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Self-efficacy and allocation of effort during reading among older and younger adults

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SELF-EFFICACY AND ALLOCATION OF EFFORT DURING READING AMONG OLDER AND YOUNGER ADULTS

BY

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DEDICATION

This dissertation is dedicated to my models of successful aging: Jerry Dearborn ("Grandpa," who still traipses across the country at 80), Merle Woodward ("Grams," who at 70 can still play a mean electric guitar), Frank Woodward ("Grampy," who can take your car apart and put it back together, better than before, at 73), and Roy Parsons ("Scott's grandpa," who, it seems, can build about anything). I hope that as I age, I retain the capacity to be productive and to enjoy life as they have shown me.

"We don't stop playing because we grow old;
We grow old because we stop playing."

-- *Wound & Wound Toy Co.*
Hollywood, CA

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ABSTRACT

SELF-EFFICACY AND ALLOCATION OF EFFORT DURING READING AMONG OLDER AND YOUNGER ADULTS

By

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Recent research in social cognition suggests one's self-efficacy beliefs regarding one's cognitive abilities can influence the effort expended on cognitive tasks (Bandura, 1989; 1997; Cavanaugh & Greene, 1990; Dunlosky & Hertzog, 1998), which may affect performance. This project was conducted to examine the relationship between age, self-efficacy beliefs, text difficulty, resource allocation to text comprehension processes, and memory for text. 82 younger adults and 74 older adults completed the Metamemory in Adulthood Questionnaire (MIA; Dixon, Hultsch & Hertzog, 1988), Reading Self-Efficacy Questionnaire (RSEQ), and Media Consumption Habits Questionnaire. Using the on-line word-by-word moving window method, participants read 24 two-sentence passages for immediate recall after reading either comparatively easier or more difficult texts. Younger adults reported higher Memory Self-Efficacy (MSE) and higher Reading Self-Efficacy Strength (RSE) than older adults; there were no age differences in RSE Level. Groups were split into high reading self-efficacy (HRSE) and low reading self-efficacy (LRSE) based on RSEQ scores. Analyses of reading times indicated that HRSE individuals allocated more time to processing target texts after reading difficult texts than LRSE individuals, suggesting that SE may influence effort and persistence following difficulty. HRSE individuals recalled more of the text than LRSE individuals overall. A marginal interaction of Self-Efficacy and Age was found; older adults with HRSE recalled more from the text than older adults with LRSE, whereas there were no differences in

performance among younger adults. RSE was also more strongly related to recall performance among the old than among the young. HRSE individuals recalled more from target texts following difficult texts than those with LRSE. While HRSE individuals overpredicted recall performance, LRSE individuals were relatively accurate. Regression analyses indicate that working memory span, verbal ability, age, and reading self-efficacy make independent contributions to recall performance. The data also suggest that reading self-efficacy, as measured by the domain-specific RSEQ, may be a better predictor of memory for text than memory self-efficacy, as measured by the domain-general MIA. Collectively, the data support Bandura's (1997) self-efficacy theory in that self-efficacy beliefs influence both effort to reading and performance. Limitations and avenues for future research are discussed.

INTRODUCTION

When queried about the prospect of growing older, many adults report that they expect their memory and intellectual functioning to decline (e.g., Ryan, 1992; Ryan & Kwong See, 1993). In fact, research often finds that younger adults outperform older adults on laboratory tasks that assess memory performance (e.g., memory for word lists) (Hultsch, Hertzog, & Dixon, 1984). However, there is some evidence that older adults are also able to compensate for age-related declines in cognitive ability to produce performance equal to that of their younger counterparts when the task is ecologically valid or when there is contextual support, as in the case of everyday problem solving (e.g., Artistico, Cervone, & Pezzuti, 2003) and memory for meaningful text materials (e.g., Hultsch et al., 1984; for reviews see Hess & Pullen, 1996; Smith & Earles, 1996).

In an attempt to reconcile some of the inconsistencies, researchers within the past few decades have become more interested in the mechanisms that influence and govern the self-regulation of cognitive abilities. Recent research in social cognition suggests one's *beliefs* about cognition can influence the effort expended on cognitive tasks (Bandura, 1989; Cavanaugh & Greene, 1990; Dunlosky & Hertzog, 1998), which may affect performance. In our own laboratory, we have found that older adults who exhibited high levels of text recall allocated more effort to certain text comprehension processes than did older adults with lower levels of text recall (e.g., Stine, 1990). This suggests that strategic allocation of effort may help to compensate for some of the declines in cognitive ability associated with aging.

Although the factors that influence these allocation policies are currently unclear, several models of self-regulation have been proposed which draw on social cognitive theory (e.g., Abeles, 1990; Bandura, 1997; Cavanaugh & Greene, 1990; Dunlosky &

Hertzog, 1998). Although these models differ broadly with respect to the inclusion or exclusion of various constructs, the relative contributions of constructs, the pathways between constructs, and the level of analysis, they are all similar in that they provide a schematic representation to delineate the effects that an individual's subjective beliefs regarding their memory functioning may have on subsequent strategy selection, expended effort, and ultimate performance outcomes. Although memory beliefs broadly comprises several related constructs (e.g., memory complaints, implicit theories, control beliefs) the focus of this project is on self-efficacy beliefs regarding memory functioning.

CHAPTER I

BELIEFS AND COGNITIVE PERFORMANCE

Self-Efficacy as a Construct

There has been an increased interest in the concept of self-efficacy as a factor affecting the self-regulation of effort. Broadly defined, self-efficacy refers to the beliefs that an individual holds regarding his or her ability to motivate the cognitive, behavioral, and social resources needed to execute action plans that will result in desired outcomes (Bandura, 1986, 1997). In other words, self-efficacy represents the confidence that individuals have regarding their competence to complete specific tasks. Bandura (1997) makes the distinction between the skills and abilities that one possesses and the ability to integrate these abilities and use them to motivate behaviors. Even though people may possess similar skills, be placed in similar situations, or have similar resources available to them, there is often variation in performance that may be attributable in part to the fluctuations in perceived self-efficacy (Bandura, 1997). Bandura also argues that perceived levels of self-efficacy will influence how individuals will evaluate their performance:

> People who doubt their capabilities in particular domains of activity shy away from difficult tasks in those domains. They find it hard to motivate themselves, and they slacken their efforts or give up quickly in the face of obstacles. They have low aspirations and weak commitment to the goals they choose to pursue. In taxing situations, they dwell on their personal deficiencies, the formidableness of the task, and the adverse consequences of failure. Such perturbing thinking further undermines their efforts and their analytic thinking by diverting attention from how best to execute activities to concerns over personal deficiencies and possible calamities. They are slow to recover their self-efficacy following failure or setbacks.

> People who have strong beliefs in their capabilities approach difficult tasks as challenges to be mastered rather than as threats to be avoided. Such an affirmative orientation fosters interest and engrossing involvement in activities. They set themselves challenging goals and maintain strong commitment to them. They invest a high level of effort in what they do and heighten their effort in the face of failures or setbacks. They remain task-focused and think strategically in the face of difficulties. They attribute failure to insufficient effort, which supports a success orientation. (Bandura, 1997, p. 39)

Theoretically, there is a qualitative difference in the behaviors of individuals with high versus low self-efficacy. Since the original article by Bandura (1977), a growing body of empirical evidence has garnered quantitative support for these assertions. The original theory has been modified and refined as a result of data that both challenge and support the model (see Eastman & Marzillier, 1984; Bandura, 1984; and Marzillier & Eastman, 1984 for a debate). Moreover, the concept of self-efficacy has been expanded from Bandura's original article on the clinical treatment of phobias to a number of different domains of functioning. High levels of self-efficacy have been associated with better performance in clinical studies (Bandura, Reese, & Adams, 1982), business management (Bandura & Jourden, 1991; Bandura & Wood, 1989), academic achievement (Multon, Brown, & Lent, 1991), problem solving (Artistico, Cervone, Pezzutti, 2003), memory performance (Berry, West, & Dennehey, 1989), and mnemonic training (Rebok & Balcerak, 1989).

Individual differences in self-efficacy may affect one or more domains of behavioral functioning across the lifespan differently, which make this construct especially important for gerontologists to study for a number of reasons (Bandura, 1989; Cavanaugh & Greene, 1990; Hertzog, Dixon, & Hultsch, 1990a; West & Berry, 1994). First, one of the main tenets in life-span developmental psychology is that development within different domains of functioning follows different trajectories of growth and decline (Baltes, Staudinger, & Lindenberger, 1999). Thus, efficacy in

different domains may be more or less salient to an individual at a given point in the developmental process (Baltes, 1997). As both older and younger adults typically expect that their memory functioning will decline with advancing age (Ryan, 1992; Ryan & Kwong See, 1993), memory self-efficacy may be a salient predictor of memory performance, especially among older adults.

Second, within the gerontological literature, investigations of memory in a clinical context have suggested that an individual's perceptions or beliefs about memory are not always representative of actual memory ability. For example, Kahn, Zarit, Hilbert, and Niederhe (1975) found that clinically depressed older adults often expressed more complaints about their memory functioning than did mildly depressed older adults. However, there were no reliable differences between these groups on standard memory tests, with one exception: complaints about memory were negatively related to performance on a delayed test of story recall. Other researchers have reported weak to modest relationships between memory complaints and memory performance (cf. Hertzog et al., 1990a; Jonker, Launer, Hooijer, Lindeboom, 1996; Sunderland, Watts, Baddeley, & Harris, 1986). Preliminary data from longitudinal studies also indicate that older adults' perceived memory change is weakly related to their actual levels of change (Hertzog, Dixon, Hultsch, & Maitland, 2004). The primary conclusion is that beliefs about one's memory functioning may not be an accurate reflection of actual ability and ultimate performance. Therefore, it is necessary to investigate the factors that contribute to the veridicality of older adults' judgments regarding their memory, including the beliefs regarding memory functioning.

Because older adults often express lower levels of memory self-efficacy than do younger adults (e.g., Berry et al., 1989; Hertzog, Dixon, & Hultsch, 1990b; Rebok & Balcerak, 1989), these feelings of reduced efficacy, whether reflective of actual ability or not, may negatively affect older adults' behaviors in a wide array of contexts and

situations that involve memory performance (Bandura, 1997). Several researchers who study cognitive aging have recognized the importance of investigating memory performance as a function of memory belief, and there is evidence to suggest that memory beliefs do indeed influence cognitive functioning among the elderly (cf. Cavanaugh & Greene, 1990). Therefore, it is also important to investigate the consequences of memory beliefs with respect to memory-related tasks (Berry, 1989) in order to determine the relative contributions of beliefs to performance.

Measures of Memory Self-Efficacy

The methodologies that have been used to study memory self-efficacy beliefs are varied, owing to conceptual differences in the applications of self-efficacy theory. Although some researchers have conceived of self-efficacy as part of a theory of self (e.g., Sehulster, 1981), others posit that memory self-efficacy is a subcomponent of larger constructs, such as metamemory (e.g., Hertzog et al., 1990) or control (e.g., Abeles, 1990). Still others have stayed true to Bandura's original theory and measured memory self-efficacy as a temporal and situation specific construct (e.g., Berry et al., 1989). The following section briefly reviews these measurement methods.

Measuring Memory Self-Efficacy Using Questionnaires

Sehulster (1981) has argued that memory beliefs represent a subset of a larger set of beliefs that are related to one's self-schema. This suggests that memory beliefs are part of a stable theory of self. Although personal experiences can alter one's perception of self, the underlying assumption is that these beliefs are part of a more enduring self-concept. Based on this theoretical perspective, some researchers have construed memory self-efficacy as part of a larger set of highly schematized beliefs regarding memory. Therefore, questionnaires have been used to assess the extent to which these enduring beliefs regarding memory affect cognitive performance.

Metamemory. Some researchers have studied memory self-efficacy (MSE) as a subcomponent of larger construct of metamemory (cf. Cavanaugh & Greene, 1990). Broadly defined, metamemory comprises an individual's knowledge, beliefs, perceptions, and behaviors regarding the functioning, development, and capacities of one's own memory and memory in general (Dixon, Hertzog, & Hultsch, 1986; Perlmutter, 1978). Two instruments have been developed to assess the individual self-evaluation of memory functioning: the Metamemory in Adulthood Questionnaire (MIA; Dixon, Hultsch, & Hertzog, 1988; Hertzog et al., 1990a), which is specifically oriented towards metamemory, and the Memory Functioning Questionnaire (MFQ; Gilewski & Zelinsky, 1988), which is directed more towards awareness of general memory functioning, especially instances of forgetfulness or of a failure for memory to work properly.

In its current form, the Metamemory in Adulthood Questionnaire (MIA; Dixon & Hultsch, 1983; Dixon et al., 1988) is a 108-item questionnaire that measures knowledge of memory processes, strategies, and memory self-efficacy. As metamemory is by definition composed of multiple abilities or dimensions (presumably each with distinct properties), the MIA comprises seven distinct subscales: Strategy (knowledge about one's use of memory strategies), Task (knowledge of basic memory processes), Capacity (perception of one's ability to perform specific tasks), Change (the extent to which memory changes or is stable with age), Anxiety (feelings related to memory performance), Achievement (perceived importance of possessing/ maintaining a good memory), and Locus (extent to which one feels that memory is controllable). Participants respond to questions using a 5-item Likert scale, ranging from *Strongly Agree* to *Strongly Disagree* (cf. Appendix B).

Psychometric data have been obtained for the MIA from several studies (Cavanaugh & Poon, 1989; Dixon & Hultsch, 1983a; Dixon & Hultsch, 1983b; Dixon et al., 1988). Overall, the seven subscales exhibit moderate to high internal consistencies,

with Cronbach Alpha reliability coefficients ranging from 0.71 to 0.93. Using factor analysis techniques, these scales typically produce a two-factor solution, which comprise Memory Knowledge (Strategy and Task scales) and Memory Self-Efficacy (Capacity and Change). The two-factor solution provides empirical evidence that an individual's knowledge of memory functioning and strategy use is theoretically separable from beliefs regarding memory performance. In other words, having knowledge about memory is different from believing one has the ability to put that knowledge to good use. The remaining scales (Locus, Achievement, and Anxiety) have been found to load onto both factors (Dixon et al., 1988; Hertzog, Dixon, Schulenberg, & Hultsch, 1987), although some have also found evidence that these three remaining scales may combine to form an Affect factor (Dixon & Hultsch, 1983).

The MIA demonstrates good discriminant validity. Measures of locus of control, state and trait anxiety, and depression have been found to be unrelated to the two higher-order factors identified in the MIA (Memory Knowledge, Memory Self-Efficacy) (Hertzog, Dixon, & Hultsch, 1990). Predictive validity has also been empirically demonstrated: Hertzog et al. (1990) provides a summary of several validation studies in which scores on the MIA were predictive of recall performance for both word-lists and text.

The Memory Functioning Questionnaire (MFQ; Gilewski & Zelinski, 1988) has also been used in gerontological research on memory beliefs. In its current form, this 64-item instrument contains seven subscales[1]: General Rating of Memory (rating of one's general memory problems), Retrospective Functioning (current memory performance on tasks compared to *x* years prior), Frequency of Forgetting (frequency with which names, faces, etc, are problematic to remember), Frequency of Forgetting

when Reading (frequency with which remembering information from text is problematic), Remembering Past Events (remembering things that occurred *x* amount of time prior), Seriousness of Forgetting (perception of impact of forgetting names, faces, etc), and Mnemonics Usage (use of reminders, schedule books, etc). Participants respond to questions using a 7-point Likert scale, with higher values representing more positive beliefs regarding memory. Psychometric data indicates that the subscales produce three factors: General Frequency of Forgetting (composed of General Rating, Frequency of Forgetting, Frequency of Forgetting while Reading, Remembering Past Events scales), The Seriousness Factor, comprised the Seriousness of Forgetting scale, and Retrospective Functioning and Mnemonics usage subscales combined into a single factor. Reliabilities for the factors were high, with internal consistency coefficients (Cronbach alpha) = 0.94, 0.94, and 0.82, respectively.

Composite factor loadings from one or more of the subscales from each of these questionnaires have produced a higher order factor of memory self-efficacy; Hertzog, Hultsch, and Dixon (1989) compared the MIA and the MFQ to examine the convergent validity (i.e., whether the self-efficacy factor from the MIA was conceptually similar to the self-efficacy factor that emerged from the subscales of the MFQ), discriminant validity (whether the MSE factors that emerged were empirically distinguishable from other measured constructs), and sensitivity to age differences of the two instruments. The MIA and the MFQ were administered to two samples of younger and older adults, along with measures of vocabulary level and two recall tests (word and text). Comparisons were made using simultaneous confirmatory factor analysis using LISREL.

The results indicated that Capacity, Anxiety, and Change scales of the MIA

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[1] This is a revision of the Metamemory Questionnaire (Zelinski, Gilewski, & Thompson, 1980), which was a 92-item instrument with 9 subscales: the 7 from the MFQ plus two others, representing Reliance on Memory and Effort to Remember.

loaded onto a higher order self-efficacy factor, and the Frequency of Forgetting, Remembering Past Events, and General Rating scales created a higher order self-efficacy factor. Moreover, these two MSE factors exhibited near perfect convergence (≈ 0.90), indicating strong convergent validity and evidence that the two questionnaires are essentially tapping the same MSE construct. Of notable interest was the fact that Change was negatively related to both of the MSE factors, suggesting that people with low MSE expected their memory to change more than did those with higher MSE. Both the MSE factors and Change factor shared weak negative correlations with MIA Task scale and the Strategy factors, again providing empirical evidence that different constructs (MSE vs. Knowledge and Strategy) are being assessed with these instruments. The factor loadings were comparable across age groups with the exception of the relationship between Change and MSE, which was stronger in the older adult group than in the younger adult group.

Predictive validity was also assessed for the two memory questionnaires in conjunction with memory task performance (Hertzog et al., 1990a). The Change and Capacity subscales of the MIA correlated modestly with word recall (0.24) and text recall (0.23). The Frequency of Forgetting scale of MFQ was also a modest predictor of performance on word recall tasks (0.27) and text recall (0.21). The scales that loaded most highly on the MSE factor for each questionnaire shared relatively the same magnitude of predictive ability.

Comparisons of the two metamemory questionnaires demonstrated evidence of convergent validity, although the predictive validity was lessened. Hertzog et al. (1990a) argue that the main source of variance seen in measures of metamemory may be largely attributed to differences in MSE, as individuals' responses to questionnaires may be biased by preexisting beliefs about memory. That is, older adults may access memory self-efficacy beliefs and then derive estimates of memory behaviors (e.g., frequency of

forgetting) from those beliefs, rather than actual memory experience or performance. Therefore, it is argued that questionnaires such as the MIA and MFQ measure global memory self-efficacy, as they require individuals to make generalized judgments about themselves as rememberers in situations that are devoid of temporal or situational context.

Evidence for this hypothesis was supported by longitudinal follow-up research conducted by Hertzog et al. (1990a). The MIA and MFQ were administrated to the previous samples as a two year-follow up to the initial validation studies. There were no changes in mean MSE (assessed using the Capacity and Frequency of forgetting scales) or in perceived change (measured using the MIA Change scale), with test-retest correlations greater than 0.80. Thus, it appears as though these questionnaires tap global memory self-efficacy, which acts more like a stable trait than a state (Funder, 1997).

Perceived Control. Self-efficacy represents a core set of beliefs that an individual has regarding his or her abilities. Therefore, it is no surprise that this concept has sometimes been used interchangeably with the concept of perceived control, which represents the extent to which one believes that s/he is *responsible* for events and outcomes in life (Cavanaugh & Greene, 1990; Berry & West, 1993; & Welch & West, 1995; Miller & Lachman, 1999). Indeed, the two are somewhat related, as people must believe that it is within their control to effect change, or else they will not exert any effort or attempt to perform a task (Bandura, 1997). Although both represent beliefs that one has regarding the capacity to achieve a goal, they differ with respect to personal agency. In this case, self-efficacy refers specifically to beliefs about the ability that an individual has to perform a specific task, whereas perceived control refers to outcome expectation, which is a judgment of the likelihood that such a performance will produce certain responses or consequences (Bandura, 1997).

According to Rotter (1966), one's sense of control is thought to arise from both external and internal sources. The external dimension represents the extent to which an individual expects that outcomes are contingent upon the actions of environmental forces that are either random (i.e., luck, chance, fate) or non-random (i.e., the influence of another, more *powerful other* individual, such as medical professional). The internal control dimension is influenced by beliefs and expectations regarding one's own skills and capabilities, combined with knowledge of the task (and its controllability) to bring about a certain outcome. Essentially, one's perception of control is really a perception of outcome expectations. One will express more perceived internal control if there seems to be a relationship between one's actions and outcomes; those with less perceived internal control will feel as if they are powerless to affect their environment, as there is little to no contingency between actions and outcomes.

Different researchers have constructed different models to explain how control and efficacy beliefs are related. Skinner, Wellborn, and Connell (1990; as cited in Berry & West, 1993) argue that one's perception of controllability actually comprises three components: *strategy beliefs* (i.e., causes of outcomes), *capacity beliefs* (i.e., whether one can enact those outcomes), and *control beliefs* (i.e., whether one has the capability to perform an action regardless of the causal sources). In the Skinner et al. (1990) model, the capacity beliefs subscale represents self-efficacy beliefs. They argue that these capacity beliefs influence the level of engagement on a task, which in turn influence performance on the task. In Abeles' (1990) model of control, self-efficacy is subsumed under the internal locus of control as a contributing component. However, proposing that self-efficacy is a subcomponent of the larger construct of internal control creates a situation in which the application of both the control and self-efficacy constructs are limited, as it constrains discussions to only those domains for which an individual feels as though s/he has an internal locus of control (how can you talk about

having an ability to do something if you do not feel it is within your ability to control?) (Cavanaugh & Greene, 1990).

Separation of perceived control and efficacy expectations allows the possibility that one could believe that something is controllable, but at the same time lack the confidence to believe that control is within one's capability. For example, one can realize studying hard will produce good grades in school. In this case, the response-outcome expectation is that the act of studying (response) will lead to high grades (desired outcome); these are actions that are indeed within one's scope of control. However, one can also realize that s/he lacks the willpower to resist her friend's urgings to party and ignore schoolwork. Therefore, one can possess the expectancy that a certain collection of behaviors will produce a particular outcome, but still have doubts in one's capability to execute those behaviors. Applied to cognitive aging, this allows for the possibility that older adults may realize that mnemonic strategies are effective in helping one to remember information, yet lack the confidence that *they* are able to make those mnemonics work. Although the two constructs are similar, this represents the difference between knowing and doing. That is, knowing that something is under one's control is separate from the beliefs one has in the ability to actually perform the task.

Gerontologists have a particular interest in control research, as the process of aging is often accompanied by losses of control (e.g., over one's senses, bodily functions, independence, finances, and memory) (Lachman, Ziff, & Spiro, 1994). Researchers such as Rowe and Kahn (1997) and Rodin (1986; Rodin, Timko, & Harris, 1985) have underscored that having a strong sense of control over one's life is an important contributor to older adults' overall well-being.

Much of the research on the relationship between memory control beliefs and performance on memory-related tasks has been conducted by Lachman (Lachman, Baltes, Nesselrode, & Willis, 1982; Lachman, 1983; Lachman, 1986) using a personality

– ability paradigm, where control beliefs about memory represent both one's beliefs and capacity to affect certain outcomes regarding their memory functioning, and their beliefs in the ability of others to effect outcomes (Miller & Lachman, 1999). The Personality in Intellectual Contexts Inventory (PIC; Lachman et al., 1982; Lachman, 1983) has been used to assess older adults' control beliefs regarding their own intellectual aging. This 72-item instrument is divided into six separate subscales, derived from six parent personality scales but with a domain-specific focus on intellectual functioning. The locus of control scales were derived from Levenson's (1974) conceptualization of controllability. The Internal Control scale assesses the extent to which individuals feel that control over their intellectual abilities are primarily influenced by their own actions (e.g., "It's up to me to keep my mental faculties from deteriorating"), the Powerful Others Control scale measures the extent to which intellectual abilities are dependent on others (e.g., "I wouldn't be able to figure out postal rates on a package without a postman's help"), and Chance represents the extent to which random external events influence intellectual aging (e.g., "I have little control over my mental state"). Other scales include Achievement Motivation, which assesses one's desire to maintain intellectual abilities (e.g., "It means a lot to me to be able to write coherent letters to my friends and relatives"), Anxiety, which measures the amount of discomfort associated with intellectual activities (e.g., "When I have to make a quick decision I remain calm and collected."), and Morale, which provides an indication of one's feelings regarding their current intellectual functioning versus their past intellectual functioning (e.g., "I used to be much better at working with numbers."). Individuals respond to items using a six-point Likert scale, with responses ranging from Strongly Agree to Strongly Disagree.

The scales showed good internal consistency (alpha coefficients ranging from 0.76 to 0.91). The test-retest coefficients were also high, ranging from 0.74 to 0.88 after a 5-month interval. Using factor analyses, the six scales loaded onto two larger factors:

Intellectual Self-Efficacy (SE, comprising Internal Control and Achievement Motivation) and Concern About Intellectual Aging (CA, comprising Chance, Powerful Others, Anxiety, and Morale) (Lachman, 1983).

Studies examining the relationships between locus of control and aging have found mixed results, with some studies reporting decreases in internal control among older adults over a two-year period, suggesting a declining sense of personal ability to effect change in the environment (Lachman, 1983), and others finding that older adults' sense of internal control remained stable, whereas their beliefs in the influence of Powerful Others increased (Lachman & Leff, 1989). In a meta-analysis of research on aging and locus of control, Lachman (1986) argued that many of these inconsistencies are the result of differences within samples (e.g., age, educational level), methodology (cross sectional vs. longitudinal design), and measurement instruments (general or domain specific scales across general or specific behaviors). Overall, using domain-specific scales, rather than general scales, has produced more consistent results, and suggested that older adults' internal locus of control tends to remain relatively stable, whereas external locus of control increases. Thus, it seems as though older adults may maintain a certain sense of mastery over their abilities, while at the same time acknowledging an increase in external forces, namely "random" losses of control (e.g., changes in roles resulting from retirement, inability to perform activities due to declining health, loss of friendships or other support due to disease or death) and an increasing dependence on "powerful others" (e.g., medical personnel, adult children, etc) for aid (Lachman, 1986; Lachman, et al., 1994).

Research using the PIC has shown some relationships between locus of control and memory performance. Riggs, Lachman, and Wingfield (1997) presented older adults who were self-reported "Internals" (defined as those who scored high on the PIC internal scale and middle to low on the Chance and Powerful Others scales) and

self-reported "externals" (defined as those who scored low on the PIC internal scale and middle to high on one or both of the Chance and Powerful Others scales) with a prose recall task using a spontaneous segmentation paradigm. This methodology allows individuals to stop the taped recording at any point, thereby controlling the number of words they have to remember. The only constraints are that participants recall the prose with 100% verbatim accuracy, using the longest segments possible. Before each passage, participants were asked to predict how many words they thought they would be able to recall. Overall, those with an internal locus of control recalled a higher percentage of the words than did those with an external locus of control. Although there were no differences between internals and externals in the number of words they thought they would be able to recall, both groups underestimated their performance, with internals slightly more accurate in their predictions than externals. Both groups also selected segments that were larger than what they predicted they would be able to recall and larger than they could actually accurately recall with internals showing less of a discrepancy than externals. Riggs et al. (1997) concluded that individuals who report higher scores on the internal locus of control scale think and act differently from those who reported having more of an external locus of control. That is, those who believed that their actions were responsible for outcomes had superior memory performance and were more efficient in their strategy, as evidenced by the differences between segment selection and recall accuracy. Moreover, those who were more internally oriented demonstrated more awareness of their own capabilities, as this group had less of a discrepancy between their predicted and actual performance.

In another study (Miller and Gagne, in press) older and younger adults completed the PIC and were divided into two groups (high or low internal control) based on their scores. Participants then read two easy and two difficult expository passages using the word-by-word on-line reading paradigm (Just, Carpenter, & Woolley, 1982) for

immediate recall; both reading times (i.e., allocation of effort) and text recall were used as indices of performance. The results indicated that older adults who espoused strong internal control beliefs allocated significantly more time to certain text comprehension processes when difficult texts were encountered than did those older adults who scored comparatively lower on the internal control scale. Those scoring high on the internal control scale also exhibited better memory for text than did those who reported less perceived control. This offers limited support for the idea that control beliefs may be more salient for older adults, and may also influence performance via the strategic allocation of resources.

Collectively, the data suggest that memory self-efficacy as measured by the Capacity and Change subscales of the MIA, the Frequency of Forgetting subscale of the MFQ, and as a component of internal control beliefs, represents global, schematized memory beliefs. Consistent with models of self-regulation (e.g., Cavanaugh & Greene, 1990; Dunlosky & Hertzog, 1998), they are a salient predictor of memory performance in a variety of studies.

Measuring Memory Self-Efficacy Using Bandura's Methodology

As previously described, psychologists have often used general questionnaires to assess memory self-efficacy, and have then examined whether self-efficacy scores were related to or predictive of certain behaviors. The underlying assumption is that the attribute under scrutiny is stable, enduring, and invariant regardless of situation or contextual determinants. Alternately, Bandura (1982; 1986; 1989) argues that while self-efficacy beliefs may have a stable component, these beliefs are largely thought to represent dynamic, task-specific performance predictions, which are influenced by the interaction of temporal and situational elements in which they are made. In this conceptualization, self-efficacy behaves more like a state than a trait (Funder, 1997). That is, our beliefs in our capabilities are constantly being altered and adjusted by the

continuous interactions of one's social context, situational demands, task characteristics, individual development, and domain of functioning.

Self-efficacy beliefs may change over time, depending on individual experiences. According to Bandura (1997), a "trait" measure of efficacy for a particular ability should be measured across a wide range of activities that are clearly specified within a delimited domain of functioning (e.g., health or intellectual ability, athletic ability, creativity). The means should then be summated to represent a composite index of efficacy for that ability. For example, one test question might require an individual to rate his or her level of generosity on a Likert scale, without any reference to the situation, the recipients, or the medium of generosity (e.g., money, time, friendship, etc). Thus, the context envisioned by the one(s) who created the questionnaire may not be the same as those who are taking it. Bandura argues that many general tests are obscure and ambiguous in what they are trying to assess, which reduces their predictive ability.

Bandura also argues that self-efficacy cannot be accurately measured using general measures that ask general questions that are completely devoid of any situational information. In this case, self-efficacy beliefs are domain specific. As these task-specific beliefs usually do not generalize to unrelated domains, global measures of self-efficacy beliefs are not as predictive of performance as domain-specific measures. In fact, investigators often find that task and domain-specific construct measures are better predictors of performance (cf. Berry & West, 1993; Lachman, 1986).

Bandura assessed perceived self-efficacy using a microanalytic approach that comprises three dimensions: magnitude, strength, and generality. *Magnitude*, or *Level*, refers to the most or least difficult task that an individual feels that s/he can perform, given a range of possible behaviors. While some people may feel that they can effectively tackle any situation within a specific domain of functioning, others may feel efficacious only for tasks of moderate difficulty. Still others may feel themselves capable

of the simplest tasks in an area. In the laboratory, specific behaviors within a domain of functioning are presented to an individual, beginning with the most difficult task goal. In a typical laboratory setting, an individual might be asked to make a judgment of perceived self-efficacy to remember words from a word list. The most difficult task may be to remember all of the words from the list (e.g., "I could remember all 12 words from a 12-word list"). This is followed by progressively easier behaviors of moderate difficulty (e.g., "I could remember 10 words from a 12-word list"; "I could remember 8 words from a 12-word list", etc.) until a relatively easy goal is reached (e.g., "I could remember 2 words from a 12-word list"). Typically, the participant is asked to circle either YES or NO to indicate one's ability to perform that specific behavior if given the opportunity. If multiple tasks within a domain are measured, then Self-Efficacy Level for that domain is represented by the average level at which people switch from YES to NO.

Self-efficacy *strength* refers to the certainty of one's self-efficacy, realized as the average level of confidence one has in his/her ability to perform a task. In general, those who have high levels of self-efficacy will be more persistent in their pursuits than those who have a weak sense of self-efficacy (Bandura, 1977). After individuals indicate whether they can or cannot perform a specific behavior, they rate the strength of their expectations (i.e., their confidence) on a 100-point scale that is divided in increments of 10, with 100 conveying complete certainty and 10 representing complete uncertainty (presumably, those who feel no confidence (0%) would have answered "NO"). The strength of an individual's self-efficacy is computed by taking an average of the strength scores for a particular domain. Using both of these measures allows for the measurement subtle variations in self-efficacy. For example, some individuals may feel supremely confident in their ability to perform the most difficult tasks (i.e., high SE strength and high SE level) while others may express strong confidence in their ability to perform the most basic tasks (i.e., high SE strength, low SE level). Similarly, some may

judge themselves as inefficacious to perform the more difficult tasks (i.e., low SE strength, and high SE level).

This microanalytic strategy also allows for tests of Congruence, which is "obtained by recording whether or not individuals judge themselves capable of executing each of the various levels of performance and computing the percentage of accurate correspondence between self-efficacy judgment and actual performance" (Bandura, 1997, p. 55). Lack of congruence occurs when there is a mismatch between the level of self-efficacy judgments and actual performance. For example, individuals can overestimate their performance by judging that they can perform an activity and then failing to do so, or individuals can underestimate their performance by indicating that they are incapable of performing an activity and then completing it successfully.

Generality refers to the extent to which self-efficacy expectations in one domain of functioning extend beyond one specific situation or set of behaviors and apply to generalized behaviors or situations in other domains. That is, some people may have high self-efficacy only for certain, limited domains of functioning, such as athletics or artistry, whereas others believe that they are efficacious in a wide variety of situations (a jack-of-all-trades, so to speak). The similarities between tasks can vary on several dimensions, such as degree of similarity or situational context. Generality measures are computed by asking people to rate their perceived self-efficacy level and strength for the overall tasks presented (Cavanaugh & Greene, 1990).

Some researchers have adopted Bandura's methodology to study memory self-efficacy among older adults (cf. Cavanaugh & Greene; cf. Miller & Lachman, 1999). The construction of the Memory Self-Efficacy Questionnaire (MSEQ; Berry, West, & Dennehey, 1989) was heavily influenced by self-efficacy theory as proposed by Bandura (1977; 1986; 1997), and accordingly provides assessments of self-efficacy level (SEL), self-efficacy strength (SES) for ten scales that participants use to assess their ability to

perform various memory tasks. In validation studies, participants were presented with the *Word* scale, which assesses one's ability to recall a series of words; the *Maze* scale, which evaluates the ability to remember directions needed to draw a path through a maze; the *Digit* scale, which assesses the ability to recall digits; the *Picture* scale, which asks participants to recall line-drawn pictures; the *Grocery* scale, which requires participants to recall items from a grocery item list to retrieve for a sick friend; the *Map* scale, which asks participants to recall directions to a friend's house; the *Phone* scale, which assesses the ability to recall three telephone numbers from a directory; and the *Location* scale, which assesses the ability to remember item locations in a room. Two other subscales, *Photograph* and *Errands,* were used as fillers and not scored.

In the MSEQ, individuals are asked to decide whether or not they would be capable of completing a specific goal task (e.g., I could remember all 12 items from a 12-item grocery list) and then to indicate their response by circling "YES" or "NO". Four variations of this task follow, hierarchically arranged in order of descending difficulty (e.g., I could remember 10 items from a 12-item grocery list, I could remember 8 items from a 12-item grocery list, etc). At each level, participants also indicate their confidence level, on a scale from 100% (complete certainty) to 10% (complete uncertainty), with 10-unit increments representing intermediate responses. "NO" responses are scored as 0%.

Berry et al. (1989) assessed the psychometric properties of the MSEQ in three studies. Study one included older adults as participants, study two included younger adults as participants, and the third experiment compared both age groups. Berry et al. (1989) argued that the MSEQ demonstrated good face validity, as it was constructed in accordance with Bandura's theoretical specifications. The memory tests described explicit memory situations, which were followed by the actual tests, thus providing data in support of its predictive validity. Berry et al. (1989) also described the test as having

adequate content and ecological validity, as the scales were drawn from memory phenomena with which older adults typically express difficulty, although the list is not all-encompassing.

In the first study, a group of older adults completed a 50-item version of the questionnaire. SEL scores were computed by adding the number of YES responses that were made with at least 20% confidence. Self-efficacy strength (SES) was computed by averaging confidence ratings across the eight task scales (5 items for each scale). The eight scales were found to be moderately intercorrelated, $r = 0.54$ for SEL and $r = 0.60$ for SES, which suggests that the scales measured overlapping efficacy constructs, and demonstrated high reliability, Cronbach alpha equal to 0.90 for SEL and 0.92 for SES. The eight scales were divided into two groupings, "Everyday" memory tasks (i.e., Map, Location, Phone, and Grocery), which had an internal consistency of 0.74 for SEL and 0.78 for SES, and "Laboratory" memory tasks (i.e., Word, Picture, Digit, and Maze), which had an internal consistency of 0.88 for SEL and 0.90 for SES. After completing the MSEQ, participants engaged in the tasks described by the scales, and actual performance was compared to predicted performance for both the Everyday tasks and the Laboratory tasks. SEL predicted performance on Everyday task measures, and accounted for almost 35% of the variance, while 42% of the variance was accounted for by SES. Therefore, scores obtained on the MSEQ were effective in predicting performance on everyday memory tasks. However, SEL and SES did not predict performance on lab tests, with SEL only accounting for 14% of the variance and SES accounting for 25% of the variance. These data suggest that the older adults' performance predictions may have been influenced by familiarity with the "everyday" tasks versus the "laboratory" tasks. The greater consistency among the "laboratory" task scales versus the "everyday" task scales is most likely due to the *Phone* task in the everyday section, which did not make a significant contribution to the relationship

between SES and performance; this is probably because individuals are unlikely to need to recall three or more completely from memory at the same time in everyday life.

