGNAL
LINEN
VELVET
WEAPON
CARPET

CANVAS
MEMBER
TURKEY
LETTER
HARBOR
BERRY

Seven Word Sets

ELBOW
MOTOR
PONY
HONEY
BABY
LIQUOR
DIET

GARDEN
IRON
DEBATE
ENGINE
MONKEY
HELMET
CHAPEL

Eight Word Sets

FINGER
NEPHEW
MOTHER
HAMMER
WAGON
BASKET
SPIDER
UNCLE

DEVICE
SYSTEM
BUTTON
PILLOW
NOVEL
METAL
ARMOR
COTTON

Appendix F: Sentences Used in Reading Span Task

Two sentence sets

After dinner, the chef prepared dessert for her guests.
Everyone in the stadium felt cold.

The people on the airplane had never flown before.
In the library, the girl read her book.

The basketball team won the championship last year.
The woman planted pansies on her patio.

Three sentence sets

The fans at the football game wore hats and scarves.
The passengers on the train were happy.
David was going with William to the meeting.

The children in the car wanted to stop for ice cream.
Last fall the farmers had a good harvest.
The baseball player hit the ball over the fence.

The maid usually washes clothes in the afternoon.
The iron gate clanged shut.
The door that leads to the basement was locked.

Four sentence sets

The cat chased the mouse through the barn.
This morning the mailman brought three letters.
The man ran up the hill.
After the movie, Tom ordered the pizza.

The sofa in the living room is green.
This evening the grocer will deliver the food.
The students planned a class reunion.
The boy put the pencils in the drawer.

A bear looks for food in the woods.
The bald eagle soared over the trees.
At the end of the day, the children counted their money.
My sister answered the lawyer's questions.

Five sentence sets

Sarah put her toys in the chest.
Frank caught a large blue fish in the river.
Mary drove her new red car to the station.
Jerry is the class president.
The ticket is good for one trip on the railroad.

Bob made his mother a wooden desk.
Susan works at the factory which produces trucks.
Last night, Carol sent invitations to her friends.
Tomorrow, Simon will bring treats for the children.
The teacher told the boy to sharpen the pencil.

Carol received a raise from her boss.
This light house is an important mark for pilots.
In the morning, Bill has a math class.
Jill knits all of her family's sweaters.
At the back of the house there is a small garage.

Appendix G: Instructions and Examples of Words Used in WAIS-R Vocabulary Subtest

Read aloud to participants: "I want you to tell me the meanings of some words. Let's start with _____; What does _____ mean?"

Three words on the WAIS-R subtest:

winter

designate

audacious

Appendix H: Synonyms Test

Synonyms Vocabulary Test

Directions: For each of the items below, select the numbered word or phrase that most nearly corresponds in meaning to the word in CAPITAL LETTERS and circle it.

CAPSIZE	1) leak 2) race 3) grow 4) overturn 5) measure	WEIGHTY	1) sly 2) serious 3) shabby 4) spry 5) innocent
PROLONG	1) prompt 2) decrease 3) difficult 4) extend 5) waste	FANATIC	1) follower 2) strange 3) untrustworthy 4) sly 5) zealous
SUCCULENT	1) juicy 2) raw 3) cooked 4) spoiled 5) spicy	BUSTLE	1) tree 2) ornament 3) bureau 4) movement 5) cluster
AGITATED	1) hungry 2) excited 3) agile 4) tired 5) sick	LASCIVIOUS	1) lustful 2) liberal 3) final 4) loser 5) inclined
FRUGAL	1) sparing 2) huge 3) tasty 4) fashionable 5) musical	RECAPITULATE	1) surrender 2) brief 3) rebuild 4) relay 5) restate
MOLEST	1) purchase 2) muffle 3) lowest 4) annoy 5) groom	REMUNERATE	1) check 2) count 3) replete 4) compensate 5) satisfy
APATHY	1) understanding 2) leniency 3) rage 4) indifference 5) danger	EFFECTUATE	1) praise 2) accomplish 3) dissimulate 4) nullify 5) pretend

