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# THE INFLUENCE OF SELF-EFFICACY ON OLDER ADULTS' EFFORT



BY

TRACEY FELLOWES

A THESIS

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled THE INFLUENCE OF SELF-EFFICACY ON OLDER ADULTS EFFORT submitted by TRACEY FELLOWES in partial fulfilment of the requirements for the degree of MASTER OF SCIENCE.

Nancy L Hulbert
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Brenda G Kuiper

Date: May 19, 1988

## DEDICATION

This thesis is dedicated to my friend and mentor, Nancy.

ABSTRACT

The purpose of this study was to explore the relationship between older adults' self-efficacy and their effort at cognitive tasks. Tested were differences in effort between groups of older adults with high and low self-efficacy expectations, and differences in estimates of general and memory self-efficacy of older adults. Bandura's (1981) model of self-efficacy was used as the conceptual model for this research study.

Forty older adults participated in the study and were grouped into four treatment groups of ten participants: high self-efficacy expectations and high efficacy instructions; high self-efficacy expectations and low efficacy instructions; low self-efficacy expectations and high efficacy instructions; and low self-efficacy expectations and low efficacy instructions. It was hypothesized that those in the high self-efficacy expectations and high efficacy instructions group would work longest at the task, followed by high self-efficacy and low efficacy instructions, low self-efficacy and high instructions, and the low self-efficacy, low instructions group who were hypothesized to work the least amount of time on the task. In addition it was hypothesized that the older adults would estimate their memory efficacy poorer than their general efficacy.

A chi-square analysis indicated that significantly more older adults estimated their memory efficacy poorer than their general efficacy. There were no significant differences in the amount of time worked on the task between the participants with high and low self-efficacy expectations, or between the type of instructions received by

the participants.

The results of this study do not support Bandura's (1981) model, however these results need to be interpreted with caution. First, the analysis had low power due to the small sample size. In addition older individuals' poorer perception of their memory efficacy compared to their general efficacy indicates that there are other aspects of Bandura's (1981) model which are not yet tested that may further explain these results. For example, how individuals form self-efficacy expectations has not been examined. The results of this study have implications for Family Life Education programmers working with older adults.

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# CHAPTER I

## Introduction

Growing old is a life process that most individuals will experience. In Alberta the older (those aged 65 years and over) population will increase from 7.7 percent of the population in 1985, to 8.84 percent by the year 2000, and increase yearly thereafter (Alberta Senior Citizen's Bureau, 1986). These changes have created an increased research interest in older individuals' ability to function as active, equal family members, and to contribute to society. In the past, few Family Life Education programs have been designated to meet the special needs of this population. Shifts in perspective are now necessary; family supports and programming must adapt to include older persons. In order to do this, programmers need to understand issues related to aging so programming reflects the needs of the older individual (Arcus, 1987; Home Economics Philosophy on Aging, 1962). Two such issues regard older individuals' cognitive abilities (the process of knowing) and their expectations for cognitive performance.

Complaints about cognitive abilities are reportedly universal among older persons (Poon, 1985). Memory decline in particular is one of the most common subjectively reported complaints related to growing older (Dobbs & Rule, 1987; Zarit, Gallagher, & Kramer, 1981). The relationship between intellectual ability and decline in cognitive performance in older individuals has been debated over the last decade (Baltes & Schaie, 1976; Horn, 1976; Horn & Donaldson, 1976; Hultsch, Hertzog, & Dixon, 1987).

Researchers such as Baltes and Schaie (1976) have suggested that cognitive performance decline in older people may not be a result of inevitable intellectual decline with age. Rather, as Bandura (1981) has hypothesized, a decline in cognitive performance with age may be influenced by factors such as subjective feelings, beliefs, or expectations that people have about their own ability to perform cognitive tasks. Those who believe they are able to competently affect performance are more likely to do better, and try harder, than those who believe they will not perform well. These beliefs, termed "self-efficacy expectations," are thought to influence not only cognitive performance, but also influence variables such as effort (Bandura, 1977a, 1981).

The purpose of this study was to explore the relationship between older individuals' self-efficacy and their effort at cognitive tasks. Effort may mediate between beliefs about performance and actual performance: in some situations tasks may not be attempted if expectations for satisfactory performance are low. This issue has been tested with younger adults but not with older participants. Study of the relationship between older individuals' self-efficacy and effort may further our understanding of the influence of variables which mediate between cognitive performance and ability in older people. Understanding how mediating variables, such as effort, influence performance has important implications for family life programming since interventions that do not account for the influence of mediating variables may not be successful.

Expectations about personal efficacy may influence effort and cognitive performance in the manner of a self-fulfilling prophecy. For most individuals, the higher their perceived efficacy, the more effort they will exhibit at an unsolved cognitive task, and conversely, the less competently individuals perceive their ability, the less effort they will exhibit (Bandura, 1981). When individuals expect a certain result, they are inclined to exert the amount of effort required to attain the result they expect. In some situations (e.g., when satisfactory performance is not a perceived possibility) individuals make a decision not to attempt the task at all. Once the expected performance is achieved the original efficacy expectation is confirmed, and becomes information on which future performance expectations are based. This relationship between efficacy, effort, and cognitive performance operates in a self-fulfilling manner because it is reciprocal (Bandura, 1977a, 1977b, 1981).

For older individuals the prophetic aspects of efficacy expectations are thought to be even more salient. Bandura (1981) argued that older individuals are in a state of frequent and inaccurate efficacy appraisal. Performance accomplishments from past experiences and daily environmental experiences provide individuals of all ages with information they integrate into self-efficacy expectations. For older individuals performance accomplishments are anchored in the more distant past, which may lead them to rely more on efficacy information portrayed in the environment about growing older, which is often negative (e.g., stereotypes). Efficacy reappraised in terms of aging stereotypes is more likely to be inaccurate since stereotypes don't

provide an accurate portrait of individual performance ability and achievement (Bandura, 1981). According to Bandura (1981), this process results in the curtailing of older individuals' effort and range of activities--trying long or hard may be perceived as a waste of time.

Self-efficacy and performance related to older individuals has been explored primarily through examining the relationship between metamemory and performance. Metamemory refers to individuals' knowledge or understanding of their memory functioning (Cavanaugh & Perlmutter, 1982; Dobbs & Rule, 1987; Hultsch et al., 1987). Study of the relationship between metamemory and performance has resulted in equivocal findings concerning how self-efficacy relates to performance (Bruce, Coyne, & Botwinick, 1982; Hurlbut, 1988; Lachman & Jelalian, 1984; Lachman, Lachman, & Thronesbery, 1979; Lovelace & Marsh, 1985; Perlmutter, 1978). These results may be partially explained by several factors, including the influence of variables which may mediate between efficacy and performance, which was of interest in this study.

Effort is one mediating factor which may be greatly influenced by individuals' beliefs about their ability (Bandura, 1977b, 1981; Chaffin & Herrmann, 1983; Hultsch et al., 1987; West, Boatwright, & Schleser, 1984). As West et al. (1984) suggest, older persons who do not expect to succeed may "reduce their effort since they 'can't succeed' anyway" (p.197). To date, the influence of self-efficacy expectations on decisions to enter memory demanding situations are virtually unexamined in the older population (Hultsch, et al., 1987). Understanding how effort may be influenced by individuals' perceptions of their ability to perform tasks may clarify the mechanics of the

relationship between beliefs about ability to perform and actual performance.