In the third experiment, the MSEQ was administered to a group of older and younger adults to determine whether the instrument would be sensitive to age differences in self-efficacy level and/or strength. For this study, the alternate form of the MSEQ (A-MSEQ) was used, which was identical in format to the original, but with slightly different tasks. Four "Laboratory" tasks included *Word* (recall of lists of animals), *Digit* (recall of digit strings), *Cubicles* (recall of pictures from a 3x4 array), and *Word Pair* (recall of abstract paired associates). Four "Everyday" tasks were constructed to parallel the "Laboratory" tasks in content, but were worded as tasks that could plausibly occur during the course of everyday activities. These tasks included *Grocery* (remembering groceries for a sick friend, to parallel the *Word* scale), *Phone* (where the number of telephone numbers parallels the number of digits on the *Digit* scale), *Location* (recall of object locations in a room, similar to the *Cubicle* scale), and *Couples* (paired-associate test using relatives names, comparable to the *Word Pair* scale). Each task had five levels of difficulty arranged from most to least difficult, and individuals indicated both SEL and SES for each scale. Participants then completed the memory tests and then completed the A-MSEQ a second time.

Again, the scales were moderately correlated, $r = 0.47$ for SEL and $r = 0.53$ for SES, demonstrating a common construct among the eight scales. Pretest and posttest scores were relatively stable, $r = 0.83$ for SEL and $r = 0.76$ for SES. Older adults had slightly higher test-retest estimates for SEL ($r = 0.85$) and SES ($r = 0.82$) relative to younger adults (SEL $r = 0.71$; SES $r = 0.74$). Canonical correlations between the self-efficacy scales and memory task performance were comparable for the Everyday tasks (SEL = 0.52, SES = 0.50 (marginally significant) than for the Laboratory tasks (SEL = *ns*, SES = 0.56.) at pretest. At posttest, the correlation between self-efficacy and

performance on the Everyday tasks revealed a relatively strong relationship (SEL was 0.78 and the SES was 0.80), and the correlations between the MSEQ and performance Laboratory tasks became significant; SEL was 0.71 and SES was 0.75. Overall, the average confidence was not different between age groups, but younger adults regularly had higher self-efficacy levels than did the older adults. It is possible that these differences in level reflect true performance perceptions, or it may reflect differences in the decision standards that each age group uses to make performance judgments, with older adults using more conservative standards. As different factors may be contributing to performance predictions, it is important that age-related studies of self-efficacy and performance consider both level and strength.

Overall, the MSEQ is useful because it provides an index of self-efficacy level and self-efficacy strength across a variety of specific tasks within the memory domain, in keeping with Bandura's (1977; 1986; 1997) microanalytic methodology. The scale seems to have good reliability, internal consistency, and predictive ability. However, Hertzog et al. (1990a) make the argument that individuals who have no experience with the tasks described by the MSEQ may respond to the questions based on their own global memory self-efficacy beliefs. Thus, if the participants taking the tasks do not have a lot of experience with the tasks being assessed, questionnaires measuring more global memory self-efficacy (e.g., the MIA or MFQ) may yield similar results to questionnaires that purport to measure task-specific memory self-efficacy. In actuality, using both measures may increase the amount of explained variance in performance.

Measuring Memory Self-Efficacy Using Single-Item Predictions

Some researchers have stayed true to Bandura's traditional conceptions of self-efficacy measurement, while others have used more non-traditional measures that are nevertheless still grounded in self-efficacy theory (Berry & West, 1993). For example, researchers have assessed self-efficacy by asking individuals to simply rate their ability

to perform a particular memory task. In one study, Lachman and Jelalian (1984) had participants predict how many questions out of a 15-question test they would answer correctly both prior to and immediately after performance, presumably providing a measure of self-efficacy level. For both age groups, prediction accuracy was greatest when individuals were given tests in their "skill specialty" (tests of crystallized tests for older adults; tests of fluid ability for younger adults). This provides some evidence that self-efficacy predictions are more veridical for tasks in which there is a high degree of familiarity or experience. Rebok and Balcerak (1989) also used this technique to investigate the effects of mnemonic training in younger and older adults. In this study, participants used a 100-point index to rate their confidence in their ability to recall items in the correct order from 12-item word lists and 12-item digit lists. The scale was divided into 10-point increments, with 100 representing relative certainty (*real sure*) and 10 representing relative uncertainty (*not sure*). Thus, the highest number on the scale that was circled represented Self-Efficacy Strength (SES) for perfect recall performance. For each list, participants were also asked to predict how many items they thought they would be able to remember. This number represented the individual's self-efficacy level (SEL). However, no confidence ratings were taken for this measure. Overall, younger adults reported higher SES and SEL than did the older adults and also exhibited better recall performance. Overall, Self-Efficacy Level was more strongly related to word recall performance ($r = 0.45$ for younger adults; $r = 0.43$ for older adults) than was Self-Efficacy Strength ($r = 0.29$ for younger adults; $r = 0.30$ for older adults).

The Reading Self-Efficacy instrument created by Shell, Bruning, and Murphy (1989) also represents a self-assessment of self-efficacy to read and understand various written materials, using a combination of single-item prediction and questionnaire formats. In this study, which investigated reading self-efficacy among college students, participants indicated their confidence in their ability to successfully read and understand

18 specified reading tasks (e.g., an application for employment, a letter from a friend or relative). Overall, there was a 0.30 correlation between reading efficacy (averaged across all 18 tasks) and scores on the Degrees of Power Reading Test, which is a 63-item questionnaire measuring reading comprehension. Thus, in this study, reading efficacy was a modest predictor of reading comprehension.

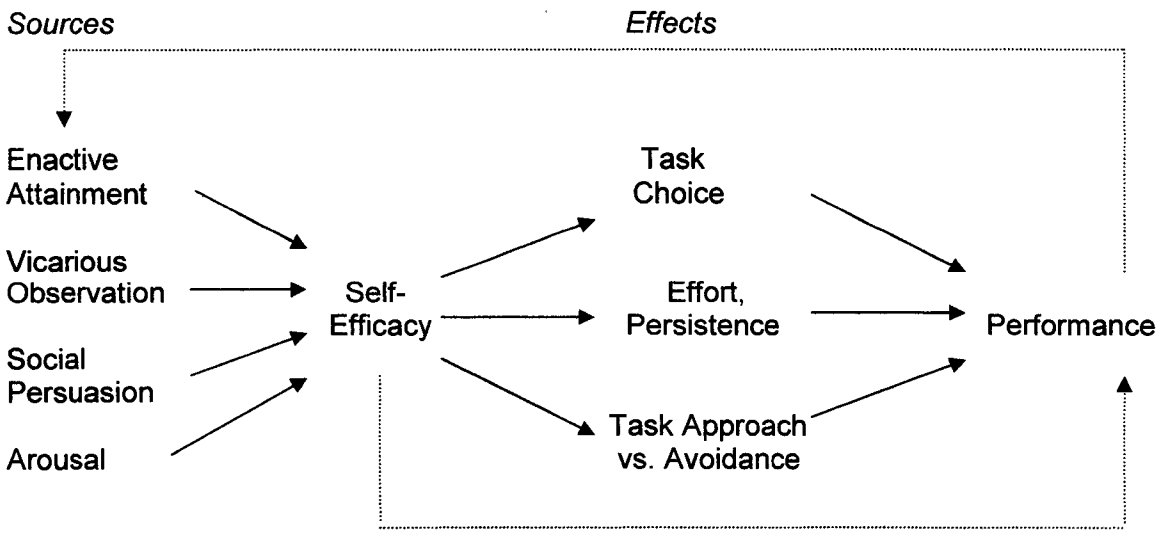
There are benefits and drawbacks to using single-item predictions as measures of self-efficacy. On the one hand, task-specific performance predictions have the benefit of being tied to a domain-specific task (either memory or reading), thus satisfying Bandura's criterion for context-related judgments. However, Bandura (1989; 1997) argues that single-item assessments have two shortcomings. For one, this type of measure yields a truncated range of scores because it fails to account for individuals who possess different efficacy beliefs at different levels of difficulty. For example, an older adult may doubt that s/he will be able to remember all the items on a 12-item list, but may be quite certain of his/her abilities to remember half of those items. Second, the assessments of efficacy are provided for one specific type of task, and have little generalizability to other tasks within the same domain of functioning. For example, some individuals often report that they are horrible at remembering names, but find numbers very easy to remember (Berry & West, 1993). Thus, it is preferable to have domain-specific measurement tools that assess self-efficacy strength at several levels[2].

[2] Although it appears single-item self-efficacy predictions and Judgment-of-Learning (JOL) paradigms are highly similar, Cavanaugh and Greene (1990) argue that there are a few (mostly theoretical) distinctions. First, JOLs measure participants' predictions of their actual performance, whereas self-efficacy measures require predictions for tasks that may or may not be executed. Second, JOLs only make predictions for the task that they are being asked to perform, rather than a hierarchical range of tasks, and so JOLs do not provide a true index of level.

Sources of Developmental Change in Memory Self-Efficacy

Research on memory self-efficacy beliefs has often found that perceived self-efficacy is lower among older adults compared to younger adults, whether the measurement tool has been the MIA (Cavanaugh & Poon, 1989; Hertzog et al., 1990a), the MSEQ (e.g., Berry et al., 1989), or single item predictions (e.g., Rebok & Balcerak, 1989). Bandura (1977; 1997) argues that self-efficacy beliefs are derived from four specific sources: 1) Mastery experiences (which includes prior performance within the related domain of functioning), 2) Observation of others, 3) Social persuasion (e.g., stereotypes associated with aging), and 4) Affective and physiological feedback (e.g., stress and/or anxiety). It is possible that changes in self-efficacy beliefs may arise from any one or more of these sources because of the normal aging process. In addition, research has found that perceived levels of self-efficacy are related to performance, both directly and indirectly as a mediating factor. As seen in the model below, Bandura (1977; 1997) proposes that an individual's level of self-efficacy will affect performance through its effects on task choice, effort and persistence, and task approach or avoidance.

Figure 1. Sources and Effects of Self-Efficacy Beliefs on Performance (Bandura, 1997).



Enactive Mastery Experiences. Enactive Attainment is the most influential source of efficacy information, as it is based on the actual mastery experiences of the individual. All of our everyday experiences alter the strength of our self-efficacy beliefs in some way by providing feedback regarding our success or failure to achieve the goals that we have set for ourselves. In general, successful performance of tasks and goals serves to raise self-efficacy levels, while sub-standard performance and failures lower one's self-efficacy beliefs. It should be noted that the model in Figure 1 is recursive, such that mastery experiences will contribute to self-efficacy, which will in turn contribute to performance. Performance experiences will then help to modify self-efficacy beliefs. Thus, the model predicts that self-efficacy will influence performance, but also that performance will influence self-efficacy beliefs (see also Miller & Lachman, 1999).

Bandura (1997) argues that attainments may or may not affect self-efficacy, depending on what is made of the attainments when they are compared to some sort of internal standard. If one's attainments fall short of an internal standard, then self-efficacy may be lowered. If one exceeds an internal standard, then self-efficacy may increase. Thus, whether experiences are perceived as "mastery experiences" may depend on the attributions for performance. This notion is closely related to attribution theory (Weiner, 1985), which defines attributions as explanations for performance outcomes. In general, attribution theory (Weiner, 1985) argues that attributions for successes and failures vary along two dimensions, with one dimension representing internal factors (i.e., originating from within oneself) and external factors (i.e., originating from others or the environment), and the other dimension representing factors that are considered stable (i.e., enduring) or unstable (i.e., transient). This combination yields a 2 x 2 categorization scheme, such that individuals can make four possible attributions for their performance: ability (internal, stable), effort (internal, unstable), task difficulty (external, stable), and luck, chance, or fate (external, unstable). In general, participants

are asked to perform a task, and then asked to indicate the relative contribution of each of these factors to their performance.

There is an overarching tendency for individuals to ascribe successes to high ability and hard work (which are internal attributions). The result of such attributions has the net effect of raising one's self-efficacy. For example, if one completes a task after exerting relatively little effort, then self-efficacy may be raised because the implication is that a high level of ability allowed success with minimal effort. Along this vein, failures are thought to be more devastating to self-efficacy if they are attributed to one's abilities, as this is an internal factor that is difficult to change. In contrast, success at the expense of a large amount of effort may have negative or weakly positive effects on self-efficacy, as it conveys lower levels of innate ability (Bandura, 1977; Weiner, 1985).

Covington and Omelich (1979) provide empirical evidence for the idea that allocation of effort is a "double-edged sword." In this study, students received a questionnaire that described hypothetical scenarios in which a student in a class performed well, performed at an average level, or failed a college exam. Four potential reasons for failure were given: a 2 x 2 cross between effort (either presence or lack thereof) or self-serving excuses (presence or absence). Participants were asked to imagine themselves in these scenarios, and were then asked to provide ratings of perceived inability and affective reactions. Results indicated that failure combined with high effort led to negative attributions of ability, regardless of excuses. It was found that the availability of self-serving excuses (e.g., failure due to illness) served to preserve estimates of ability, as no personal threat to one's efficacy was perceived. Moreover, low effort was an acceptable reason for failure. These patterns of results indicate that efficacy may be influenced by the perception of effort in relationship to success or failure.

Similarly, poor performance coupled with little effort expenditure is not likely to convey any new information regarding one's self-efficacy (Bandura, 1986). According to Trope (1983; cited in Bandura, 1997), the amount of effort expended on a task can be a strong or weak source of self-efficacy information. For example, individuals who do not put a lot of effort into a situation cannot garner much information regarding their ability in the case of failure, as it then becomes unclear as to whether the failure was due to lack of capability or lack of effort. Indeed, individuals who often employ these strategies (i.e., *self-handicapping strategies*; Strube, 1986) do so because it creates a win-win situation for their ego. These individuals will routinely create situations in which their ability to perform is limited in some way. For example, a student may decide to go out drinking alcohol the night before a big exam. If the student fails the exam, then there is no way to know whether the failure was due to events from the night before (e.g., hangover, lack of sleep, poor concentration) or from lack of ability (e.g., intelligence). If the student succeeds, then they have done so *despite* impediments, then this is often taken as evidence of high ability, as success came in the face of less than optimal conditions. It is also possible that older adults may also create self-handicapping situations in order to "explain away" memory loss. For example, if an elderly individual forgets something that someone said it is much less damaging to the ego to explain the failure in terms of "not paying attention," as it is then unclear whether the failure was indeed due to age-related memory deficits or to lack of effort. Although there is a paucity of data in this area, research in self-handicapping among older adults is currently being conducted (e.g., Braman & Strube, 2000).

For those with strong self-efficacy beliefs, failure to perform a task adequately may be attributed to insufficient effort or strategies, thus lessening the impact of the failure. In fact, this type of appraisal may actually be beneficial to the individual,

especially if perceived failures lead to an increase in effort and eventual success (Bandura, 1986; Bandura, et al., 1982).

Research investigating the attributional tendencies of older and younger adults suggests that individuals may use a double standard when making attributions for performance. Erber, Szuchman, and Rotherberg (1990a) presented a group of younger and older adults with vignettes that described an individual who had some sort of memory difficulty (forgetting a name, forgetting an item at the store, forgetting why a person went upstairs, etc). Half of the participants in each group read that the protagonist was an elderly female (aged 63 to 74) and half read that the protagonist was a young woman (aged 23 to 32). Using a Likert scale, participants rated whether they thought the woman's difficulties were due to lack of ability, lack of effort, task difficulty, bad luck, all the things going on around her, or all the things that might have been on her mind. They also rated whether the exhibited difficulties were a sign of mental difficulty, whether the individual should seek professional guidance in memory training for those difficulties, or whether the individual should be referred to a physician for medical or psychological diagnosis. Older participants were more likely than younger participants to attribute memory difficulties to task difficulty. The younger participants were more likely to suggest that the lapses in memory were indicative of mental difficulty and demonstrated less tolerance than did the older adults, suggesting that a person with these lapses should seek medical or psychological attention sooner. More interesting, both younger and older adults used a double standard; both younger and older participants attributed memory lapses to "all the other things going on in the environment" and "all the other things that might have been on her mind" younger protagonists more so than to the older protagonists. Both groups also rated memory failures in the older adult protagonist as more indicative of mental difficulty, and memory training was recommended more often for this group.

In a similar follow-up study, Erber, Szuchman, and Rothberg (1990b) presented older and younger participants with 12 vignettes that described memory failures (short-term memory, long-term memory, very long-term memory for numbers, names, letters, lists) for either a younger (21-32) or an older (65-75) man or woman. After reading each vignette, participants were asked to rate whether the memory failures described were the results of ability, effort, task difficulty, luck, or attention. Participants also judged whether the failure was a sign of memory difficulty, and whether the target person should seek professional help. The results essentially replicated those of the previous study, in that memory failures in younger adult protagonists were attributed to lack of attention and/or effort, whereas both younger and older male and female subjects attributed memory failures in older adult protagonists to mental difficulty. In addition, younger adults reported being more annoyed and uncomfortable with memory failures than did the older adults. Thus, it seems that the double standard with which we make attributions for performance among younger and older adults does not vary as a function of age.

The attributions that are made to explain memory performance may have far-reaching effects for older adults' psychological functioning. Lachman (1990) administered the Attributional Style Questionnaire to a group of older and younger adults. This instrument contains six positive and six negative hypothetical events. Using a 7-point Likert Scale, participants were asked to evaluate the events on three scales: Internality (7 = totally due to me, 1 = totally due to others), Stability (7 = Will always be present, 1 = will never again be present), and Globality (7 = Influences all situations in my life, 1 = Only influences this one situation). Participants were also asked to generate two negative and two positive events that might plausibly happen to them and then evaluate these using the same scale.

Lachman (1990) found that older adults attributed both positive and negative events to stable causes more than did the younger adults, and made more specific attributions for negative events. Younger adults expected more positive events to happen than did the older adults. In self-generated events, older adults made more stable attributions for negative events, whereas younger adults made more stable attributions for positive events. Overall, the results suggest that older adults are more likely to view negative events as unique to certain situations (e.g., talking in front of audiences), but that these situations are unchangeable (i.e., stable). Thus, this attributional style is more likely to lead older adults to withdraw or avoid situations towards which they feel negative. By reducing the opportunity to engage in these situations, older adults also reduce the opportunities that they have to act in these situations and possibly turn them into mastery experiences.

Within the domain of intellectual functioning, different skills and abilities often exhibit different developmental trajectories during the normal and usual aging process (Rowe & Kahn, 1997). Baltes et al. (1999) illustrate the multidirectionality of cognitive abilities with respect to fluid and crystallized abilities. Skills that usually fall under the rubric of fluid intelligence (e.g., reasoning, perceptual speed) increase through childhood and adolescence, peak during early adulthood, and then begin a linear decline with a rapid decrements in these abilities becoming more salient in very old age. On the other hand, crystallized abilities (e.g., verbal ability), which are acquired and enriched by virtue of experience, often peak in adulthood and continue to improve throughout the lifespan, finally declining only in very old age.

These changes may initiate re-evaluation of self-efficacy skills in older adults, especially if they are troubled by the changes that they are observing within themselves. For example, Willis, Jay, Diehl, and Marsiske (1992) conducted a seven-year longitudinal study (1979 to 1986) to examine age-related changes in everyday

competence among older adults and to examine the relationship between performance on these tasks and self-efficacy beliefs. In other words, they wanted to know whether intellectual control beliefs predicted competence, or competence predicted control beliefs. At both times of measurement, older adults completed psychometric tests that assessed fluid intelligence (e.g., Raven's Advanced Progressive Matrices), crystallized intelligence (e.g., Vocabulary), memory (e.g., auditory and visual number span tasks), and perceptual speed (e.g., Finding A's). Everyday task competence was assessed using the Test of Basic Skills from the Educational Testing Service, which is a 65-item assessment of individual's ability to comprehend materials that may be encountered during normal everyday functioning (e.g., medicine bottle labels, newspaper articles). The Test of Basic Skills also asked questions regarding one's ability to complete tasks of independent living, such as food preparation and grocery shopping. Intellectual self-efficacy was represented by a higher order factor derived from the internal control and achievement scales of the PIC.

Average scores on the Test of Basic skills declined over the seven-year period, as did mean scores for fluid intelligence, crystallized intelligence, and perceptual speed, although 62% of the sample maintained their rank-order stability. Only the ability scores for memory did not change reliably. Willis et al. (1992) examined the ability and control beliefs variables taken at Time 1 to predict everyday task competence at Time 2, the ability of everyday task performance at Time 1 to predict ability and control variables at Time 2, and whether the former showed a stronger predictive relationship than the latter. Cross-lagged correlations were computed for all of the factors at Time 1 and Time 2, and then entered into two sets of structural equation models. The best fit for the model was represented by significant paths from performance on the Test of Basic Skills at Time 1 to Intellectual Beliefs at Time 2. That is, performance on everyday activities was a more salient predictor of intellectual control beliefs than the reciprocal pattern. Willis et al.

(1992) argue that those who performed well on tasks of daily living at Time 1 may have been more likely to view themselves as competent individuals, which was reflected in their self-efficacy beliefs at Time 2 (also recall that this pattern held despite the significant decline in competency scores across the seven-year period). Thus, this provides some evidence that performance on intellectual tasks may affect levels of perceived self-efficacy.

Lachman (1983) also provided further evidence that performance influences self-efficacy beliefs. Older adults were administered a battery of personality tests and intelligence tests at two times of measurement that were two years apart (1977 & 1979). The intelligence tests assessed fluid ability, crystallized intelligence, memory span, and perceptual speed. The personality tests comprised Levenson's (1974) Locus of Control Scales and the six subscales of the PIC, which (as noted earlier) forms two higher order factors: Intellectual Self-Efficacy (Internal control, Achievement Motivation) and Concern About Intellectual Aging (Chance, Powerful Others, Anxiety, Morale). Scores on the assessment instruments at each time of measurement were entered into structural equation models and compared. Lachman (1983) found that longitudinal decreases in internal locus of control over the two-year period were correlated with declines in sense of personal mastery. It was also found that changes in fluid intelligence over the two-year period were associated with changes in Intellectual self-efficacy, whereas the reverse pattern (changes in intellectual self-efficacy predicting performance on tests of fluid intelligence) was non-significant. These findings support Bandura's (1977; 1997) argument that performance can influence self-efficacy beliefs.

Both of these studies suggest that older adults' intellectual abilities decline with advancing age, and that these changes are accompanied by declines in perceived intellectual self-efficacy. Although older adults are put into situations where they realize that their intellectual abilities may be declining in the course of everyday functioning, the

opportunities for older adults to engage in mastery experiences that might increase perceived self-efficacy are often reduced or (in extreme cases) eliminated altogether, due to transitions in lifestyle and environment that may accompany age-related changes in health and cognitive functioning (Welch & West, 1995). For example, well-intending adult children may choose to move their aging parents from their own dwelling (where they may have had to care for themselves alone) to an assisted living, skilled nursing, or nursing home facility, presumably because they will receive more consistent medical care or have more people around in case of an emergency. These new environments offer a wide range of cognitive challenges and mastery experiences; however, it is likely that the older adults will have less control and fewer opportunities for cognitive challenges than they did previously (cf. Rodin, Timko, & Harris, 1985). In these facilities, older adults may not have to remember to take their medications, as the staff may provide medications with meal delivery. Although this may be healthier for the older adult, it also removes another opportunity to demonstrate competence. In several studies of institutionalized elderly, M. Baltes and Reisenzein (1986) found that dependent behaviors are encouraged and reinforced, while independent behaviors are overlooked or discouraged. For example, those who require assistance with basic activities such as getting dressed may be rewarded by conversation and social interaction from a staff member, whereas those who perform activities independently are deprived of these attentions and interactions, effectively squelching autonomous behavior.

Although older adults in these conditions may be easier to manage, the result is reductions in self-efficacy as opportunities for mastery experiences and control are reduced or removed. Even in non-institutionalized settings, older adults may voluntarily "withdraw" from everyday tasks (e.g., preparing tax forms, programming a VCR) and increase reliance on others to complete tasks they are quite capable of performing

(Lachman, 1986). Since older adults' performance on cognitive and intellectual tasks has been shown to improve with practice (e.g., Lachman & Jelalian, 1984), it is important that opportunities for mastery are maintained.

In summary, enactive mastery experiences are a salient source of self-efficacy beliefs. Several researchers (e.g., Lachman, 1983, 1990; Willis et al., 1992) have found empirical evidence that performance influences self-efficacy beliefs. However, the degree to which self-efficacy beliefs are strengthened or weakened depends on the subjective assessment of performance by the individual. These subjective evaluations may be influenced by performance attributions, comparisons to others' performance, and one's personal standards.

Observation. Observations of others, as well as comparison of self to others, also provides a source of information for an individual's sense of self-efficacy, as one's skills and capabilities are often assessed in relation to other's performance (Bandura, 1997). For example, receiving a score of 100 on an IQ test is relatively meaningless, unless it is considered against the scores of other individuals. These effects vary as a function of congruence between the model and the individual, with greater influences on self-efficacy occurring when there is more of a perceived similarity, such that seeing other individuals who are judged to be peers (i.e., they possess comparable skill sets) successfully complete tasks can serve to raise one's self-efficacy, as it conveys a "if you can do it, so can I" type of attitude. Along the same lines, watching others who are considered similar in ability fail at a task, despite their best efforts, may serve to undermine one's own self-efficacy (the "Why should I be able to do it, if they couldn't?" mentality).

In an early test of this hypothesis, Bandura, Reese, and Adams (1982) conducted two experiments in a clinical setting using individuals with self-reported moderate to severe phobias. In the first experiment, individuals with a snake phobia

watched a therapist successfully model various feared activities. After observing the model, the participants then confronted and mastered progressively more threatening tasks until specific self-efficacy levels were reported (low, medium, high), as indicated by a self-efficacy probe following each task. Fear arousal and coping behavior were also measured. In the second phase of the experiment, those reporting low to medium levels of self-efficacy engaged in further behavior modification training to raise their perceived efficacy to higher levels, and measurements of fear arousal and coping behavior were taken again. The data suggested that simply watching a competent model produced a significant 14% increase in participant's perceived self-efficacy. In a second experiment, individuals with a moderate to severe fear of spiders observed a therapist modeling feared activities, but they were not allowed to engage in any of the actions. Thus, any changes in perceived self-efficacy would be completely attributable to vicarious experience. Participants observed feared activities until either a low or medium self-efficacy level was reported. After observations, they were asked to perform the various activities.

In both experiments, those with higher levels of perceived self-efficacy completed more tasks successfully than did those reporting lower levels of self-efficacy. In addition, an analysis of perceived self-efficacy and reported fear arousal suggests that those with higher levels of perceived self-efficacy reported lower levels of fear, whereas those who were the least efficacious reported the highest amount of fear. Fear arousal was shown to decrease as self-efficacy increased. Thus, these studies provide evidence that individual's self-efficacy levels can be altered simply by observing someone else successfully perform a task that one also seeks to perform successfully.

Self-efficacy can also be affected by direct comparisons with peers. In the study by Bandura and Jourden (1991), students in the same graduate program in business studies received feedback regarding their performance that indicated that their

performance was superior to, inferior to, or comparable to that of their peers, or whether they were demonstrating increasing mastery compared to their peers, depending on the experimental group to which they were assigned. It was found that those who received feedback that their performance was declining compared to the performance of their peers expressed declines in their levels of perceived self-efficacy, demonstrated erratic analytical thinking, and were self-critical of their performance attainments, which steadily declined. On the other hand, those who received feedback that their performance was steadily increasing (progressive mastery) expressed an increase in self-efficacy, and improved their analytical thinking strategies. They expressed dissatisfaction when their scores were inferior to their peers and satisfaction when they exceeded their peers. Those in the superior group had high self-efficacy and efficient analytic thinking, but also set lower personal goals than those in the progressive mastery group. They also expressed high levels of satisfaction with their performance, despite the fact that it was below the standards set for production by the experimenter. In other words, this group was happy with their sub-par performance because they were doing better than their peers. Bandura and Jourden (1991) concluded that social comparisons may influence the may in which we evaluate our own performance, and that these evaluations are based on relative versus absolute values.

In older adult populations, self-efficacy beliefs may be preserved when individuals compare themselves with others within their own cohort, who may also be experiencing various levels of memory failure and intellectual decline. In contrast, social comparisons with younger adult models that are at their peak of intellectual functioning may make performance impairments more salient, thus reducing self-efficacy beliefs. Studies investigating younger and older adults' attitudes towards their own memory functioning and the memory functioning of other age groups often find that adults generally expect memory abilities to decline with advancing age (Cavanaugh & Morton,

1988; Lineweaver & Hertzog, 1998; Ryan, 1992; Ryan & Kwong See, 1993). However, some older adults maintain that their memory functioning is equivalent to or better than that of their peers (Cavanaugh & Morton, 1988; Lineweaver & Hertzog, 1998). It is possible that older adults maintain these beliefs to prevent reductions in self-efficacy associated with comparisons to a younger, more able cohort.

In summary, the results of these studies suggest that individuals' self-efficacy may be raised or lowered based on their observations of others' successes or failures. This may be especially true if the individual perceives a high degree of similarity (e.g., in age or ability) between him/herself and the model or if a comparison is made between oneself and another that has desirable traits (e.g., a confident clinician who has overcome a snake phobia) or abilities (e.g., a younger adult with a better memory).

Social Persuasion. Bandura (1997) suggests that self-efficacy beliefs may be altered by verbal or social persuasion, although the effects of this variable are usually more modest than others (e.g., performance). In general, individuals who are struggling with a task may find their beliefs in personal ability bolstered by a "pep" talk from another person who expresses faith in their abilities. However, these "pep talks" are only as effective as they are realistic; persuading someone to undertake tasks that are well beyond their level of competence only sets the stage for failures and reductions in self-efficacy (Bandura, 1986; 1997). Much of the research on social persuasion and efficacy can be conceptualized in terms of research on stereotypes in aging, which suggests that social influences can have both harmful and beneficial effects on older adults' self-efficacy beliefs and subsequent performance.

Some evidence exists to indicate that older adults are often the victims of negative age-related stereotyping, and that these negative stereotypes may differentially impair older adults' performance once invoked. In one study, Hess, Auman, Colcombe, and Rahhal (2003) examined the impact of stereotype threat on older adults' memory

performance. According to Hess et al. (2003) stereotype threat occurs when individuals are placed in a situational context that invokes attributes that are associated with certain characteristics of a person's group membership. That is, they are given a task to invoke these stereotyped traits, and there is a high value placed on those traits. In this study, older and younger adults read two fabricated "newspaper articles" that either described older adults' memory skills as being worse than younger adults (memory loss as inevitable; traditional view of aging and memory loss) or described memory loss due to aging as due in part to individual differences as well as environment (i.e., memory loss as controllable; non-traditional view of aging and memory loss). Stereotype activation was assessed using a naming task; this task measures participant's reaction times to classify age-positive words (e.g., wisdom) versus age-negative words (e.g., senile) that followed age-targeted primes (e.g., the word *senior*). Participants then completed a free recall task in which they studied and recalled thirty words.

Hess et al. (2003) found evidence of activation of a negative age stereotype. There were no differences in response times when participants responded to traits following young primes. However, when traits followed old primes, individuals who had read information describing age related declines in memory took longer to respond to positive traits than those in the other conditions, suggesting that the negative stereotype of aging was activated. In addition, those in the control group who received no information about the relationship between memory and aging showed the shortest response times to negative traits when they followed an old prime, suggesting that a negative stereotype of aging is dominant. With respect to recall, younger adults recalled more of the words than did the older adults overall. For the younger adults, recall performance did not vary as a function of stereotype manipulation. However, stereotype threat did impair older adults' recall; those who received the negatively-biased information recalled significantly less than those in either the positively-biased or control

conditions. This empirical evidence demonstrates that both older and younger adults may implicitly process negative stereotypes about age and memory loss, which may be activated by environmental cues. Moreover, these implicit negative age stereotypes affected the older adults' explicit performance on a recall task.

Levy (1996) also found that implicit negative age-related stereotypes affected performance of older adults. Using an implicit stereotyping paradigm in which stereotyped words are flashed on a computer screen at speeds high enough so as to be processed subconsciously, Levy (1996) presented older adults with the subliminal primes of *old* or *senior*, followed by a combination of neutral words (e.g., between, sentence) and words that were either consistent with a negative view of aging (*senile condition*; e.g., decline, senile, dementia, confused, incompetent) or a positive view of aging (*wise condition*; e.g., wise, sage, creative, enlightened, insightful). Prior to and after the priming task, participants also completed tests of immediate recall, learned recall, delayed recall (in which participants reproduced a dot-pattern at various intervals), photo recall (recalling activities associated with faces), and an auditory recall task (recalling words from a 15-word list). In the *wise* condition, the immediate, learned, delayed, and photo recall task means were higher after the priming intervention than before, although only the photo recall reached significance. Comparison of pre- and post- priming performance in the *senility* condition indicated that means scores decreased for the immediate, learned, delayed, and auditory recall tasks, although the differences were only significant for the immediate and delayed recall tests. These results are taken as evidence that even implicitly activated stereotypes can influence memory performance, even without older adults' cognitive awareness. In a second study, this procedure was repeated with younger adults. With the exception of an improvement in scores on the learned recall and photo recall tasks following the senility primes, there were no differences in memory performance when pre- and post- priming

scores were compared, suggesting that younger adults' performance was not affected by the negative stereotypes associated with advancing age.

Thus, these data suggest that older adult's performance can be influenced by contextually activated information, which may affect performance by altering older adults' memory self-efficacy. Given that older adults are frequently exposed to negative information regarding aging (e.g., the preponderance of negatively skewed "jokes," advertisements, and literature), there is a large potential for negative age stereotypes to become reinforced on a daily basis. Therefore, the extent to which older adults experience stereotype threat, and the influence of those stereotypes on performance, becomes an important source of self-efficacy to consider.

Affective/Physiological Arousal. "In judging their capabilities, people rely partly on somatic information conveyed by physiological and emotional states." (Bandura, 1997, p. 106). Theoretically, individuals may interpret stress and agitation in certain situations as signs that they are ineffectually dealing with the situation, which may serve to reduce self-efficacy levels.

It is thought that distress level will vary as a function of the discrepancy between a perceived threat and one's assessment of their ability to cope with the situation. Therefore, individuals with weak self-beliefs may become more disturbed by physiological reactions to stress; these elevated levels of somatic and autonomic arousal may be accompanied by visions of failure, and feelings of low self-worth (cf. Bandura, 1997). People tend not to perform difficult and effortful skills well under duress. Therefore, individuals with low levels of self-efficacy may experience fear and anxiety, which may inhibit effective coping strategies and serve to bring about less than successful outcomes. This, in turn, will reinforce stress and anxiety reactions.

Those with low self-efficacy may experience apprehensive cognitive intrusions and inefficacious thought patterns. These ruminations are thought to undermine coping

strategies, as cognitive attention is diverted from strategic plans and actions that would effectively deal with the stressors and instead is focused on the individual's personal deficiencies and consequences of failure (Bandura, 1989).

Research with aging populations has been conducted to investigate the inter-relationships among negative affect, self-efficacy, and memory performance. Most often, concerns over memory failures are manifested as memory complaints. Although some studies have found no relationship between memory complaints and impaired performance on memory tasks (e.g., Kahn et al., 1975), some studies have reported that higher incidence of complaints have been associated with decrements in memory performance, greater rates of depression, and lower self-efficacy regarding one's memory functioning (Gilewski & Zelinski, 1988; Zelinski & Gilewski, 1988). For example, Jonker et al. (1996) found that individuals who complained frequently about their memory failures also demonstrated lower levels of memory performance, compared to those who did not have as many complaints. Zelinski and Gilewski (1988) argue that these discrepant findings may be the result of ineffective assessment measures and large individual differences among participants.

The relationship between memory complaints and performance may be mediated by factors such as self-efficacy. Berry and Strube (2004) found that memory complaints were negatively associated with memory self-efficacy. In this study, older adult women completed the Geriatric Depression Scale, Memory Complaint Questionnaire, and a Self-Efficacy Questionnaire prior to engaging in a free recall memory task. A hierarchical regression in which depression and memory complaints were used as predictors of self-efficacy revealed that memory complaints accounted for a significant portion of the unique variance in self-efficacy, even when depression scores were controlled for. Although memory complaints and depression were positively related (r = .50), the depression scores themselves were not predictive of self-efficacy.

This evidence suggests that the source of memory failures may be the result of motivational factors, rather than actual cognitive deterioration. It is hypothesized that individuals with low self-efficacy may report greater rates of depression, have more complaints about memory, and perform lower on memory tasks because they do not believe in their own capabilities (Zelinski & Gilewski, 1988), although more work in this area is needed to clarify the connections between memory complaints, depression, self-efficacy beliefs, and performance (Berry & Strube, 2004).

Collectively, the evidence provided in this section suggests that self-efficacy beliefs among older adults may be influenced by several different sources. These include perceived changes in one's skills and competencies with advancing age and attributions for performance associated with those changes, social comparisons with other individuals, social information and stereotypes associated with that information, and one's own physiological and emotional state. Because these self-efficacy beliefs may contribute to memory performance and intellectual functioning beyond that of actual ability, it is not only important to identify those factors that may alter perceived self-efficacy levels, it is also important to understand the effects of different levels of efficacy beliefs on performance.