BRAVADO	1) celebrity 2) outlaw 3) boasting 4) turmoil 5) salutation	DIAPHANOUS	1) nocturnal 2) quarrelsome 3) morbid 4) logical 5) ethereal
CURSORY	1) hasty 2) dilatory 3) intrinsic 4) profane 5) dire	SPLEEN	1) grudge 2) caprice 3) impetuosity 4) melancholy 5) malice
INDIGENT	1) obnoxious 2) moody 3) sleep 4) nasty 5) poor	HORDE	1) greed 2) bully 3) harvest 4) crowd 5) content
LOQUACIOUS	1) garrulous 2) ostentatious 3) frivolous 4) limpid 5) dowdy	HIRSUTE	1) woman 2) shaggy 3) chamber 4) quaint 5) sorrowful
HIATUS	1) break 2) swamp 3) fence 4) disgust 5) flower	CAUDAL	1) brutal 2) careful 3) posterior 4) nervy 5) recent
BANAL	1) evil 2) trite 3) prohibitory 4) jovial 5) decaying	GUIDON	1) miniature 2) hat 3) hero 4) flag 5) achiever
TEDIUM	1) dilatory 2) anxiety 3) exhaustion 4) weakening 5) dull	VICISSITUDE	1) direction 2) generosity 3) hardship 4) ceremony 5) ferocity
LASSITUDE	1) contempt 2) convenience 3) permissiveness 4) lethargy 5) levity	SEVERALLY	1) unkindly 2) respectively 3) continuously 4) abruptly 5) harshly

Appendix I: Instructions for Letter Sets Test

Letter Sets Test

Each problem in this test has five sets of letters with four letters in each set. Four of the sets of letters are alike in some way. You are to find the rule that makes these four sets alike. The fifth letter set is different from them and will not fit this rule. Draw an X through the set of letters that is different. NOTE: The rules will not be based on the sounds of sets of letters, the shapes of letters, or whether letter combinations form words or parts of words.

Examples:

A.	NOPQ	DEFL	ABCD	HIJK	UVWX
B.	NLIK	PLIK	QLIK	THIK	VLIK

In Example A, four of the sets have letters in alphabetical order. An X has therefore been drawn through DEFL. In Example B, four of the sets contain the letter L. Therefore, an X has been drawn through THIK.

Your score on this test will be the number of problems marked correctly minus a fraction of the number marked incorrectly. Therefore, it will not be to your advantage to guess unless you are able to eliminate one or more of the letter sets.

You will be allowed 7 minutes for each of the two parts of this test. Each part has one page. When you have finished Part 1, STOP. Please do not go on to Part 2 until you are asked to do so.

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Award for Completed Research from Division 20 (Adulthood and Aging) of APA, 1996
Graduated Summa Cum Laude in Psychology, 1992
Outstanding Senior, College of Liberal Arts & Sciences
Outstanding Senior in Psychology
Omicron Delta Kappa
Mortar Board
Psi Chi, 1991
Phi Kappa Phi
Dean's Scholarship
Dean's List, eight semesters at Bradley University
Alpha Lambda Delta
Phi Eta Sigma

Professional Affiliations

Student Member of Gerontological Society of America, 1992-Present
 Student Affiliate of American Psychological Association, 1992-Present
 Student Member of Division 20, APA, Adulthood and Aging, 1993-Present
 Student Member of American Society on Aging, 1992-1995
 Student Member of Division 7, APA, Developmental Psychology, 1992-1993

Publications

Shaw, R. J., & Laumann, L. L. (1994). The interactions of knowing and remembering in Alzheimer's disease. West Virginia Journal of Psychological Research and Practice, 3, 77-86.

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Shaw, R. J., Huang, W., Ruther, N. M., Laumann, L. L., Keefover, R. W., & Rankin, E. D. (1996, April). Characteristics of free recall in normal aging and Alzheimer's disease. Paper presented at the Cognitive Aging Conference. Atlanta, Georgia.