In this study the mediating variable of interest was effort. If, as Bandura (1977a, 1981) has suggested, the relationship between self-efficacy and cognitive performance is mediated by effort, then effort may be a factor which can be included in a Family Life Education intervention designed to increase older individuals' opportunity to cultivate their fullest potential. By promoting greater effort in older individuals, programmers can foster higher performance accomplishments.

Clearly the hypothesized relationship between older individuals' self-efficacy and effort, the contradictory findings regarding self-efficacy and cognitive performance, and the continuing complaints older individuals have about perceived cognitive deficits, theoretically and practically justify the purpose of this study which was to test the following. How does self-efficacy influence effort in older individuals? A secondary question relates to (a) differences between older individuals' perceptions of general efficacy, or overall ability, and their perceptions of efficacy related to memory specifically and, (b) how each of these may influence effort at cognitive tasks. If older individuals are not expending effort and so minimizing their ability then their potential for leading as full and satisfying a life as possible will ultimately be curtailed, and in the long run society will lose the contribution of their years of experience and effort.

## CHAPTER II

## Framework of the Study

The focus of this study is the relationship between the self-efficacy expectations of older individuals and their effort at cognitive tasks. For the purposes of this study, self-efficacy theory will form the central framework. Self-efficacy is a mini-theory derived from the larger social learning theory perspective. Social learning theory emphasizes role learning and the importance of social experiences in the environment (Bandura, 1977b). Behaviors which define certain societal roles, such as mother, father, senior, teen, etcetera, are learned at a very early age by observing role models--the individuals who occupy those roles. Daily interactions with others, the media, and observing the positive and negative consequences of certain role behaviors, further serve to socially "teach" people how to behave, and what to expect, when one occupies certain roles (Bandura, 1977b).

According to social learning theory, our environment is our basic "school" and the observations we make in it are cognitively integrated and applied as behavior (Bandura, 1977b). In other words, we think about what we see, and then act on our thoughts. Change is possible in this paradigm because individuals can learn how their thoughts, and behaviors, are influenced by what is happening around them and by others' expectations. Change occurs when individuals challenge the behavioral expectations that define certain roles. A recent example concerns older individuals and sexual behavior. For many individuals sexuality and sexual expression have been considered behaviors

appropriate to roles occupied by younger adults. However, some older individuals are challenging that perception of role behavior and assuring younger people that sexual behavior is an important and enjoyable part of growing older. With this action older individuals who object to the constraints of the old "non-sexual" role, create a new set of expectations for the role "old". Future generations observe the new attitude and behavioral manifestations of it, and begin to accept the revised behavior as an inevitable part of the role. When individuals challenge traditional behavioral expectations in this way, they change the environment and other individuals' experiences in that environment. This process, in which the environment influences individuals and individuals influence the environment, is termed "reciprocal determinism," and is a core concept of social learning theory (Bandura, 1977b).

Reciprocal determinism influences both social change and resistance to change; some individuals may be social "changers," and some may be social "resistors." Individuals' beliefs influence the type of behavior in which they choose to engage, and this behavior affects environmental conditions (Bandura, 1977a, 1977b). For example, when individuals contest the behaviors defined by a role, as in the example above, they often encounter resistance since others have learned that these behaviors are inappropriate. Individuals of all ages who are resistant to role change do not accept actions which contradict their learned expectations of behavior for certain roles. In the example above, those who are resistant to change may perceive that "sex in old age is unhealthy." When individuals hold a certain

perception, according to Bandura, they (1977b) are likely to behave in a manner consistent with their beliefs, and to influence the environment so that their beliefs are confirmed and reinforced by their experience. Individuals will often interact with those they perceive to hold similar beliefs, selectively attending to role model behavior consistent with their perceptions and ignoring that which is not consistent. In this manner individuals act on the environment so that there is little opportunity to observe the influence of new behavioral expectations for certain roles. By this action, "their" environment reinforces original perceptions about the unacceptability of the new role behaviour.

Self-efficacy figures centrally in the reciprocal relationship between the individual and the environment because it specifically concerns beliefs about ability to affect behavior. Whether or not one is a social "changer" or a social "resistor," depends partly upon the level of these beliefs (Bandura, 1977a, 1977b). Those with high self-efficacy believe in their own power to influence the environment. These individuals may be less easily influenced by negative environmental conditions such as stereotypes or others disapproval and would therefore be more likely to exercise their power as social "changers." Those with lower levels of self-efficacy are more likely to be influenced by negative environmental information because of beliefs about their inability to affect behavior. These individuals may not believe they have the power to affect change and would more likely be social "resistors" who are more comfortable with the known conventional roles they observe in the environment. Those with the

highest levels of efficacy may even consciously use their behavior to exploit favorable environmental conditions, whereas those with lower levels of efficacy may be less conscious of the influence of their behaviour on the environment (Bandura, 1977a, 1977b, 1981).

Self-efficacy is also influenced by individuals' environmental experiences (what they see and hear) related to their beliefs about ability to perform prospective cognitive tasks (Bandura, 1977a, 1977b, 1981). Individuals' performance expectations are influenced by environmental information about performance success or failure. For example, observing others succeed or fail at tasks provides clues as to what individuals may be able to accomplish when they attempt that task. Each time a task is performed individuals act on the environment, and are provided with more environmental information about their ability to succeed or fail. Since individuals are continually influencing the environment with task performance, and being influenced by what they see and hear in the environment about task performance, efficacy expectations are continually readjusted or reappraised as new tasks are attempted (Bandura, 1977a, 1981).

Efficacy expectations are acquired and reappraised throughout the lifecycle as individuals learn to cope with their environment, and learn what is expected of them in the changing roles they occupy at each different developmental stage. Initial efficacy experiences are anchored in the family but gradually move to the outside world as the child grows and interacts in other spheres (Bandura, 1981). According to Bandura's (1981) developmental model, the earliest stage of efficacy development is that of the young child who lacks even the most basic

knowledge of his or her capability or of the consequences of behavior. Later, as the child becomes exploratory, play activities broaden his or her knowledge base and more competency is experienced. Peer relationships and school also provide new sources of efficacy information. In adolescence the mastery of the skills necessary to become a mature adult become the focus of much efficacy information. Adulthood presents varied situations for which self-efficacy levels may fluctuate by demanding many different roles, such as marriage, parenthood, and for some divorce, and remarriage. In the middle years many individuals begin to feel they have reached their peak and experience fear of perceived decline with age. This fear reflects cultural stereotypes that "it's all downhill" after a certain "age" (Cox, 1984). In later years self-efficacy is influenced greatly by "reappraisal and misappraisal" of capabilities as well established roles fade and individuals begin to search for new roles. In this search they compare themselves to the societal model of aging that is represented by decline and loss of capability (Bandura, 1981).

These societal role expectations are only one of four principle sources of self-efficacy information (Bandura, 1977a, 1977b, 1981, 1982). Those four sources are: performance accomplishments (e.g., what the individual has achieved before); vicarious experiences (e.g., societal role expectations); verbal persuasion (e.g., telling someone to perform an action); and emotional arousal (e.g., feeling happy, or depressed). According to Bandura (1981) the first two sources of efficacy information are the most powerful influences on efficacy judgements and the expenditure of effort. Only these two sources were

of interest in this study.