Effects of Developmental Changes on Self-Efficacy Beliefs

Bandura (1977; 1997) argues that self-efficacy level is determined by the interaction of the previously described factors. He also argues that self-efficacy affects task performance, both directly and indirectly as it mediates the relationships between task choice, invested effort, and the persistence of that effort in the wake of difficulty.

Task choice.

The extent to which an individual feels capable of performing an activity will determine whether or not s/he chooses to initially engage in that activity or task (Bandura, 1977; 1986). Situations that are thought to exceed capabilities will be

avoided, whereas those situations thought to be within the realm of one's capabilities will be engaged. Therefore, accurate judgment of one's capabilities becomes an essential consideration for determining in which activities to invest time and effort (Bandura, 1986). For example, consider the mediocre swimmer who strongly believes that s/he can swim the English Channel. Extreme overconfidence in one's abilities may lead an individual to pursue activities that are beyond one's reckoning, sometimes with dire consequences. In contrast, those who underestimate their abilities are more likely to withdraw from challenging situations, thereby constricting their range of experiences and averting potentially successful situations that could increase self-efficacy (Bandura, 1986).

In research, choice behavior has been operationalized as whether or not an individual chooses to perform a given task, choice of task difficulty level, and personal goals (Berry & West, 1993). One's perceived level of self-efficacy is thought to influence the ranges in which these behaviors are expressed. For example, Artistico, Cervone, and Pezzuti (2003) conducted a study to assess younger and older adults' ability to solve everyday problems. Both groups of individuals were presented with the Tower of Hanoi Problem, and three sets of five "everyday" problems that were more common to younger adults, more common to older adults, or problems equally common to both age groups. As a measure of self-efficacy, individuals indicated how many moves they thought they would need to be able to solve the Tower of Hanoi puzzle or how many of the everyday problems in each group to which they thought they would be able to generate viable solutions (1 to 5). Confidence ratings were also provided. The correlation between self-efficacy perceptions and performance was significant for each of the four tasks: Tower of Hanoi ($r = 0.59$), common problems ($r = 0.37$), young-adult problems ($r = 0.69$), older adult problems ($r = 0.68$). More interesting, though, is the finding that younger adults demonstrated higher levels of perceived self-efficacy than did

the older adults on the young-adult-oriented problems, whereas older adults' self-efficacy levels were higher than those of the younger on older-adult-oriented problems. Older adults also outperformed the younger adults on the problems that were more relevant for older adults, whereas younger adults' performance was superior on the other three problem types. That is, individuals' performance was better on the tasks that were more appropriate to their respective age group. Because there was a strong relationship between self-efficacy and performance, it is possible that individuals will prefer to pursue activities for which they feel high self-efficacy. This implies that older adults may only pursue activities for which they feel efficacious, to the exclusion of others. If this includes memory-related tasks, the implication is that older adults may withdraw from tasks involving memory because they feel that they cannot perform well, regardless of their actual ability levels.

Although it seems that "everything in moderation" would produce the best performance, it actually appears that the most effective policy regarding one's abilities is slight overconfidence. If people always engage in routine activities that are within the upper limits of one's self-efficacy, then the adage, "nothing ventured, nothing gained," would seem to be the most appropriate. It is optimism in our own abilities that leads to situations in which individuals pursue goals that are challenging relative to current levels of functioning, but also realistic and attainable. Successful completion of goals and challenges then serve to maintain or strengthen self-efficacy beliefs (Bandura, 1986; 1989).

In fact, Taylor and Brown (1988) argue that overly positive self-evaluations of our abilities actually help to foster adaptive coping strategies. Since our everyday lives are usually filled with hassles, frustrations, and setbacks, a slight overconfidence on one's abilities to perform help an individual to take action to effect change in spite of these setbacks (Cavanaugh & Greene, 1990). In contrast, those who are more "realistic" in

their assessments often self-report more anxiety and depression than the overly optimistic individuals (Taylor & Brown, 1988; although, see Colvin and Block, 1994 for a critique). When faced with challenges or difficulties, it is unlikely that these individuals will mobilize the necessary resources to effect change. Therefore, those who hold strong self-efficacy beliefs may outperform those with weaker self-efficacy beliefs, despite any lack of differences in actual ability to perform a specific task. This may be a more adaptive attitude for older adults, as the propensity to overestimate memory capabilities and intellectual functioning (e.g., Lachman & Jelalian, 1984; Bandura, 1989) may lead them to continue to engage in cognitive tasks, despite age-related deficits.

Much of our current behavior is influenced by our future goals, as we must plan and execute the appropriate course of action that will lead us to the realization of these goals. The goals that we set for ourselves are influenced by our self-efficacy beliefs. Those with higher self-efficacy tend to set higher goals for themselves, have a higher commitment to those goals, and generally achieve higher levels of performance than those with lower self-efficacy (Bandura & Wood, 1989; Berry & West, 1993).

Effort and Persistence. Once engaged in a task, self-efficacy beliefs influence the amount of effort that individuals invest in completing their chosen tasks (Bandura, 1977; 1986; 1989). Here, effort may be defined as the type and quality of behaviors that are employed when one tries to master a task (Berry & Strube, 2004), such as mental exertion or the use of cognitive strategies (Berry & West, 1993). For example, in the Berry & Strube (2004) study, older adult women completed a battery of questionnaires prior to a free recall task where both word recall performance and study time (i.e., effort) were recorded. The data indicated that individuals with high levels of self-efficacy recalled more words than did those with low levels of self-efficacy. Analyses of zero-order correlations indicated that self-efficacy was not only related to performance (r = 0.42), but also to the amount of time individuals spent studying the words for later recall

(r = 0.38). Moreover, effort was also positively related to performance (r = 0.67). Path analyses revealed that the relationship between self-efficacy and memory performance was partially mediated by effort (r = 0.19) In other words, there is evidence to suggest that individuals with high self-efficacy recalled more of the words because they allocated more time to studying word lists for recall than did individuals with lower levels of self-efficacy.

Bandura (1986) also argues that self-efficacy beliefs may affect the allocation of effort differently, depending on the type of task in which an individual is engaged. In learning situations, those with high self-efficacy beliefs may spend very little time *preparing* to learn a task, as they may believe that they have the capacity and skills to complete the task (e.g., an English professor who prepares a lecture the night before class on a never-before seen piece of literature in his/her area of expertise). In contrast, those with self-doubts in their ability may increase their effort towards learning new materials, as they do not believe they have the skills necessary to perform (e.g., an English professor who is given a paper on nuclear physics to read and evaluate may spend extra time reading background materials). When individuals are *performing* these tasks, those with high self-efficacy beliefs may intensify and sustain the efforts they devote to the endeavor (e.g., the English professor who pores over the reading in his/her own content area). While on the contrary, those with low self-efficacy beliefs may interpret the first sign of struggle as an inherent lack of ability and reduce efforts (e.g., the English professor who struggles with nuclear physics may resort to "skimming" or glossing over large sections that don't make sense). Higher levels of self-efficacy are associated with greater and greater effort, and a greater determination to master challenges, while those with low self-efficacy tend to slacken their efforts when faced with difficulty.

An individual's beliefs in their abilities will determine how long s/he perseveres when faced with threatening challenges or adversities (Bandura, 1977; 1986; 1997), which may be quantified as the number of attempts to master a task that one makes (Berry & Strube, 2004) the amount of time spent on a task (Berry & West, 1993) or in studies of self-efficacy and academic success, the number of terms completed (Multon, Brown, & Larkin, 1991). Those who possess a strong sense of self-efficacy will devote more effort to and be more persistent in their endeavors, which will most likely lead to positive outcomes that will in turn serve to strengthen self-efficacy further. However, those with little faith in their own abilities will invest less effort and give up more quickly when faced with obstacles. This in turn will further strengthen their notions of low self-efficacy.

The relationships among self-efficacy, persistence, and effort, have been observed in several difference venues, most notably in academic settings. Lent, Brown, and Larkin (1984) found that individuals who expressed higher levels of self-efficacy for their ability to pursue a career in a technical major obtained higher grades and persisted longer in these majors than those who reported lower levels of self-efficacy. In a meta-analysis of self-efficacy beliefs and academic performance, Multon et al. (1991) found that self-efficacy beliefs were able to account for nearly 14% of the variance in academic performance and 12% of the variance in academic persistence (p. 34).

In the laboratory, Bouffard-Bouchard (1990) investigated the relationship between self-efficacy and persistence in problem solving performance. She induced either high or low levels of self-efficacy in college participants by using a false feedback paradigm to inform them that they either performed better than (high self-efficacy inductions) or worse than (low self-efficacy induction) their peers on a sentence completion problem task. In this task, participants were given six sentences, with the same word in each of the sentences replaced with a nonsense word (e.g., "She dreamed

of the day her *marito* would be over." "Her recurring *marito* was described in the book." "The movie she had seen had given her terrible *maritos*."). The goal was to figure out the actual word that the nonsense words replaced (*morito* = nightmare). To assess that the self-efficacy manipulation was effective, participants completed another set of sentence problems and indicated how many of the problems to which they would be able to find the correct word. They also rated their confidence in their ability to solve these problems. Participants were then given time to actually solve the problems. Several dependent measures were assessed; persistence was indexed as the number of problems that a student completed, either with an incorrect or correct response, while success was measured as the number of correctly solved problems.

Students who received positive feedback reported that they thought themselves capable of solving more problems and expressed higher levels of confidence than did those who received negative feedback, thus suggesting that the two groups differed on perceived levels of self-efficacy (with the former being higher than the latter). The results indicated that those with higher levels of self-efficacy completed significantly more problems than did those with lower self-efficacy, and that high levels of perceived self-efficacy were also positively related to successful completion of problems attempted ($r = 0.63$). Those with high self-efficacy also completed more problems overall than did those with lower levels of self-efficacy. In addition, 84% of the students in the high self-efficacy group reported that they had the personal objective of solving all of the problems, compared to only 31% of those in the low self-efficacy group. Bouffard-Bouchard (1990) argued that these data provide evidence that those with higher levels of self-efficacy not only attained higher performance, but were more persistent in their efforts, as they set higher goals for themselves and completed more of the problems that they started than those with low self-efficacy.

Under the rubric of control beliefs, beliefs regarding memory have also influenced the amount of effort expended on cognitive tasks among older adults. As mentioned earlier, Miller and Gagne (in press) divided older and younger adults into either high-control or low-control groups based on their PIC scores. Participants then read two relatively difficult and two relatively easy texts for immediate recall. Word-by-word reading times were recorded, as was recall performance. The data indicated that high-control older adults allocated more time to comprehension processes while reading difficult texts than did low-control older adults. However, there were no differences in the time that younger adults allocated to reading difficult texts, nor were there any age or control belief differences among those who read the easy passages. It was concluded that control beliefs were more important to older readers versus the younger readers when faced with a challenge.

In conclusion, the concept of self-efficacy has generated many empirical studies in a variety of domains since Bandura's original article (1977). Within the intellectual and cognitive domains, individuals with high self-efficacy generally outperform those with lower levels of self-efficacy on a variety of tasks, ranging from recall of words and prose to analytic problem solving. Empirical evidence suggests that older adults' self-efficacy may be lower than those of younger individuals as the result of negative age-related stereotyping, comparisons to younger, more able, cohorts, and reductions in opportunities for mastery experiences. Moreover, these *ability beliefs* may contribute to age differences beyond the contributions of actual ability differences. Although the mechanisms are still unclear, it is thought that self-efficacy beliefs affect performance both directly and indirectly by influencing task choice, goals, effort invested performing a task, and persistence in the face of difficulty. Given that older adults may have lower self-efficacy beliefs compared to the young, it is important to investigate the extent to which efficacy beliefs alter the allocation of effort or persistence to various tasks. The

purpose of this study was to add to the literature by investigating efficacy beliefs among older and younger adults as they relate to strategy within the domain of discourse processing.

CHAPTER II

DISCOURSE PROCESSING

The ability to read and comprehend discourse is important for successful negotiation through our everyday life at any age (Lorch & van den Broek, 1997). Indeed, the ability to read allows us to complete a wide array of activities, ranging from grocery shopping and driving through a city to scholarly pursuits. In general, reading is considered a deliberate and motivated activity, such that adequate text comprehension requires intentional allocation of resources and effortful cognitive processing (Guthrie & Wigfield, 1999). However, very little research has actually been conducted to investigate the joint effects of both cognitive factors as well as non-cognitive factors (e.g., reading motivation and beliefs) on text comprehension among older adult readers. The purpose of this next section is to discuss a model of text comprehension that includes both cognitive and motivational processes.

Cognitive Factors in Reading

The act of reading discourse involves the execution and coordination of several processing components, with each varying in the cognitive demand requirements and time required for effective completion (cf. Graesser & Millis, 1997; Just and Carpenter, 1980; for a review of on-line reading time effects). Research in discourse processing in adulthood suggests that some of these processes remain relatively unaffected throughout the aging process, while others often demonstrate reliable age differences (cf. Stine, Soederberg, & Morrow, 1996). The following section provides a cursory overview on-line reading methodology, discusses some of the theoretical constructs underlying text comprehension, and provides information regarding measurement.

On-Line Reading Paradigm

During the late 1970s and early 1980s, researchers began to develop methodologies to allow the on-line assessment of processes that occur during normal text comprehension. In particular, the moving window method and resource allocation approach has been used to investigate how individuals allocate time to specific reading and comprehension processes. In this methodology, the letters of the words in a text (e.g., a sentence) are represented on the computer screen as dashed lines, grouped into word formations with punctuation marks in place. This allows readers access to the characteristics of the sentence (e.g., length and structure) that are usually available during naturalistic reading. When the participant presses the space bar, the first word appears in place of the dashed lines. Each subsequent button press causes the next word to appear in place of the dashed lines, and the previous word to revert to dashed lines. As the participant progresses through the text, only one word is available for viewing at any given time, giving the appearance that they are reading through a "moving window." The time that an individual spends looking at each word is recorded and stored for later analysis.

The word-by-word on-line reading paradigm is based on the assumption that the reading times for the individual words are indicative of the time that a reader spends processing information related to those particular words (Aaronson & Ferres, 1984). This premise is derived from two assumptions of on-line reading advanced by Just and Carpenter (1980): the *immediacy assumption* and the *eye-mind assumption*. The immediacy assumption states that, "a reader tries to interpret each content word of a text as it is encountered... Interpretation refers to processing at several levels such as encoding the word, choosing one meaning if it, assigning it to its referent, and determining its status in the sentence and in the discourse... interpretation at all levels are not deferred; they occur as soon as possible." (Just & Carpenter, 1980; p. 330).

Similarly, the eye-mind assumption stipulates that, "the eye remains fixated on a word as long as the word is being processed..." (Just & Carpenter, 1980; p. 330).

These assumptions are not without controversy, as they are in contrast to the notion of "buffering," which argues that individuals buffer semantic material in working memory to be processed at a later time (e.g., in the case of anaphoric resolution). Peaks in reading times are often found for words that appear at clause boundaries or syntactic constituents within sentences or at the ends of sentences and are thought to reflect both immediate processing of the word and "wrap-up" processes, in which meaning is constructed from the text as individuals organize and integrate the concepts that have been presented and "buffered" in working memory up to that point (Aaronson & Ferres, 1984; Just & Carpenter, 1980).

There is some evidence to suggest that readers simultaneously employ both strategies (Stine, Cheung, & Henderson, 1995). In Stine et al. (1995), younger and older adults read three text passages using the word-by-word reading paradigm. They found that reading times increased when readers encountered new concepts in the text as well as at the ends of sentences, demonstrating both immediacy of processing and buffering strategies. Similarly, using a word-by-word reading paradigm, Haberlandt et al., (1986) found that reading times at the sentence boundary increase as a function of the number of new arguments introduced within a sentence. Haberlandt and Graesser (1989) found that reading times for words representing intrasentence clausal boundaries increased as a function of the number of new concepts introduced to that point, as well as at the sentence boundary words. Collectively, these data provide evidence for both the immediacy of processing and buffering strategies.

There are several advantages to using the word-by-word paradigm as a research methodology (cf. Aaronson & Ferres, 1984). Research using eye-tracking has found that almost every content word in a text is fixated upon (i.e., looked at) at least once

(Just & Carpenter, 1980). The first advantage of the word-by-word method is that the on-line nature of this procedure allows experimenters to assess perceptual encoding during reading, as reading times reflect processing while individuals perceive each individual word (Aaronson & Ferres, 1984). Second, the word-by-word reading paradigm is sensitive to individual differences in reading patterns as well as characteristics of individual sentences, thus reducing measurement error due to noise when group data are averaged. Third, reliable effects are often found using this technique. The within-subject variability is often quite low, suggesting that reading patterns are relatively stable.

Critics of this methodology have often cited that it represents an unnatural method of reading. Aaronson and Ferres (1984) make several arguments in favor of the moving window method as representative of naturalistic reading. First, the word-by-word moving window method corresponds to participant's natural reading rate, as participants are able to self-pace themselves through the experiment. This is important, as participants can allocate as much time to particular aspects of text processing and develop their own reading strategies that are not limited by experimenter constraints. Second, some have criticized this methodology for its lack of ecological validity, arguing that individual's normal, everyday reading activities do not usually involve reading in a word-by-word manner. Although repeatedly pressing a button to advance to the next word may seem unnatural, many research paradigms often touted as more "naturalistic" are often unnatural in their own way, as they often use devices such as bite boards, head clamps, contact lenses, and headgear that may restrict natural vision. Finally, critics have argued that the moving window method is unnatural because it prevents individuals from making regressions back to previous parts of the text. Although this is an inherent limitation of the procedure, it is preferable to other types of on-line measures (e.g., eye tracking), in which regressive movements are allowed. This is due to the fact

that eye tracking technology, in many cases, cannot account for individuals who may differentially take advantage of perceptual span (Rayner & Pollatsek, 1989) to process information not related to the word that they are reported to be fixating on. That is, some individuals may be able to "look ahead" and process words in their peripheral vision up to 15 characters to the right of a fixation point, whereas some individuals may have a smaller (e.g., 5-7 character) span[3]. Although the eye-mind assumption postulates that individuals are processing the word on which they are fixating, there is no way to ensure that the individual is actually processing the word that they are fixating on or on another word or words within their peripheral view.

Although a seemingly contrived methodology, there is evidence to suggest that this methodology produces patterns of reading times that approximate those obtained with more "naturalistic" methods. (Just, Carpenter, & Woolley, 1982). Just et al. (1982) compared the data from several on-line reading paradigms, including eye-tracking, rapid serial visual presentation, and the moving window method. Linear regressions were used to analyze reading times, with variables representing linguistic processes used as independent predictors of reading time. Overall, the reading times from the moving window method most closely resembled gaze durations (i.e., how long an individual actually spends looking at a word), which most closely approximated natural reading. However, the times in the moving window paradigm tended to be longer than those in the gaze duration condition. Overall, the correlation between moving window and gaze duration data was moderate ($r = 0.57$). Despite intercept differences, the data from the moving window method displayed similar patterns as those found by Just and Carpenter (1980). Thus, this methodology is comparable to other studies of on-line reading.

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[3] In fact, Salthouse (1984) has demonstrated that older adult expert typists differentially rely on their perceptual span to compensate for age-related changes in typing speed.

Cognitive processes in discourse processing.

In order to comprehend and remember discourse, the reader must engage in a coordinated array of linguistic computations in order to transform the author's message from its written form to an internal representation and extract meaning. The following sections provide a brief, superficial review of linguistic processing (for reviews, see Graesser & Millis, 1997; Kintsch, 1998).

Kintsch (Kintsch & van Dijk, 1978; Kintsch, 1994) agues that the process of extracting meaning from text occurs in different levels: word-level, textbase-level, and discourse-level. At the most basic *word level*, individuals must first perceptually decode the orthography through of the written symbols on the page and realize the collections of letters as words. This is followed by lexical access, in which the word's meaning(s) are retrieved from long-term memory and the most appropriate one selected given contextual constraints. At the *textbase level*, concepts are accessed from the words. These concepts (as well as the linguistic relationships between them) are then encoded as propositions, which are rule-governed constructions (idea units) that express the relationships between the concepts of a text (Kintsch & van Dijk, 1978). According to Kintsch and van Dijk (1978), groups of propositions are processed separately as units or "input cycles," with the size of the segment selected for processing constrained by working memory limitations (Just & Carpenter, 1980; 1992). As the reader progresses through the text, propositions from within the sentence clauses must be actively integrated with prior information in order to preserve the text coherence. That is, propositions from one input cycle are combined with those from the subsequent input cycle, with argument overlap providing a means of constancy (Kintsch & van Dijk, 1978; Kintsch, 1988). Integration may also occur as the product of updating, as the reader adds words and ideas to arguments that are maintained in working memory (Just & Carpenter, 1980). Discourse-level processing involves combining knowledge from the

text with background knowledge to develop a deeper understanding about what the text is about (i.e., *situation model* (Kintsch, 1994; Zwaan, Langston, & Graesser, 1995)).

Reading times are used as the dependent variables in linear multiple regression equations in order to determine the extent to which cognitive resources (i.e., time) are allocated to the particular linguistic and computational demands that are associated with text comprehension. In the resource allocation approach (Lorch & Myers, 1990), individual reading times are regressed onto an array of features that represent the processes under study for each individual participant. The regression coefficients for the array of text parameters represent an individual's reading strategy (Aaronson & Ferres, 1984).

Typically, reading time is influenced by word-level and text-level features in relatively predictable ways. Individuals' reading times are positively associated with word length, such that longer words (i.e., ones that contain more syllables) take longer to read. Reading time also increases as a function of word frequency, with longer times associated with less frequently used or rare words, presumably reflecting lower levels of activation in long-term memory and therefore reduced availability (Haberlandt, 1984; Just & Carpenter, 1980; Just et al., 1982). At the textbase level, reading time is positively related to the number of new arguments or new concepts per sentence, representing the time needed for the activation and instantiation of new concepts (Haberlandt, 1984; Just et al., 1982). Similarly, increases in the number of propositions per sentence also increase reading time (Aaronson & Scarborough, 1976; Kintsch & Keenan, 1973).

Studies of reading time have found that words at the ends of sentences often have longer reading times than other words in the sentence. Just and Carpenter (1980) argue that the ends of sentences represent computational "hot spots" in which readers "wrap-up" the contents of the sentences. These wrap-up processes take time, as they involve the assignment of unassigned referents, the construction of interclause relations,

the formation of inferences, and the resolution of inconsistencies. Reading time at the sentence boundary tends to increase as the number of new concepts presented in the sentence increases (Haberlandt, Graesser, Schneider, & Kiely, 1986; Haberlandt & Graesser, 1989), suggesting that wrap-up processes are sensitive to the conceptual load of the sentence. Aaronson and Scarborough (1977) have also found that readers evince a scalloped reading pattern when reading naturalistic text. Wrap-up processes are represented as "reading peaks," in which there is a large increase in reading time relative to the surrounding words (Aaronson & Scarborough, 1976; 1977). These reading time peaks represent points during reading at which individuals organize the information from the immediately preceding constituents and integrate it with prior constituents (Aaronson & Scarborough, 1977), with these peaks largely corresponding to syntactic constituent boundaries. Jarvella (1971) found that verbatim recall of a sentence was highest when participants were interrupted and asked to recall the text at clause boundaries. However, verbatim recall declined dramatically when individuals were interrupted before reaching these clause boundaries (i.e., mid-sentence). These results suggest that readers store the surface form of a text until they reach a point of integration, at which point the surface form is replaced by a representation of the sentence's meaning. In neurocognitive studies of event-related brain potentials (ERPs) Osterhout and Halcomb (1992) found changes in individual's brain wave patterns when they encountered sentence-final words, again suggesting changes in cognitive processes associated with processing meaning.

Thus, whether called an "input cycle" (Kintsch & van Dijk, 1978), "wrap-up" (Just & Carpenter, 1980), or "organization" and "integration" (Aaronson & Scarborough, 1977; Aaronson & Ferres, 1984), it appears as though readers process information in "chunks" at clausal boundaries, with larger integration processes occurring at the ends of sentences and smaller integration processes occurring at intrasentence boundaries.

Allocation to these different text comprehension processes follows different trajectories of change as a function of the aging process. Research has suggested that older adults may experience declines in text comprehension and memory for text as a result in age-related declines in cognitive abilities, such as reduced working memory capacity (e.g., Just & Carpenter, 1992), declines in processing speed (e.g., Salthouse and Babcock, 1991) and inefficient inhibitory mechanisms (e.g., Hasher & Zacks, 1988) (see Wingfield & Stine-Morrow, 2000 for a review). Some older readers may attempt to compensate for these declines by engaging in resource allocation strategies that are supportive of text memory.

In fact, some researchers have argued that differences in the allocation of time to these different text comprehension processes (i.e., the manner in which text is encoded) may in part be responsible for age differences in recall performance (Cohen & Faulkner, 1981; Stine, 1990). Stine (1990) examined older and younger adults' resource allocation and recall performance for sentences that were presented using the word-by-word moving window method. High levels of recall performance were associated with different patterns of resource allocation for younger and older adults. Whereas younger adults with perfect recall performance allocated more time to major clause boundaries than did younger adults with average recall performance, older adults with perfect recall performance allocated differentially more time to minor clause boundaries than did older adults with average recall. Across the entire sample, younger adults allocated more time to wrap-up processes at the sentence boundary than did the older adults, and demonstrated better recall performance than did the older adults. This suggests that differential allocation of resources to integration processes at intrasentence clause boundaries and end of sentence boundaries is associated with better memory for text. Additionally, these data imply that older adults may need to process the text in smaller chunks, perhaps to accommodate smaller working memory capacities (Stine, 1990).

Similar patterns of data were found in Stine et al. (1995). Using word-by-word reading paradigm, the data revealed that younger adults allocated resources to processing concepts at both minor and major intrasentence boundaries as well as end-of-sentence boundaries, whereas older adult predominantly allocated resources to intrasentence boundaries, but not sentence boundaries. Age differences in recall performance were found in favor of the younger adults on two of the three passages studied.

Slightly different results were found by Stine-Morrow et al. (2001). Both older and younger adults again read sentences for immediate recall using the word-by-word moving window method. The findings here indicate that older readers allocated more time to processing words at both intrasentence and sentence boundaries than did the younger adults. Interestingly, there were no age differences in recall performance. Moreover, recall performance was reliably related to allocation to words at the intrasentence boundary (r = .28, r = .22 for young and old, respectively) and the sentence boundary (r = .30, r = .29). In general, both younger and older adults respond similarly to word-level comprehension processes, whereas age differences are often found for textbase processes.

Collectively, these data suggest that strategic resource allocation to specific text comprehension processes is related to text memory. Specifically, allocation to textbase construction processes at intrasentence and sentence boundaries may be especially important to text memory for older adults.

How motivation fits into a science of reading

In general, motivation is defined "in terms of characteristics of individuals, such as their goals, competence related beliefs, and needs that influence their achievement and activities." (Guthrie, Wigfield, Metsala, & Cox, 1999, p. 233). Guthrie and Wigfield (1997; 1999) argue that the study of motivation is essential to a complete understanding and theoretical explanation of reading and text comprehension, as studies of "cold"

cognition and basic mechanisms may not capture the complexities that occur when reading is done in a specific context. In this case, they define *reading motivation* as the goals and beliefs that an individual holds regarding reading, which in turn influence the ways in which an individual interacts with text. Subsumed under this general construct are sub-component processes, such as achievement goals, intrinsic motivation, reading amount, and self-efficacy beliefs. Each of these will be discussed briefly, with the crux of the discussion focusing on self-efficacy as it has been applied to reading.

Achievement Goals

Readers rarely sit down to read a document without a goal. Whether it is for entertainment, editing, or scholarly interest, readers generally have a purpose for reading specific texts. Achievement goal theory suggests that the goals individuals set provide standards by which individuals guide their efforts and strategies that will help them to achieve their intended objectives (see Dweck & Leggett, 1988, for a review of achievement goal theory). Individuals who possess *high task-mastery goals* (also referred to as *learning-oriented goals*) are interested in reading and learning from the text because these are valued activities in and of themselves. Readers with these intentions seek to improve their own competency levels, and strive to comprehend the text fully through the strategic allocation of effort. Success is assessed in terms of improvement of one's already existing abilities or mastery of a new skill. In contrast, those *with low task-mastery* goals (also known as *performance* or *ego-oriented goals)* are more interested in demonstrating that they have high abilities as readers or comprehenders, and seek to compare their levels of attainment with others. Often a performance is only thought of as a success if some objective standard or some other was surpassed in some way. Studies have found that students who espouse task-mastery orientations often choose more difficult tasks and use cognitive strategies that

engender conceptual understanding; these goals are also strongly related to measures of academic achievement (Meece & Miller, 1999).

Intrinsic Motivation

Second, intrinsic motivation represents the extent to which an individual will read for the sake of reading. This is realized as enjoyment obtained from the knowledge gained by reading, and the pursuit of reading activities whenever possible. For example, Benware and Deci (1984) asked students to learn the contents of an article in such a manner as to be able to either take an exam on the material or teach it to another individual so that person could take an exam on it. It was thought that teaching materials requires intrinsic motivation, as the goal is not one's own performance, but someone else's. Indeed, those who studied the material in the teaching condition reported higher levels of intrinsic motivation, felt more active in their learning, and demonstrated higher levels of conceptual understanding compared to those in the exam condition.

Reading Amount

Reading amount refers to both the frequency with which an individual engaged in reading activities, and the amount of time spent reading an array of reading materials for various purposes (Guthrie, Wigfield, Metsala, & Cox, 1999). In general, research has found that reading amount is related to several other aspects of reading motivation, including curiosity about reading, involvement (desire to become part of narrative "world) and challenge (enjoyment found in mastering information).

In studies of middle-school students, reading amount has been found to be moderately correlated with text comprehension. Using the Reading Activity Inventory, Guthrie and Wigfield (1997) assessed the breadth and frequency of fourth and fifth graders' reading activities. Children who read more frequently were likely to continue these reading activities, whereas those who read less frequently were less likely to

increase the amount that they read. These findings were also related to measures of intrinsic motivation, suggesting that those who were motivated to learn read more than did those who expressed more of an extrinsic motivation orientation. Reading amount was also positively related to reading achievement. Reading amount has also been found to be a significant predictor of text comprehension, even when other factors such as past reading achievement and prior topic knowledge were controlled (Guthrie et al., 1999).

Stine-Morrow, Loveless, and Soederberg (1996) used the Reading and Listening Questionnaire in a sample of both younger (i.e., college aged) and older (i.e., 60+) adults to assess the types of materials that individuals read and listened to, and the amount of time spent engaging in various media consumption activities. Overall, older adults reported that they spent more time reading and enjoyed reading more than younger adults. While younger adults spent more time reading textbooks, older adults spent more time reading magazines, newspapers, and novels than did the younger adults. These measures of reading habits were then compared to measures of recall performance and strategy (i.e., time allocation to various text comprehension processes). Among older adults, they found that those who exhibited higher levels of recall performance tended to read more resource-intensive materials (e.g., textbooks and novels), whereas those with lower levels of recall tended to spend more time reading materials that could be "skimmed" quickly in short periods (e.g., magazines and newspapers). This suggests that the quality of the reading experience is related to memory for text. Although Stine-Morrow et al. (1996) found that reading habits and media consumption were related to recall performance for both age groups, reading habits were not related to strategy among older and younger adults.

Rice, Meyer, and colleagues conducted a series of studies to investigate the relationships between age, verbal ability, reading behaviors, and recall performance

(Rice, 1986a; Rice 1986b; Rice & Meyer, 1985; Rice & Meyer 1986; Rice, Meyer, & Miller, 1988), and advanced the hypothesis that individuals whose daily activities regularly involve the reading and recollection of information should display better memory for prose than those whose daily routines did not include such activities. This is based on the notion that age differences in laboratory recall tasks may be in part due to differences in the cognitive lifestyle and everyday learning activities in which older adults and their younger comparison groups regularly engage. That is, younger participants in experimental studies are very often college students. As students, they regularly engage in activities that require them to read and remember information that they have read. Therefore, they are more practiced at using the types of skills often relied upon in laboratory tests of text memory, whereas the skills of individuals who have left the educational settings may vary widely; these changes in reading behaviors may lead to variations in recall performance.

In their studies, younger, middle-aged, and older adults of either high or average verbal ability read prose passages and then recalled as much of the content of the passages as they could in writing. Rice and Meyer (1985) found age differences in recall performance in some instances, but not in others. Inspection of the data revealed that older adults had a tendency to spend as much or more time reading than did the younger adults. Interestingly, age differences were eliminated when there was no significant difference in the time that both age groups spent reading because information was "needed." However, when the time that younger adults spent reading for the purpose of "needing information" exceeded that of the older adults, age differences in recall performance appeared. Thus, these data provide partial support for the reading practice model.

Rice and Meyer (1985) concluded that, although the *quantity* of reading was positively related to recall performance, the *quality* of the reading was also an important

correlate of recall performance. Individuals who read textbook-types of materials for the purpose of extracting information for later use or recall had better recall performance than those who read other types of materials (e.g., magazines) for other reasons, such as pleasure or relaxation. This is also consistent with the findings of Stine-Morrow et al. (1996), who also found that older adults who read for information recalled more than did those who read magazines and newspapers. They also found that individuals who took an analytical approach to reading (e.g., making outlines, identifying important points, relating reading to previously known information, etc.) also had recall performance that was higher than those who did not engage in such active reading strategies. Similar patterns of results were found in Rice and Meyer (1986) and Rice, Meyer, and Miller (1988).

Stanovich, West, and Harrison (1995) have examined the relationship between print exposure, which is a close relative of reading amount, and verbal ability in older and younger adults. Print exposure measures comprised the Author Recognition Test (ART), Magazine Recognition Test (MRT), the Newspaper Recognition Test (NRT), an activity preference questionnaire, and a reading habits questionnaire. Measures of declarative knowledge and a measure of verbal ability were also administered. Stanovich et al., (1995) found that older adults scored higher than the younger adults with respect to declarative knowledge and verbal ability. They also found large age differences on the activity preference questionnaire and reading habits questionnaire, with older adults preferring reading activities to other activities more often than did the younger adults. Using regression analyses with age and print exposure measures as predictors of declarative knowledge, they found that age differences in verbal ability were largely accounted for by reading habits. In fact, age accounted for relatively little of the unique variance after exposure to print variables were entered into the equation. Stanovich et al., (1995) concluded that exposure to print mediated the positive

relationship between age and performance on declarative tasks, and that this provides evidence that individuals with higher verbal abilities may have acquired such skills as a result of reading habits, that is, exposure to printed material.

In summary, the data suggest that reading behaviors and habits are related to verbal ability, and may contribute to older adults superior performance on tests of crystallized intelligence when compared to younger adults. Reading habits and patterns also appear to be salient contributors to recall performance and knowledge among older and younger adults.

Self-Efficacy Beliefs

As aforementioned, self-efficacy beliefs represent feelings of competence in a particular domain. In this context, self-efficacy refers to the belief that one has the capacity to read effectively. Self-efficacy beliefs affect reading behavior in many of the same ways that other behaviors are affected (as described in the previous section). Schunk and Zimmerman (1997) argue that "self-efficacy within a reading task is associated with use of strategies, self-regulation, and text comprehension within the tasks." Students with high self-efficacy beliefs tend to view difficult reading tasks as challenges to be mastered, and work diligently to overcome those challenges by employing productive cognitive strategies.

Guthrie and colleagues (Guthrie et al., 1999) conducted two studies to explore the relationship between reading motivation and text comprehension. In one study, third and fifth grade children completed two measures of text comprehension (ability to provide answers to open-ended questions about the text; ability to generate a "presentation" from a reading assignment), followed by questionnaires on the student's reading amount, reading motivation, and reading efficacy. In this study, efficacy beliefs were measured using three questions from the Motivation for Reading Questionnaire (MRQ; Wigfield, 1997), which had previously been associated with reading achievement.

For example, one item consisted of the following statement, "I know that I will do well in reading next year," and required students to answer using a 4-point scale (1 = very different from me; 4 = a lot like me). Several multiple regression analyses were used to examine the effects of reading efficacy and motivation on comprehension. Guthrie et al. (2000) found that a significant portion of the variance in passage comprehension was accounted for by reading amount (R^2 = 0.42), even after prior learning was controlled. Neither reading efficacy nor reading motivation made significant contributions to the explained variance. In a second study, a sample of eighth- and tenth-grade students read five short text passages and then answered multiple choice questions on the reading. Students also completed an activity questionnaire in which they indicated the frequency with which they engaged in fifteen different activities, such as visiting with friends and reading. Students were also given questionnaires to assess their reading motivation and reading efficacy. On the motivation questionnaire, students responded to questions about why they were taking various subjects in school; for the reading efficacy questionnaire, students rated statements related to academic self-concept, (e.g., "I learn quickly in English classes), on a 1 (False) to 6 (True) scale. The data indicate that passage comprehension was predicted by reading amount and reading motivation when variables such as past comprehension were controlled. Past text comprehension and reading efficacy were also significant predictors in this sample.

The investigators argued that the significant contribution of reading efficacy to performance in Study 2, but not in Study 1, may have been the result of developmental differences between the two age groups, or due to the way in which self-efficacy was assessed. In these studies, reading efficacy is conceptualized as the sense that one is able to read effectively. It is possible that the three-questions used in the first study were not strong enough to assess self-efficacy beliefs adequately. However, the relationship

found in the second study suggests that beliefs in one's capability as a reader may serve to mediate text comprehension via reading amount.