Shaw, R. J., & Laumann, L. L. (1994, April). The roles of Working Memory and knowledge in verbal memory in Alzheimer's disease. In R. J. Shaw (chair), Medical, social, and psychological aspects of Alzheimer's disease. Symposium conducted at the Spring meeting of the West Virginia Psychological Association, Charleston, WV.

Shaw, R. J., & Laumann, L. L. (1993, April). Neurobiological considerations in the study of normal aging. In D.W. Schaal (Chair), Biological factors in psychology. Symposium conducted at the Spring meeting of the West Virginia Psychological Association, Davis, WV.

Etaugh, C., & Laumann, L. (1992, August). Perceiving elder caregivers: Effects of gender, employment, and caregiving hours. Poster presented at annual meeting of the American Psychological Association, Washington, D.C.

Work in Progress

Edelstein, B., Laumann, L., Kalish, K., Jones, K., Staats, N., & Northrop, L. Role of memory in performance on the Hopemont Capacity Assessment Interview. (Data collection in progress).

Laumann, L.L. Age differences in vocabulary acquisition as a function of individual differences in working memory and knowledge base. (Dissertation proposal approved, data analyses in progress).

Laumann, L.L., & Shaw, R.J. Adult Age Differences in Vocabulary Acquisition. (Manuscript in preparation for review).

Shaw, R. J., Laumann, L. L., & Ruther, N. M. General priming effects of encoding a list of words. (Data collection in progress).

Research Interests

My research interests center on cognition in later adulthood, specifically processes such as memory and information acquisition. Previous and current research topics include work on the priming phenomenon across adulthood, the development of inhibitory mechanisms, working memory in adults with dementia, the relation of memory to different dimensions of intelligence testing, reading comprehension, and vocabulary acquisition.

Research Experience

- 1) Served as a research assistant for Dr. Raymond Shaw on a grant from the Alzheimer's Association. Responsibilities included testing patients with varying degrees of dementia using the Geriatric Depression Scale, the Mini Mental Status Exam, and various WAIS-R subtests. I developed valuable assessment and interaction skills from this experience.
- 2) Interaction with many different populations during my data collection activities, including children, college students, and older adults, many of whom had varying levels of cognitive impairment. In addition I have taught and supervised numerous undergraduate research assistants.
- 3) Serve as a member of a geropsychology research group involved in a research project designed to evaluate the influence of memory capacity on medical and financial decision making abilities in elderly nursing home residents. This project entails conducting structured interviews and numerous standardized cognitive tests.

Teaching Interests

Introductory Psychology, Developmental Psychology, Life Span Development, Adult Development and Aging, Cognitive Development, Introductory Statistics, Introductory Research Methods, Gerontology

Teaching Experience

Instructor:

Introduction to Gerontology, Fall 1996 – Present; approximately 120 students each semester, responsibilities include lecturing, grading, developing exams, and scheduling guest speakers to incorporate the multidisciplinary aspect of the course.

Introduction to Human Development, Spring 1995 - Summer 1996; approximately 120 students each semester, responsibilities included lecturing, grading, helping to develop exams, and individual direction for certain students.

Teaching Assistant:

Organismic Factors in Psychology, Fall 1992 - Fall 1993, 100 students per semester, 4 laboratory sections of 25 students each, gave instructions and guidance on computer generated labs and graded weekly papers and tests.

Departmental Service

Member, Undergraduate Honors Thesis Committee, Department of Psychology, West Virginia University, Fall 1997 – Spring 1998

Graduate Student Representative, Curriculum Committee, Center on Aging, Education Unit, West Virginia University, Spring 1997

Student Representative, Microlab Committee, Department of Psychology, West Virginia University, 1995 - 1996

Graduate Student Representative, Developmental Training Committee, Department of Psychology, West Virginia University, Fall 1993 - Spring 1994

Member, Undergraduate Honors Thesis Committee, Department of Psychology, West Virginia University, 1992 - 1994

Graduate Student Representative, Full Faculty, Department of Psychology, West Virginia University, 1992 – 1993

References

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