Predictions for future performance are based partly on past performance accomplishments, or "authentic mastery experiences," which are the first most salient source of efficacy information (Bandura, 1981). Past performances provide individuals with information about the level of accomplishment they might achieve at new tasks. The more recent the past performance is, then the more salient it will be in forming efficacy judgements. Personal successes increase efficacy, and repeated failures lower efficacy. Individuals who have developed a high level of efficacy (i.e., believe they can competently perform tasks they will encounter) withstand infrequent failures; these failures are integrated as isolated incidents and are not attributed to one's ability.

Vicarious experiences, the second most influential efficacy information source, are a subtle, almost imperceptible influence on the formation of efficacy expectations. When individuals observe others (e.g., role models) perform behaviors, they personally experience the role models' success or failure. For example, entire nations experience feelings of accomplishment through the achievements of their athletes at the Olympic Games. Individuals do not have to directly observe behavior to experience it vicariously. Individuals can experience the feelings associated with the observed behavior through imagination and identification. Vicarious experiences are often unconscious and many individuals are not aware of such influences over their beliefs and behavior (Bandura, 1977a, 1977b, 1981).

Older individuals have a different set of vicarious experiences and are influenced differently by past performance than are younger adults. The later years of life are dominated by vicarious experiences which centre on loss, decline, and inability (Achenbaum, 1985). For older individuals previous performances at cognitively challenging tasks are anchored more in the distant past than they are for younger groups. Because performance accomplishments are based on past experiences, older individuals may rely more on vicarious experiences for their efficacy information than a younger group might. Since common stereotypes portray negative messages about aging, the seniors' efficacy may be reappraised more in terms of vicarious experiences related to decline, independent of their past performance ability. This can lead to more inaccurate efficacy appraisal than other age groups experience.

Inaccurate efficacy appraisal may lead the elderly to inaccurately assess their ability to achieve new task performances, or even to maintain present levels of performance (Bandura, 1981). Since efficacy expectations and performance are influenced by the reciprocal relationship between individuals and the environment, these elderly individuals may inadvertently manipulate the environment to achieve the level of performance they expect. Bandura (1981) reasons that they do this by adjusting the amount of effort they exert, so that effort is exerted congruent to what individual's expect to achieve. Performance successes or failures provide individuals with new information on which to base their efficacy judgements and with which to determine the amount of effort to be exerted on future tasks. Those with a strong

sense of self-efficacy exert greater effort because they feel mastery is an achievable end; those who try harder usually perform better and have their sense of high self-efficacy reinforced. Those with doubts about ability stop trying because they think they can't perform the task; those who do not try have their sense of low self-efficacy reinforced and may further reduce their effort (Bandura, 1977a, 1981).

To summarize, Bandura's (1977a, 1977b, 1981, 1982) self-efficacy theory describes the formation and maintenance of expectations about ability to competently affect behavior in prospective situations. These expectations are learned primarily through performance accomplishments and vicarious experiences in the environment. Those with higher self-efficacy expectations attempt more new things and persist longer at them than those with lower self-efficacy expectations who tend to avoid new situations or experiences because they expect to perform incompetently. The higher the individual's efficacy expectations are, then the longer one will persist at a task; the lower one's efficacy expectations, the less effort one exerts. Efficacy expectations are not static but subject to change due to the changing environment and role expectations for individuals as they move through the life cycle and encounter new situations. While effort mediates between efficacy and performance, older individuals may be influenced differently by this relationship than other age groups. Seniors may have fewer recent cognitive performance accomplishments than younger groups and, because of this, may rely more on vicarious experiences when forming efficacy judgements. Since these vicarious experiences often reflect negative stereotypes about aging they may

result in more frequent and inaccurate efficacy appraisal for older adults than for younger adults. In turn these lower efficacy expectations should reduce the amount of effort older individuals exert which will lower their actual performance.

# CHAPTER III

## Literature Review

### Introduction

The self-efficacy framework, as a part of the newer theories that explore sociocultural variables related to the older adult's cognition, has risen out of the debate about the existence of normative, universal, biologically based, cognitive decline with age. The first part of this section is a brief discussion of this debate. In the next sections I present the literature regarding self-efficacy and older individuals, self-efficacy and effortful behavior, and social-psychological studies in which effort was a variable. A summary discussion of the literature concludes the chapter.

### Cognition and Aging

The literature related to aging and cognition reflects a lively debate about the nature and origin of intellectual change in later years (Baltes & Schaie, 1976; Horn, 1976; Horn & Donaldson, 1976). According to Baltes and Schaie (1976), prior to the mid 1970's intellectual development in old age was characterized primarily by a model of decline. Schaie's (1970, 1979) longitudinal study of age changes in intellectual performance helped to establish that intellectual decline does not occur "in toto." Data collected at seven year intervals from several cohorts of adults over 21 years of age revealed no longitudinally measured significant decrements in performance before the late sixties although there were significant cohort differences favoring younger adults. This data has been used to support the theory that changes in intelligence with age are

represented by interindividual differences, multidimensionality, multidirectionality, modifiability, and the joint import of age and cohort related determinants.

From research such as this Baltes and Schaie (1976) contend that historical and cohort variance account for some of the change in older individuals' performance. That is, the experiences of cohorts in different time periods are influenced by the social and educational trends of the time period. These experiences relate to performance. For example, the increase in the educational level of most individuals over the last fifty years means that cohorts born earlier would not have the benefit of that experience and might, therefore, perform less well on cognitive tasks. According to Baltes and Schaie (1976) these factors do not mean that there is no decline in intellectual functioning with age, just that the decline is not universal for all individuals. Conversely, Horn and Donaldson (1976) argue that cognitive decline with age is universal for certain types of intelligence. In a cross-sectional study Horn and Donaldson (1967) found that fluid intelligence declined with age and crystallized intelligence was maintained or increased in adults 41-61 years of age. It is argued that fluid intelligence is biologically based, whereas crystallized intelligence is more socially based. Studying whether cognitive changes are biologically based or socially influenced does not address how cognitive changes with age impact older individuals performance and daily functioning. Therefore, researchers have changed their focus.

In the last few years research has begun to shift towards the discovery of variables that relate to cognitive changes and the influence of these variables on older individuals' behavior (Poon, 1985; Willis & Baltes, 1982). For example, the influence of beliefs about decline in old age have been examined in an effort to understand the interaction between cognition, perceptions, and the social experiences of older individuals in the environment. Bandura's (1981) theory of self-efficacy describes these concepts, how they are interrelated, and how they might influence behavior. Researcher's now appear to have moved from asking if intelligence declines, to asking what variables relate to cognitive change and how one's behavior is influenced by cognition in the later years of life. This study of self-efficacy and performance in older individuals is a part of that thrust.

Self-Efficacy and Older Adults

Self-efficacy research on older individuals' cognition has focused on examination of the relationship between metamemory and memory performance at learning tasks. Metamemory refers to one's knowledge and understanding of one's own memory functioning, as well as beliefs about one's own memory ability (Cavanaugh & Perlmutter, 1982; Hultsch et al., 1987). Metamemory is often measured by asking individuals to estimate their performance before completing a task and after completing a task (Bruce et al., 1982; Lachman & Jelalian, 1984; Lachman et al., 1979; Lovelace & Marsh, 1985; Perlmutter, 1978). These estimates are often compared to cognitive performance scores and analyzed for predictive accuracy.