Within the cognitive aging literature, few studies have investigated the relationship between older and younger adults' self-efficacy beliefs, strategy, and recall performance for text passages. Luszcz (1993) presented both older and younger adults with two expository and two narrative texts, which they read for later recall. Participants also completed an attribution questionnaire, which required individuals to indicate the source of their performance on the text recall task (ability, effort, age, mental ability, luck, passage length, interest, ease of reading), and the MIA (Dixon & Hultsch, 1984). Overall, older adults made more internal attributions for their performance than did younger adults. In fact, younger adults reported their performance was largely due to ease of reading and length of passage, both of which were external characteristics of the text. Age differences were found for expository text in favor of the younger adults. Although there were no age differences on the narrative text recall, more material was recalled from these passages than the expository text. Curiously, there were no age or genre differences for the total amount of time spent reading the passages. A measure of self-efficacy was derived from the Capacity, Change, Anxiety, and Locus scales of the MIA, and indicated that younger adults had stronger perceptions of self-efficacy than the older adults. Correlational analyses revealed that memory self-efficacy was indeed negatively related to age (r = - 0.39), but positively related to memory performance (r = 0.43). In regression analyses, self-efficacy perceptions were better predictors of memory performance than memory knowledge (as measured by the MIA) or specific attributions. Lusczc (1993) argues that because older adults expressed more internal attributions (i.e., indicating that they believed they are responsible for performance) on the prose recall task, it is possible that self-efficacy perceptions may be more salient for older adults.

In another study (Miller & Gagne, in press), older and younger adults who expressed strong or weak control beliefs in their cognitive abilities read easy or difficult texts for later recall. Older adults with strong beliefs allocated more effort to text processing (i.e., they had longer wrap-up times), and recalled more of the text than those with weaker beliefs. These results suggest that beliefs in one's capabilities may indeed influence the effort one exerts on a task. Although far from conclusive, there is a growing body of research demonstrating that motivational variables are indeed associated with text comprehension and performance on reading tasks. These collective results support the need for further research in reading that investigate the impact of motivational constructs in reading tasks.

In summary, the previous literature review suggests that 1) with respect to measurement, Memory Self-Efficacy measures that have been used to investigate memory for text have found modest correlations (e.g., Hertzog, Hultsch & Dixon, 1990), but the relationships and amount of variance explained by self-efficacy beliefs may be improved if both general and domain-specific measures that are appropriate for older adults are utilized (Berry & Strube, 2004), 2) older adults generally exhibit overall poorer memory functioning, poorer memory for text (Johnson, 2003) and poorer memory self-efficacy than do younger adults (Cavanaugh & Greene, 1990), 3) Self-efficacy beliefs may influence task choice, effort, and persistence, 4) depending on self-efficacy beliefs, effort and persistence may be differentially affected by task difficulty, 5) effort may mediate the relationship between self-efficacy beliefs and performance.

Self-Efficacy Beliefs and Discourse Processing: Current Study

The present study was designed to build on previous work by investigating questions raised by the application of self-efficacy theory to a specific kind of memory task: memory for text. Moreover, the goal of this study was to expand on the literature by examining whether the relationship between self-efficacy beliefs, resource allocation

to text comprehension processes, and memory for texts of varying difficulty differed among older and younger adults. Specifically, participants this study sought to answer the following questions:

1. What are the psychometric properties of the Reading Self-Efficacy Questionnaire?
2. Are there age differences in perceived self-efficacy (both reading and memory)?
3. Do self-efficacy beliefs influence task choice (i.e., reading habits and patterns)?
4. Do self-efficacy beliefs influence the amount of effort allocated to processing text?
5. Is there a relationship between self-efficacy beliefs and text memory?
    5a. Does this relationship change as a function of Age?
    5b. Does this relationship change as a function of Age and Difficulty?
6. Is perceived memory for text congruent with actual memory for text?
7. Does allocation of effort mediate the relationship between self-efficacy and recall performance?
8. Is a domain-specific measure of self-efficacy a better predictor of performance than a broader measure?

To answer these questions, both younger and older adults completed a series of questionnaires that assessed basic demographic information, self-efficacy beliefs related to reading and remembering text (i.e., the Reading Self-Efficacy Questionnaire, which was developed for this study), memory self-efficacy, and reading habits and patterns. All participants were scheduled to visit the laboratory individually, during which time they read several sets of sentences of varying difficulty for immediate recall. Both reading time and recall performance was recorded. After completing the reading task, participants completed tests of vocabulary and working memory to be used as individual

difference measures.

Several findings were anticipated with respect to self-efficacy beliefs. Given that most of the research in the cognitive aging literature has found age differences in memory self-efficacy (cf. Berry & West, 1993; cf. Cavanaugh & Greene, 1990), it was expected that older adults in this sample would also report lower levels of memory self-efficacy when compared to younger adults. Because there is a relative scarcity of data regarding reading self-efficacy among older adults, there were relatively few expectations with respect to reading self-efficacy. However, older adults generally show reduced memory for text, so it was expected that older adults would indicate reduced reading self-efficacy compared to younger adults. This study was also used to aid in the development of the Reading Self-Efficacy Questionnaire. This instrument was designed according to Bandura's (2001) theoretical specifications, and was intended to be able age-appropriate to both younger and older adults.

Bandura's (1997) self-efficacy theory suggests that self-efficacy beliefs should influence the amount of effort one exerts while performing a task and the degree to which one persists on a task in the face of difficulty or challenge. Therefore, this study specifically measured the extent to which cognitive resources (i.e., effort) were allocated to conceptual integration processes at both intrasentence and sentence boundaries. It was hypothesized that self-efficacy beliefs would influence the amount of effort exerted, such that those high in self-efficacy would allocate more effort to these boundaries than those low in self-efficacy. Moreover, those high in self-efficacy would maintain or increase their resource allocation to these effortful comprehension processes during or after reading difficult texts. In contrast, those low in self-efficacy were expected to give up when difficult texts are encountered, which would be evinced as a withdrawal of effort, or, in this case, a reduction in resource allocation.

Several questions focus on the relationship between self-efficacy beliefs and text

memory. Based on previous research (cf. Berry & West, 1993; Cavanaugh & Greene, 1990), it was expected that individuals with strong self-efficacy beliefs would recall more of the text than those with weaker self-efficacy beliefs. Some research suggests that affective information may become more important to older adults functioning (Cavanaugh & Poon, 1989; Dixon & Hultsch, 1983), and information regarding beliefs may influence cognitive performance to a greater extent among older adults than among younger adults. Therefore, an interaction between Age and Self-Efficacy was expected, such that greater age differences would be found among those with low self-efficacy versus those with high self-efficacy.

Because self-efficacy is thought to influence persistence in the face of difficulty, an interaction between Self-Efficacy and Condition was also expected, with individuals with high levels of self-efficacy beliefs recalling more after reading difficult texts than those with low self-efficacy levels. As it was expected that those with low self-efficacy would withdraw resources after encountering difficult texts, this group was predicted to have the worst text recall performance. Self-Efficacy and Condition were also expected to interact with Age, such that older adults with low levels of self-efficacy would recall the least in the difficult condition (basically, giving up altogether).

Question six asked whether there were differences between predicted versus actual recall performance. Research shows that older adults tend to overestimate recall performance, whereas younger adults tend to underestimate or make accurate predictions regarding performance (Berry, West, & Dennehey, 1989; Bruce, Coyne, & Botwinick, 1982; Lachman & Jelalian, 1984). Self-efficacy theory (Bandura, 1997) predicts that slight overconfidence in one's abilities is the most adaptive. Therefore, it was predicted that those with high self-efficacy would overpredict their performance, whereas those with low self-efficacy tend to be either accurate or underpredict performance.

According to self-efficacy theory (Bandura, 1997), the relationship between self-efficacy beliefs and performance are mediated by effort. Therefore, it was hypothesized that resource allocation to conceptual integration processes would mediate the relationship between self-efficacy and recall performance.

CHAPTER III

METHODS

Participants

The participants were 84 younger adults and 94 older adults. Younger adults were recruited from Psychology classes or from the University of New Hampshire community, while older adults were recruited from the local seacoast via newspaper advertisements or mailings to University alumni currently residing in the area. Of that sample, three younger adults and 18 older adults returned the questionnaire packets, but were unable to keep their lab appointment due to scheduling constraints, medical reasons, or other reasons. The final sample comprised 82 younger adults (aged 18-33; 63 females, 19 males) and 74 older adults (aged 61 to 86; 45 females; 29 males).

Participants were screened via a telephone interview prior to participation; those reporting uncorrected/uncorrectable visual or auditory limitations, possible cognitive impairments originating from head and/or neurological trauma, dementia, medication, or severe illness, and non-native speakers of English were excluded from this study. Younger participants were given either course credit or a $15 honorarium, and older adults were given a $15 honorarium for their participation. The majority (97.4%) of this sample was White, with 2.6% of the participants representing a combination of Asian, American Indian, and African minorities. Although this sample is representative of the ethnicity of the region, these ethnic groups are underrepresented when compared to the national population (U.S. Census Bureau, 2000). The majority of the older adults (n = 64) in our sample reported that they were retired; however, 39 of those individuals indicated that they worked at a part-time job or engaged in volunteer work on a regular basis. See

Table 1 for participant information; Appendix A displays histograms and scatterplots for background and ability variables.

All participants reported themselves to be in good or excellent health on a single-item question based on a 5-point Likert scale that ranged from *1* (Excellent) to *5* (Poor). The older adults in this sample had more years of formal education than did the younger adults, $t(154) = 8.41$, $p < .001$. Consistent with previous literature in cognitive aging (e.g., Park et al., 1996), older adults also demonstrated higher verbal ability than did younger adults, as measured by the Extended Range Vocabulary Test from the Kit of Factored Cognitive Reference Tests (KRFT; Harman, Ekstrom, French, & Derman, 1976), $t(154) = 13.08$, $p < .001$.

Working memory (WM) was assessed using a variant of Daneman and Carpenter's (1980) Loaded Listening Span (LLS) and Loaded Reading Span (LRS) Tasks (Stine & Hindman, 1994). This task requires participants to either listen to a sentence via headphones or to read a sentence from a computer screen (e.g., A fish that is one-hundred feet long is called a perch), and then indicate whether the information presented in the sentence is true or false (based on everyday world knowledge) by depressing the appropriate keys on a computer keyboard. Participants are also asked to remember the last word from each sentence in any given sentence set; the sentence set sizes range from two to eight sentences. Participants begin with two practice sentences, followed by two sentences on the first trial. Advancement to the next level and the addition of another sentence is contingent upon successful true/false decision-making and recall of all the final words in a set in order. If participants are unable to recall all the sentence-final words, they are given another set of sentences at the same level. Sentence sets continue to increase in size until the participant makes an error on both sets of sentences from the same level, at which point the session is terminated. Thus, the span score represents the last level in which the participant was able to store and

manipulate information successfully, plus the proportion of the words that are recalled at the next highest level. In this sample, the scores for the Loaded Listening Span and the Loaded Reading Span were averaged to produce a more reliable score. Younger adults exhibited larger working memory spans than did the older adults, $t(152^{4}) = 6.74$, $p < .001$.

Table 1.
Participant information as a Function of Age.

	Younger Adults		Older Adults	
	M	*SD*	*M*	*SD*
Age	19.70	3.03	73.01	5.96
Education	12.87	1.47	15.61	2.51
Verbal Ability	16.28	6.14	31.60	8.42
Working Memory Span	4.68	1.17	3.60	0.76

Materials

All participants completed a packet of questionnaires before completing the reading task. All questionnaires and survey instruments may be found in Appendix B; stimulus materials for the reading task are located in Appendix C.

Demographics Questionnaire.

Following an introduction letter, this brief survey asked participants to provide basic background information, such as age, gender, educational history, occupation/major, ethnicity, and perceived health.

Metamemory in Adulthood Questionnaire (MIA).

The MIA is a 108-item instrument used to assess individual's beliefs regarding their memory. Participants respond to items on each of the seven subscales (Change, Capacity, Anxiety, Achievement, Locus, Strategy, and Task) using a 5-point Likert scale, in which responses ranged from *strongly agree* to *strongly disagree* or *always* to *never.* Overall, the seven subscales exhibit moderate to high internal consistencies, ranging

[4] One older and one younger adult did not complete the span task.

from 0.71 to 0.93, and typically produce two strong factors; Memory Knowledge (comprising most often the Strategy and Task subscales) and Memory Self-Efficacy (comprising the Capacity and Change subscales). The remaining subscales (Anxiety, Achievement, Locus) typically share variance with either of these factors or form another factor (sometimes called an "affective" factor) (Dixon, Hultsch, & Hertzog, 1988).

Media Consumption Habits Questionnaire.

The questionnaire was constructed using sections from two separate questionnaires: The Reading and Listening Questionnaire (Stine-Morrow et al., 1996) and the Adult Reading Habits and Patterns Questionnaire (Scales & Rhee, 2001). Broadly, this questionnaire was used to provide an assessment of both reading habits and reading patterns. Participants used a variety of response modes to answer questions comprising three separate sections.

The purpose of the first section was to measure reading habits. Participants provided an estimation of the number of hours per week that they spent reading various materials (e.g., books, magazines, and newspapers) and the amount of time they spent reading for a specific purpose. Participants rated whether they liked to read specific types of materials (e.g., magazines, non-fiction) using a 7-point Likert scale (1 = *Strongly Agree*; 7 = *Strongly Disagree*). Participants responded to questions on the second section of the questionnaire using a 5-point Likert scale (1= *Never*; 5 = *Always*). The questions assessed specific reading behaviors in three parts. The first part measured the types of behaviors in which individuals engage before reading a text (e.g., reading with purpose and previewing the text). The second part asked participants to report what they do while they read and how often they engage the text in order to optimize comprehension. For example, individuals answered questions about word identification (e.g., "Do you use the dictionary to find a word meaning?"), metacognitive questions that asked individuals to determine if they perceived the text as being difficult, and questions

to determine the extent to which participants were extracting meaning from the text. The third part asked people to rate behaviors they engage in after reading, such as discussing and sharing what they have read with others. In the Scales and Rhee (2001) study, the subscales demonstrated moderate to high reliability, with internal consistency coefficients (Cronbach alpha) equal to 0.77, 0.61, 0.91, 0.84, and 0.85 for the Preview Text, Word Identification, Reading Difficulty, Getting Meaning, and Sharing/Relating subscales, respectively.

In the third and final section, participants responded to broad questions regarding their television viewing and radio listening habits. Participants were again asked to provide estimates of the total time they spent either watching television or listening to the radio and the specific purpose for their media consumption during that time (e.g., for educational purposes, for relaxation, etc).

Reading Self-Efficacy Questionnaire (RSEQ).

This questionnaire was created for this study, based on the guidelines provided by Bandura (2001). The six scales (Short Sentence, Long Sentences, Paragraph/Newspaper/Magazine article, Short Story, Short Novel, and Long Novel) represent reading activities both older and younger adults might encounter on a regular basis, although this list is not exhaustive. There are five statements for each scale, which represent a hierarchy of task difficulty ordered from most difficult to least difficult. For example, if the task is to remember all of the ideas from a sentence, then the participant would be asked to respond to whether they could remember more than three-quarters of the ideas from the sentence (i.e., almost all of it), up to three-quarters, up to half, up to a quarter, and at least one of the ideas from the sentence. After each statement, participants circled YES or NO to indicate whether they thought that they could perform the described activity. If they circled YES, then they indicated their

confidence in their response using a 100-point scale with 10-point increments ranging from 10% (Complete Uncertainty) to 100% (Complete Certainty).

Post-Experiment Evaluation.

This brief evaluation asked participants to provide information regarding the reading task. Using a 7-point Likert scale, older and younger adults rated (1) how interesting they found the sentences that they read, (2) how much effort they put into reading the sentences carefully, (3) how much effort they put into recalling the sentences completely, and (4) how motivated they were to perform well on the reading task. Higher numbers represented higher levels on a dimension (e.g., 1 = Very uninteresting, absolute minimum; 7 = Very Interesting, all of my effort). Participants also provided information regarding their motivation or reasons for participating in the experiment. This was done by placing an "x" next to the reason(s) that best represented their motivation for participating in the experiment, or by placing an "x" next to the "other" space and providing their own reason if none of the given reasons seemed appropriate.

Stimulus Sets.

Sixty two-sentence passages were adapted from those originally used by Stine-Morrow et al. (2001) and divided into four sentence sets: Moderate-Baseline, Moderate-Target, Easy, and Difficult. General properties of the sentences are described first, which is followed by a description of the difficulty manipulation.

Each passage consisted of an 18-word target sentence followed by an eight- to ten-word filler sentence that provided a natural continuation of the topic. The purpose of the filler sentence was to provide a more naturalistic reading experience. That is, it was placed to ensure that the reading times for the last words in the target sentence were a reflection of reading comprehension processes, as they were less likely to be contaminated by the reader's anticipation of recall. Moreover, the addition of the filler sentence increased the probability that participant's recall protocols were more likely to

reflect instantiation and integration of the concepts, rather than rote recall of the surface structure (Jarvella, 1971; Stine-Morrow et al., 2001). The first sentence in each of the passages was strictly controlled along a number of dimensions (see below). The filler sentences were less constrained, although they were comparable across passages.

Shorter sentences were used instead of longer passages for three reasons. First, research in cognitive aging has suggested that older adults may take differential advantage of longer text passages to facilitate text processing, as they are able to rely on situation model processing to compensate for age-related deficits in text processing (e.g., Radvansky, Zwaan, Curiel, & Copeland, 2001). It was preferable to use materials that did not provide an advantage to this age group. Second, shorter sentences allowed for more experimenter control, as text characteristics such as syntax, word frequency, and the number of new concepts was easier to hold constant. Third, the sentences used in the Stine-Morrow et al. (2001) study covered a wide range of domains, and thus hopefully appealing to a wide array of individual interests. This is especially important, given that an individual's interest in a text may influence reading effort and recall (e.g., Shirey & Reynolds, 1988).

To measure the extent to which individuals allocate resources to textbase construction, words were also coded along four variables reflecting conceptual processing. Sentences were analyzed for their semantic content using the Kintsch system of propositional analysis (Kintsch & van Dijk, 1978; Turner & Greene, 1978) and the number of propositions for the whole sentence was recorded. Words representing new concepts were dummy coded (0/1 for occurrence) to account for the immediate processing of new conceptual information (i.e., the *immediacy assumption*; Just & Carpenter, 1980). Words appearing at intrasentence boundaries (e.g., clauses, major noun phrases) and at the ends of sentences were also dummy coded (0/1) to account

for conceptual organization within the sentence and at the end of the sentence (i.e., *wrap-up*; Just & Carpenter, 1980).

Time allocated to reading processes that were not directly related to text encoding were coded so that time related to these nuisance effects could be controlled in analyses. Words appearing at the beginning of the sentence were dummy coded for occurrence (0/1) to account for the time to begin reading the sentence. Whether the word appeared at a new line was also dummy coded for occurrence in order to account for the right-to-left sweep of the eyes.

In this study, the sentences were adjusted to create four sentence sets of three varying levels of difficulty. Sentence difficulty was manipulated by altering certain word-level or text-base level features. The log word frequency was decreased to increase the processing difficulty of sentences in the Difficult set, as words with lower frequencies (i.e., less common words) are more difficult to process than are common words with higher word frequencies. The number of propositions per sentence was also altered, such that the Difficult sentence sets had more propositions to complicate textbase construction and the Easy sentence sets had fewer propositions (Stine & Hindman 1994). The number of words per sentence, word length, and overall syntactic complexity were left unchanged. Flesch Reading Ease Scores[5] and Flesch-Kincaid Grade Level Scores[6] were measured and used as objective measures of difficulty.

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[5] Flesch Reading Ease Scores rate the text on a 100-point scale; higher scores represent an easier text. Formula = 206.835 – (1.015 x ASL) – (84.6 x ASW). ASL represents the average sentence length (the number of words divided by the number of sentences), and ASW represents the average number of syllables per word (the number of syllables divided by the number of words). (Microsoft ® Word, 2002)

[6] F Flesch-Kincaid Grade Level Scores provide the rating of the difficulty of the text, based on a U.S. grade school level. For example, a score of 6.0 means that a sixth grader can understand the document. Formula = (.39 x ASL) + (11.8 x ASW) – 15.59. ASL represents the average sentence length (the number of words divided by the number of sentences), and ASW represents the average number of syllables per word (the number of syllables divided by the number of words). (Microsoft ® Word, 2002)

Table 2 shows the text characteristics for each difficulty level. Sentences sets will be referred to as "Moderate - Baseline," "Easy," "Difficult," and "Moderate - Target."

An Analysis of Variance (ANOVA) conducted on each of these text variables indicated that there were no significant differences between the difficulty groups for number of Syllables, $F(3, 1076) = 1.68$, $p > .15$. However, the groups differed significantly from each other with respect to the total number of New Concepts per sentence, $F(3, 1076) = 30.77$, $p < .001$, the number of Propositions per sentence, $F(3,1076) = 1653.86$, $p < .001$, Log Word Frequency, $F(3,1076) = 4.66$, $p < .01$, Flesch Reading Ease Scores, $F(3,1076) = 29.56$, $p < .001$, and Flesch-Kincaid Grade Level Scores, $F(3, 1076) = 36.10$, $p < .001$.

Post-hoc comparisons using Games-Howell statistics (Kirk, 1995) revealed that the Moderate did not differ from each other with respect to the number of New Concepts or number of Propositions per sentence $p > .22$ and $p > .05$, respectively. These Moderate Sets contained fewer New Concepts and Propositions than did the Difficult sentences, but more than the Easy sentences, $p < .05$. The two Moderate sentence sets did not differ with respect mean log Word Frequency; the Difficult sentence set was significantly lower (representing less frequent words) than the log Word Frequency for the Easy set. For the Flesch Reading Ease Scores, the Moderate – Baseline sentence set had lower reading ease scores (representing greater reading difficulty) than did the Easy sentence set, but higher reading ease scores than the Difficult sentence set, $p < .05$. The scores for the Moderate - Target sentences were lower than the Easy sentences only, and the readability scores for the Easy sentences were significantly higher than for all other sentence sets. Post-hoc analyses on the Flesch-Kincaid Grade Level scores revealed that all pairwise comparisons were significant except the difference between the Difficult sentences and the Moderate - Target sentences.

Table 2.
Text Characteristics as a Function of Difficulty.

Difficulty	Easy	Moderate Baseline	Moderate Target	Difficult
Text Characteristics	*M* *SD*	*M* *SD*	*M* *SD*	*M* *SD*
Syllables per word	1.46 (0.82)[a]	1.53 (0.75)[a]	1.60 (0.84)[a]	1.61 (0.81)[a]
(Log) Word Frequency	2.75 (1.55)[a]	2.52 (1.55)[b]	2.52 (1.55)[b]	2.20 (1.42)[c]
# Propositions	5.92 (0.49)[a]	7.91 (0.49)[b]	8.04 (0.79)[b]	10.33 (0.63)[c]
# New Concepts	5.17 (1.07)[a]	5.67 (0.85)[b]	5.50 (1.36)[b]	6.25 (1.36)[c]
Flesch Reading Ease Score	65.12 (15.52)[b]	57.68 (18.73)[a]	54.16 (12.81)[ab]	52.74 (17.46)[b]
Flesch-Kincaid Grade Level Score	8.48 (1.94)	9.23 (1.90)	9.98 (1.50)[a]	9.77 (2.09)[a]
Standardized Difficulty	-.83 (1.34)	-.04 (1.36)[a]	-.13 (1.30)[a]	1.12 (1.41)

Note: Means are presented with standard deviations in parentheses ( ). Identical letters represent homogeneous groups within comparison dimension.

In order to assess absolute level of difficulty, the variables for log word frequency, number of new concepts, number of propositions, and Flesch Reading Ease Score were standardized (i.e., *z*-scored) and averaged to form a composite "Standardized Difficulty" variable. Flesch-Kincaid Grade Level Score was not included due to its high correlation with Flesch Reading Ease (r = -.93). The number of syllables was also not included in the composite, as the number of syllables are included in the formula for calculating the Flesch Reading Ease.

A one-way ANOVA revealed that there were significant differences between the groups in terms of absolute difficulty, $F(3, 1076) = 78.46$, $p < .001$. Post-hoc analyses (Fisher's Least-Significant-Difference; Kirk, 1995) indicated that both the Easy and the Difficult Sentence sets were significantly different from all others. The Moderate Sentence sets were not significantly different from one another.

Procedure

Overall, the experiment took place in two parts. During the first part, participants completed a questionnaire packet. During the second part, both older and younger adults visited the laboratory individually, during which they completed the reading task, post-reading task evaluation, extended range vocabulary test, and loaded span tasks.

Older adults who expressed interest in participating in this research project were mailed a packet of questionnaires (e.g., Demographics Questionnaire, Media Consumption Habits Questionnaire, Metamemory in Adulthood Questionnaire, Reading Self-Efficacy Questionnaire) and scheduled for an individual lab appointment. Younger adults completed the questionnaires in scheduled group sessions, at which they signed up for an individual lab session. Participants reported that it took approximately 45 – 60 minutes to complete the questionnaires. Upon arriving at the lab, participants surrendered their packet of completed questionnaires and were seated at a Power Macintosh G3 computer with 19" Apple Vision color monitor. Participants were encouraged to adjust their seat and lighting as necessary so that they were comfortable and could see the computer screen clearly.

Overall, the laboratory session required individuals to read three sets of two-sentence passages for immediate recall, making self-efficacy predictions prior to each set, and then to complete the post-experiment evaluation, the Extended Range Vocabulary Test, and the Loaded Span Tasks. Individuals began the main task of reading using the word-by-word moving window method (Aaronson & Ferras, 1984; Just et al., 1982). As previously described, in this methodology, the letters of the words in a sentence are represented on the computer screen as dashed lines, grouped into word formations with punctuation marks in place. When the participant presses the space bar, the first word appears in place of the dashed lines. Each subsequent button press

causes the next word to appear in place of the dashed lines, and the previous word to revert to dashed lines. As the participant progresses through the text, only one word is available for viewing at any given time, giving the appearance that they are reading through a "moving window." This technique allowed the recording of the time that the participant spends reading each word to be recorded.

All sentences were programmed using PowerLaboratory software (Chute, Westall, & Barisa, 1997) in a 24-point, non-proportional font (Courier New), which allows a smooth, even transition between dashed lines, letters, and back. Each trial (consisting of a target and filler sentence) began with a READY? signal, followed with a plus sign (+) that served as a fixation point in the upper left-hand corner and indicated where the sentence was to start. Participants were asked to read in a normal, comfortable pace, keeping in mind that they would be asked to recall the sentences aloud immediately after they finished reading. It was also emphasized that individuals should recall the sentence in their own words, and not to try to memorize the sentences verbatim. Recall protocols were audio-taped for later transcription.

Figure 2. Schematic Representation of the Reading Task Components.

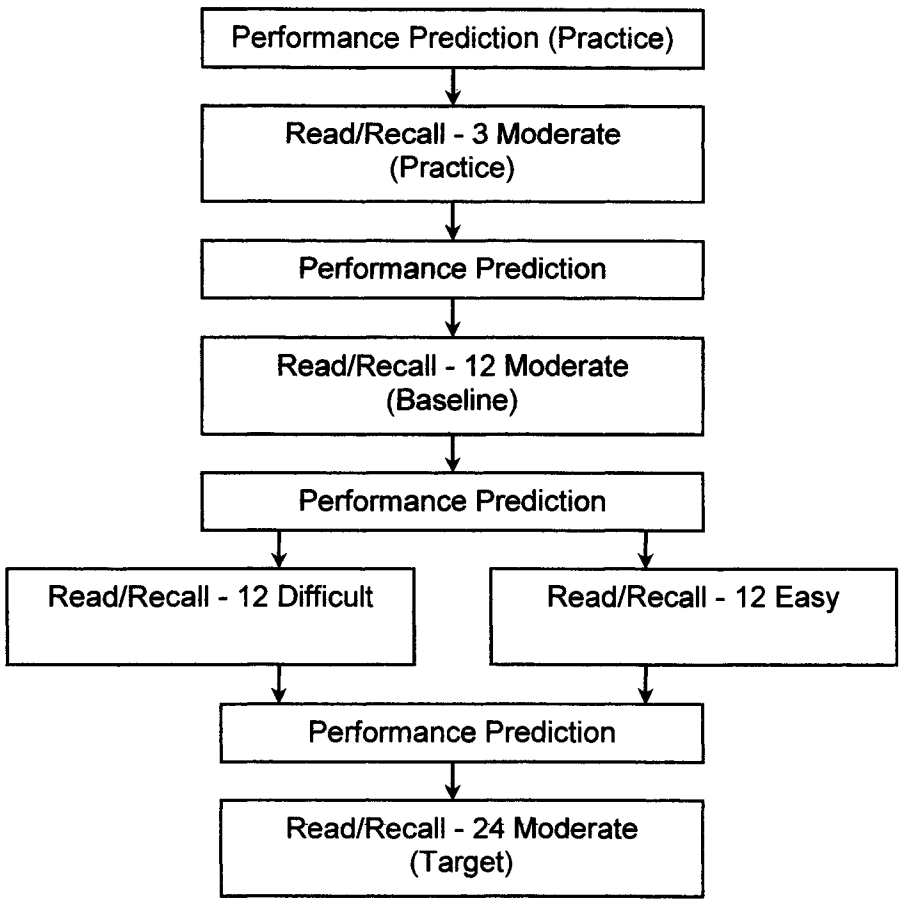

Figure 2 provides a visual representation of the design for the reading task. To become familiar with the task, all participants began by reading and recalling three practice sentences of moderate difficulty. After completing the practice, participants were asked to make a performance prediction using the Long Sentence subscale from the RSEQ, which was identical to the one they had filled out on the questionnaire (e.g., "If I were to read a long sentence (15-20 words), for as long as I wanted, I would be able to remember *n* from the sentence....", with *n* representing five levels of difficult ranging from most difficult (i.e., more than three-quarters of the ideas) to least difficult (i.e., at least one of the ideas). If participants indicated that they could not meet that goal (i.e., made a "no" response), then they went on to the next statement. If they indicated they

could (i.e., made a "yes" response), then they were asked to indicate their confidence on a scale of 10% (Complete uncertainty) to 100% (complete certainty) by pressing the corresponding numerals on the computer's keyboard.

The performance prediction was followed by the 12 passages in Moderate - Baseline sentence set. The purpose of this first sentence set of moderate difficulty was to establish a baseline index of effort and memory for the text. After completing the first set of sentences, participants were again asked to provide a perceived self-efficacy rating using the Long Sentence Scale of the RSEQ.

After providing self-efficacy ratings, half of the participants in each age group read the 12 passages in either the Easy Set or the Difficult Set. After the difficulty manipulation, participants were again asked to provide self-efficacy ratings using the Long Sentence Scale of the RSEQ. Participants then read the 24 Moderate - Target passages. The focus of the analysis was the performance on this last sentence set; therefore, the number of sentences the participants were asked to read doubled to increase reliability. Asking all groups to read the same set of sentences, rather than counterbalancing materials, also provided greater experimental control to ensure that any effects of difficulty were not attributable to experimental materials.

Participants were encouraged to take short rest breaks between the sentence sets if needed. At the end of the sentence sets, participants completed the post-experiment evaluation. Finally, participants completed the Extended Range Vocabulary Test, the Loaded Listening Span task, and the Loaded Reading Span task. They were then thanked for their time and debriefed. The entire laboratory session lasted approximately 90 minutes for younger adults and 120 minutes for older adults.

CHAPTER IV

RESULTS AND DISCUSSION

Beliefs

Memory Beliefs

In order to assess whether there were age differences in perceived memory self-efficacy among older and younger adults, the Metamemory in Adulthood Questionnaire (MIA) was used to assess global memory beliefs. Occasionally, some of the metamemory instruments were returned with missing data (usually the result of a participant skipping a page inadvertently). If only one data point was missing for any one subscale, the other remaining items were averaged to provide a value for that subscale. If more than two data points were missing for any one subscale, the entire scale was assigned a missing value for that participant. Using this criterion, the data for four older participants and six of the seven subscales for one younger participant were disqualified.

In this sample, the seven subscales demonstrated moderate to high reliability, with standardized coefficients (Cronbach's alpha) ranging from 0.70 to 0.90 (see Table 3). These values are consistent with previously published literature using the MIA (Dixon & Hultsch, 1983; Dixon, Hertzog, & Hultsch, 1986; Dixon, Hultsch, & Hertzog, 1988; Hertzog, Hultsch, & Dixon, 1989). From these seven subscales, three higher order dimensions were created based on previously published factor analyses (Dixon & Hultsch, 1986; Dixon, Hertzog, Hultsch, 1986). The Memory Self-Efficacy scale (MIA: MSE) was created by combining scores from the Capacity and Change scales, the Memory Knowledge scale (MIA: MK) was created from scores from the Strategy and

Task subscales, and the Memory Affect scale (MIA: AFF) comprised the Locus, Achievement, and Anxiety subscales (the Anxiety subscale was reverse scored in order to preserve consistency in direction among the subscales). It should be noted that in many studies, the subscales of the MIA: Affect scale load often onto the two other factors, so there may be some degree of overlap in the measurement of these constructs (Hertzog, Dixon, Schulenberg, & Hultsch, 1987).

Table 3.
Means, standard deviations, and reliability coefficients for subscales of the Metamemory in Adulthood (MIA) questionnaire.

	Younger Adults	Older Adults	*t*(149)	α
	M SD	*M SD*		
Achievement (+ = high achievement)	3.52 (0.35)	3.63 (0.36)	2.04 *	.70
Anxiety (+ = high anxiety)	3.10 (0.61)	2.98 (0.54)	1.18	.84
Capacity (+ = high capacity)	3.32 (0.50)	3.13 (0.47)	2.38 *	.78
Change (+ = stability)	3.26 (0.47)	2.67 (0.62)	6.67 ***	.90
Locus (+ = internal locus)	3.35 (0.50)	3.39 (0.58)	< 1	.79
Strategy (+ = high use)	3.66 (0.58)	3.62 (0.43)	< 1	.86
Task (+ = high knowledge)	4.04 (0.46)	3.96 (0.36)	1.16	.82
Memory Self-Efficacy	3.29 (0.42)	2.90 (0.49)	5.35 ***	.90
Memory Affect	3.26 (0.27)	3.35 (0.31)	2.07 *	.78
Memory Knowledge	3.84 (0.43)	3.78 (0.32)	< 1	.86

Note. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 3 displays the means and standard deviations as a function of Age. A 2(Age) x 7(Subscale) Multivariate Analysis of Variance (MANOVA) revealed a that age differences were reliable, $F(10,140) = 8.82$, $p < .001$, Wilk's $\lambda = 0.61$. Older adults reported higher scores on the Achievement subscale than did the younger adults, suggesting that having a good memory and performing well on memory tasks was

perceived as more important to the older adults group than to the younger adult group. However, younger adults scored higher than did the older adults on the Capacity subscale and on the Change subscale. Because the Capacity and the Change subscales are components of general Memory Self-Efficacy, it is little surprise that age differences were found for the higher order Memory Self-Efficacy scale. In fact, Age was negatively correlated with MSE (r = -0.40) in this study, which replicates findings from studies that have used the MIA as well as other Memory Self-Efficacy measures (Berry, West, & Dennehey, 1989; Cavanaugh & Poon, 1989; Dixon & Hultsch, 1983a; Lusczc, 1993; Rebok & Balcerak, 1989).

These age differences suggest that younger adults believe more strongly in their ability to perform well on certain types of memory tasks (e.g., remembering names or dates), and that they expect that these abilities will remain stable later in life. Taken from another perspective, age differences in Memory Self-Efficacy can also be taken to imply that older adults believe less in their memory capabilities and subscribe to the notion that these abilities will inevitably decline as they age, which is also consistent with research examining beliefs regarding memory functioning as a function of advancing age (Lachman et al., 1995; Ryan, 1992; Ryan & Kwong See, 1993). Broadly, age differences in memory self-efficacy in favor of the younger adults suggest that younger adults have stronger beliefs in their ability to remember information in a variety of contexts than do the older adults.

In our sample, no age differences were found for the Locus subscale, suggesting that older and younger adults did not differ in their beliefs of the controllability of memory. The cognitive aging literature itself presents mixed results with respect to intellectual locus of control (cf. Lachman, 1986). While several studies have found that older adults report being less internal when compared to younger adults (Cavanaugh & Poon, 1989; Dixon & Hultsch, 1983a; Hultsch, Hertzog, & Dixon, 1987; Lachman, 1983;

1986), others have found that individuals develop more of an internal orientation with age (Gatz & Karel, 1993), suggesting that older adults maintain the beliefs that internal factors (e.g., effort) influence their cognitive performance (cf. Miller & Lachman, 1999). Others have found age similarities in perceived control (e.g., Lachman & Leff, 1989; Miller & Gagne, in press).

Younger adults had slightly higher scores than the older adults on the Anxiety subscale, although these age differences were not reliable. This implies that there were no age differences in experiences of anxiety regarding memory failures. Despite the fact that age differences were minimal or non-existent on the Locus and the Anxiety subscales, age differences were reliable when these subscales were combined with the Achievement subscale to form the Memory Affect scale. High scorers on the Memory Affect scale are individuals who place value on memory achievements, believe that it is within their ability to control their memory performance, and are not anxious when memory failures occur. In this case, older adults' higher scores suggest that older adults may place a higher value on good memory performance.