Some of the earliest research was done by Perlmutter (1978) who found that there was no decrement in memory monitoring (subjects accurately predicted their performance pre-task) with age. This finding was duplicated by Lachman et al. (1979) who found that younger and older adults showed no age differences in their ability to predict how well they would be able to perform. More recently, Dobbs and Rule (1987) found that there were no overall age differences between young and older adults on a prospective memory task and self-rated item metamemory questionnaire. In other studies, older individuals have been found to give overestimates of predictive accuracy, or to perform worse than their efficacy estimates indicated (Bruce et al., 1982; Hurlbut, 1988; Lachman & Jelalian, 1984; Lovelace & Marsh, 1985). The results indicate that the relationship between self-efficacy and performance in older individuals is unclear. These equivocal findings may be partially explained by: definition and measurement of metamemory, underestimation of task difficulty, and the influence of variables which may mediate between efficacy and performance.

According to Hultsch et al. (1987) metamemory originally referred only to knowledge of the kind of memory demanded by a task, and knowledge of the strategy needed to perform the task. Later, metamemory was expanded to include beliefs about memory ability in general. It is currently thought that each of these dimensions are differentially related to performance (Cavanaugh & Perlmutter, 1982; Dixon & Hultsch, 1983; Hultsch et al., 1987). That is, one dimension may relate to performance in one way and a second dimension in another (Hultsch et al., 1987).

A second measurement issue is indicated by differences between older individuals' perceptions of memory ability and their perceptions of general ability. For example, Chaffin and Herrmann (1982), and Hultsch et al. (1987) found that older individuals' perception of memory ability, or "memory efficacy," is poorer than their perceptions of "general efficacy." This finding is supported by studies which measured older individuals' perceptions of memory ability.

Older individuals' perceptions of memory ability clearly reflect feelings of decline with age. Zarit, Cole, and Guider (1981) found that memory complaints fluctuated independently of performance, reflecting expectations about memory decline with age, rather than actual individual ability. Williams, Wadsworth-Denney, and Schadler (1983) found that older individuals' perceptions of problem solving ability had increased, while their perceptions of memory ability had decreased. Finally, Hultsch et al. (1987) found that older adults complained about reduced memory capacity, decline in memory functioning, and believed they have less control over memory ability. This perception of declining memory ability does not appear to be reflected in older individuals' higher than expected efficacy estimates on metamemory measures in the metamemory research discussed above.

Lachman et al. (1979) and Lovelace and Marsh (1985) suggest that older participants in their metamemory study actually had lower performance expectations than the laboratory measures indicated. Older participants displayed perceptions of declining memory ability even though they overestimated their performance. These participants made casual statements about declining memory ability that contradicted the

laboratory measures of metamemory. That is, the older participants in these metamemory studies gave high efficacy estimates on the study instruments but verbalized perceptions of memory decline that were not made by younger participants. Similarly, Dobbs and Rule (1987) found an increase in reported memory related problems with age as assessed by a metamemory questionnaire, even though performance on prospective remembering tasks was unrelated to metamemory judgements for both younger and older participants.

The apparent contradiction between metamemory accuracy scores and subjective perceptions of memory decline have led to several hypotheses. Lovelace and Marsh (1985) have suggested that the participants' subjective statements represent their true performance expectations which for some reason are not reflected in the research. Dobbs and Rule (1987) have suggested that this occurs because researchers have a different interpretation of the term "memory" than do older study participants. They suggest that there is little knowledge of either how the lay person understands questions about memory functioning, or about the lay persons' concept of memory. Dobbs and Rule (1987) also suggest two other presumptions underlying questions about memory. The first is a paradoxical relationship between memory ability and knowledge of memory ability: individuals may not remember what they forget. Second, Dobbs and Rule (1987) suggest that it is assumed in most metamemory research that all types of memory are amalgamated and change with age uniformly. Another explanation is that metamemory instruments in past metamemory accuracy research have measured a general overall sense of efficacy rather than

efficacy judgements related to the memory domain. If this is the case, then judgements of ability would not relate to performance because perceptions of memory decline were not measured.

A second factor, the underestimation of task difficulty, may also partially explain equivocal findings to date. Lovelace and Marsh (1985), Lachman and Jelalian (1984), and Hurlbut (1988) hypothesized that instead of overestimating ability, older adults underestimate task difficulty because they do not have the same recent experience with study tasks that younger adults might possess. This places older participants at a distinct disadvantage with younger study participants who have many recent experiences to access when assessing task difficulty.

Bandura's (1981) self-efficacy framework also supports the "experience" hypothesis. He suggests that older individuals' past performance experiences are anchored in a more distant past than are younger adults' performance experiences. According to Bandura (1981), individuals use their past experiences as a major source of information for the formation of efficacy estimates. He argues that lack of recent performance experiences is one of the reasons older individuals tend to estimate efficacy inaccurately. Overestimating performance, or rather inaccurately estimating performance, would be an expected outcome of underestimating task difficulty for older individuals' in Bandura's (1981) framework. Thus, older individuals' ability to accurately assess task difficulty leads to similar outcomes as does their ability to accurately assess performance.

Variables which mediate between efficacy and performance are the final factor which may partially explain the equivocal findings in the metamemory-performance relationship. West et al. (1984), and Zarit, Gallagher, and Kramer (1981) were some of the first to examine the influence of mediating variables in the metamemory-performance relationship. They found that affect was related to self-assessment of memory. In addition West et al. (I984) suggested that older adults acceptance of stereotypes about aging and memory should mediate their effort, influencing their decisions to engage in tasks or to try their best. A mediating variable hypothesis suggested by Bandura (1977a, 1981) is that self-efficacy expectations regulate the amount of effort individuals exert at a task, and therefore mediate task performance. The influence of perceptions of declining memory on the mediating variable effort has not been examined with older individuals.

In summary, research findings regarding older individuals' self-efficacy and performance have been equivocal. Some data have indicated that the older individuals' performance estimates are not different from their observed performance and some indicated that older individuals performed worse than their estimated performance. It was suggested that these findings may be partially explained by the definition and measurement of metamemory, the appraisal of task difficulty, and the influence of variables, such as effort, which may mediate between efficacy and performance. The influence of self-efficacy on effort has not been examined with an older group of study participants. This issue has been tested with other groups and the data from these studies provides insight into the possible relationship

in older groups. The next section presents this literature.

Self-Efficacy and Effort

A review of any body of research must include the classic research in the field. In self-efficacy research the classic starting point is the work of Albert Bandura, who developed the self-efficacy model. Much of Bandura's work (Bandura & Adams, 1977; Bandura, Adams, & Beyer, 1977; Bandura, Adams, Hardy, & Howells, 1980) has been done with adults with various chronic phobias who were exposed to situations designed to increase their efficacy in previously perceived "threatening" situations. These studies revealed that a strong positive relationship exists between performance mastery and self-efficacy, and a weaker but yet strong positive relationship exists between self-efficacy and vicarious experience. Later, Bandura et al. (1980) concluded that close congruence between changes in self-efficacy and different forms of coping behavior in agoraphobia (fear of open spaces) is evidence of the generality of efficacy theory across different areas of functioning. This conclusion concurs with Bandura et al. (1977) finding that self-efficacy was an "accurate predictor of performance on all tasks [in phobia situations] whether mastery or vicarious experiences were used" (p. 125). Recent research has attempted to apply the model to various other situations to test the generality of self-efficacy.