There were also no age differences on the Memory Knowledge scale, or on its component subscales of Task subscale and Strategy. Age similarities on these subscales suggest that both older and younger adults were aware of basic memory processes as well as strategies for memory improvement, such as use of mnemonic techniques or memory aids (e.g., writing appointments on a calendar to facilitate memory). It also suggests that there are no differences in individuals' awareness of their own performance in specified situations. The present results are in contrast to studies that have found that younger adults score higher than older adults on the Task subscale (Dixon & Hultsch, 1983a). With respect to the Strategy subscale, the data are consistent with Dixon and Hultsch (1983a) in showing that both groups may use mnemonic strategies or physical reminders to compensate for potential memory deficits. However,

Hultsch, Hertzog, and Dixon (1987) found that younger adults scored higher than the older adults on this scale.

Collectively, these data suggest that older adults in this study (1) valued memory performance and (2) were familiar with how memory functions and with the various mnemonic strategies that can help to improve memory performance. At the same time, however, they also believed that their own memory capabilities were relatively poor. Moreover, they expected that their memory would worsen as they continue to age. Given that the correlations between Memory Self-Efficacy and Memory Knowledge have been relatively low (both in the literature, e.g., Hertzog et al. (1987), and in this sample), this pattern of findings (age differences on Memory Self-Efficacy, but not on Knowledge) suggests that older adults may be aware ways to potentially improve memory, but may not have the efficacy to enact those changes. Finally, these results provide additional evidence that beliefs about memory and knowledge about memory are separate components of a larger metamemory construct.

Reading Self-Efficacy

The Reading Self-Efficacy Questionnaire (RSEQ) was designed for this study to assess the participant's perceived ability to perform reading tasks within a specified hierarchy of task difficulties and the confidence with which they could perform those tasks. Reading Self-Efficacy scores were calculated according to Bandura's procedures (Bandura et al., 1982). Reading Self-Efficacy Level (RSEL) represented the highest level at which the participant asserted that they could perform the indicated goal behavior with at least 20% confidence. Thus, RSEL reflects the extent to which an individual feels that s/he could read and remember the content from a specified text item. Reading Self-Efficacy Strength (RSES) scores for each task were calculated as the average confidence rating for that task subscale (comprising five items). These

scores represent the average confidence at which an individual indicated that s/he could perform the tasks within the specified scale[7].

Table 4 provides the intercorrelations among the six RSEQ subscales; correlations for RSEL are shown above the diagonal, correlations for RSES are shown below the diagonal, and correlations between RSEL and RSES for each task are presented along the diagonal. The task-specific assessments of self-efficacy were moderately to highly correlated, ranging from 0.46 to 0.92 for Reading Self-Efficacy Level (RSEL) and 0.47 to 0.90 for Reading Self-Efficacy Strength (RSES). These relationships suggest that scores among reading tasks from each subscale are generalizable to other types of reading activities. That is, self-efficacy for one type of reading task is related to self-efficacy on other kinds of reading tasks. Reliability estimates indicated that the internal consistency was quite high, as standardized coefficients (Cronbach alpha) for r(RSEL) = 0.92 and for r(RSES) = 0.93.

Across the entire sample, correlations tend to be highest among reading scales that assessed capability to read and remember texts that are more similar. These relationships displayed a simplex pattern (Guttman & Greenbaum, 1998), as the highest correlations were closest to the diagonal and weakest correlations were found at the edges of the table. For example, correlations between the Short Sentence and Long Sentence were moderate to high, as were the correlations between Short Novel and Long Novel. However, correlations between the Short Sentence subscale and the Long Novel subscale were much lower. This suggests that similar types of reading tasks are tapping into different gradations of reading self-efficacy.

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[7] For example: On the Long Sentence Scale, a participant indicates that s/he could not read and remember more than 3/4 of the ideas or up to 3/4 of the ideas from the sentence. However, s/he could remember up to 1/2 of the ideas with 30% confidence, up to a 1/4 of the ideas with 50% confidence and at least 1 of the ideas with 100% confidence. The RSEL score would be "3," as three items received a "yes" response; RSES = 60%.

Table 4.
Intercorrelations between subscales of the Reading Self-Efficacy Questionnaire (RSEQ).

All Participants						
	1	2	3	4	5	6
1. Short Sentence	.13	.67 ***	.48 ***	.50 ***	.48 ***	.46 ***
2. Long Sentence	.71 ***	.21 **	.71 ***	.70 ***	.61 ***	.59 ***
3. Paragraph	.61 ***	.80 ***	.05	.70 ***	.70 ***	.68 ***
4. Short Story	.58 ***	.69 ***	.77 ***	.20 **	.79 ***	.75 ***
5. Short Novel	.55 ***	.62 ***	.73 ***	.90 ***	.17 *	.92 ***
6. Long Novel	.47 ***	.57 ***	.70 ***	.80 ***	.88 ***	.26 **

Older Adults						
	1	2	3	4	5	6
1. Short Sentence	.26 *	.65 ***	.42 ***	.67 ***	.50 ***	.47 ***
2. Long Sentence	.73 ***	.31 **	.72 ***	.80 ***	.66 ***	.67 ***
3. Paragraph	.66 ***	.89 ***	.10	.68 ***	.76 ***	.77 ***
4. Short Story	.51 ***	.70 ***	.76 ***	.21 †	.84 ***	.83 ***
5. Short Novel	.55 ***	.68 ***	.75 ***	.88 ***	.19	.96 ***
6. Long Novel	.52 ***	.68 ***	.78 ***	.77 ***	.88 ***	.30 *

Younger Adults						
	1	2	3	4	5	6
1. Short Sentence	-.07	.70 ***	.56 ***	.37 ***	.49 ***	.45 ***
2. Long Sentence	.68 ***	.07	.69 ***	.57 ***	.55 ***	.47 ***
3. Paragraph	.50 ***	.64 ***	-.02	.70 ***	.63 ***	.53 ***
4. Short Story	.59 ***	.67 ***	.78 ***	.21 †	.75 ***	.62 ***
5. Short Novel	.48 ***	.53 ***	.71 ***	.83 ***	.07	.85 ***
6. Long Novel	.38 ***	.43 ***	.60 ***	.71 ***	.84 ***	.21 †

Note. RSEL scores are above the diagonal; RSES scores are below the diagonal. Diagonal (underlined) represents correlation between RSEL and RSES for that variable.
** $p < .01$. *** $p < .001$. † $p < .10$

It was interesting to note that although the correlations among the subscales for Reading Self-Efficacy Level and Reading Self-Efficacy Strength were reliable, the correlations between Self-Efficacy Level and Self-Efficacy Strength for each reading task were low by comparison. This provides additional evidence that self-efficacy level and self-efficacy strength are tapping into related, but separate, dimensions of self-efficacy. Overall, reliability for the instrument as a whole was, nevertheless, very good (Cronbach alpha = 0.89).

As illustrated in Table 5, younger adults reported Reading Self-Efficacy Levels that were higher than those of the older adults, although the differences between the two age groups were not reliable. In contrast, younger adults expressed significantly greater confidence in their performance than did the older adults on almost all of the reading tasks *except* for the Long Sentence scale.

Table 5.
Reading Self-Efficacy Questionnaire Scores as a Function of Age.

	Younger Adults	Older Adults	
	M SD	*M SD*	*t*(154)
Reading Self-Efficacy Level			
Short Sentence	4.90 (0.49)	4.88 (0.55)	< 1
Long Sentence	4.76 (0.73)	4.68 (0.85)	< 1
Paragraph	4.78 (0.65)	4.74 (0.76)	< 1
Short Story	4.71 (0.81)	4.61 (0.99)	< 1
Short Novel	4.73 (0.67)	4.40 (1.36)	1.64†
Long Novel	4.62 (0.84)	4.38 (1.26)	1.08
Average RSEL	4.75 (0.57)	4.64 (0.84)	< 1
Reading Self-Efficacy Strength			
Short Sentence	91.77 (10.24)	85.26 (14.28)	3.24**
Long Sentence	81.64 (13.23)	77.77 (17.04)	1.57
Paragraph	82.21 (11.84)	78.26 (15.80)	1.75†
Short Story	78.87 (15.77)	69.72 (17.07)	3.48**
Short Novel	76.94 (16.67)	66.42 (19.92)	3.38**
Long Novel	75.66 (16.82)	68.40 (18.60)	2.32*
Average RSES	81.18 (11.81)	74.39 (14.78)	3.09**

Note: RSEL max = 5; RSES max = 100. $^{\dagger}p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Interestingly, older adults in this study reported similar levels of Reading Self-Efficacy, but were less confident in their performance. These findings are in contrast to a previous study by Berry et al. (1989), who found age differences in Memory Self-Efficacy Level, but not Memory Self-Efficacy Strength, using the Memory Self-Efficacy Questionnaire. In that study, older adults indicated that they could perform at lower memory levels, but were as confident as the younger in their memory at those lower

levels. It is possible that the differences in tasks (e.g., memory tasks versus reading tasks) were responsible for the differences. The Berry et al. (1989) study asked participants to report their Self-Efficacy Level based on statements such as "I could remember 12 out of 12 items on a grocery list without taking the list with me to the store." This statement is concrete, with readily identifiable tasks. It is possible that each participant developed his or her own conception of "an idea" or "the main points" and "details" (Curiously, only 3 participants – 1 younger and 2 older – asked what was meant by an "idea"), and that RSEL scores are therefore based on different metrics of measurement.

It is also possible that the null effects in RSEL may be due in part to ceiling effects with the instrument, as the uppermost level in each of the task difficulty hierarchies (e.g., "...more than three-quarters of the ideas form the sentence;" " ...the main ideas and three-quarters of the details") may not have been discriminating enough to reveal age differences. Shell, Murphy, and Bruning (1989) experienced similar ceiling effects with their reading self-efficacy instrument. On the other hand, it is possible that both age groups were equally confident in their Reading Self-Efficacy Level, and these scores reflect actual beliefs in ability. Adjustments to the difficulty levels and reading tasks would help to clarify these results.

To determine the relationships between general memory self-efficacy and reading self-efficacy, correlations were computed for the three higher order scales of the Metamemory in Adulthood (MIA) Questionnaire and the subscales of the Reading Self-Efficacy Questionnaire (RSEQ). As seen in Table 6 modest correlations (ranging from .23 to .29) existed between the MIA Memory Self-Efficacy scale and all but the Short Sentence subscale of the Reading Self-Efficacy Level subscales (although this relationship was marginally significant). MIA Affect was also related to the Long Sentence and Paragraph Reading Self-Efficacy Level subscales, and marginally

correlated with the Short Story Self-Efficacy level subscale. No significant correlations were found between the RSEQ Self-Efficacy levels and the MIA Memory Knowledge Scale.

Similar patterns were found with respect to Reading Self-Efficacy Strength, except that significant correlations were stronger. The correlations (ranging from 0.31 to 0.48) between Memory Self-Efficacy and Reading Self-Efficacy Strength were significant for all Reading Self-Efficacy Strength subscales, except the Short Story subscale (the correlation was marginal) and the Paragraph subscale. The relationship between the MIA Memory Affect scale and the Reading Self-Efficacy Strength subscales were all modest, but significant (range of 0.21 to 0.25), with the exception of the Short Sentence and Long Sentence subscales (both marginally significant). Although the Short Story subscale exhibited a marginally significant relationship with the MIA Memory Knowledge scale, none of the other correlations were reliable.

Table 6.
Correlations Between the Metamemory in Adulthood (MIA) Questionnaire and the Reading Self-Efficacy Questionnaire (RSEQ).

	MIA: MSE	MIA: MK	MIA: AFFECT
Reading Self-Efficacy Level			
Short Sentence	.15 †	-.09	.11
Long Sentence	.27 ***	-.01	.21 *
Paragraph	.24 **	-.01	.20 *
Short Story	.25 **	-.06	.16 †
Short Novel	.25 **	-.03	.11
Long Novel	.29 ***	-.02	.14 †
Average RSEL	.49 ***	-.10	.25 **
Reading Self-Efficacy Strength			
Short Sentence	.36 ***	.02	.17 *
Long Sentence	.32 ***	-.14 †	.16 *
Paragraph	.42 ***	-.06	.22 **
Short Story	.50 ***	-.16 *	.24 **
Short Novel	.49 ***	-.10	.27 ***
Long Novel	.45 ***	-.10	.25 **
Average RSES	.49 ***	-.10	.26 **

Note: MSE = Memory Self-Efficacy. MK = Memory Knowledge. $^{\dagger} p \leq .09$. * $p < .05$. ** $p < .01$. *** $p < .001$.

To summarize, the Reading Self-Efficacy Questionnaire (RSEQ) represents an attempt to measure aspects of self-efficacy related to the ability to read and remember information from text. The psychometric data from this study suggested that the six subscales were internally consistent for both Reading Self-Efficacy Level (RSEL) and Reading Self-Efficacy Strength (RSES). Comparisons with the Memory Self-Efficacy scale of the MIA revealed some evidence of construct validity, as the two measures of self-efficacy, although modestly related, were among the strongest of the relationships. Importantly, the subscales of the RSEQ were not related to the Memory Knowledge scales of the MIA. As these two scales presumable measure different constructs, the lack of relationship between these scales provide some evidence of discriminant validity. The modest relationships between the RSEQ subscales (particularly those for RSES) and the Memory Affect scale of the MIA are consistent with earlier literature (Cavanaugh & Poon, 1989; Dixon & Hultsch, 1983) that some aspects of self-efficacy have an affective component. Age differences were found for Reading Self-Efficacy Strength, but not Self-Efficacy Level, suggesting that older adults believe they can perform at the same level at younger adults, but are less confident. Moreover, Reading Self-Efficacy Levels were relatively high, which may reflect actual beliefs regarding ability, or may reflect ceiling effects, in that the instrument was not discerning enough at higher levels. Although this instrument may provide a useful instrument in the assessment of Reading Self-Efficacy, additional research is needed to validate and refine this questionnaire.

Beliefs and Ability

Analyses were conducted to determine if beliefs were related to individual differences in ability. Table 7 provides correlations among age, education level, verbal ability, working memory span, the three MIA composite scales (Memory Self-Efficacy

(MIA: MSE), Memory Knowledge (MIA: MK), Memory Affect (MIA: AFF)) and average Reading Self-Efficacy Level (RSEL) and Strength (RSES).

Table 7.
Correlations Between Beliefs and Ability and Background Measures

	MIA MSE	MIA MK	MIA AFF	Average RSEL	Average RSES
All					
Age	-.40 ***	-.09	.15 †	-.10	-.27 ***
Education	-.24 **	-.14 †	.08	.04	.00
Verbal	-.28 ***	-.04	.14 †	.02	-.02
WM Span	.22 **	.09	-.05	.01	.10
Younger					
Age	.09	-.27 *	.16	.13	.10
Education	.04	-.22 *	.01	.08	.04
Verbal	.00	.05	-.03	.16	.08
WM Span	.05	.03	-.09	-.12	-.13
Older					
Age	-.09	.11	-.18	-.15	-.22 †
Education	-.05	-.05	-.04	.13	.25 *
Verbal	.04	.00	.07	.11	.36 **
WM Span	.01	.16	.21 †	.04	.13

Note: WM = Working Memory. MSE = Memory Self-Efficacy. MK = Memory Knowledge RSEL = Reading Self-Efficacy Level. RSES = Reading Self-Efficacy Strength. † $p \leq .09$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Among younger adults, both age and years of education were negatively related to MIA Memory Knowledge. However, inspection of the data indicates that these negative correlations were driven by three younger adults who had nearly completed non-psychology doctoral programs. This suggests that highly educated, more mature adults within this age range may not believe that they are in a position to need to engage in strategies supportive of memory (e.g., using mnemonics techniques to remember word lists) or to analyze specific situations in which memory is better (e.g., remembering concrete versus abstract words). Among the older adults, average Reading Self-Efficacy was positively related to both education and verbal ability. As the older adults in our

sample had higher levels of formal education and higher verbal abilities overall, it is possible that these educational experiences as well as crystallized abilities (i.e., these strengths in ability) are more salient determinants of Reading Self-Efficacy Strength for those in older age groups.

Among all participants, Age was negatively related to both global Memory Self-Efficacy and Reading Self-Efficacy Strength, although it was more strongly related to the former than the latter. Both education and verbal ability were negatively correlated with MIA: MSE, most likely driven by the fact that both of these variables were positively related to age (r = .57, *r* = .74, respectively). In fact, these correlations were nonsignificant within both of the age groups. MIA: MSE was positively related to working memory span for the entire sample, but not when age groups were considered separately.

The correlational data between ability, Memory Self-Efficacy, and Reading Self-Efficacy suggests that although both Reading and Memory capabilities decrease with advancing age, declines in Reading Self-Efficacy (i.e., efficacy for memory for text) may not show as steep of a decline as overall Memory Self-Efficacy. Moreover, background variables specifically related to reading (e.g., educational attainment, and verbal ability) are supportive of Reading Self-Efficacy, especially among the older adults.

Reading Habits, Patterns, and Behaviors.

Self-efficacy theory argues that beliefs regarding ability may influence task choice (Bandura, 1977; 1997). In order to assess whether reading habits and behaviors were influenced by age, ability, and/or self-efficacy beliefs, participants completed the Media Consumption Habits Questionnaire. The data from the Media Consumption Habits Questionnaire differed in format, with some of the data representing ratings of preference and ratings of frequency, and some data representing time estimates of behaviors. The first section represents reading habits and patterns, while the following

section provides information regarding specific reading behaviors that individuals engage while reading. The means and standard deviations for each age group as well as significance tests are located in Tables 8 and 9.

Reading Habits and Patterns.

Participants rated their abilities to understand what they read and remember what they read using a 7-point scale (1 = *Excellent*; 7 = *Poor*). Given that a score of "4" represented the midpoint of this scale (i.e., "Average" performance), both age groups rated themselves as above average on both measures. Interestingly, younger adults rated themselves as better able to *remember* what they had read, although the age difference was not reliable. However, older adults rated their ability to *understand* what they had read as better than that of the younger adults; this age difference was reliable. The inference is that older adults perceive their ability to retain meaning from text as better than their ability to remember the content of the text.

Participants also used a seven-point Likert scale (1 = *strongly agree,* 7 = *strongly disagree*) to indicate the extent to which they liked to read particular materials. Overall, older adults reported that they liked to read more than did the younger adults and that they read more often than did the younger adults. With respect to reading materials, older adults liked reading textbooks or educational materials slightly more than did the younger adults. Older adults also preferred to read newspapers, non-fiction materials, religious materials, and self-help manual, more so than did the younger adults.

Table 8.
Reading Habits and Patterns as a Function of Age.

	Younger Adults (N = 81)		Older Adults (N = 69)		t(148)
	M	*SD*	*M*	*SD*	
Understand reading	2.69	(1.29)	2.31	(1.08)	1.94 *
Remember reading	3.20	(1.34)	3.39	(1.21)	<1
I like to read	2.56	(1.62)	1.58	(1.04)	4.49 ***
I read often	3.11	(1.72)	2.10	(1.41)	3.98 ***
"Generally, I like to read..."					
Textbooks and Journal articles	4.62	(1.60)	4.07	(1.99)	1.80 †
Newspapers	3.30	(1.43)	2.24	(1.51)	4.41 ***
Magazines	2.20	(1.02)	2.25	(1.17)	<1
Fiction	2.56	(1.69)	2.74	(1.95)	<1
Non-fiction	3.67	(1.70)	3.04	(1.82)	2.14 *
Religious texts	5.70	(1.49)	4.25	(2.28)	4.43 ***
Self-Help manuals	5.31	(1.51)	3.91	(1.93)	4.94 ***
Comics	4.85	(1.93)	5.09	(2.01)	< 1
Poetry	4.27	(1.86)	3.97	(1.94)	<1
Total hours spent reading	11.94	(9.23)	17.92	(10.35)	3.74 ***
Reading Purpose					
School or education	7.09	(6.06)	2.07	(3.98)	6.01 ***
Work or job-related	0.92	(2.91)	0.65	(1.28)	< 1
Information to assemble item	0.20	(0.43)	0.42	(0.85)	1.97 *
Hobbies or recreation	1.25	(3.17)	1.64	(2.54)	< 1
Interest or entertainment	2.29	(3.76)	5.77	(5.34)	4.54 ***
Relaxation	1.49	(3.75)	3.84	(5.98)	2.84 **
Religious or moral purposes	0.13	(0.47)	0.96	(1.93)	3.48 **
Self-help	0.35	(1.23)	0.72	(1.26)	1.82 †
Personal communication	1.54	(2.39)	2.88	(3.42)	2.73 **
Type of Text					
Textbooks or journals	3.37	(2.89)	0.55	(1.90)	8.83 ***
Newspapers	0.87	(1.73)	4.79	(3.81)	7.88 ***
Magazines	0.99	(1.87)	3.54	(10.26)	2.04 *
Fiction	2.23	(4.08)	5.18	(8.61)	2.60 *
Non-fiction	0.48	(1.12)	1.79	(2.51)	4.03 ***
Religious text	0.00	(0.30)	0.70	(1.73)	2.98 **
Self-help	0.11	(0.58)	0.45	(0.81)	2.93 **
Comics	0.22	(0.99)	0.15	(0.43)	< 1
Poetry or plays	0.14	(0.50)	0.14	(0.58)	<1
E-mail or internet	1.37	(1.64)	1.65	(2.60)	1.83 †

Note: † $p \leq .09$. * $p \leq .05$. ** $p < .01$. *** $p < .001$.

Participants also reported the amount of time that they spent engaged in various reading activities. T-tests were used to examine whether there were differences in the total number of hours that younger and older adults reported that they allocated to reading specific texts and to reading for particular purposes. Overall, older adults reported that they spent approximately six more hours per week reading than did the younger adults. While younger adults read more textbooks and journals than did the older adults, the older adults surpassed the younger adults in the amount of time that they spent reading newspapers, magazines, non-fiction, and religious texts. Younger adults reported that they spent more time reading for school or educational purposes, while older adults spent more time than the younger adults reading for pleasure or interest, to assemble something (it should be noted the reading recipes for cooking was included in this category), for religious or moral purposes, and for personal communication.

The findings here are consistent with previous studies, as Rice and Meyer (1985) and Rice (1986a) have also found that older adults tend to spend more hours reading, enjoy reading more as an activity in and of itself, and read more often than do younger adults. In addition, researchers have also found that while younger adults tend to read more educational materials, older adults tend to read more "leisure materials," such as newspapers, magazines, and novels (Rice & Meyer, 1985; Stine-Morrow et al., 1996). These habits and patterns are most likely due to the educational and vocational demands unique to each age group. The younger adults in this sample were all university students, presumably where reading is a daily requirement. The extra time available to those in the older sample (e.g., resulting from children leaving home, reduction in work hours) affords more time for recreational reading (e.g., Rice, 1986b).

Reading Behaviors

The Media Habits Consumption Questionnaire also provided data regarding behaviors in which individuals engage before, during, and after reading texts. Participants responded to these questions using a five-point Likert scale (1 = *Never*; 5 = *Always*). To compute scores for the five subscales (Preview Text, Word Identification, Reading Difficulties, Getting Meaning, Sharing and Relating), scores from items for each subscales were combined, reverse scoring if necessary to make interpretation meaningful. Reliability analyses suggested that the subscales in these sections were moderately reliable. Internal consistency coefficients (Cronbach alpha) for the subscales are as follows: Preview Text (items 1-6), $\alpha = 0.70$; Word identification (items 7-12), $\alpha = 0.61$; Reading Difficulties (items 13-14), $\alpha = 0.86$; Getting meaning (items 15-25), $\alpha = 0.65$; and Sharing and relating (items 26-31), $\alpha = 0.66$. Means and standard deviations are located in Table 9; higher means are indicative of behaviors consistent with careful, effortful reading.

Table 9.
Reading Behaviors as a Function of Age.

	Younger Adults (N = 81)		Older Adults (N = 71)		$t(148)$
	M	*SD*	*M*	*SD*	
Before Reading					
Previewing text	3.33	(0.54)	3.45	(0.72)	1.20
During Reading					
Word identification	2.73	(0.52)	2.62	(0.65)	1.16
Reading difficulties	2.27	(0.68)	2.29	(0.69)	<1
Getting meaning	3.25	(0.41)	2.99	(0.44)	2.11 *
After Reading					
Sharing and relating	3.08	(0.50)	3.15	(0.50)	<1

Note: * $p < .05$.

The Getting Meaning subscale was the only one to show age differences, with younger adults reporting more often that they engaged in behaviors that would allow them to more thoroughly understand the text, such as rereading parts of a text that they did not understand or asking themselves questions about the text while reading. These findings are somewhat consistent with a study by Zabrucky and Moore (1994), who used behavioral data to show that older readers actually failed to reread parts of texts that were inconsistent, thus compromising their ability to understand the full meaning of the text. Given that fact that older adults in this study rated their ability to understand what they had read from the text as better than that of younger adults, these results suggest that older adults' perception of their reading ability may not be consistent with the actual reality of what they do to during reading.

Reading Habits, Patterns, Behaviors, and Ability.

In order to simplify analyses, only subscales of the Reading Purpose with a mean greater than one (i.e, one hour per week) were included. The subscales of reading for education, hobbies, interest, relaxation, and communication were entered into a principal components factor analysis using the criterion that the eigenvalue be greater than one. As expected, two factors emerged: *Read for Education*, represented by the read for education subscale, and *Read for Enjoyment,* comprising reading for interest, reading for hobbies, reading for relaxation, and reading for communication. The subscales of the *Read for Enjoyment* factor were moderately reliable; Cronbach alpha = 0.70. Table 10 provides the factor structure.

Table 10.
Factor Loadings for Reading Habits Variables (Rotated and Sorted)

	Read for Enjoyment	Read for Education
Education	---	.939
Hobby	.762	---
Interest	.765	---
Relaxation	.715	---
Communication	.668	---
Variance Explained	42.81%	22.10%

Table 11.
Intercorrelations Between Reading Habits and Patterns and Ability and Background Measures

	Total hours	For Ed.	For Enjoy.	Pre Text	Word Id	Read Diffs	Get Mean	Share
All								
Age	.29 ***	-.44 ***	.31 ***	.10	-.11	.02	-.18 *	.06
Education	.25 **	-.17 *	.21 *	.07	-.22 **	-.21 **	-.09	.10
Verbal	.27 ***	-.28 ***	.25 **	.17 *	-.16 *	-.19 *	-.12	.15 †
WM Span	-.14 †	.17 *	-.15 †	-.02	.01	-.16 †	-.03	-.11
Younger								
Age	.29 **	-.04	.21 †	.06	-.17	-.18	-.12	.07
Education	.08	-.03	.11	.03	-.18	-.17	-.04	.08
Verbal	.10	-.02	.06	.09	-.01	-.21 †	-.02	.18
WM Span	.01	-.10	-.03	-.06	.01	-.17	-.23 *	-.20 †
Older								
Age	-.15	-.07	-.20	-.02	-.03	.21 †	-.05	-.15
Education	.11	-.28 *	-.02	.02	-.21 †	-.34 **	.04	.08
Verbal	.07	.20	-.01	.16	-.22 †	-.36 **	.03	.13
WM Span	-.01	.09	.07	.15	-.14	-.21 †	.04	.12

Note: WM = Working Memory. Pre Text = Preview Text. Word Id = Word Identification. Read Diffs = Reading Difficulties. Get Mean = Get Meaning. Share = Sharing and Relating. † $p \leq .10$. * $p \leq .05$. ** $p < .01$. *** $p < .001$.

Table 11 shows the intercorrelations between reading habits, reading behaviors, and ability and background measures. As expected from earlier analyses, Age was positively correlated with the number of hours per week spent reading and the number of

hours per week spent reading for enjoyment, but negatively related to reading for education and the ability to get meaning from text.

Formal education is positively correlated with the total number of hours per week spent reading as well as reading for enjoyment; it is possible that advanced schooling helps individuals to develop reading skills that make reading an enjoyable activity throughout the lifespan. Strangely, formal education was negatively related to reading for education. Although this relationship is most likely driven by the strong relationship between Age and Education ($r = 0.57$), it is possible that individuals who are more highly educated are also the least likely to be in an education setting, and therefore can allocate more time to other reading activities, whereas those with lower education levels may still be in that setting. In fact, the correlation between age and education is strongest among younger adults, all of whose daily activities involve reading for educational purposes. Education was negatively associated with Word Identification. As this scale asks questions such as "how often do you...skip over words you do not know" and "how often do you...sound the word out?" it is intuitive that basic reading behaviors such as these would become less frequent as individuals advanced in education and were exposed to a wider variety of words. Reading Difficulties are also inversely related to education, again suggesting that formal schooling helps individuals to develop skills that allow them to comprehend text successfully.

Positive correlations were found between verbal ability, the total number of hours spent reading per week, and reading for enjoyment; a negative correlation was found with reading for education, again probably due to the strong relationship between Age and verbal ability ($r = 0.74$). Interestingly, verbal ability was the only variable related to Previewing the text, suggesting that individuals with high verbal skills may engage in purposeful preparatory behaviors that are supportive of careful reading, as this variable is also negatively related to reading difficulties.

Among all the participants, working memory span was related to the number of hours spent reading for educational purposes. Among the older adults, both perceptions of reading difficulties decreased as the number of years of education, higher verbal ability (and to some extent working memory span) increased, which provides some evidence that these abilities are supportive of text comprehension.

These data are largely consistent with those found by Meyer and Rice (1986). Collectively, it appears as though older adults spend more time reading per week, and that they are primarily reading leisure materials for pleasure. Younger adults spend less time reading than the older adults, and their reading behaviors are primarily driven by their educational setting. The data also suggest that highly verbal, well-educated individuals experience fewer reading difficulties. Moreover, the act of reading appears to be more rote, as these individuals also spent less time on component skills associated with reading, such as basic word identification.

Reading Habits, Patterns, Behaviors, and Beliefs.

In order to assess whether self-efficacy beliefs influenced task choice, and whether this influence changed as a function of age, reading behaviors and self-efficacy beliefs were examined as a function of age group as well as for the entire sample. Table 12 provides intercorrelations between memory beliefs, reading self-efficacy, and reading habits and behaviors.

Table 12
Intercorrelations Between Reading Habits, Patterns, Behaviors, and Beliefs and as a Function of Age.

	Total hours	For Ed.	For Enjoy.	Pre Text	Word Id	Read Diffs	Get Mean	Share
All								
MIA MSE	-.01	.19 *	-.09	.12	-.07	-.21 *	.12	.07
MIA MK	-.04	.11	-.08	.15 †	.24 *	.09	.28 ***	.20 *
MIA Affect	.23 **	-.08	.23 **	.34 ***	.04	-.12	.10	.19 *
RSEL	.08	.02	.04	.11	-.10	-.02	.17 *	.19 *
RSES	-.01	.07	.08	.21 **	-.14 †	-.25 **	.04	.06
Younger								
MIA MSE	-.07	-.06	-.09	.20 †	-.16	-.28 *	-.13	-.10
MIA MK	.09	.09	-.02	.18	.33 **	.16	.30 **	.21 †
MIA Affect	.07	-.04	.09	.32 **	-.04	-.15	-.05	-.01
RSEL	.05	-.06	.09	.19 †	-.03	-.03	.15	.19
RSES	.05	-.08	.18 †	.13	-.18	-.34 **	-.04	-.01
Older								
MIA MSE	.29 *	.18	.18	.15	-.08	-.18	.25 *	.35 **
MIA MK	-.17	.06	-.11	.15	.13	-.02	.24 *	.23 †
MIA Affect	.30 *	.08	.26 *	.34 **	.12	-.10	.29 *	.29 ***
RSEL	.14	.04	.06	.09	-.15	-.02	.16	.21 †
RSES	.09	-.02	.17	.32 **	-.16	-.18	.02	.15

Note: Pre Text = Preview Text. Word Id = Word Identification. Read Diffs = Reading Difficulties. Get Mean = Get Meaning. Share = Sharing and Relating. MIA = Metamemory in Adulthood Questionnaire. MSE = Memory Self-Efficacy. MK = Memory Knowledge. RSEL = Reading Self-Efficacy Level; RSES = Reading Self-Efficacy Strength. † $p \leq .10$. * $p \leq .05$. ** $p < .01$. *** $p < .001$.

In general, the relationships were not very strong. However, there are several relationships between beliefs and reading activities that were worth noting. Across age, Memory Self-Efficacy (MIA: MSE) was related to the amount of reading in which individuals engage for educational purposes as well as the perception of fewer reading difficulties encountered while reading. Thus, individuals who read specifically to remember information later may have developed some skills that afford them the ability to work through reading difficulties. Alternatively, it is possible that individuals may encounter the same levels of reading difficulty, but those with higher levels of MIA: MSE perceive those difficulties differently. Among older adults, MIA: MSE was predictive of

the total amount of time spent reading, as well as the ability to extract meaning from text and sharing this information with others. These data suggest that individuals with higher self-efficacy may be more confident in their memory for the text, and so comfortable sharing with others. Interestingly, these relationships were not significant among the younger adult sample, suggesting that Self-Efficacy is an important determinant of the extent to which older adults, but not younger adults, read and share information.

Memory Knowledge was related to reading behaviors that are supportive of careful reading, such as word identification, getting meaning, and sharing and relating ideas from the text with others. This suggests that internal knowledge of strategies that are supportive of memory are somewhat realized externally as behaviors. With the exception of word identification for the older adults, these relationships held for each age group as well as for the whole sample. Thus, it is possible that all ages were aware of strategies that will support effective reading, but may employ those strategies to different extents.

Memory Affect was related to both the total number of hours spent reading as well as reading for enjoyment, suggesting that those who have lower Anxiety and value using their memory effectively spent more time engaged in these reading activities. Memory Affect was also associated with Previewing Text behaviors and Sharing ideas with others. It is possible that individuals with positive memory affect are thoughtful about what they are going to read, and because they are less anxious regarding what they have read from the text, feel comfortable sharing this information with others. These relationships were stronger in the older adult sample than in the entire sample, suggesting that these non-cognitive variables may be especially salient predictors of reading behavior for this age group.

Reading Self-Efficacy Level was related to Getting meaning from the text and sharing those ideas with others, while Reading Self-Efficacy Strength was predictive of

Previewing the Text and inversely related to Reading Difficulties. Interestingly, neither RSEL nor RSES were predictive of the total hours spent reading. As MIA: MSE was more predictive of time spent reading among older adults, it is possible that there are other aspects of memory that are taken into account when choosing to read that may not be captured by the RSEQ.

Overall, there is some support for the notion that affective components such as Anxiety, Achievement, and Self-Efficacy are predictive of the amount of time individuals reading, perception of meaning extracted from text, perception of reading difficulties, and whether the information read gets shared with others. Interestingly, there seem to be stronger relationships between these variables among the older, versus the younger adults. This may provide some support for the notion that beliefs regarding one's ability to perform certain activities are salient determinants the frequency in which those activities are engaged. Because Memory Knowledge was related to behaviors that support the understanding of text for both younger and older adults, it seems that both age groups are on equal footing with respect to knowledge, but that beliefs may affect the execution of that knowledge.

Resource Allocation and Recall Performance: Preliminary Analyses

The purpose of the next section was to answer several major questions. First, this research sought to address whether self-efficacy beliefs influenced the amount of effort allocated to processing texts of varying difficulty. Second, this study sought to examine whether self-efficacy beliefs were related to the amount of information recalled from text and whether this relationship changed as a function of age and difficulty of the text. The third question asked whether or not perceived memory for text was congruent with actual memory for text. Finally, the data should elucidate whether allocation of effort mediated the relationship between self-efficacy and recall performance. These questions will be further elaborated in their specific sections.

In order to assess the effect of self-efficacy on resource allocation and recall performance, participants in each age group were categorized as having either high or low Reading Self-Efficacy (HRSE and LRSE, respectively). These groups were formed by rank-ordering participants according to their average Reading Self-Efficacy Level followed by their average Reading Self-Efficacy Strength (as measured by the Reading Self-Efficacy Questionnaire) and then conducting a median split on these variables. Thus, the Low Reading Self-Efficacy group (LRSE) contained individuals who may have scored a "1" for Reading Self-Efficacy Level (RSEL), but 100% for Reading Self-Efficacy Strength (RSES) as well as those who scored "4" for RSEL, but 40% for RSES. Means and standard deviations for these groups are located in Table 13.

To verify that equivalent groups were created across both difficulty conditions, a 2 (Age) x 2 (RSE Group) x 2 (Condition) ANOVA was conducted, using both RSEL and RSES as dependent variables. Means and Standard deviations are located in Table 13. The overall effect for age was reliable for RSES, $F(1, 148) = 21.42$, $p < .001$, $\omega^2 = .13$, but was not reliable for RSEL, $F(1,148) = 1.78$, $p > .10$, $\omega^2 = .01$. Age interacted with RSE Group, $F(1, 148) = 8.16$, $p < .01$, $\omega^2 = .05$, such that there were no age differences in RSES among those with high RSE, $t(75) = 1.65$, $p > .10$, but LRSE older adults had significantly lower confidence scores than did the LRSE younger adults, $t(77) = 4.42$, $p < .001$. Thus, one should be careful when interpreting effects associated with Low Reading Self-Efficacy. The effects of Condition were not reliable, nor were any of its interactions with Age or Self-Efficacy. Thus, random assignment to difficulty condition produced two groups that were equivalent with respect to Reading Self-Efficacy.

A 2 (Age) x 2 (Condition) x 2 (RSE) ANOVA was also conducted to examine whether differences existed between groups of participants in terms of Age, Education Level, Verbal Ability, and Working Memory Span as a function of Condition. Not

surprisingly, there was a reliable difference between self-efficacy groups in terms of verbal ability, $F(1, 145) = 5.17$, $p < .05$, $\omega^2 = .03$, such that individuals with higher verbal ability were disproportionately represented in the high self-efficacy group ($M_{HRSE} = 25.27$, $SD = 0.82$; $M_{LRSE} = 22.64$, $SD = 0.82$). Unfortunately, the average working memory span was higher among individuals who read the Difficult sentence set compared to those who read the Easy sentence set, ($M_{Diff} = 4.34$, $SD = 0.11$; $M_{Easy} = 3.92$, $SD = 0.11$), $F(1, 145) = 7.43$, $p < .01$, $\omega^2 = .05$. Thus, all of the following analyses involving condition effects were conducted with and without working memory as a covariate.

Table 13.
Reading Self-Efficacy and Ability and Background Measures as a Function of Age, Self-Efficacy Group, and Difficulty Condition.

	Younger Adults				Older Adults			
	High RSE		Low RSE		High RSE		Low RSE	
	Easy $n = 21$	*Difficult* $n = 19$	*Easy* $n = 20$	*Difficult* $n = 22$	*Easy* $n = 20$	*Difficult* $n = 17$	*Easy* $n = 17$	*Difficult* $n = 20$
RSEL	5.00 (0.00)	5.00 (0.00)	4.70 (0.39)	4.34 (0.90)	5.00 (0.00)	5.00 (0.00)	4.42 (1.11)	4.08 (1.03)
RSES	87.29 (7.09)	89.60 (7.07)	73.07 (9.91)	75.46 (12.65)	86.86 (5.25)	84.6 (7.49)	61.94 (10.87)	63.79 (12.25)
Age	19.57 (2.01)	20.00 (4.26)	19.68 (2.77)	19.64 (3.16)	71.45 (6.64)	72.47 (5.08)	73.75 (6.76)	74.35 (5.42)
Education	12.67 (0.86)	12.89 (2.00)	13.26 (1.76)	12.68 (1.15)	15.65 (2.32)	16.65 (2.89)	15.06 (1.88)	15.30 (2.64)
Verbal	16.52 (6.29)	16.50 (7.80)	17.45 (6.01)	14.29 (4.28)	31.81 (7.96)	36.24 (7.69)	27.84 (7.07)	30.98 (9.08)
WM Span	4.09 (0.80)	4.97 (1.26)	4.81 (1.18)	4.79 (1.17)	3.55 (0.66)	3.86 (0.98)	3.21 (0.75)	3.73 (0.53)

Note. RSEL = Reading Self-Efficacy Level. RSES = Reading Self-Efficacy Strength. Verbal = Verbal ability. WM = Working Memory. Means are presented with standard deviations in parentheses ( ).

Resource Allocation

Data Trimming

To assess the extent to which resources were allocated to text processing, reading times for each word were collected. Raw reading time data were screened for extreme values prior to analysis. For each sentence set, outliers were defined as any value that fell five standard deviations above an individual's mean reading time and were replaced with this upper limit. Using this criterion, extreme scores caused by non-reading activities (e.g., lapses in attention, attention to distractions) were taken into account while preserving the natural variability of individual reading times. This trimming process resulted in replacement of 0.78% of the data for the older adults and 0.76% of the data for the younger adults.

Regression Analyses

Linear regressions were conducted to assess the extent to which resource allocation to text processing demands predicted reading time. As previously described, variables representing the number of syllables per word, log word frequency, and whether the word represented a new concept, intrasentence boundary, or sentence boundary were regressed onto the reading times for each participant in each condition for each age group (Lorch & Myers, 1990) for the target texts. Thus, one regression equation was computed for each participant, with $n = 432$ in the target sentence set. Beta coefficients were screened for outliers within condition for each age group, and values that exceeded the mean by 2.5 standard deviations were replaced with the mean for the group. T-tests indicated that all beta coefficients were significantly greater than zero, for all $t(155)$, $p < .001$. Means and standard deviations are provided in Table 14.

Table 14.
Resource Allocation Parameters as a Function of Age and Condition for Target texts.

	Younger Adults				Older Adults			
	High RSE		Low RSE		High RSE		Low RSE	
	Easy	Difficult	Easy	Difficult	Easy	Difficult	Easy	Difficult
Adjusted R^2	.20	.25	.25	.22	.25	.28	.26	.28
	(.14)	(.19)	(.18)	(.12)	(.16)	(.13)	(.19)	(.18)
Constant	448	529	469	411	597	669	684	559
	(118)	(204)	(187)	(341)	(307)	(489)	(587)	(398)
# Syllables	56	67	65	64	79	73	40	105
	(28)	(63)	(46)	(80)	(113)	(85)	(80)	(88)
Log Word	-18	-23	-15	-17	-23	-13	-19	-16
Frequency	(23)	(38)	(28)	(29)	(63)	(55)	(48)	(53)
New	40	26	29	38	94	136	159	111
Concepts	(58)	(107)	(101)	(121)	(146)	(124)	(241)	(151)
Intrasentence	96	215	146	188	262	379	247	281
Boundary	(115)	(248)	(145)	(236)	(313)	(299)	(235)	(264)
Sentence	820	1331	858	1253	1975	2837	2673	2087
Boundary	(937)	(1680)	(804)	(1529)	(2486)	(3024)	(3465)	(2135)

Note. Means are presented with standard deviations in parentheses ( ). Coefficients given in milliseconds (ms)

A 2 (Age: Young, Old) x 2 (Reading Self-Efficacy: High, Low) x 2(Condition: Easy, Difficult) multivariate ANOVA was conducted using Age, Reading Self-Efficacy, and Condition as between-subjects fixed-factor variables and regression coefficients for the resource allocation variables for the Target sentence set as dependent variables.

There were no effects of Age, Reading Self-Efficacy, or Condition on the proportion of variance accounted for in the reading times by the resource allocation parameters (Adjusted R^2; $M = 0.25$, $SE = 0.01$). Regression constants (expressed in milleseconds, ms), which reflect sensorimotor time as well as resource allocation to processes that are not reflected by our set of text variable, were affected by Age, $F(1, 156) = 8.37$, $p < .01$. The *y*-intercepts for older adults were greater than those of the

younger adults (M_O = 623, SD = 443; M_Y = 462, SD = 230), suggesting that older adults may have not have been as fast as the younger adults in their response time.

There were several other effects of Age on the allocation parameters. Older adults allocated more time to processing new concepts than did the younger adults, $F(1,156) = 17.35$, $p < .001$ (M_O = 123, SD = 168; M_Y = 33, SD = 98). Older adults also spent more time engaged in wrap-up processes than did younger adults at the intrasentence boundary, (M_O = 290, SD = 280; M_Y = 160, SD = 196), $F(1,156) = 11.66$, $p < .001$, and at the sentence boundary (M_O = 2364, SD = 2751; M_Y = 1054, SD = 1287), $F(1,156) = 15.02$, $p < .001$.

The main effect of Reading Self-Efficacy was not reliable for any of the resource allocation parameters, all $F(1, 148) < 1.00$. T-tests conducted to test the *a priori* hypothesis that resource allocation to wrap-up processes would be greater among those with high reading self-efficacy failed to reveal any significant effects.

There was an effect of Condition on resource allocation to wrap-up processes at intrasentence boundaries, $F(1,156) = 4.12$, $p < .05$, in that individuals allocated more time to wrap-up processes after reading comparatively more difficult texts (M = 260, SD = 266) than after reading comparatively easier texts (M = 184, SD = 222). This pattern did not change as a function of age, as both younger and older adults responded to the increase in text difficulty in a similar manner, $F<1$ for the interaction at the intrasentence boundary and the sentence boundary.

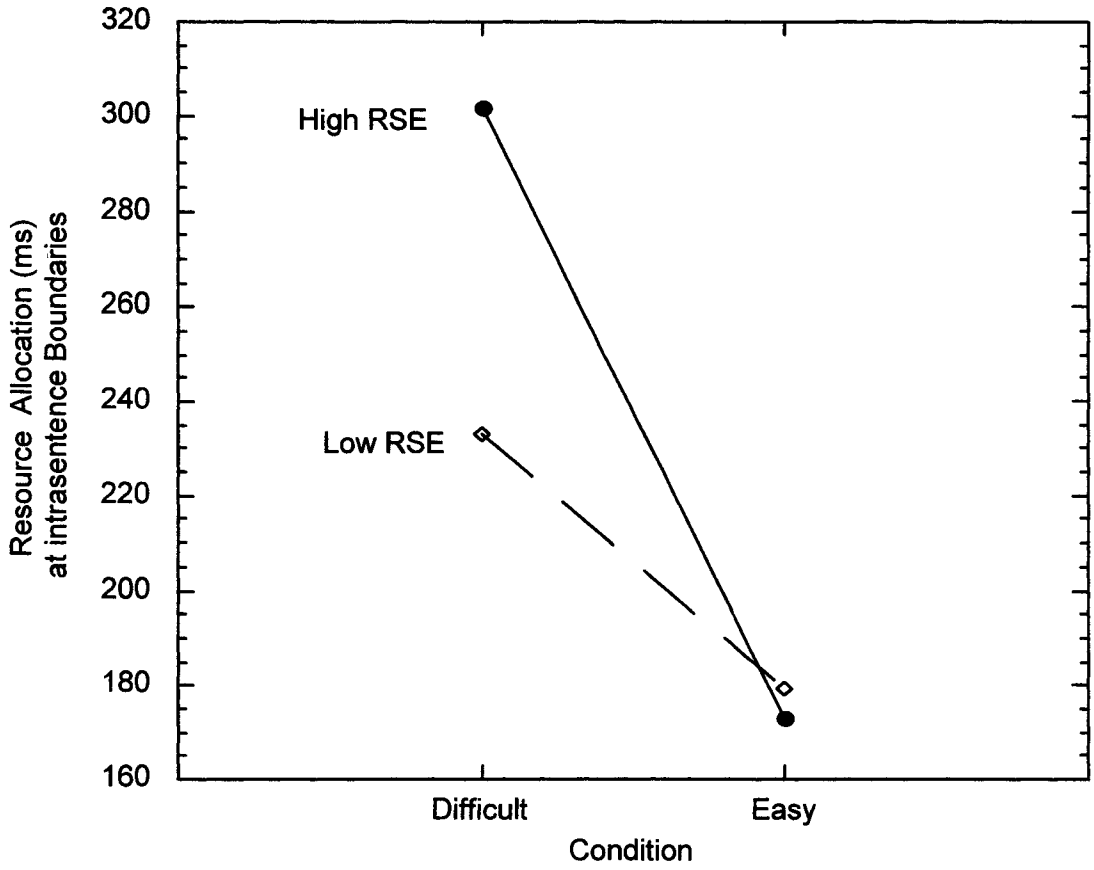
Controlling for working memory span did not alter the patterns of results significantly. The y-intercept for the regression equation was still greater for older adults than for younger adults, $F(1, 144) = 4.52$, $p < .05$, $\omega^2 = .03$. Older adults also spent more time processing New Concepts, $F(1, 144) = 17.99$, $p < .001$, $\omega^2 = .11$, and more

time engaged in wrap up processes at both the intrasentence, $F(1, 144) = 11.62$, $p < .001$, $\omega^2 = .08$ and sentence boundaries, $F(1, 144) = 13.75$, $p < .001$, $\omega^2 = .09$.

The effect of Condition on resource allocation to wrap-up at the intrasentence boundaries dropped to a marginal level of significance, $F(1, 144) = 3.71$, $p = .056$, $\omega^2 = .03$. However, because it was predicted a priori that individuals with high levels of self-efficacy would allocate more time to wrap-up processes than those with low levels of self-efficacy, post-hoc comparisons were conducted. As seen in Figure 3, the results indicated that individuals with strong self-efficacy beliefs allocated more time to processing Difficult texts, $F(1,173) = 4.06$, $p < .05$, than did those with weaker self-efficacy beliefs, $F(1,174) = 1.10$, $p = .30$. This supports the hypotheses that self-efficacy beliefs influence effort, and that individuals with high self-efficacy are more persistent in their efforts when faced with challenge.

It was expected that those with lower levels of self-efficacy would either maintain or reduce processing resources after encountering difficulty. However, the data here do not support that part of the hypothesis. In this sample, individuals with lower levels of reading self-efficacy also increased their efforts to processing the target texts after encountering difficult texts, albeit to a lesser extent than those with higher self-efficacy levels.

Figure 3. Resource Allocation at Intrasentence Boundaries as a function of Reading Self-Efficacy and Condition.



With respect to age, these results collectively show that older adults spent more time engaged in textbase processing than the younger adults, possibly as a compensatory strategy. That is, older adults, who presumably have smaller working memory capacities, may be wrapping-up more often in order to process language in smaller "chunks" and reduce processing load. There was an effect of Condition on resource allocation, which was still present even after controlling for working memory. The fact that both older and younger readers responded similarly to the difficulty manipulation by increasing their resource allocation on target texts after reading Difficult texts suggests that both age groups were sensitive to changes in the text and changed their reading strategy in response.

Although there was no main effect of Reading Self-Efficacy on resource allocation, the presence of the Reading Self-Efficacy by Condition interaction provides partial empirical support for self-efficacy theory. In this case, individuals who were high in Reading Self-Efficacy responded to the challenge presented by comparatively difficult texts by increasing their efforts to processing the text. However, individuals who indicated lower levels of Reading Self-Efficacy did not change their reading strategy significantly.

Beliefs and Resource Allocation.

To simplify the analyses between background and ability measures, beliefs, reading habits and patterns, resource allocation and recall performance, the resource allocation parameters for the Target texts were standardized (z-transformation) and combined into two scales. Word Level comprised parameters representing word length (# of syllables) and word frequency, and the Textbase Level scale was composed of parameters for new concepts, intrasentence boundary and sentence boundary. The reliability coefficient for the word Level scale was quite low (Cronbach alpha = 0.48), whereas reliability for the Textbase level scale was much higher (Cronbach alpha = 0.78). The rationale for combining these variables in this manner is theoretically driven rather than statistically driven. The intercorrelations between variables are provided in Table 15.

Table 15.
Intercorrelations Between Ability and Background Measures, Beliefs, Reading Patterns and Behaviors, Recall Performance, and Resource Allocation.

	Younger Adults		Older Adults		All	
	W	TB	W	TB	W	TB
Individual Differences						
Age	-.08	-.11	.04	.01	.07	.30 ***
Education	-.06	-.13	-.08	-.14	-.02	.07
Verbal Ability	-.03	-.04	.14	-.04	.11	.20 *
Working Memory	.05	.07	.19	.14	.06	-.07
Beliefs						
MIA MSE	-.13	-.02	.08	.01	-.03	-.13
MIA MK	.07	.03	-.06	.12	.00	.04
MIA Affect	-.25 *	-.21 †	.12	-.07	-.01	-.05
RSEL	-.17	-.07	-.08	.06	-.11	.00
RSES	-.09	.07	.02	-.05	-.04	-.09
Reading Habits						
Total hours reading	-.05	.00	.17	.03	.09	.10
Read for Education	-.02	-.06	-.02	.00	-.04	-.15 †
Read for Enjoyment	-.10	.03	.01	-.01	-.02	.10
Reading Behaviors						
Preview Text	-.03	.00	-.23 *	-.15	-.15 †	-.07
Word Identification	-.04	.06	-.13	-.27 *	-.11	-.18 *
Getting Meaning	.18	.11	-.10	-.02	.00	-.03
Reading Difficulties	-.01	.09	.14	.20 †	.08	.15 †
Sharing/Relating	.07	.03	.01	-.09	.04	-.02

Note. W = Word Level Scale. TB = Textbase Level Scale. MIA = Metamemory in Adulthood Questionnaire. MSE = Memory Self-Efficacy. MK = Memory Knowledge. RSEL = Reading Self-Efficacy Level; RSES = Reading Self-Efficacy Strength. † $p \leq .10$. * $p \leq .05$. ** $p < .01$. *** $p < .001$.

Among the entire sample, allocation to both word-level and textbase-level processing was generally unrelated to ability, beliefs, and reading habits. There were isolated relationships between reading behaviors and resource allocation, in that textbase processing was negatively related to word identification behaviors for the whole sample, and for older adults in particular. It is plausible that textbase processes, which presumably are associated with creating a coherent representation of the text, would be negatively related to word identification behaviors.

Resource allocation to textbase-level processes was related to recall performance for both age groups separately and for the entire sample, suggesting that allocation to conceptual activation and integration and wrap-up processes at sentence boundaries is supportive of memory for text. Word-level processes were also related to recall performance, but only in the young adult sample. This offers some support for the notion that certain word-level processes may become more automatic with age (LaBerge & Samuels, 1974).

Recall Performance

Text Memory.

As noted earlier, participants' recall protocols were audio-taped during the experimental session and later transcribed. Of the 156 audio-taped recall protocols, all data for six participants (five younger, one older) and data from at least one sentence set for eight participants (five from Moderate - Baseline, three from Moderate - Target) were lost due to equipment malfunction or experimenter error. The remaining protocols were scored using a gist criterion (Turner & Greene, 1978), in which the recall protocols are compared to the original textbase to determine whether the "gist" of each of the propositions was expressed in the recall protocol. Using this criterion, generalizations or overspecifications (e.g., using "bird" to refer to a "bunting") were scored as correct. If a participant made an error and incorrectly identified one of the arguments or relations and that error was repeated or carried over to another subordinate proposition, then the subordinate proposition was considered correct in order to avoid double-penalizing the participant.

One rater scored all of the recall protocols. Two trained raters independently scored twenty randomly selected protocols, 10 from among the younger adults and 10 from among the older adults (five from each age group contained "easy" sentences, and five contained "difficult" sentences). Overall, agreement between the raters ranged from

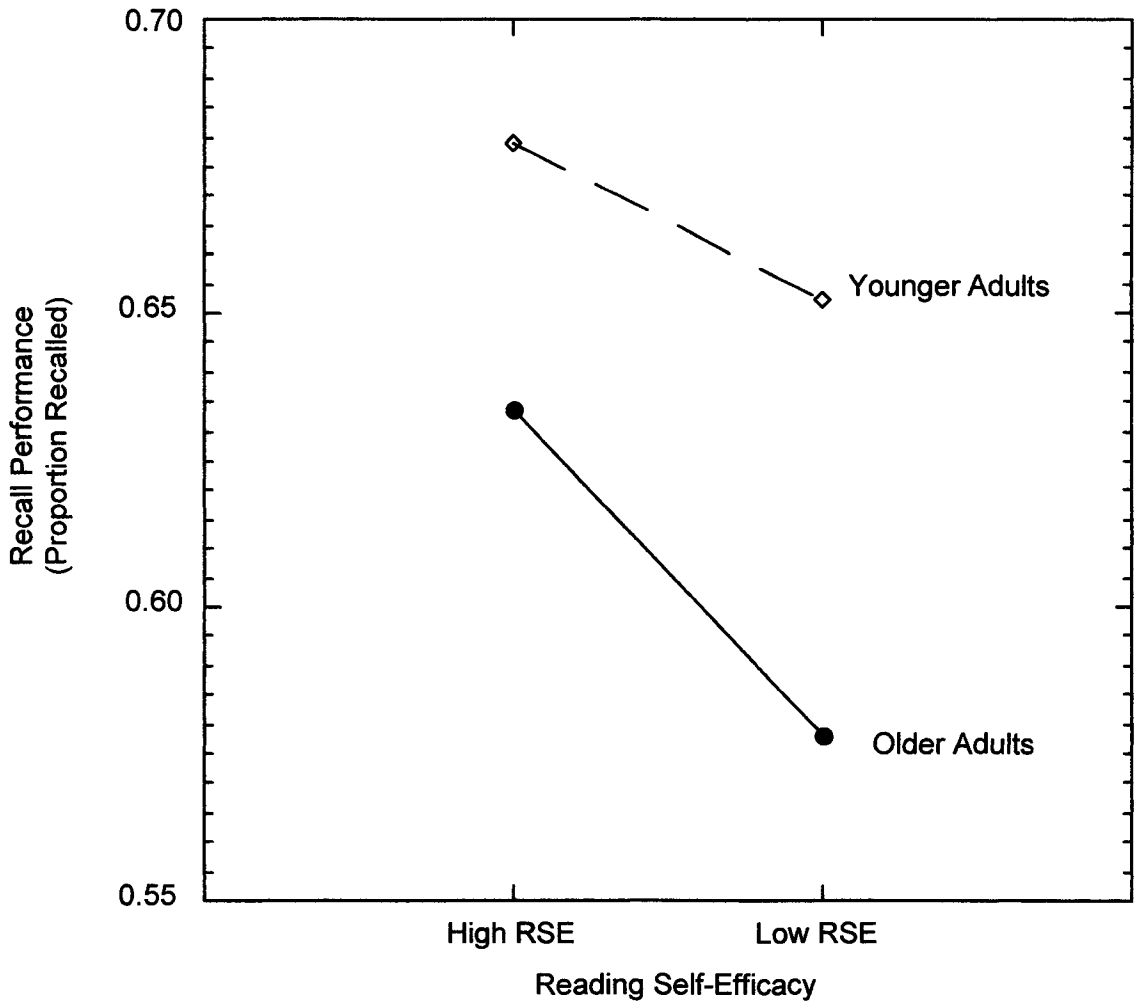
0.93 to 0.95. An individual's score reflects the number of propositions correctly recalled divided by the total number of possible propositions for any sentence.

A 2 (Age: Young, Old) x 2 (Self-Efficacy: High, Low) x 2(Condition: Easy, Difficult) univariate analysis of variance (ANOVA) was conducted on recall performance for the Target sentence set. In this analysis, working memory was not used as a covariate. The main effect of Age was reliable, in that younger adults recalled more of the semantic content of the sentences than did the older adults for the target texts (M_O =.61, SD = .14; M_Y = .67, SD = .13), $F(1, 137) = 7.43$, $p < .001$, $\omega^2 = .05$. The effect of Self-Efficacy was marginal, $F(1,137) = 3.29$, $p = .07$, $\omega^2 = .23$, in that those with reading high self-efficacy beliefs tended to recall more from the text (M = .66, SD = .13) than did those with lower levels of self-efficacy (M = .62, SD = .14). The Age and Self-Efficacy interaction was not reliable, $F(1,137) = 1.14$, $p > .25$, $\omega^2 = .01$. The effect of Condition was marginal, $F(1,137) = 3.04$, $p = .08$, $\omega^2 = .02$, with individuals recalling more of the semantic content of the target texts after reading difficult sentences (M = .66, SD = .13) than after reading easier sentences (M = .62, SD = .14). However, it is possible that this was driven by the fact that individuals in the difficult condition had higher working memory capacities than did those in the easy condition. Condition did not interact with Reading Self-Efficacy, $F(1,137) = 1.68$, $p > .19$, $\omega^2 = .01$.

As previous analyses found that a disproportionate number of individuals with high working memory capacities were inadvertently placed in the Difficult condition, analyses were repeated using working memory span as a covariate. The main effect of Age was no longer reliable after controlling for this variable, $F(1, 133) < 1$, $p > .85$, $\omega^2 = .00$. The effect of Condition was also eliminated, $F < 1$, suggesting that the higher levels of recall performance exhibited in the Difficult condition previously may have been due to the higher working memory capacities of the participants in that condition.

Interestingly, the effect of Reading Self-Efficacy became significant, $F(1, 133) = 4.65$, $p < .05$, $\omega^2 = .03$. Those high in RSE recalled more from the text ($M = .66$, $SE = .01$) than did those lower in RSE ($M = .62$, $SE = .01$). *A priori* tests were conducted to test the hypotheses that the relationship between Age and text memory should vary as a function of Reading Self-Efficacy. As seen in Figure 4, the data revealed that older adults high in reading self-efficacy recalled slightly more of the text than did those low in reading self-efficacy, $F(1,65) = 3.52$, $p = .065$. However, among younger adults there was no significant difference in the amount of information recalled by those with either higher or lower levels of Reading Self-Efficacy, $F(1,171) < 1.00$. However, it is important to consider that older individuals in low self-efficacy group had significantly lower reading self-efficacy strength scores than did those with low reading self-efficacy in the younger adult group. Therefore, it is difficult to discern whether these data are the result of group differences or phenomena related to reading self-efficacy. Although future work is needed to disentangle these possibilities, these results offer tentative support for the notion that self-efficacy beliefs may contribute more to performance for the older adult age group.

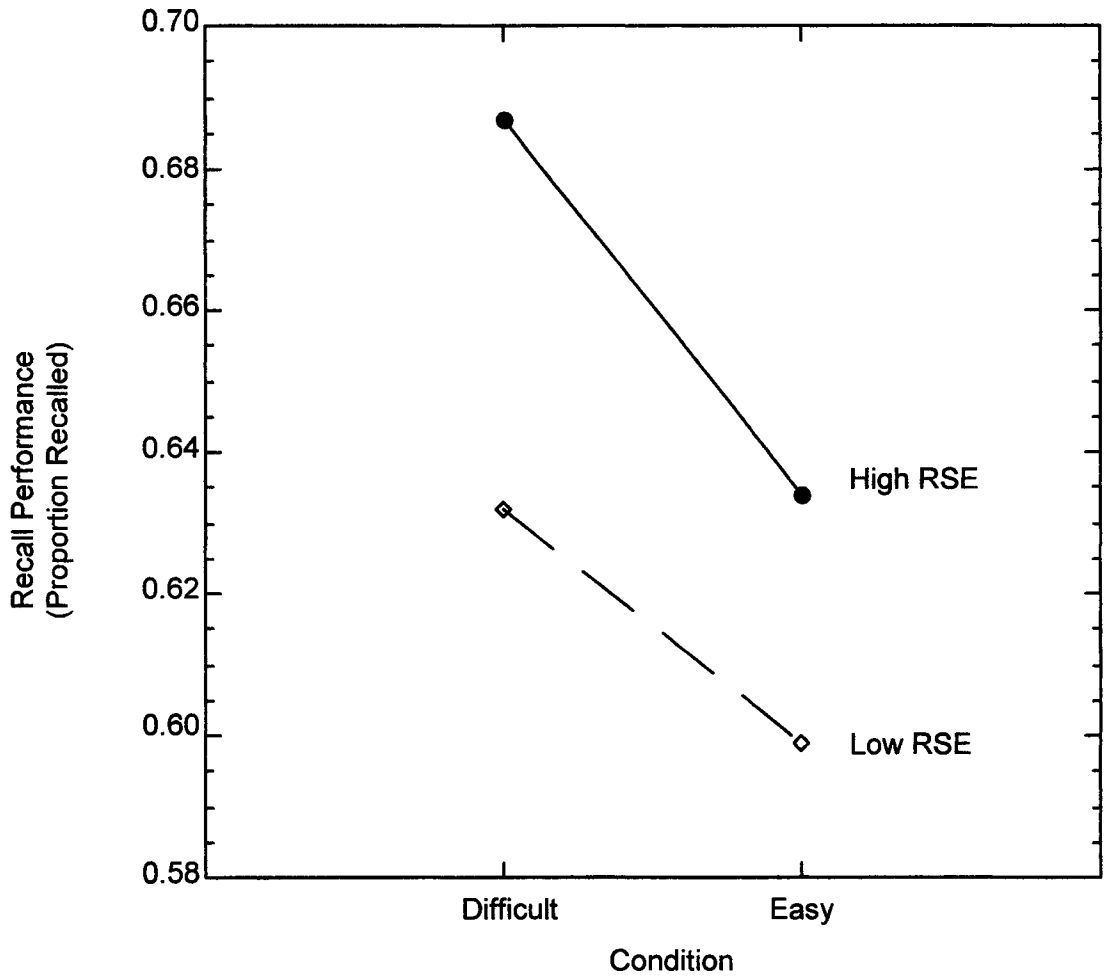
Figure 4. Recall performance as a function of Age and Reading Self-Efficacy.



A priori tests were also conducted to investigate the Reading Self-Efficacy by Condition interaction, as it was predicted that those with high levels of Reading Self-Efficacy would recall more of the text in the Difficult condition than those with low levels of Reading Self-Efficacy. As illustrated in Figure 5, there was a marginal difference in the amount recalled from the target texts after individuals read Difficult texts between those with High and Low Reading Self-Efficacy, $F(1,67) = 3.49$, $p = .066$. However, there were no differences in recall performance among those with High and Low RSE after Easy texts were read, $F(1,69) = 1.68$, $p = .20$. Interestingly, these results are very

similar in pattern to those found in Figure 3. It is possible that the extra time allocation to conceptual integration processes among those with High Self-Efficacy in the Difficult condition was productive, such that it afforded better recall performance.

Figure 5. Recall performance as a function of Condition and Reading Self-Efficacy.



No other effects of interactions were significant, including the *a priori* tests of the three-way interaction between Age, Reading Self-Efficacy, and Condition. Overall, the data provided support for the hypotheses that (a) individuals with higher reading self-efficacy recalled more from the text than those with lower levels of self-efficacy, (b) those

with high levels of self-efficacy recalled more from the target texts after reading difficult texts, and (c) there is some evidence that there may be greater difference in recall performance between those with high and low reading self-efficacy among older adults versus younger adults.

Predicted versus Actual Recall Performance.

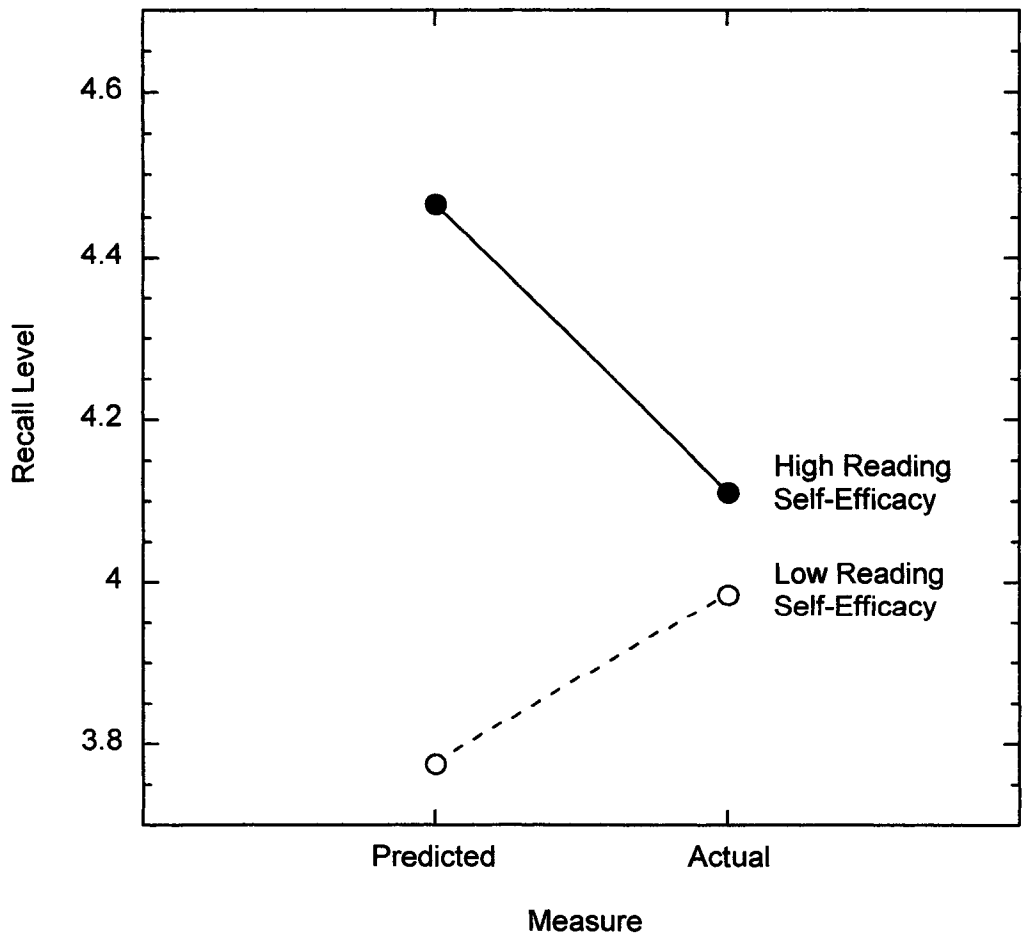
Task choice may be influenced to the extent that individuals feel that they are able to perform a task successfully. To assess metacognitive accuracy, actual recall performance was compared to predicted recall performance. Some literature shows that older adults tend to overestimate their recall performance, while younger adults tend to underestimate their performance on make accurate predictions (Bruce, Coyne, & Botwinick, 1982; Lachman & Jelalian, 1984; Berry, West, & Dennehey, 1989). Thus, the results of this study were expected to repeat that pattern. Self-Efficacy theory would argue that individuals with high self-efficacy would also tend to overestimate performance, while those with lower levels of self-efficacy would either underestimate or be accurate in their predictions.

Older and younger adults made performance predictions prior to reading each sentence set using an on-line version of the Long Sentence Scale of the RSEQ; this provided an indication of the percentage of the ideas from the sentences that individuals thought they would be able to remember immediately after reading the sentence. Although measures were put into place in order to facilitate completion of this task (e.g., the "Y" and "N" keys were designated with fluorescent yellow stickers), some participants inadvertently struck the incorrect keys, and so their responses were not recorded. This resulted in a loss of 8.11% of the data for the older adults and 1.83% loss for the younger adults (both RSEL and RSES combined).

To facilitate comparisons, predicted recall made with at least 50% confidence and actual recall were recoded on a 5-point scale, such that 5 = "more than three-

quarters of the ideas" = 75 – 100%, 4 = "up to three-quarters" = 51 – 75%, 3 = "up to half" = 26 – 50%, 2 = "up to a quarter" = < 25%, and 1 = "at least one idea". Since all participants recalled an average of at least one proposition per sentence, a "1" was used to represent anything less than 25%. Thus, if a participant predicted that s/he would be able to remember "more than three-quarters of the ideas from the sentence..." (i.e., responded "yes" to the most difficult task on the hierarchy with at least 50% confidence), then he or she was assigned a "5" for predicted recall. If that individual then recalled an average of 65% of the ideas from the target sentence set, he or she was assigned a "4" for actual recall performance.

Figure 6. Predicted versus Actual Recall Performance as a Function of Reading Self-Efficacy Level.



A 2(Age) x 2 (Reading Self-Efficacy) x 2 (Condition) x 2 (Measure: Actual recall, Predicted recall) repeated-measures ANOVA revealed an effect of Self-Efficacy on predicted recall, $F(1, 130) = 11.15$, $p < .01$, $\omega^2 = .08$, such that individuals with high Reading Self-Efficacy predicted that they would recall significantly more of the material from the sentences than did individuals with Low Reading Self-Efficacy ($M_{HRSE} = 4.30$, $SE = .09$; $M_{LRSE} = 3.89$, $SE = .09$). Self-Efficacy also interacted with measure, $F(1,130) = 9.44$, $p < .01$, $\omega^2 = .07$. These same results held even when working memory was used as a covariate; for Self-Efficacy, $F(1,126) = 11.18$, $p < .001$, $\omega^2 = .08$; for the Self-Efficacy by Measure interaction, $F(1, 126) = 8.22$, $p < .01$, $\omega^2 = .06$. Figure 6 illustrates these effects with working memory as a covariate. Post-hoc analyses revealed that those in the High Self-Efficacy group significantly overpredicted their actual performance, $t(67) = 3.09$, $p < .01$. There was a trend for those in the Low Reading Self-Efficacy Group to underpredict their actual recall level, although this difference was not reliable, $t(69) = 1.66$, $p = .10$.

These results provide support for the idea that the beliefs that one has regarding ability may cause that individual to make judgments of performance that are congruent with beliefs. That is, individuals who have a strong belief in their capacity to perform a task may overestimate their performance levels, whereas those with low self-efficacy will underestimate or be accurate in their estimation of their potential performance (e.g., Taylor & Brown, 1988). These data suggest that beliefs in one's ability to perform a task may not be veridical with respect to actual ability. Although there is a correlation between memory and beliefs, these beliefs may serve to exaggerate the reality.

Background and ability measures, beliefs, reading habits, patterns, and behaviors, and Recall Performance.

The correlations between background and ability measures, beliefs and reading habits, patterns, and behaviors and recall performance were examined as a function of Age. Correlations are provided in Table 16.

Table 16.
Background and Ability Measures, Beliefs, and Reading Habits, Patterns, and Behaviors as Predictors of Recall Performance as a Function of Age.

	Younger Adults	Older Adults	All
Individual Differences			
Age	.04	-.29 *	-.24 **
Education	-.03	.33 **	.03
Verbal Ability	.46 ***	.41 ***	.13
Working Memory	.46 ***	.38 ***	.47 ***
Beliefs			
MIA MSE	.17	.00	.17 *
MIA MK	.05	-.01	.04
MIA Affect	-.14	.10	-.05
RSEL	.11	.33 **	.24 **
RSES	.09	.16	.17 *
Reading Habits			
Total hours reading	.05	.05	-.04
Read for Education	-.08	.26 *	.13
Read for Enjoyment	.13	-.05	-.09
Reading Behaviors			
Preview Text	.00	-.14	-.10
Word Identification	-.04	-.25 *	-.13
Getting Meaning	-.05	.07	.04
Reading Difficulties	-.20 †	-.21 †	-.21 *
Sharing/Relating	-.08	-.01	-.07

Note. MIA = Metamemory in Adulthood Questionnaire. MSE = Memory Self-Efficacy. MK = Memory Knowledge. RSEL = Reading Self-Efficacy Level; RSES = Reading Self-Efficacy Strength. † $p \leq .10$. * $p \leq .05$. ** $p < .01$. *** $p < .001$.