There has been some self-efficacy research done with depressed individuals that yields important information about the maintenance of self-efficacy and its affect on effort and performance. In their study of the relationship between self-monitoring processes, memory, and

depression, Roth and Rehm (1980) found that depressed individuals were more apt to attend to negative information and less apt to attend to positive information. They concluded that these processes may help to explain the development and maintenance of pessimism, low self-esteem, and helplessness" (Roth & Rehm, 1980, p. 155). Further, Davis and Yates (1982) found that self-efficacy ratings correlated positively and strongly with performance for depressed individuals in a similar study which specifically employed the self-efficacy model.

While Roth and Rehm (1980) used constructs different from the self-efficacy construct, and both Roth and Rehm (1980) and Davis and Yates (1982) studied depressed participants, the relationship drawn between processing of information and inattention to negative cues is reminiscent of self-efficacy research with non-depressed groups. In Roth and Rehm's (1980), and Davis and Yates' (1982) work, it was found that individuals may increase attention to negative efficacy information if they perceive themselves to be incapable of dealing with the situation in question. Such individuals minimize positive efficacy information and miss opportunities to engage in enriching efficacy increasing experiences (Bandura, 1981, 1982). Reduced opportunity to increase efficacy for those who perceive themselves as inefficacious leads to further personal confirmations of low self-efficacy judgements (Bandura, 1977a, 1981, 1982). Beliefs about inability to perform may lead to reduced effort and performance.

Self-efficacy and cognitive performance have been studied in relation to various variables including effort. In all of the following research, effort was only one of the variables measured.

Singh (1985) studied the cognitive dynamics of underachievement in socially disadvantaged students and found that students in a high self-efficacious treatment increased their effort and their performance. Minor and Roberts (1984) also found a significant positive correlation between self-efficacy and effort as defined by time spent on an unsolvable puzzle task in their study of undergraduates' persistence. Felson (1984) examined the effect of self-appraisals of ability on undergraduates' academic performance. He found that students with high efficacy appraisals work harder, as defined by higher grades, than students with low self-efficacy appraisals. All these studies support the assumption (Bandura, 1977a, 1981) that higher self-efficacy is related to greater expended effort at cognitive tasks.

Bandura and Cervone (1983) studied the relationship between undergraduates' goal systems, self-efficacy judgements, and effort on a physical exertion task (a bicycle ergometer). Goal systems are simply sets of goals that individuals create for themselves. When individuals set their own goals a personal performance standard that represented self-efficacy expectations was created. In addition the participants received performance feedback manipulated by the experimenter via statements presented on a video screen ("your performance from the last session was...," Bandura & Cervone, 1983, p. 1020). In this situation those with higher perceived self-efficacy for attaining goals, and higher self-dissatisfaction with a sub-standard performance intensified their effort at the task. The authors concluded that highly efficacious individuals intensify and sustain effort needed to meet challenges. These individuals may feel they can meet challenges if

they just try hard enough, whereas individuals with low self-efficacy may perceive the expenditure of effort as a waste of time. This research supports Bandura's (1977a, 1981) hypothesis that performance (both cognitive and physical) is mediated by the amount of effort/persistence spent at a task, which is in turn subject to level of self-efficacy.

Lent, Brown, and Larkis (1984) studied academic achievement and task persistence in college students and found that those with high self-efficacy had higher grades and persisted longer in school. Cervone and Peake (1986) found similarly that undergraduates' differences in task persistence paralleled differences in self-efficacy judgements. In a second experiment with high school students by Cervone and Peake (1986) these results were replicated. These data support the hypothesis that individuals with higher self-efficacy have a commitment to higher standards which increases their motivation as they seek out challenges (Bandura, 1977a, 1981). On the other hand, those with lower efficacy further reduce their expectations for performance every time they "give up" or avoid a task they perceive as too difficult. In this situation, the highly efficacious individual spirals upwards and the low efficacious person stagnates or spirals downward in both judgements of efficacy and observed performance.

In a test of the interface between control theory and self-efficacy theory, Jacobs, Prentice-Dunn, and Rogers (1984) found that self-efficacy expectancies, compared to outcome expectancies and degree of self-awareness were the best predictors of persistence at a task. In this study, 96 undergraduates worked on extremely difficult anagram

tasks for five minutes. It was impossible to complete the task in that length of time. The participants were then told that their performance was not very good and that most people get at least a few correct. The participants then completed an unsolvable design task they could work on for up to thirty minutes for which they received either high (i.e., "this task is easy") or low (i.e., "this task is hard") efficacy stimulating instructions. They also received outcome expectancy information which was either positive (solving these tasks sharpens your skills) or negative (solving these tasks does not sharpen your skills). Self-awareness was manipulated by the presence or absence of a mirror. Effort was measured by the amount of time spent on the second task. Only self-efficacy expectancies were related to performance; those with higher self-efficacy worked longest on the second task. Jacobs et al. (1984) concluded that the extremely strong positive effect of self-efficacy expectancies on effort provided substantial support for Bandura's (1977a, 1981) theory.

Effort has also been studied in conjunction with a variety of other constructs which are similar to self-efficacy in that they involve perceptions of "self" and self-assessment. For example, Kernis, Zuckerman, Cohen, and Spadafora (1982) studied effort in terms of learned helplessness theory with undergraduate participants. They found that under high self-awareness, persistence and interest in a maze task were greater when participants received instructions that the task was difficult. McFarlin, Baumeister, and Blascovich (1984), have studied self-esteem and the amount of time spent on unsolvable puzzle tasks with undergraduates and found that high self-esteem individuals

worked longer on a series of unsolvable puzzle tasks in both productive and non-productive conditions. The participants were told to work until a solution was reached (productive condition) or to move on when faced with a "difficult" puzzle (non-productive condition). None of the participants was aware that a solution was impossible to attain. The high self-esteem subjects worked longer than low self-esteem participants even in the non-productive condition. McFarlin et al. (1984) explained these results by hypothesizing that high self-esteem participants have a pattern of "not giving up" that may at times be detrimental to their performance. Overall, the authors conclude that this pattern serves to increase effort and performance because failures are perceived as infrequent and are discounted by high self-esteem individuals.

In a later study, McFarlin (1985) substantiated this hypothesis. He suggested that the participants with high self-esteem in the McFarlin et al. (1984) study continued to work on non-productive puzzle tasks because the advice to move on to the next task may have constituted an admission of lack of ability to the participants. The type of contingency information was important in McFarlin's (1985) study. He found that when self-esteem participants were told the task was impossible they did not work as long as the low self-esteem participants. Thus, when high self-esteem participants knew that the task was unsolvable, stopping work on the task did not constitute a threat to their perceived ability. In contrast, Bandura's (1984) theory is based on the concept that individuals do not know the outcomes of the tasks they attempt in day to day life ahead of time.

Tasks are approached based only on perceptions of self-efficacy related to performance in prospective situations of which the outcome is unknown. Telling participants that the task is impossible to perform constitutes information about the outcome of tasks and is not appropriate in tests of self-efficacy. Therefore, these findings (Kernis et al., 1982; McFarlin, 1985; McFarlin et al., 1984) appear to generally support Bandura's (1977a; 1981) hypothesis that those with higher perceived self-efficacy will persist longer at a task in prospective situations, when they do not know the outcome of the task.

In summary, research has demonstrated a relationship between self-efficacy expectations, how well one thinks he or she will do on a task, and performance. Findings from studies of phobics and depressed individuals that illustrated this relationship have been expanded to studies of self-efficacy and effort at cognitive tasks among undergraduates and high school students. This research assessed how effort, the amount of time one persists at a task, is influenced by self-efficacy expectations. Generally, it was found that higher self-efficacy is related to greater expenditure of effort in the form of persistence at a task. Those with lower levels of self-efficacy expended little effort, or avoided tasks completely. Research with other variables related to self-assessment has also demonstrated a relationship between higher levels of "self" related constructs and persistence at a task.