As is often found in the cognitive aging literature, age was negatively related to recall performance (Lusczc, 1993; Rice & Meyer, 1986; cf. Johnson, 2003); this

relationship was reliable within in the older adult group alone. Both working memory capacity and verbal ability were moderate predictors of recall performance for both younger and older adults. Several studies have found that verbal ability is a salient predictor of recall performance, and in some cases, age differences in recall performance have been mitigated when old adults of higher verbal ability are compared to younger adults of average verbal ability (Dixon, Hultsch, Simon, & von Eye, 1984; Meyer & Rice, 1983). Although the older adults in our study were of high verbal ability compared to the younger adults, it was not enough the mitigate age differences in recall performance.

Some researchers have found that the Affective dimensions of the MIA (e.g., Achievement, Anxiety) were predictive of recall performance among older, but not younger adults (e.g., Cavanaugh & Poon, 1989; Dixon & Hultsch, 1983b). Other researchers have found that Memory Knowledge (comprising Strategy and Task subscales of the MIA) are also predictive of recall performance (Dixon & Hultsch, 1983b; Hertzog, Dixon, & Hultsch, 1990). The data here do not support those findings, as neither Memory Affect nor Memory Knowledge was predictive of recall performance in either age group or across the entire sample.

Memory Self-Efficacy was a weak predictor of recall performance for the whole sample, although the magnitude of this relationship was slightly more attenuated compared to those typically found by others using the MIA to predict recall performance (Cavanaugh & Poon, 1989; Hertzog, Dixon, & Hultsch, 1990; Lusczc, 1993). As self-efficacy beliefs are thought to be task- and situation- specific ability judgments, it was predicted that the Reading Self-Efficacy Questionnaire would be more strongly related to recall performance than the more general memory self-efficacy measures. The data here offer partial support to that hypothesis: Reading Self-Efficacy Levels did exhibit a stronger relationship with recall performance than did the MIA Memory Self-Efficacy

Scale, but the correlation between Reading Self-Efficacy Strength and recall performance was the same as that between memory self-efficacy and recall. Thus, these findings offer limited support for the idea that domain-specific self-efficacy instruments are more predictive than general measurements.

In their investigations of reading habits and behaviors, Rice and colleagues found significant relationships between total time spent reading and recall performance (Rice & Meyer, 1986; Rice, Meyer, & Miller, 1988). Although the data here did not indicate a relationship between total hours reading and recall performance, the data did reveal significant correlations between Reading for education (i.e., "need to know information") and recall performance on the Media Habits Consumption Questionnaire, which lends support to previous conclusions that individuals who read for educational purposes (presumably obtaining information for later use) may engage in qualitatively different reading behaviors that are supportive of memory for text, more so than those who read for other reasons (Rice & Meyer, 1986; Stine-Morrow et al., 1996).

Mediation Analysis

According to Bandura (1986; 1997), self-efficacy beliefs influence performance via effort. That is, individuals with high self-efficacy allocate more effort to the task at hand, which in turn produces superior performance. In this study, Bandura's model (1977; 1997) was tested within the domain of discourse processing.

According to Baron & Kenney (1986), there are three conditions necessary to demonstrate mediation by an intervening variable: 1) the independent variable (RSE) is related significantly to the dependent variable (Text Recall); 2) the independent variable (RSE) is related significantly to the intervening variable (Resource allocation/Effort); and c) the intervening variable (Resource Allocation/Effort), residualized with respect to the independent variable (RSE), is related significantly to the dependent variable (Text Recall). Total mediation would be indicated in the case in which the independent

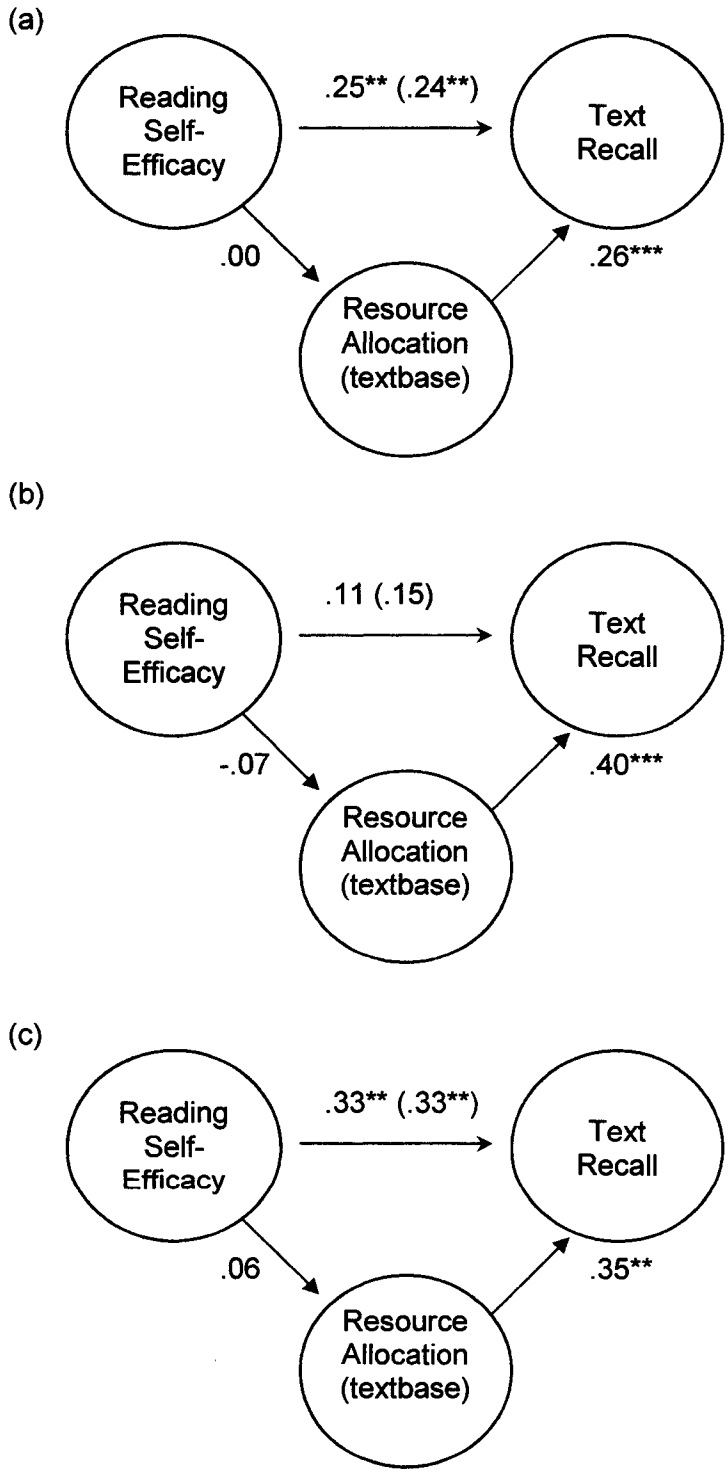
variable (RSE), residualized with respect to the intervening variable (Resource allocation/Effort), is not related significantly to the dependent variable (Text recall). Partial mediation would be evinced by an attentuation of this relationship.

Despite the fact that the data from this study does not meet the necessary requirements for a mediational analysis (i.e., reading Self-Efficacy is not related to resource allocation), the analysis was conducted to test the *a priori* hypotheses that resource allocation would mediate the self-efficacy-performance relationship. As illustrated by the path analysis in Figure 7, even though recall performance was predicted by both Reading Self-Efficacy Level and resource allocation to textbase-level processing, the correlation between Reading Self-Efficacy and Recall Performance, controlling for resource allocation, was virtually the same as the bivariate correlation. Thus, the data do not provide any support for the notion that effort, as measured by these variables, mediates the relationship between reading self-efficacy and memory for text for the whole sample (Figure 7a) or for each individual age group (Figures 7b and 7c for younger and older adults, respectively).

Alternative, it is possible that "effort" in reality does mediate the relationship between self-efficacy beliefs recall performance. The important caveat to note is that effort in this study was operationalized as resource allocation to conceptual integration at intrasentence and end of sentence boundaries. Some evidence suggests that older adults may differentially rely on situation model information during discourse processing (e.g., Morrow, Stine-Morrow, von Leirer, Andrassay, & Kahn, 1997; Radvansky et al., 2001), and so it is possible that older adults were using background knowledge to assist them in their sentence processing. As the Reading Self-Efficacy Questionnaire was developed to assess beliefs regarding the ability to read and *remember* information, it is also possible that a significant amount of effort was allocated during the recall process. Thus, it is possible that the definition of effort used in this study did not represent all the

possible venues in which effort was allocated. Future research should consider measuring these alternative variables.

Figure 7. Mediational relationship between Reading Self-Efficacy, Resource Allocation, and Text Recall for (a) the entire sample, (b) younger adults, and (c) older adults. Partial correlations are presented in parentheses ( ).



Regression Analyses.

Regression analyses were conducted to determine whether a domain-specific measure of self-efficacy beliefs (i.e., the Reading Self-Efficacy Questionnaire) was a better predictor of text recall performance than the broader, domain-general measure of self-efficacy beliefs (i.e., the higher-order Memory Self-Efficacy factor of the MIA). Based on the literature (e.g., Bandura, 1997; Lachman, 1986), it was predicted that the domain-specific measure would account for more variance in recall performance than the more general measure.

Table 17 provides data for two stepwise regression models. Model 1 in both panels (a) and (b) are the same, and provide the data for a regression analysis that was conducted in which working memory scores (WM) and vocabulary scores were entered on the first step and Age was entered on the second step as predictors of recall performance. This model (Model 1) had an adjusted $R^2 = 0.35$. Working Memory, Vocabulary, and Age all make significant, independent contributions to recall performance.

In Model 2 (panel a, left side) represents a regression model in which Memory Self-Efficacy (as measured by the Metamemory in Adulthood Questionnaire) was also added on the first step in addition to the other ability variables. The regression coefficient for this variable was not significant, and did not make a significant contribution to the amount of explained variance in recall performance. In fact, the portion of unique variance explained by this set of parameters was actually reduced slightly (adjusted $R^2 = 0.33$) by the inclusion of this variable. However, the beta coefficient for Reading Self-Efficacy Level was significant. There was also a significant increase in the proportion of the unique variance explained by this set of variables (adjusted $R^2 = 0.37$).

Table 17. Regression analyses to test the relative contribution of (a) Memory Self-Efficacy (measured by the MIA) and (b) Reading Self-Efficacy Level (measured by the RSEQ).

(a)

Model	Stand β Coeff	t	Sig
1			
(Constant)		8.47	.000
WM	.301	3.67	.001
Verbal	.598	5.52	.000
Age	-.551	-4.54	.000
2			
(Constant)		4.29	.000
WM	.288	3.14	.001
Verbal	.597	5.38	.000
MIA: MSE	.042	.054	.591
Age	-.531	-4.08	.000

(b)

Model	Stan β Coeff	t	Sig
1			
(Constant)		8.47	.000
WM	.301	3.67	.001
Verbal	.598	5.52	.000
Age	-.551	-4.54	.000
2			
(Constant)		4.29	.000
WM	.288	3.14	.001
Verbal	.597	5.38	.000
RSEL	.179	2.63	.010
Age	-.491	-4.06	.000

Thus, it appears as though Reading Self-Efficacy Level, which was a domain-specific measure, was able to explain a significant portion of the variance in recall performance, whereas the global measure of Memory Self-Efficacy did not. This provides some evidence that domain-specific measures are preferable to domain-general measures, and may improve predictive ability of researchers.

Critics of self-efficacy theory have often argued that individuals who exhibit high self-efficacy do so because they are often those who have higher cognitive abilities (e.g., higher verbal ability). It was also interesting to note that in this study, both self-efficacy beliefs and ability measures made independent contributions to performance. Thus, this

also provides some evidence that ability and beliefs regarding one's ability may not always be congruent, and may make differential contributions to performance.

Post-Experiment Evaluation

There were no age differences in the amount of effort participants reported putting into reading the sentences carefully, (M_O = 5.81, SD = 1.18; M_Y = 5.59, SD = 0.81), $t(121) = 1.14$, $p > .25$, or into recalling the sentences completely, (M_O = 5.83, SD = 1.13; M_Y = 5.99, SD = 0.79), $t(121) < 1.00$. Older adults rated the sentences are more interesting than did the younger adults, (M_O = 5.49, SD = 1.34; M_Y = 4.87, SD = 1.00), $t(121) = 2.93$, $p < .01$. Older adults were also more motivated to do well on the reading task compared to younger adults, (M_O = 6.51, SD = 0.70; M_Y = 6.03, SD = 0.85), $t(119)$ = 3.37, $p < .01$.

Participants also indicated their reasons for participating in this experiment (they were allowed to check off more than one reason, so values may exceed 100%). Of the younger adults, 52.4% participated in order to receive course credit, 1.2% (i.e., one person) participated to receive money, 28.6% said they were curious to see what the experiment was about, 11.9% wanted to contribute meaningfully to the University, 15% wanted to contribute to science, 26.2% were concerned or wanted to know more about memory and reading, 6% participated because it was suggested to them by a friend or relative, and 1.2% chose "other". Of the older adults, 1.3% (i.e., one person) participated for money, 63.5% participated because they were curious about the experiment, 60.8% wanted to contribute to the University, 56.7% wanted to contribute to science, 71.6% had concerns or wanted to learn more about their memory, 44.6% wanted to learn more about their reading ability, 12.2% participated at the suggestion of a friend or family member, and 10.8% chose "other".

Overall, the majority of the younger adults participated in this experiment because they were *required* to, whereas the majority of the older adults participated

because they *wanted* to. Moreover, the older adults in our sample reported a higher motivation to perform well. Casual conversations with participants provide some qualitative support for these findings; whereas younger adults often expressed that they wanted to complete the tasks in as little time as possible and asked few questions, older adults asked questions regarding instructions or about the study and general research purposes much more often. Although the quantitative data is more compelling, both forms of observations suggest that the older adults in our sample may represent a highly-motivated and selective older adult population.

CHAPTER V

GENERAL DISCUSSION

This project was conducted to examine the relationship between age, self-efficacy beliefs, resource allocation, and memory for text to test whether self-efficacy beliefs influenced the amount of effort individuals allocated to text processing and the amount of information recalled from the text. Moreover, one of the goals of this study was to determine whether the relationship between self-efficacy and effort or performance changed as a function of Age and task Difficulty. To this end, younger and older adults completed several questionnaires to assess their beliefs and reading habits, and then read twenty-four passages for immediate recall after reading either comparatively easier or more difficult texts. Consistent with previous studies, younger adults reported higher memory self-efficacy than did older adults (cf. Berry & West, 1993; cf. Cavanaugh & Greene, 1990). Although younger adults recalled more of the text than did the older adults (cf. Johnson, 2003), this effect became non-significant when working memory was used as a covariate in analyses. Overall, those with high levels of self-efficacy recalled more from the text than those with lower levels of self-efficacy; there is some marginal evidence that this difference was greater for older adults than for younger adults. There was also some evidence to suggest that individuals with high self-efficacy allocated more time to reading and recalled more of the target texts after reading Difficult texts than those with low levels of self-efficacy. Both Effort (i.e., resource allocation to wrap-up processes) and self-efficacy beliefs were related to recall performance for both older and younger adults. However, self-efficacy did not influence allocation of effort.

Implications for Models of Self-Efficacy

Applications of Bandura's (1986; 1997) model of self-efficacy to intellectual functioning among older adults have generally demonstrated that an individual's memory performance is influenced by self-efficacy level, with stronger self-efficacy beliefs contributing to higher recall performance. Several predictions can be made from this model. The first is that that the relationship between self-efficacy beliefs and recall performance is mediated by effort. Second, this model suggests that age differences in recall performance may be moderated by the influence of self-efficacy beliefs.

Mediation.

The data from the present study does not provide any evidence to support the hypothesis that effort mediates the relationship between self-efficacy and recall performance. Although both Reading Self-Efficacy and resource allocation were significant predictors of recall performance, there was no evidence of a relationship between Reading Self-Efficacy and resource allocation. Moreover, there was virtually no change in the correlation between beliefs and recall performance once resource allocation was controlled.

These results are inconsistent with previous studies that have found relationships between beliefs, encoding strategies, and performance among students (Multon et al., 1991) and among older adults (Berry & Strube, 2004; Miller & Gagne, in press). However, there are several differences between those and the current study.

One possibility for the discrepancy in results was the index of effort that was used. In the Berry and Strube (2004) study, total time on task was used as the index of effort. It is possible that the total time captured a level of effort that this study did not. Although this study used specific indices of resource allocation, no significant relationships were found when correlations between median reading times, beliefs, and recall performance were examined. As noted earlier, future researchers should consider

using multiple indices of effort to determine if there is in reality an influence of beliefs on memory performance.

A second possibility for the difference in findings is the nature of the participant sample. Whereas Berry and Strube (2004) specifically recruited older women with self-reported memory difficulties that had little more than a high school education, the older adult sample in this study comprised individuals who responded to advertisements regarding an experiment on "the ability to read and remember information," and the majority had at least a bachelor's degree or higher. In terms of absolute levels, older adults in this sample reported high levels of Reading Self-Efficacy (> 4 on a 5-point scale). Thus, it is possible that the sample in this study was of higher functioning than the one used in the Berry and Strube (2004) study, and therefore the effects of beliefs on effort were more attenuated. While it is plausible that there is an existing relationship that our variables did not capture, it is also plausible that self-efficacy exerts its influence during retrieval, and not during the encoding process.

Difficulty.

Bandura's model (1986; 1997) also predicts that self-efficacy beliefs influence the extent to which individuals persist in the face of difficulty. Based on this theory, it was predicted that individuals with high reading self-efficacy would devote more resources to text comprehension after reading comparatively difficult versus easy texts. Overall, individuals did allocate more resources to textbase processing at intrasentence boundaries after reading difficult texts. There was also some evidence to suggest that this varied as a function of self-efficacy beliefs. These results are similar to the results of Miller and Gagne (in press), who found that older readers with low internal control beliefs withdrew processing resources, whereas high control older adults maintained resource allocation levels despite difficulty.

These data offer some support to Bandura's self-efficacy theory, in that high levels of self-efficacy may allow individuals to persist in the face of difficulty. Alternatively, it is also possible that the results were due to the fact that the older adults in this sample were generally high-functioning and capable. In fact, they did not differ from younger adults in terms of Reading Self-Efficacy Level. It is possible that these older adults, as a whole, represent a group higher in self-efficacy than is typically found. The older adults also reported a higher motivation to do well on the experimental task than the younger adults did, which may have translated to high personal performance goals.

Studies of self-regulation (Dunlosky & Hertzog, 1998; Dunlosky & Thiede, 1998) suggest that individuals enter tasks with a preset "norm of study" that provides standards of learning. When standards are increased, allocation to study time also increases in compensation. As self-efficacy has been found to be positively related to goal setting (Bandura & Wood, 1989; Bandura & Jourden, 1991; Locke, Frederick, Lee, & Bobko, 1984; Wood & Bandura, 1989), it seems plausible that the participants in this study would have high internal standards of performance. Although studies have found that individuals often undercompensate for the time needed to learn material to the desired level (e.g., Dunlosky & Thiede, 1998), individuals both allocated more resources to processing at the intrasentence boundaries and recalled more information from the target texts after reading difficult texts, suggesting that the extra time allocated to wrap-up processing in the difficult condition was used somewhat effectively.

Reading Self-Efficacy

Research often finds that domain- and task- specific measures of beliefs are more predictive of performance than general measures (Bandura, 1982; 1989; cf. Berry & West, 1993; Lachman, 1986). However, research in cognitive aging has thus far used the Metamemory in Adulthood Questionnaire (MIA), which has a general factor of

Memory Self-Efficacy, to predict memory for text. The Reading Self-Efficacy Questionnaire (RSEQ) was created in part to test the hypothesis that a domain- and task-specific measure of reading self-efficacy would be more predictive of text recall performance than the MIA.

In the present study, the RSEQ demonstrated good internal reliability among its subscales. Correlations with MIA Memory Self-Efficacy (MIA: MSE) was moderate, providing some evidence for both discriminant and convergent validity. The correlational data indicated that both Reading Self-Efficacy Strength (RSES) and MIA: MSE are similarly predictive of recall performance, whereas Reading Self-Efficacy Level (RSEL) had greater predictive ability, especially when age groups were considered separately. Moreover, regression analyses indicated that the RSEQ explained a greater portion of the variance associated with recall than did MIA: MSE after ability. Collectively, these data supported the hypothesis that the RSEQ, which predicted memory for text from reading self-efficacy, was a more powerful predictor of text recall than was the MIA: MSE, which predicted memory for text from memory self-efficacy.

The creation of the RSEQ contributes to the cognitive aging literature because it gives researchers an additional instrument in their arsenal of measures in which to investigate the relationship between beliefs and text recall performance among older and younger adults. Moreover, it may also help to resolve some of the inconsistencies found in the metacognitive literature with respect to text recall performance. In the present study, the data indicated that individuals with high RSE tended to overpredict recall performance, whereas those with low RSE tended to underpredict recall performance. To some extent, this suggests that individual's metacognition may depend on their beliefs regarding their ability.

The fact that the RSEQ has both Self-Efficacy Level and Strength components may provide a slight advantage over the Reading Self-Efficacy Instrument used by Shell,

Bruning, and Murphy (1989), which only assessed reading Self-Efficacy Strength for different reading tasks, as the inclusion of both dimensions may prove to make this instrument more sensitive to subtle age differences (Berry et al., 1989).

Despite its strengths, the RSEQ would benefit from several modifications. First, as reading is a multi-faceted domain, it would be worthwhile to increase the scope of reading activities represented on the RSEQ. In this regard, the Shell et al. (1989) instrument is superior, as it requires participants to predict their confidence in performing eighteen different reading activities (e.g., reading an employment application, an employee manual, a philosophical treatise, and an insurance contract). Although not all of these activities lend themselves readily to hierarchical scales, increasing the breadth of reading activities would provide a more complete picture of Reading Self-Efficacy.

Second, it would be informative to increase dimensions of the scale to include self-efficacy for both *remembering* as well as *understanding* information that one has read from various texts. This would help to distinguish those who may have an excellent capacity for more superficial processing (e.g., remembering the main ideas of a philosophical treatise) versus deeper text engagement (e.g., understanding the content well enough to be able to "teach" it to someone else).

Third, different levels of scale difficulty and format should be considered. Berry et al. (1989) and Cervone and Peake (1986) both found that estimates of self-efficacy were greater when task hierarchies presented tasks in descending levels of difficulty (i.e., beginning with the most difficult task first and becoming easier) as opposed to ascending levels. It is possible that the descending format used in this study was responsible for producing generally high Reading Self-Efficacy Levels among both age groups. It is also possible that the most difficult tasks in the hierarchies (e.g., "...remember more than 3/4 of the ideas") were not discerning enough to truly distinguish high Reading Self-Efficacy from Low Reading Self-Efficacy. Indeed,

remembering 3/4 of the ideas, or 75%, roughly translates to a "C" in terms of academic achievement, and is considered easily attainable by many students. This seems to be a common problem, as similar ceiling effects were also found by Shell et at. (1989) with their instrument. Therefore, increasing the task difficulties would most likely improve the predictive ability of the measure.

Reading Habits, Patterns, and Behaviors

Guthrie et al. (1999) argue that in order to fully understand the complexities that underlie one's ability to effectively read and remember discourse, both cognitive factors (e.g., allocation to textbase processing) and non-cognitive factors (e.g., motivation, reading amount, interest) must be considered. One of the goals of this study was to examine whether beliefs regarding reading ability were realized as behavioral patterns in reading activities.

The data suggest that individuals who exhibit higher reading self-efficacy engage in behaviors associated with Previewing Text. As these reading behaviors involve thinking about what the text is about and the purpose for reading, it suggests that those with high reading self-efficacy are more directed in choosing reading as an activity to pursue than those with low self-efficacy.

The relationship between RSEL and Previewing Text was stronger among older adults than in the whole sample. Moreover, the Memory Self-Efficacy and Affect scales of the MIA were both predictive of the total time spent reading. Collectively, these data provide additional support for the idea that older adults' choice of reading activities may be influenced by motivational and affective factors rather than cognitive factors.

More importantly, these data imply that individuals with low reading and memory self-efficacy, and those who may have anxiety associated with reading, will engage in reading behaviors less frequently than their high self-efficacy peers. There is a high possibility that these behaviors will have consequences for future cognitive functioning.

Whether reading tax forms, medical information, or personal letters, the act of reading is a part of everyday life. By avoiding reading, or reducing the amount that one reads, individuals reduce their opportunities for learning and exercise of cognitive abilities. "Such behaviors tend to preclude successful cognitive performance in the future. When cognitive skills fail, the individual's motivation to maintain independence and self-sufficiency is reduced, leading ultimately to increased dependence on others." (Welch & West, 1995, p. 151). Withdrawal from activities also reduces opportunities for mastery experiences, which are also a source of self-efficacy (Bandura, 1997; Berry & West, 1993; Welch & West, 1995). Although more research is needed to ascertain the direction of causality (i.e., do reading habits predict reading self-efficacy, or does reading self-efficacy predict reading habits), it is plausible that finding ways to improve reading self-efficacy or other motivational aspects of reading may help older adults to maintain cognitive functioning.

Limitations and Future Directions

For the most part, the younger adults used in this study were representative of a "typical" university student; however, the inclusion of graduate students added breadth to this sample that is not often seen in other studies involving younger adults as participants. However, the older adults comprised a much more selective sample. Although efforts were made to post advertisements for the study in a broad range of locations to increase visibility to individuals with different backgrounds (e.g., newspapers (local and community), coffeehouses, restaurants, libraries, church choirs), there was a definite volunteerism bias. That is, the older adults who participated in this experiment largely well-educated, active, healthy, and generally very capable. They were highly motivated to perform well, and expressed more altruistic reasons for their participation (e.g., contributing to science; "giving back" to the University or community) than did the younger adults. As previously mentioned, it is possible that the older adults in this study

were more informed or aware of their own memory functioning and abilities than is typically found among older adults.

For both older and younger adults, the majority of this sample was Caucasian. Although the racial composition of the participants was representative of this northeastern seacoast region, racial diversity is significantly underrepresented when compared to national statistics (U.S. Census Bureau, 2000). Given that self-efficacy may fluctuate depending on cultural context (Bandura, 2002), the results are limited in their generalizability to other populations.

Unfortunately, individuals in the older low-self-efficacy group had absolute levels of reading self-efficacy significantly lower than those in the low-self efficacy younger adult group. In this case, there were age differences with respect to self-efficacy strength for the low self-efficacy group, but not for the high self-efficacy group. Although this finding was expected based on the literature, it muddies the analyses because it is not possible to discern if differences in performance were due to beliefs or age. However, it is also unclear whether the age differences in beliefs were veridical or a product of the measurement instrument. As the Reading Self-Efficacy Questionnaire is a newly created measure, the results should be interpreted tentatively until additional psychometric data can be collected.

In this study, ability was confounded with condition. Although covariate analyses were used to control for the uneven influences of working memory capacity, it is possible that in doing so the effect of working memory may have been overcorrected. That is, typically younger adults have higher working memory span capacities than do older adults. By placing everyone on the same scale, potential age differences in performance (particularly text recall) may have been masked inadvertently. Methodologically, it would have been better if Condition represented a within-subjects variable, rather than a between-subjects variable. Although this was not done in the

present study due to time constraints with the current materials (i.e., a longer experiment may have introduced fatigue effects), such a design would eliminate the potential ability by condition confound.

The results here indicate that resource allocation was unrelated to beliefs. However, it is possible that the relationship between reading self-efficacy and recall performance is mediated by a variable that was not measured by this study. Moreover, it is possible that the marginal relationships expressed among many of the variables would be cleaned up (either become more or less significant) with additional participants.

In summary, Bandura's (1977; 1982; 1986; 1997) theory of self-efficacy has been applied to a wide range of domains, participant groups, and empirical questions. Within the cognitive aging literature, self-efficacy has become more widely recognized as a salient predictor of performance, and more integrated into models of cognitive self-regulation and functioning (Cavanaugh & Greene, 1990; Dunlosky & Hertzog, 1998). The present study contributes to this literature by extending it to the domain of reading self-efficacy, and examining the effects of self-efficacy on both recall performance and resource allocation. Future research should consider the extent to which relationships between these variables vary as a function of ability and text characteristics (e.g., genre, text length) in order to fully understand the role of reading self-efficacy and its implications for cognitive functioning.

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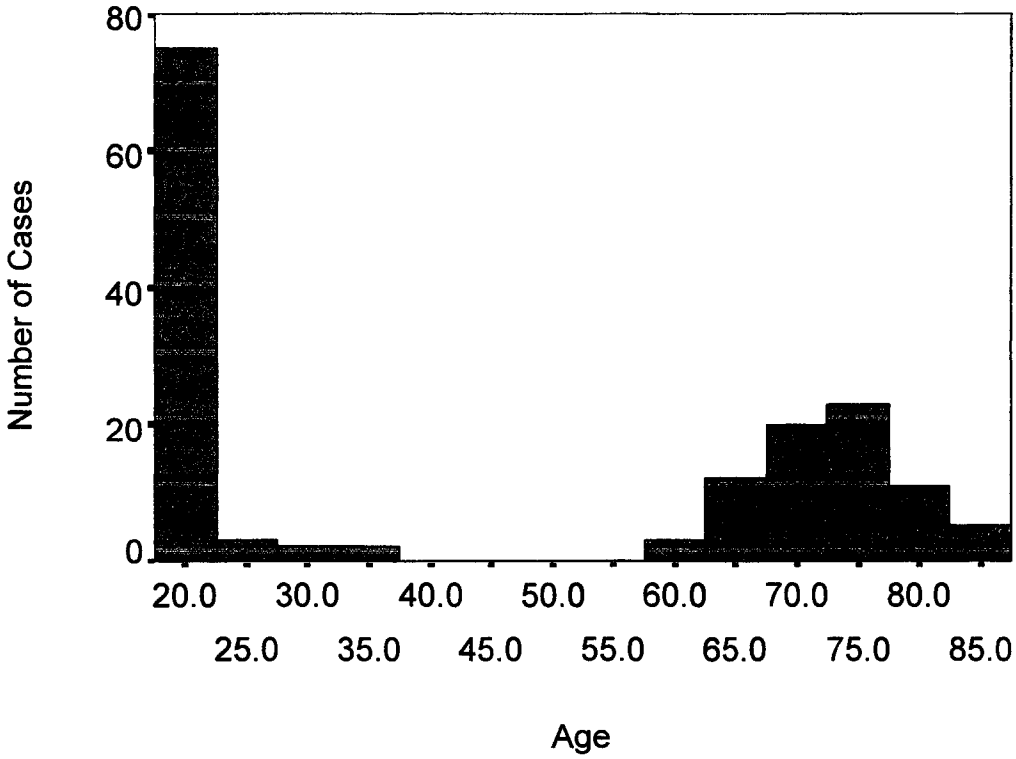
APPENDICES

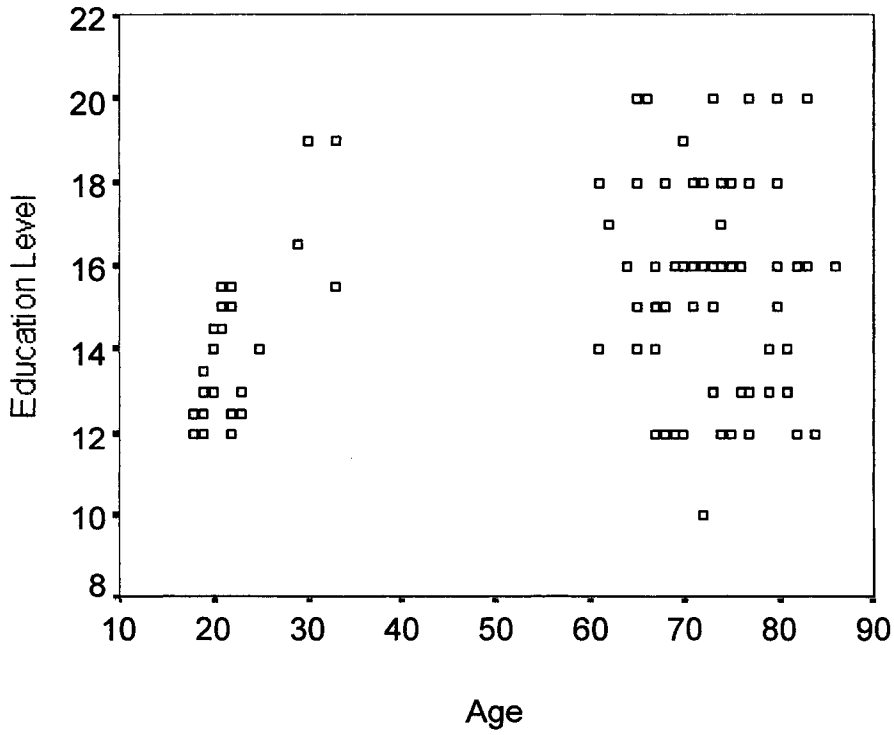
Appendix A

This Appendix provides visual representation of ability and background variables: Age, Education Level, Working Memory Span, and Verbal Ability.

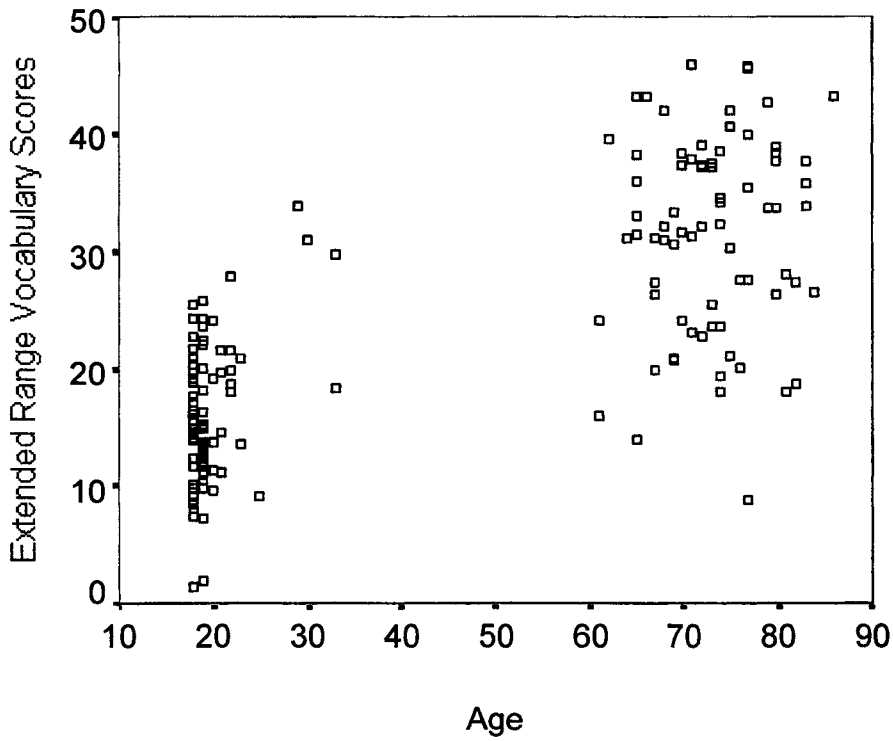
Histogram 1. Visual representation of Age Frequencies



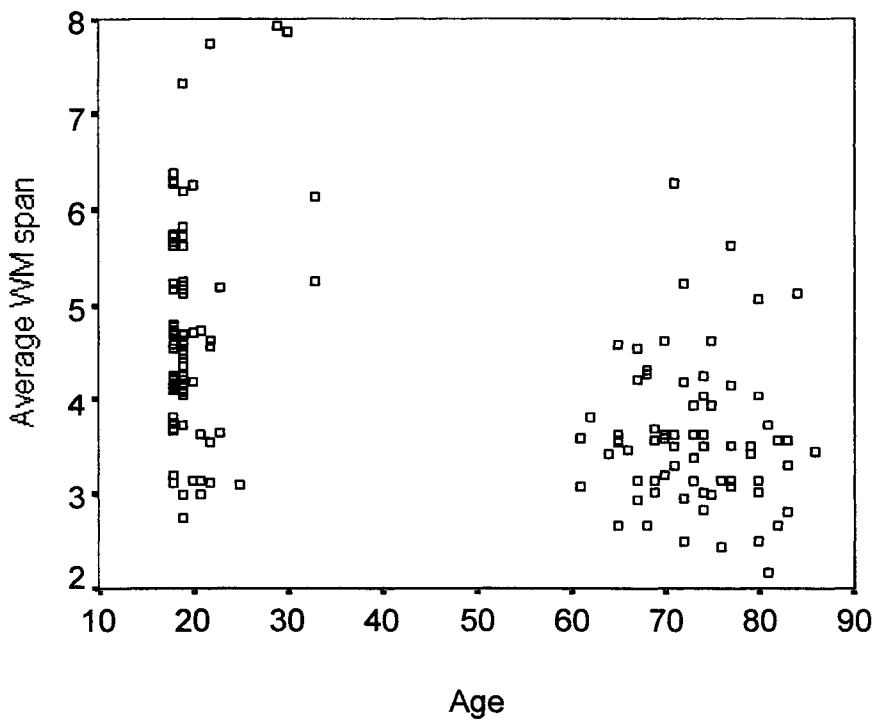
Scatterplot 1. Education Level as a Function of Age



Scatterplot 2. Verbal Ability as a Function of Age.



Scatterplot 3. Working Memory Span as a Function of Age.