In conclusion, although the issue of self-efficacy and effort has not been tested with older adult participants, the data suggest that older individuals' performance will influence the relationship between

self-efficacy and effort at cognitive tasks. The mediating influence of effort on performance for older individuals may be even more important than for other groups because of the hypothesized changes in self-efficacy with age (Bandura, 1981). Because older individuals may be more likely to assess efficacy inaccurately, their decisions about how much effort to exert at a task may be influenced more than younger adults effortful decisions have been influenced. The literature related to the measurement and definition of effort in self-efficacy research, and other research employing related variables, is briefly reviewed below for information it provides which was relevant to this study.

The Measurement of Effort

The relationship between self-efficacy and effort has been defined and measured with younger adult groups through persistence in academic programs or persistence at a cognitive puzzle task. Only one study deviated from this format; Bandura and Cervone (1983) used a strenuous physical activity to measure effort in relation to self-efficacy and setting goals. Because only those studies that measured effort, or the amount of time spent on a puzzle task, were relevant to this study, these will be reviewed.

Cervone and Peake (1986) examined the relationship between self-efficacy and task persistence in undergraduates with an unsolvable anagram task. Similarly, Jacobs et al. (1984) used an extremely difficult anagram task that was almost unsolvable and an unsolvable design task in their study of control theory, self-efficacy, and effort. Minor and Roberts (1984) also studied the relationship between

self-efficacy, control theory, and effort with undergraduates, but used a solvable anagram task. All but Cervone and Peake (1986) measured effort as the amount of time spent on the tasks. Cervone and Peake (1986) measured the time spent on two different tasks to assess effort. All of these studies used different instructions to manipulate self-efficacy; participants were told either the task was difficult or relatively easy.

Research which examined variables other than self-efficacy to measure the relationship between effort and a self-assessment or "self" type variable, exclusively employed unsolvable puzzle tasks (Kernis et al., 1982; McFarlin, 1985; McFarlin et al., 1984). The puzzle tasks were anagrams or geometric puzzles that could not be put together. In these studies, the self variable was also manipulated by varying the instructions given to participants working on the unsolvable tasks. For example, Kernis et al. (1982) and McFarlin et al. (1984), provided success and failure feedback to participants independent of their actual performance. In another study, McFarlin (1985) provided participants with either no information about the difficulty of an unsolvable task, or told them that the task was either impossible, or very difficult. In these studies and those cited above, effort varied with type of instructions. In addition, the researchers selected a pre-set time limit that was determined in a pilot study by allowing people to work as long as they wanted. The maximum time that participants worked in the pilot was doubled to determine the study stop time. Participants who continued to work on the unsolvable tasks were stopped at the pre-set time because allowing participants to work

on unsolvable tasks indefinitely was determined to be unethical. However, it was extremely rare for an individual to work until the designated time. Participants invariably stopped working on the tasks of their own accord.

In summary, most studies which have examined the relationship between self-efficacy and other "self" related variables have measured effort by the amount of time spent on a difficult or unsolvable puzzle task. Participants received different instructions which influenced the amount of effort they exerted at the task. For ethical reasons predetermined stop times were established but were rarely needed.

Conclusion

The literature reviewed has revealed an ongoing debate regarding the nature and origin of cognitive changes in later life as well as variables that might relate to the impact cognitive changes with age might have on older individuals' behavior. Expectations for performance based on perceived ability are factors that may help explain findings by researchers such as Baltes and Schaie (1976) that change in old age is at least partly socially and environmentally influenced. The general research on self-efficacy has indicated a relationship between self-efficacy expectations, or individuals' beliefs about their ability to perform a task, and cognitive performance.

Effort, defined as a persistence, has been studied in relation to self-efficacy and cognitive performance in young adult groups. The data from this research indicate those with higher levels of self-efficacy will attempt more tasks, persist longer at them, and expend

more effort. Other social-psychological research employing "self" type variables has supported this finding; high self-esteem subjects tended to persist longer at tasks.

Self-efficacy research with older participants has raised many questions because of the equivocal findings in the literature; no age differences in efficacy estimates and performance or an overestimation of performance were found in studies with older participants. It was suggested that examining the influence of the mediating variable effort in the relationship between self-efficacy and performance may help to partially explain the equivocal results.

Studying mediating variables such as effort in the self-efficacy and cognitive performance relationship can result in a new interpretation of past findings and provide the missing link in the self-efficacy-performance relationship. Examining the mediating role of effort may help to reveal the influence different levels of efficacy have for performance, because effort is something that is influenced by efficacy during task performance. This aspect of the efficacy-performance relationship in older adults has not been examined. In addition, specifying the older individuals' expectations for general efficacy and memory efficacy helps to further clarify the nature of the efficacy/effort/cognitive performance relationship, since memory efficacy has been found to be perceived more poorly than general efficacy.

Working Hypotheses

In order to examine the relationship between self-efficacy and effort in older individuals the following working hypotheses were

proposed.

1. Those in the high self-efficacy group will exert more effort at the task than those in the low self-efficacy group.

2. Those in the high efficacy instruction group will exert more effort at the task than those in the low efficacy instruction group.

3. Those in the high self-efficacy group and the high efficacy instruction group will exert the most effort at the task and those in the low self-efficacy group and the low efficacy instruction group will exert the least effort at the task.

Working Secondary Hypotheses

1. Those with a high level of general efficacy will exert more effort at the task than those with a low level of general efficacy.

2. Those with a high level of memory efficacy will exert more effort at the task than those with a low level of memory efficacy.

3. Those with a high level of general efficacy and a high level of memory efficacy will exert the most effort at the task and those with a low level of general efficacy and a low level of memory efficacy will exert the least effort at the task.

4. Some participants with a high level of general efficacy will have a low level of memory efficacy whereas those with a high memory efficacy will also have high general efficacy. Further, those with a low level of general efficacy will have a low level of memory efficacy.

# CHAPTER IV

## Methods

### Sample

Forty-seven volunteers aged 59-80 years were selected from a group of 85 older individuals who participated in an earlier study (N=93 older participants) and had agreed to participate in a second study (Hurlbut, 1980). Twenty-five volunteers in a high self-efficacy group (passing score of 75% or higher) and 22 in a low self-efficacy group (failing score of less than 75%) were randomly selected, and contacted by telephone, from these 85 participants. Three volunteers were unable to participate because of other commitments; two of these were in the high self-efficacy group, and one was in the low self-efficacy group. Four volunteers were no longer interested in participating in a second study; three of these were in the high self-efficacy group, and one was in the low self-efficacy group. Thus, a total of 40 older individuals participated in the present study. The 20 participants in each self-efficacy group were then randomly assigned to two efficacy instruction treatments, so that there were ten participants in four different treatment groups: high-self-efficacy/high efficacy instructions; high-self-efficacy/low efficacy instructions; low self-efficacy/high efficacy instructions; low self-efficacy/low efficacy instructions.

Descriptive statistics indicated that the participants in the study scored within one standard deviation of the norm for the logical memory, memory span, visual reproduction, and associative learning subscales of the Wechsler Memory test by Wechsler and Stone (1974) (See

Appendix A, Table A-1). The participants were screened for good health and the absence of chronic health problems through a self-report questionnaire. Thirty-seven participants reported good to excellent overall health; three reported fair health (two in the high self-efficacy group; one in the low self-efficacy group).

The average age of the study participants was 70 years. Ten percent of the participants were 59-64 years of age, 67.5% were 65-74 years of age, and 23.5% were 75-80 years of age. Twelve men (30%) and 28 women (70%) participated in the study. Three males were in the high self-efficacy/high efficacy instruction group, four were in the high self-efficacy/low efficacy instruction group; two were in the low self-efficacy/high efficacy instruction group, and three were in the low self-efficacy/low efficacy instruction group. Seven females were in the high self-efficacy/high efficacy instruction group, six were in the high self-efficacy/low efficacy instruction group, eight were in the low self-efficacy/high efficacy instruction group, and seven were in the low self-efficacy/low efficacy instruction group.

Educational level of the participants was high compared to the general population in the same age group. In this sample, 57.5% of the participants had completed post secondary education, 30% had grade ten or higher, and only 12.5% had completed grade nine or less. The participants demonstrated a high level of education compared to the general population in this age group because over half the participants possessed a university degree. The average number of years of completed university in Canada for the older adult population is much lower at about 13% (McPherson & Kozlik, 1980). In addition, since the

first study was completed (Hurlbut, 1988), nine participants had taken courses at Spring Session for Seniors at the University of Alberta and six had taken some type of community course. The remaining participants did not indicate participation in additional educational activities in the last two years.

Efficacy Scores

Three types of self-efficacy scores were used in the present study. One was used to test the main hypotheses and two were used to test the secondary hypotheses. The self-efficacy scores used to test the main hypotheses were calculated from data in Hurlbut's (1988) study and are explained below. The two scores used to test the secondary hypotheses were gathered in the present study and are explained under the heading "Efficacy questionnaire."

The following procedure was used to group the participants in Hurlbut's (1988) study into high and low self-efficacy groups. Participants who were seen in small groups completed several subject paced tasks. First, all participants were told the study was about age differences in learning and memory. The participants then completed a pre-study memory task consisting of the subscales on the Wechsler Memory Test. After a coffee break, the participants read a story which varied the vicarious experience in the study. Then the participants made pre-task performance estimates (a metamemory measure) followed by the learning task. Next they made post-task performance predictions (a second metamemory measure). Before leaving the participants completed a demographic questionnaire. The following materials from Hurlbut's (1988) study were used in the present study.

Wechsler memory test. All participants in Hurlbut's (1988) study were given the logical memory, memory span, visual reproduction, and associative learning subscales of the Wechsler Memory Test by Wechsler and Stone (1974). The scores on these subscales were used to describe the sample. The scores for the forty participants in the present study were gathered at this time and are presented in Appendix A, Table A-1.

Learning tasks. The learning tasks consisted of two essays and one short practice essay which were given to all the participants. After reading each essay the participants answered 18 multiple choice questions relating to each essay. There were 36 questions to answer in total, plus 2 practice questions. These tasks were used to measure observed performance. The participants in this study were randomly selected from those with an observed performance score on the learning tasks of 18 or better. Eighty-five percent of the participants in Hurlbut's (1988) study had a score of 18 or better.

Metamemory. Memory monitoring was tested with two measures that were given to all the participants. Estimates were made before participants began the learning tasks (pre-task metamemory) and after completing the learning tasks (post-task metamemory). The pre-task metamemory measure was obtained by asking the participants to estimate how many of the 36 questions on the learning tasks they would answer correctly. For the post-task metamemory measure participants were asked to estimate how many of the 36 questions on the learning tasks they had answered correctly. The pre-task estimate was used to group participants into either high or low self-efficacy groups. The following section explains the basis of this division.

Vicarious experience. The participants read a story about an older individual who wanted to attend university. Before being admitted to university the individual in the story must complete a set of learning tasks. The individual in the story experienced either success, with a score of 75% or better, or failure, with a score of less than 75%. Individuals who estimated their score on the pre-task metamemory measure as 75% or higher were placed in the high self-efficacy group. Participants who estimated their pre-task measure as lower than 75% were placed in the low self-efficacy group. In the present study 34 of 40 participants' pre and post-task estimates were consistent (i.e., both estimates were above or below 75%). Participants who estimated their pre-task and post-task metamemory inconsistently (e.g., one estimate was above 75% and the other was below 75%) were placed in a self-efficacy group based on the pre-task estimate. This was done only with participants (n=6) who did not change their estimates dramatically (e.g., those with a pre-task estimate of 30% and those with a post-task estimate of 90% were not used). The reason for using the pre-task estimate to place participants in the self-efficacy groups was because self-efficacy theory is based on individuals' feelings about ability regarding prospective tasks.

## Materials

The materials are described below and presented in Appendix B in the order they were presented to the participants.

### Efficacy Questionnaire

The first task was the efficacy questionnaire. There were two

questions that asked the participants to rate their agreement with a statement on a five point rating scale. The first question related to the amount of control one has over general ability and if it has changed since mid-life. Participants also indicated if they had more, less, or the same control as before. The second question was related to the amount of control one has over the ability to learn and remember, and if it has changed since mid-life. As in question one, the participants indicated if they felt more, less, or the same control.

Effort Task

The effort task was used to measure how long the participants worked on a puzzle task, "Squaring the Circle" manufactured by Q.E.D., Canada Games Limited (1985) of Downsview, Ontario. The task consisted of small plastic shapes which fit together to form a large circle inside a square. The task is solvable but it is very difficult to solve, and no participant was able to solve the task. This task is similar to unsolvable and/or very difficult tasks used by others (Jacobs et al., 1984; Kernis et al., 1982; McFarlin, 1985; McFarlin et al., 1984).

Instructions. The instructions used in this study were adapted from those used in other studies (Jacobs et al., 1984; Kernis et al., 1982; McFarlin, 1985; McFarlin et al., 1984). The two sets of instructions varied as follows. The experimental condition was the low efficacy instruction condition and the experimenter said: "this task is quite difficult, and is somewhat like a Rubik's cube." The control condition was the high efficacy instruction condition and was identical

to the experimental instruction except that the line "this task is quite difficult and is somewhat like a Rubik's cube puzzle" was left out. In both conditions the experimenter said "it is important that you work as quickly as possible because I'll be timing you."

Filler Task

A second task was used to ensure that all participants experienced success before leaving the experimental situation. Such an extra task is consistent with the effort literature (Kernis et al., 1982; McFarlin, 1985; McFarlin et al., 1984). The Islands Puzzle task which was used for the extra task is fairly simple to perform and is designed by Karplus and Karplus (1970) of the University of California. The task is a paper and pencil puzzle which involves instructions with 'clues' that require some reasoning skills. The experimenter worked actively with participants on this task, answering all questions and helping them to complete the task.

Demographic Questionnaire

A revised version of the demographic questionnaire used in the Hurlbut (1988) study was employed to reassess the background information of the participants, such as health condition or any additional education received. This information was used to describe the sample.

## Procedure

The participants were seen for one session on an individual basis in their homes (n=29), or at the University of Alberta (n=11), at their convenience. All tasks were subject paced. The research session was conducted according to the protocol read by the experimenter (see

Appendix C).