Appendix B

Questionnaires and survey instruments are presented in this appendix. Contents include Demographics Questionnaires, Media Habits Consumption Questionnaire, Reading Appraisal Inventory, Metamemory in Adulthood Questionnaire, and Post-Experiment evaluation.

Demographic Questionnaire (Older Adult)

Background Information

Please fill in the blanks or circle the best alternative for each item below. Please answer honestly to the best of your ability. Note that all information will be kept strictly confidential, and all of our reported results are based on group averages. *Please do not put your name anywhere on this sheet.*

Date of Birth: _____ / _____ / 19____ **Age:** _____

Gender: Male Female **Handedness**: L R

Ethnicity:
(please check one)

_____ Non-Hispanic

_____ Hispanic

(please check all that apply)

_____ Caucasian (White)
_____ African-American
_____ American Indian
_____ Pacific Islander
_____ Asian
_____ Other (please specify): _____

Are you currently retired? Y N **If yes, in what year?** _____

What is/was your occupation? _____

Do you currently work/volunteer outside the home on a regular basis? Y N

If yes, what do you do? _____

Please tell us about your educational history. What is the highest level of education that you have received? Do you hold any degrees or certificates? Do you have any special training (e.g., trade or tech school, apprenticeship)? Military experience?

_____

_____

_____

_____

How would you rate your overall health? That is, how do you feel on a regular basis? Please circle your response:

Excellent		Average		Poor
1	2	3	4	5

Demographic Questionnaire (Younger Adult)

Background Information

Please fill in the blanks or circle the best alternative for each item below. Please answer honestly to the best of your ability. Note that all information will be kept strictly confidential, and all of our reported results are based on group averages. *Please do not put your name anywhere on this sheet.*

Date of Birth: _____ / _____ / 19____ **Age:** _____

Gender: Male Female **Handedness**: L R

Ethnicity:
(please check one)

_____ Non-Hispanic

_____ Hispanic

(please check all that apply):

_____ Caucasian (White)
_____ African-American
_____ American Indian
_____ Pacific Islander
_____ Asian
_____ Other (please specify): _____

Please tell us about your educational history. What is your current class standing? Freshman Sophomore Junior Senior Graduate

If you are a graduate, please indicate year of graduation: _____

If you are a graduate student, please indicate how many years of graduate study you have completed: _____

Do you hold any degrees or certificates? Y N

If yes, please list: _____

What is your major/minor? _____

Do you have any special training (e.g., trade or tech school, apprenticeship)? Military experience? _____

_____

How would you rate your overall health? That is, how do you feel on a regular basis? Please circle your response:

Excellent		Average		Poor
1	2	3	4	5

Media Consumption Habits Questionnaire (Scales & Rhee, 2001; Stine-Morrow, Loveless, & Soederberg, 1996)

Media Consumption Habits Questionnaire

Please fill out the blanks our circle the appropriate answer from the list of alternatives. If you feel that the statement does not fit your behavior exactly, please choose the closest approximation from the options provided.

Section I

1. How many hours per week do you spend reading?_____

2. Of the total time spent reading, how many hours do you spend reading for the following purposes? (We realize that some activities may overlap with others, so please don't be concerned if all of the times below don't add up exactly to the time you indicated in #1.)

Because you need information for school or educational interests?	_____
Because you need information for work or job related activities?	_____
Because you need information to operate or assemble something?	_____
For hobbies or recreational activities?	_____
For interest or entertainment?	_____
For relaxation?	_____
For religious/moral reasons?	_____
For self-help?	_____
For personal communication? (e.g., letters, e-mail)	_____
For any other reasons? (please specify_____)	_____

3. Of the total time spent reading, how many hours do you spend reading each of the following types of materials? (We realize that some activities may overlap with others, so please don't be concerned if all of the times below don't add up exactly to the time you indicated in #1.)

Textbooks	_____
Technical journals	_____
Newspapers	_____
Magazines	_____
Novels, stories, and fiction	_____
Non-fiction novels (e.g., biographies)	_____
Bible/Koran/Torah/Other religious text	_____
Self-help manuals	_____
Comics/Comic books	_____
Poetry	_____
Plays	_____
E-mail	_____
Internet web sites	_____
Other (please specify_____)	_____

	Strongly agree						Strongly disagree
4. Generally speaking, I like to read	1	2	3	4	5	6	7
5. Generally speaking, I read often	1	2	3	4	5	6	7
6. I like to read textbooks and journal articles	1	2	3	4	5	6	7
7. I like to read newspapers	1	2	3	4	5	6	7
8. I like to read magazines	1	2	3	4	5	6	7
9. I like to read novels, stories, & fiction	1	2	3	4	5	6	7
10. I like to read non-fiction novels	1	2	3	4	5	6	7
11. I like to read Bible/Koran/Torah/ other religious texts	1	2	3	4	5	6	7
12. I like to read self-help manuals	1	2	3	4	5	6	7
13. I like to read comics	1	2	3	4	5	6	7
14. I like to read poetry	1	2	3	4	5	6	7

	Excellent			Average			Poor
15. How would you rate your ability to understand what you've read?	1	2	3	4	5	6	7
16. How would you rate your ability to remember what you've read?	1	2	3	4	5	6	7

Section 2

Before you read, how often do you...

	Never	Seldom	Some-times	Often	Always
1. think about why you are going to read?	1	2	3	4	5
2. read the titles?	1	2	3	4	5
3. read the captions of pictures, maps, or graphs that go with your reading?	1	2	3	4	5
4. look over material from beginning to end?	1	2	3	4	5
5. predict what the reading is about	1	2	3	4	5
6. think about what you already know about a topic?	1	2	3	4	5

During reading, how often do you...

	Never	Seldom	Sometimes	Often	Always
7. skip words you do not know?	1	2	3	4	5
8. break words into meaningful parts?	1	2	3	4	5
9. sound the word out?	1	2	3	4	5
10. use other words in a sentence to try to figure out the meaning of a word you do not know?	1	2	3	4	5
11. use the dictionary to find a word meaning?	1	2	3	4	5
12. ask someone to pronounce words for you?	1	2	3	4	5
13. find sentences hard to understand?	1	2	3	4	5
14. find paragraphs hard to understand?	1	2	3	4	5
15. reread parts of the reading material?	1	2	3	4	5
16. skip a sentence or paragraph?	1	2	3	4	5
17. make predictions or guesses about what is coming next?	1	2	3	4	5
18. see "pictures" in your mind when you read?	1	2	3	4	5
19. ask yourself questions as you read?	1	2	3	4	5
20. think about what it means while you are reading?	1	2	3	4	5
21. try to relate the reading to things you know already?	1	2	3	4	5
22. try to relate the reading to situations in your life?	1	2	3	4	5
23. pick out important words?	1	2	3	4	5
24. summarize the reading in your own words?	1	2	3	4	5
25. ask someone else what the reading is trying to convey?	1	2	3	4	5

After you read, how often do you...

	Never	Seldom	Sometimes	Often	Always
26. think about what the reading was about?	1	2	3	4	5
27. think about why you read what you did?	1	2	3	4	5
28. think about relating the reading to situations in your own life?	1	2	3	4	5
29. compare what you just read to other reading materials?	1	2	3	4	5
30. sharing ideas from your reading with others	1	2	3	4	5
31. discuss what you read with others?	1	2	3	4	5

Section 3

1. How many hours per week do you spend watching TV?_____

2. Of the total time spent watching TV, how many hours do you spend watching TV for the following purposes? (We realize that some activities may overlap with others, so please don't be concerned if all of the times below don't add up exactly to the time you indicated in #1.)

Because you need information for school or educational interests?	_____
Because you need information for work or job related activities?	_____
Because you need information to operate or assemble something?	_____
For hobbies or recreational activities?	_____
For interest or entertainment?	_____
For relaxation?	_____
For religious/moral reasons?	_____
For self-help?	_____
For shopping/purchasing items?	_____
For any other reasons? (please specify_____)	_____

3. How many hours per week do you spend listening to the radio?_____

4. Of the total time spent listening to the radio, how many hours do you spend listening to the radio for the following purposes? (We realize that some activities may overlap with others, so please don't be concerned if all of the times below don't add up exactly to the time you indicated in #3.)

Because you need information for school or educational interests?	_____
Because you need information for work or job related activities?	_____
Because you need information to operate or assemble something?	_____
For hobbies or recreational activities?	_____
For interest or entertainment?	_____
For relaxation?	_____
For religious/moral reasons?	_____
For self-help?	_____
For shopping/purchasing items?	_____
As background "noise" while performing other activities?	_____
For any other reasons? (please specify_____)	_____

5. Do you listen to books on tape? YES NO

Approximately how much time do you spend listening to books on tape? _____

Reading Self-Efficacy Questionnaire (RSEQ)

Reading Appraisal Inventory

Below, you will find a set of statements organized by different, specific reading activities.
For each statement, please answer **YES** or **NO** to indicate whether or not you can perform the task described in that statement.

If you answer **YES**, then also answer how sure or certain you are about performing that task by circling the appropriate number on the scale underneath each statement. The numbers range from 10% (completely *uncertain* that I could perform the task indicated by the statement) to 100% (completely *certain* that I could perform the task indicated by the statement).

10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Completely Uncertain				Moderately Certain					Completely Certain

An answer of **NO** does not require a "percent certainty" statement.

Keep in mind that there are no right or wrong answers, so please answer all questions honestly and to the best of your ability. Do not circle something simply because you think it is the "correct" answer to give. Even if you do not completely agree with the wording of a statement, please choose the answers that correspond to how would be the most likely to perform, given the options provided.

Short Sentences

If I were to read a short sentence (5-10 words) for as long as I wanted, and tried to recall the content immediately after reading, I would be able to remember **more than three-quarters** of the ideas from the sentence. YES NO

10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Completely Uncertain				Moderately Certain					Completely Certain

If I were to read a short sentence (5-10 words) for as long as I wanted, and tried to recall the content immediately after reading, I would be able to remember **up to three-quarters** of the ideas from the sentence. YES NO

10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Completely Uncertain				Moderately Certain					Completely Certain

If I were to read a short sentence (5-10 words) for as long as I wanted, and tried to recall the content immediately after reading, I would be able to remember **up to half** of the ideas from the sentence. YES NO

10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Completely Uncertain				Moderately Certain					Completely Certain

If I were to read a short sentence (5-10 words) for as long as I wanted, and tried to recall the content immediately after reading, I would be able to remember **up to a quarter** of the ideas from the sentence. YES NO

10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Completely Uncertain				Moderately Certain					Completely Certain

If I were to read a short sentence (5-10 words) for as long as I wanted, and tried to recall the content immediately after reading, I would be able to remember **at least one** of the ideas from the sentence. YES NO

10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Completely Uncertain				Moderately Certain					Completely Certain

Long Sentence

If I were to read a long sentence (15-20 words) for as long as I wanted, and tried to recall the content immediately after reading, I would be able to remember **more than three-quarters** of the ideas from the sentence. YES NO

10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Completely Uncertain				Moderately Certain					Completely Certain

If I were to read a long sentence (15-20 words) for as long as I wanted, and tried to recall the content immediately after reading, I would be able to remember **up to three-quarters** of the ideas from the sentence. YES NO

10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Completely Uncertain				Moderately Certain					Completely Certain

If I were to read a long sentence (15-20 words) for as long as I wanted, and tried to recall the content immediately after reading, I would be able to remember **up to half** of the ideas from the sentence. YES NO

10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Completely Uncertain				Moderately Certain					Completely Certain

If I were to read a long sentence (15-20 words) for as long as I wanted, and tried to recall the content immediately after reading, I would be able to remember **up to a quarter** of the ideas from the sentence. YES NO

10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Completely Uncertain				Moderately Certain					Completely Certain

If I were to read a long sentence (15-20 words) for as long as I wanted, and tried to recall the content immediately after reading, I would be able to remember **at least one** of the ideas from the sentence. YES NO

10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Completely Uncertain				Moderately Certain					Completely Certain

Paragraph or Short Newspaper/Magazine Article

If I were to read a paragraph or short article for as long as I wanted, and tried to recall the content immediately after reading, I would be able to remember **the main points and at least three quarters** of the details from the article. YES NO

10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Completely Uncertain				Moderately Certain					Completely Certain

If I were to read a paragraph or short article for as long as I wanted, and tried to recall the content immediately after reading, I would be able to remember **the main points and at least half** of the details from the article. YES NO

10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Completely Uncertain				Moderately Certain					Completely Certain

If I were to read a paragraph or short article for as long as I wanted, and tried to recall the content immediately after reading, I would be able to remember **the main points and at least a quarter** of the details from the article. YES NO

10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Completely Uncertain				Moderately Certain					Completely Certain

If I were to read a paragraph or short article for as long as I wanted, and tried to recall the content immediately after reading, I would be able to remember **one main point and at least one** of the details from the article. YES NO

10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Completely Uncertain				Moderately Certain					Completely Certain

If I were to read a paragraph or short article for as long as I wanted, and tried to recall the content immediately after reading, I would be able to remember **one main point** from the article. YES NO

10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Completely Uncertain				Moderately Certain					Completely Certain

Short Story

If I read a short story (6-20 pages) for as long as I wanted and then tried to recall the contents immediately after reading it, I could remember **most of the details regarding the setting, the major and minor characters, and the plot or themes** discussed in the story. YES NO

10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Completely Uncertain				Moderately Certain					Completely Certain

If I read a short story (6-20 pages) for as long as I wanted and then tried to recall the contents immediately after reading it, I could remember **most of the details regarding the setting, the major characters, the plot and themes, and some information regarding the minor characters** discussed in the story. YES NO

10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Completely Uncertain				Moderately Certain					Completely Certain

If I read a short story (6-20 pages) for as long as I wanted and then tried to recall the contents immediately after reading it, I could remember **most of the details regarding the plot or themes and the major characters, and some information regarding the setting and the minor characters** discussed in the story. YES NO

10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Completely Uncertain				Moderately Certain					Completely Certain

If I read a short story (6-20 pages) for as long as I wanted and then tried to recall the contents immediately after reading it, I could remember **most of the details regarding the plot or themes, and some information regarding the setting and the major and minor characters** discussed in the story. YES NO

10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Completely Uncertain				Moderately Certain					Completely Certain

If I read a short story (6-20 pages) for as long as I wanted and tried to recall the contents immediately after reading it, I could remember **a few of the details regarding the basic plot or themes** expressed by the story. YES NO

10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Completely Uncertain				Moderately Certain					Completely Certain

Short Novel

If I read a short novel (up to 200 pages) for as long as I wanted and then tried to recall the contents immediately after reading it, I could remember **most of the details regarding the setting, the major and minor characters, and the plot or themes** discussed in the story.

YES NO

10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Completely Uncertain — Moderately Certain — Completely Certain

If I read a short novel (up to 200 pages) for as long as I wanted and then tried to recall the contents immediately after reading it, I could remember **most of the details regarding the setting, the major characters, the plot and themes, and some information regarding the minor characters** discussed in the story. YES NO

10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Completely Uncertain — Moderately Certain — Completely Certain

If I read a short novel (up to 200 pages) for as long as I wanted and then tried to recall the contents immediately after reading it, I could remember **most of the details regarding the plot or themes and the major characters, and some information regarding the setting and the minor characters** discussed in the story. YES NO

10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Completely Uncertain — Moderately Certain — Completely Certain

If I read a short novel (up to 200 pages) for as long as I wanted and then tried to recall the contents immediately after reading it, I could remember **most of the details regarding the plot or themes, and some information regarding the setting and the major and minor characters** discussed in the story. YES NO

10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Completely Uncertain — Moderately Certain — Completely Certain

If I read a short novel (up to 200 pages) for as long as I wanted and tried to recall the contents immediately after reading it, I could remember **a few of the details regarding the basic plot or themes** expressed by the story. YES NO

10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Completely Uncertain — Moderately Certain — Completely Certain

Long Novel

If I read a long novel (over 200 pages) for as long as I wanted and then tried to recall the contents immediately after reading it, I could remember **most of the details regarding the setting, the major and minor characters, and the plot or themes** discussed in the story.

YES NO

10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Completely Uncertain — Moderately Certain — Completely Certain

If I read a long novel (over 200 pages) for as long as I wanted and then tried to recall the contents immediately after reading it, I could remember **most of the details regarding the setting, the major characters, the plot and themes, and some information regarding the minor characters** discussed in the story. YES NO

10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Completely Uncertain — Moderately Certain — Completely Certain

If I read a long novel (over 200 pages) for as long as I wanted and then tried to recall the contents immediately after reading it, I could remember **most of the details regarding the plot or themes and the major characters, and some information regarding the setting and the minor characters** discussed in the story. YES NO

10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Completely Uncertain — Moderately Certain — Completely Certain

If I read a long novel (over 200 pages) for as long as I wanted and then tried to recall the contents immediately after reading it, I could remember **most of the details regarding the plot or themes, and some information regarding the setting and the major and minor characters** discussed in the story. YES NO

10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Completely Uncertain — Moderately Certain — Completely Certain

If I read a long novel (over 200 pages) for as long as I wanted and tried to recall the contents immediately after reading it, I could remember **a few of the details regarding the basic plot or themes** expressed by the story. YES NO

10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Completely Uncertain — Moderately Certain — Completely Certain

Metamemory in Adulthood Questionnaire (MIA) (Dixon, Hultsch, & Hertzog, 1988)

Code No. _____

Memory Questionnaire

DIRECTIONS:

Different people use their memory in different ways in their everyday lives. For example, some people make shopping lists, whereas others do not. Some people are good at remembering names, whereas others are not.

In this questionnaire, we would like you to tell us how you use your memory and how you feel about it. There are no right or wrong answers to these questions because people are different. Please take your time and answer *each* of these questions to the best of your ability.

Each question is followed by five choices. Draw a circle around the letter corresponding to your choice. Mark *only* one letter for each statement.

Some of the questions ask your opinion about memory-related statements; for example:

My memory will get worse as I get older.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly

In this example you could, of course, choose any *one* of the answers.

If you agree strongly with the statement you would circle a. If you disagree strongly you would circle letter e. The b and d answers indicate less strong agreement or disagreement. The letter c answer gives you a middle choice, but don't use the c unless you really can't decide on any of the other responses.

Some of the questions ask how often you do certain things that may be related to your memory. For example:

Do you make a list of things to be accomplished during the day?	a. never b. rarely c. sometimes d. often e. always

Again, you could choose any *one* of the answers. Choose the one that comes closest to what you *usually* do. Don't worry if the time estimate is not exact, or if there are some exceptions.

Keep these points in mind:

(a) Answer *every* question, even if it doesn't seem to apply to you very well.

(b) Answer as honestly as you can what is true for *you*. Please do not mark something because it seems like the "right thing to say."

1. For most people, facts that are interesting are easier to remember than facts that are not.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
2. I am good at remembering names.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
3. Do you keep a list or otherwise note important dates, such as birthdays and anniversaries?	a. never b. rarely c. sometimes d. often e. always
4. It is important to me to have a good memory.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
5. I get upset when I cannot remember something.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
6. When you are looking for something you have recently misplaced, do you try to retrace your steps in order to locate it?	a. never b. rarely c. sometimes d. often e. always
7. I think a good memory is something of which to be proud.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
8. I find it harder to remember things when I am upset.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly

9. I am good at remembering birthdates.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
10. I can remember things as well as always.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
11. When you have not finished reading a book or magazine, do you somehow note the place where you have stopped?	a. never b. rarely c. sometimes d. often e. always
12. I get anxious when I am asked to remember something.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
13. It bothers me when others notice my memory failures.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
14. I'm less efficient at remembering things now than I used to be.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
15. I have difficulty remembering things when I am anxious.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
16. The older I get the harder it is to remember clearly.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly

17. Do you think about the day's activities at the beginning of the day so you can remember what you are supposed to do?	a. never b. rarely c. sometimes d. often e. always
18. I am just as good at remembering as I ever was.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
19. I have no trouble keeping track of my appointments.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
20. For most people, it is easier to remember information they need to use immediately than information they will not use for a long time.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
21. Most people find it easier to remember directions to places they want or need to go than to places they know they will never be going.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
22. I am usually uneasy when I attempt a problem that requires me to use my memory.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
23. I feel jittery if I have to introduce someone I just met.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
24. Having a better memory would be nice but it is not very important.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly

25. Do you post reminders of things you need to do in a prominent place, such as on bulletin boards or note boards?	a. never b. rarely c. sometimes d. often e. always
26. It doesn't bother me when my memory fails.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
27. I am poor at remembering trivia.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
28. I am much worse now at remembering the content of news articles and broadcasts than I was 10 years ago.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
29. Do you routinely keep things in a familiar spot so you won't forget them when you need to locate them?	a. never b. rarely c. sometimes d. often e. always
30. Compared to 10 years ago, I am much worse at remembering titles of books, films or plays.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
31. For most people it is easier to remember words they want to use than words they know they will never use.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
32. I remember my dreams much less now than 10 years ago.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly

33. I can't expect to be good at remembering zip codes at my age.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
34. Most people find it easier to remember the names of people they especially dislike than people they hardly notice.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
35. I have little control over my memory ability.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
36. When you want to take something with you, do you leave it in an obvious, prominent place, such as putting your suitcase in front of the door?	a. never b. rarely c. sometimes d. often e. always
37. I think it is important to work at sustaining my memory abilities.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
38. I misplace things more frequently now than when I was younger.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
39. As people get older they tend to forget where they put things more frequently.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
40. I work hard at trying to improve my memory.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly

41. Compared to 10 years ago, I now forget many more appointments.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
42. If I am put on the spot to remember names, I know I will have difficulty doing it.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
43. For most people, it is easier to remember the names of people they especially like than people that don't make much of an impression them.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
44. Most people find it easier to remember words they understand than words that don't mean very much to them.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
45. My memory for important events has improved over the last 10 years.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
46. I admire people who have good memories.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
47. My friends often notice my memory ability.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
48. When you try to remember people you have met, do you associate names and faces?	a. never b. rarely c. sometimes d. often e. always

49. I am good at remembering the order that events occurred.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
50. For most people, words they have seen or heard before are easier to remember than words that are totally new to them.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
51. Familiar things are easier to remember than unfamiliar things.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
52. I am good at remembering conversations I have had.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
53. I would feel on edge right now if I had to take a memory test or something similar.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
54. My memory for phone numbers will decline as I get older.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
55. I often notice my friends' memory ability.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
56. My memory for dates has greatly declined in the last 10 years.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly

57. When you have trouble remembering something, do you try to remember something similar in order to help you remember?	a. never b. rarely c. sometimes d. often e. always
58. My memory for names has declined greatly in the last 10 years.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
59. I often forget who was with me at events I have attended.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
60. Do you consciously attempt to reconstruct the day's events in order to remember something?	a. never b. rarely c. sometimes d. often e. always
61. As long as I exercise my memory it will not decline.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
62. I am good at remembering the places I have been.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
63. I know if I keep using my memory I will never lose it.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
64. Do you try to relate something you want to remember to something, else hoping that this will increase the likelihood of your remembering later?	a. never b. rarely c. sometimes d. often e. always

65. It's important that I am very accurate when remembering names of people.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
66. When I am tense and uneasy at a social gathering, I cannot remember names very well.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
67. Do you try to concentrate hard on something you want to remember?	a. never b. rarely c. sometimes d. often e. always
68. It's important that I am very accurate when remembering significant dates.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
69. It's up to me to keep my remembering abilities from deteriorating.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
70. When someone I don't know very well asks me to remember something, I get nervous.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
71. I have no trouble remembering where I have put things.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
72. It is easier for most people to remember things that are unrelated to each other than things that are related.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly

73. Even if I work on it, my memory ability will go downhill.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
74. Most people find it easier to remember concrete things than abstract things.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
75. Do you make mental images or pictures to help you remember?	a. never b. rarely c. sometimes d. often e. always
76. I know of someone in my family whose memory improved significantly in old age.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
77. I am good at remembering things like recipes.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
78. I get anxious when I have to do something I haven't done for a long time.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
79. It bothers me when I forget an appointment.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
80. Most people find it easier to remember things that happened to them than things that happen to others.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly

81. Do you mentally repeat something you are trying to remember?	a. never b. rarely c. sometimes d. often e. always
82. My memory has improved greatly in the last 10 years.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
83. I like to remember things on my own, without relying on other people to remind me.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
84. I get tense and anxious when I feel my memory is not as good as other people's.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
85. Do you ask other people to remind you of something?	a. never b. rarely c. sometimes d. often e. always
86. I'm highly motivated to remember new things I learn.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
87. I do not get flustered when I am put on the spot to remember new things.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
88. I am good at remembering titles of books, films, or plays.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly

89. My memory has declined greatly in the last 10 years.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
90. For most people it is easier to remember things in which they are most interested than things in which they are less interested.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
91. I have no trouble remembering lyrics of songs.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
92. My memory will get better as I get older.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
93. It is easier for most people to remember bizarre things than usual things.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
94. Do you write yourself reminder notes?	a. never b. rarely c. sometimes d. often e. always
95. I am good at remembering names of musical selections.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
96. Most people find it easier to remember visual things than verbal things.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly

97. After I have read a book I have no difficulty remembering factual information from it.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
98. Do you write appointments on a calendar to help you remember them?	a. never b. rarely c. sometimes d. often e. always
99. I would feel very anxious if I visited a new place and had to remember how to find my way back.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
100. I am good at remembering the content of news articles and broadcasts.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
101. No matter how hard a person works on his memory, it cannot be improved very much.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
102. If I were to work on my memory I could improve it.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
103. It gives me great satisfaction to remember things I thought I had forgotten.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
104. Remembering the plots of stories and novels is easy for me.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly

105. I am usually able to remember exactly where I read or heard a specific thing.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
106. I think a good memory comes mostly from working at it.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
107. Most people find it easier to remember unorganized things than organized things.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
108. Do you write shopping lists?	a. never b. rarely c. sometimes d. often e. always

Post-Reading Task Evaluation

Evaluation

We are interested in the experience that you had in our lab today. You will not be penalized or rewarded for any of your answers, so please answer all questions *honestly* and to the *best of your ability*.

1a) Did you find that any one SET (1st, 2nd, or 3rd) of sentences was any more or less difficult than any of the others? YES NO

1b) If yes, please check the following that apply:

_____ Set 1 was more difficult to read than Set 2

_____ Set 1 was more difficult to read than Set 3

_____ Set 2 was more difficult to read than Set 1

_____ Set 2 was more difficult to read than Set 3

_____ Set 3 was more difficult to read than Set 1

_____ Set 3 was more difficult to read than Set 2

_____ Other (please explain_____)

2) How interesting did you find the sentences that you read?

1	2	3	4	5	6	7
Very Very Uninteresting			Moderately Interesting			

3) How much effort did you put into *reading* the sentences carefully?

1	2	3	4	5	6	7
Absolute of my minimum effort			Some effort			All

4) How much effort did you put into *recalling* the sentences completely?

1	2	3	4	5	6	7
Absolute of my minimum effort			Some effort			All

5) How motivated were you to perform well on this task?

1	2	3	4	5	6	7
Not motivated wanted to At all well			Indifferent			I do really

6) Below you will see a list of items that represents possible motivations to participate in this particular experiment. Please place an "X" next to all that apply.

_____ It fulfilled a requirement for a course

_____ It fulfilled extra credit for a course

_____ I wanted/needed the money

_____ Curiosity; It sounded interesting/intriguing

_____ I wanted to contribute to science

_____ I wanted to contribute to the University

_____ I am concerned/wanted to find out more about my memory

_____ I am concerned/wanted to find out more about my reading ability

_____ My roommate/spouse/friend/family member suggested that I participate

_____ Other (please elaborate) _____

7) Please help me to improve my research! If you were to participate in an experiment like this again, please identify two topics that you would be interested to read about:

1. _____
2. _____

Appendix C

Stimulus materials are presented in this appendix. All participants received Moderate Baseline sentences followed by either Easy or Difficult sentences. Moderate Target sentences were read last by all participants.

Moderate – Baseline Sentence Set

1. Rice that is colored with turmeric and blessed by a priest is showered over Hindu brides and grooms. This is to bless the couple with prosperity.

2. Great Britain ruled Ceylon for over a century leaving behind a deep passion for cricket and pipe smoking. Ceylon has a decidedly multi-cultural feel.

3. The coastal waters in Alaska are sometimes murky because of the sediment that runs off of the glaciers. This silt eventually settles on the ocean floor.

4. Foreigners introduced the game of tug-of-war to Filipinos early in this century as a peaceful alternative to head-hunting. At that time tug-of-war had newly become an Olympic event.

5. Crocodiles have valves in their throats that close to prevent drowning when they open their mouths under water. Crocodiles can stay submerged for more than an hour.

6. Dams and canals on the upper Nile have diverted the river's path, opening the land for more residents. Now dams trap ninety-eight percent of the Nile's sediment.

7. During the Ming Dynasty, Chinese craftsmen used to make special markings on porcelain pieces to honor the emperor. These markings add to the value of the pieces.

8. As a boy, Norman Rockwell drew pictures of sailing ships, copying them from packs of American Fleet cigarettes. His talents were evident even then.

9. Every September, people of the Virgin Islands set aside a legal holiday to pray for protection from hurricanes. They believe that prayer appeases angry Nature gods.

10. The innermost layer of fur on a Husky, which is as soft as goose down, keeps it warm. Other kinds of dogs would freeze in the cold.

11. The white-backed night heron hides by day in reed beds and does not come out until after twilight. It rises gracefully from the reeds at sunset.

12. Japanese fans are fearful that many of their great baseball players will go west to the United States. There is little space for baseball parks in Japan.

Easy Sentence Set

1. Teddy Roosevelt was the one who established national parks in America to preserve the beauty of the wilderness. His farsighted ideas still have merit with modern Americans.

2. The magnificence of northern Arizona frequently calls to mind all that we imagine the Wild West to be. It stirs within us a yearning for adventure.

3. Windsor Castle was built on a bluff in a valley, which is an ideal spot for a fortress. Originally the castle was nothing more than a wooden stockade.

4. The skin of the elephantfish feels to the touch as if woven of raw silk and aluminum foil. The elephantfish gets its name, however, from its long snout.

5. Leatherback turtles will grow to a size of over six feet on a diet that consists of jellyfish. They begin life smaller than a child's hand.

6. Florida panthers are vulnerable to ringworm as the result of an immune system deficiency brought on by inbreeding. However, ringworm is more an irritant than a danger.

7. Pole vaulting was first invented by the Dutch who would vault over canals in order to keep dry. Later it became an official sport in Ireland.

8. Hippos are brutes who have formidable tusks in their mouths, which they use on anything in their way. They are not as docile as we once believed.

9. Puritans who came from the east of England introduced the forerunner of baseball, which they called "town ball." It required a ball of feathers wrapped with leather.

10. In Puerto Rico tree frogs spend the night in the treetops, jumping to the ground before the sunrise. In this manner they avoid daytime and nighttime predators.

11. The Saint Lawrence Seaway links the five Great Lakes with the waves and whales of the Atlantic Ocean. A ship can traverse its length in eight days.

12. In many species it is the females who influence evolution in the way that they choose their mates. They often choose mates who are bolder or brightly colored.

Difficult Sentence Set

1. Jane Goodall spent thirty-five years in Africa living among the chimpanzees while studying their habits and everyday lives. She found that they make tools and share technology.

2. Southern elephant seals can remain submerged to feed on squid for almost two hours in glacial Antarctic waters. Air bubbles in their fur keep them insulated.

3. The streets of Toronto are laid out in lengthy rows of tidy brick houses and lofty shade trees. Family neighborhoods back up to metropolitan centers.

4. Pitting muscles against mountains, volunteers haul boulders to shore up overused hiking trails in England's fabled lake country. Thousands of people hike these trails every year.

5. Most Turkish peddlers combine their meager funds in order to trek to sprawling cities in dilapidated old buses. They live in these buses selling wares by day.

6. Bearded seal pups live on tiny blocks of ice; therefore, catching them for study is a challenging chore. Pups take to the sea shortly after birth.

7. In redwood forests mosses reach a foot thick and contain more green leafy material than the trees themselves. This moss is vital to a forest's ecosystem.

8. Every morning housewives in Bali put some rice on small pieces of banana leaves to ward off spirits. The rice is considered to have magical properties.

9. Jet noise has been exceedingly traumatic to wildlife but military combat exercises are still permitted above animal sanctuaries. Newer regulations on altitude restrictions are slow in coming.

10. The typical height for adult Pygmies is four feet six inches because they can't process normal growth hormones. "Pygmy" in Greek means "the length of a forearm."

11. Russians swarmed into major thoroughfares with their pushcarts last year when selling wares on the street was legalized. This made some streets nearly impassable for cars.

12. The ancient Greeks never included any ball games in their Olympics, dismissing them literally as merely child's play. They preferred instead games of raw physical strength.

Moderate – Target Sentence Set

1. Early Japanese archers shot from horseback and were required to hit the target or forfeit their own lives. Japan's cavalry was much feared by its enemies.

2. It is considered a sacrilege to shout in the Siberian pastures of Ukok for it offends the spirits. These majestic pastures whistle with their own windswept music.

3. Dog sleds are not permitted on hiking trails in Idaho because officials believe that barking will frighten wildlife. Owners claim that sled dogs are too busy to bark.

4. Rice provides twenty-five to eighty percent of the calories in the daily diet of half the world's population. It is nutritious and can grow in many climates.

5. Hunting caribou is a rite and a necessity for the native Indians of the Arctic Village in Alaska. These people treat hunting with both reverence and respect.

6. A century ago James Naismith nailed up peach baskets at a YMCA in Massachusetts and basketball was born. Only later were the baskets replaced by nets.

7. The Atlantic puffin takes on vivid bill colors and facial embellishments during its spring and summer breeding season. This helps it attract a mate.

8. Scientists are exploring the lives of the Neanderthals, an ancient people who dominated Europe long before modern man. Neanderthals were probably hunters and gatherers rather than farmers.

9. New evidence suggests that infants may have highly active minds even in the first few months of life. They process language concepts long before they can speak.

10. The face of the red velvet fish is as soft as a pillow but its tentacles are poisonous. They sweep up from its face in a pompadour.

11. Leafcutter ants are serious pests for farmers and ranchers but benefit grasslands and forests by aerating the soil. Organic farmers now try to cooperate with these pests.

12. The sky-high world of the rain forest canopy is a biological frontier where there is much to discover. The canopy supports ninety percent of the forest's organisms.

13. Male buntings are super singers who are able to produce over one hundred notes in their distinctive songs. Each bird sings a different, original melody.

14. The Galapagos penguin, which stands only twenty inches high, is one of the smallest and rarest of penguins. Its northern cousins are much taller and heavier.

15. Great White sharks hunt for sea lions, harbor seals, and other sea creatures in many prime surfing spots. Humans share these waters at great risk to themselves.

16. In spite of the fact that male silverback gorillas swagger and slap the ground, they are not aggressive. They only attack when they are strongly provoked.

17. The city of Venice, with its canals and its magnificent architecture, only covers a mere three square miles. You could walk from end to end in an hour.

18. Swordfish and marlins possess muscles behind their eyes, which adjust the temperature of their brains in colder waters. This allows them to feed in a range of depths.

19. The atmosphere of Venus has temperatures comparable to those of a self-cleaning oven and incinerates any foreign objects. It consists of a blanket of sulfuric acid.

20. Uniting in the Middle Ages, merchants wrestled power from feudal lords and gave rise to a middle class. From that middle class early trade unions were formed.

21. Cobras and vipers lurk near the rice paddies in Burma making snakebites a frequent cause of deaths there. Still many Burmese risk this and work in the paddies.

22. Years ago physicians thought that an abnormal imbalance of bodily humors was the underlying cause of mental illness. Such beliefs led them to cures like bloodletting.

23. Experienced hunters in the Canadian north are able to build an igloo in thirty minutes using hard-packed snow. This skill is necessary for survival when storms arise.

24. Galileo got tired of using his telescope to spot ships and pointed it to the starry sky instead. From then on astronomy was his supreme passion.

Appendix D

Approval from the Institutional Review Board (IRB) at the University of New Hampshire for the Use of Human Subjects Research.

UNIVERSITY OF NEW HAMPSHIRE

LAST NAME *Gagne*

FIRST NAME *Danielle*

DEPT *PSYCHOLOGY*

APPROVAL DATE *10/1/2003*

PROJECT # *PSY14*

OFF-CAMPUS ADDRESS (if applicable)

DATE OF NOTICE *10/3/2003*

PROJECT TITLE *Self-efficacy and allocation of effort among younger and older adults*

The Psychology Departmental Review Committee, a subcommittee of the Institutional Review Board (IRB) for the Protection of Human Subjects in Research, reviewed and approved the protocol for your study as Exempt as described in Federal Regulations 45 CFR 46, Subsection 101 (b).

Approval is granted to conduct the project as described in your protocol. Changes in your protocol must be submitted to this committee for review and approval prior to their implementation.

The protection of human subjects in your study is an ongoing process for which you hold primary responsibility. In receiving approval for your protocol, you agree to conduct the project in accordance with the ethical principles and guidelines for the protection of human subjects in research, as described in the Belmont Report. The full text of the Belmont Report is available on the Office of Sponsored Research (OSR) webpage at http://www.unh.edu/osr/compliance/Regulatory_Compliance.html and by request from the OSR.

There is no obligation for you to provide a report to this committee upon project completion unless you experience any unusual or unanticipated results with regard to the participation of human subjects. Please report such events to this office promptly as they occur.

If you have questions or concerns about your project or this approval, please feel free to contact a member of the Psychology Departmental Review Committee.

For the IRB,

Julie F. Simpson
Manager, Research Conduct and Compliance Services

cc: File