A pilot study, with a sample size of four, was done to gain rudimentary evaluation of the face validity and of the geometric puzzle task, and also to determine the amount of time most participants persisted at the task. In other studies (McFarlin, 1985; McFarlin et al., 1984), the greatest amount of time participants took to work on the geometric tasks in the pilot was doubled and became the predetermined stop time. In this study none of the pilot participants persisted longer than 12 minutes so the cut-off time was determined to be 20 minutes. No participants persisted to the cut-off time.

On four occasions participants were asked by the experimenter if they would like to stop. Each time the participant expressed relief at being asked if they would like to stop. This question was posed only when participants repeatedly made statements such as "you must think I'm really dumb." In these cases continuing might be unethical. Participants in the following treatment groups were asked if they would like to stop, and accepted the offer: one participant in the high self-efficacy/low efficacy instruction group; two participants in the high self-efficacy/high efficacy instruction group; one in the low self-efficacy/high efficacy instruction group, and none in the low self-efficacy/low efficacy instruction group.

At the beginning of the research session the experimenter introduced herself and generally explained that the study related to aging, learning, and memory. After being told that they may withdraw from the study at any time the participants were asked to sign a consent form (see Appendix D). A copy of this form was given to the

participants to keep and included the experimenter's name and phone number, and the name and phone number of her thesis supervisor, so the participants could contact either one if they had any questions. The participants also signed a sheet requesting a copy of the study results if they so desired.

Next the experimenter administered the efficacy questionnaire after explaining how to answer the questions using the rating scale. Participants were then told that the next task was the puzzle task. The experimenter put the empty puzzle frame and puzzle pieces in random order on the table. Participants were verbally instructed to complete the puzzle, as quickly as possible, and received either the high or low efficacy instruction set. During the puzzle task the experimenter watched the participants and wrote down the participants' comments on the "Puzzle Time Sheet" (see Appendix B) while working. The experimenter also glanced at the watch frequently. This was done to put pressure on the participants. Participants completed the Islands task next and the demographic task last.

The participants were debriefed at two points in the study: after the effort task and after the Islands task. After the effort task participants were read one of two statements depending on the amount of time they had worked on the puzzle task. Those who worked for less than five minutes were told: "You seemed to discover early that this task was practically unsolvable and stopped working on it. That is very good, since this task is almost impossible to solve." Those who worked on the puzzle for more than five minutes were told: "You really persisted and stuck out this task. You worked on it for a long time

without giving up. That is very good, since this task is almost impossible to solve." In all cases the unsolvability of the task was emphasized to the participants. In addition, the solution sheet was offered to the participants so they could see how the puzzle went together.

Once the Islands task was complete, the study participants were fully debriefed and the complete nature of the study was revealed. The experimenter explained that the first (effort puzzle) task was in fact very difficult and almost impossible to solve. The experimenter also made sure that all the help desired by the participants to successfully complete the Islands task was offered. A sheet entitled "Puzzle Task Study" (see Appendix D), which explained the exact nature of the study, what the participants had done that day, and how it related to the first study (Hurlbut, 1988) in which they participated, was given to the participants. After completing the demographic questionnaire, the participants were thanked for their time. Thank-you letters were sent to all participants within one month of their participation in the study. Data were coded following procedures so that confidentiality was maintained.

## Design

The research design used in this study was both experimental and quasi-experimental since participants could not be randomly assigned to the high or low self-efficacy groups but were randomly assigned to one of two efficacy instruction groups. The two independent variables in this study were the participants' level of self-efficacy (high or low), and the type of efficacy instruction received (high or low). The

dependent variable in this study was effort, defined as the amount of time the participants spent on the puzzle task before giving up. A two way analysis of variance was used to test the significance of self-efficacy (high or low) and efficacy instructions (high or low) on the dependent variable effort (amount of time working on the task), which were the main working hypotheses. The level of measurement for the dependent variable was at least interval (i.e., time) allowing the use of parametric statistical techniques.

A secondary question in this study concerns the independence of general efficacy estimates and memory efficacy estimates, and the influence of general and efficacy memory estimates on the dependent variable (time). The first aspect of this question was analyzed using two chi-square tests of independence. A two way analysis of variance for main effects only was used to test the significance of general efficacy (high or low) and memory efficacy (high or low) on effort at the task, which addressed the second aspect of this question. The probability level for this research was set at .05.

# CHAPTER V

## Results

The main hypotheses of the study were tested by a two-way analysis of variance. Analysis of covariance was also performed using scores from the five subscales of the Wechsler Memory Test (1974) as covariates. These covariates were used in an analysis of the effect of self-efficacy group and efficacy instructions on puzzle time. The secondary hypotheses were tested by a chi-square test of independence and a two-way analysis of variance.

### Statistical Results

The analysis of variance revealed that the three main null hypotheses could not be rejected. The main effect comparing the effort of the high and low self-efficacy on effort, $F(1, 39) = 3.59$, $p = .066$, was not significant. The hypothesis that predicted a significant difference between the mean scores of effort at a cognitive task for older individuals who varied by their level of self-efficacy was therefore not supported. The main effect comparing effort by the type of efficacy instruction received by the older participants, $F(1, 39) = 3.09$, $p = .087$ and the interaction effect between self-efficacy level and type of efficacy instruction on the older participants' effort at the tasks, $F(1, 39) = .144$, $p = .087$, were also not significant. Therefore the hypothesis predicting a significant difference between the mean scores of effort at the task for older individuals who received different instructions was not supported. Similarly, the hypothesis which predicted that self-efficacy and type of efficacy instructions would interact to produce a joint effect on effort by the

participants was not supported (see Appendix E, Table E-1 for Anova summary; Table E-2 for Mean summary).

The power of these analyses was likely very low because of the small sample size (N=40). The analysis comparing the effort of high and low self-efficacy participants approaches significance at .07. With a larger sample size, power may have been increased and significance achieved at the 0.5 level (Cohen & Cohen, 1975). For a medium effect size and the conventionally accepted power of .80, a sample size of 84 would have been required (Cohen & Cohen, 1975).

The analysis of covariance on the five subscales of the Wechsler Memory Test (1974) as covariates of self-efficacy and instruction did not change the pattern of results (see Appendix E, Table E-3 for ACV summary, Table E-4 for Means summary).

The analysis of variance for the secondary hypotheses also did not yield significant results. There was no main effect of general efficacy on effort, $F(2) = .254$, $p = .777$, and no main effect for memory efficacy on effort, $F(2) = .500$, $p = .611$, (see Appendix E, Table E-5 for Anova summary). The interaction effect between general efficacy and memory efficacy on effort could not be tested due to empty cells.

The relationship between the participants' general efficacy and memory efficacy was summarized in two ways. The first analysis was performed with "strongly agree," and "agree" responses collapsed into one response category for both memory efficacy and general efficacy. The responses "strongly disagree" and "disagree" were similarly collapsed into one response category. This was done in order to reduce the data. A chi-square test was not reported for this three way

contingency table because 66% of the cells had an expected frequency of less than five per cell and thus the assumptions of the chi-square test were not met. The participants estimates of general and efficacy estimates are presented descriptively in Appendix E, Table E-6.

A chi-square test of independence was performed with the neutral responses removed in order to satisfy the assumptions of the chi-square test which were not met in the first data reduction. The neutral responses were randomly assigned to the "agree" and "disagree" categories, which had already been collapsed as described above, for both memory efficacy and general efficacy. Using Yates correction for two by two crosstabulations, the assumptions of the chi-square test of independence were satisfied. This chi-square test of independence was a two-way test of the relationship between general efficacy and memory efficacy. This Chi-square test of independence was a two-way test of the relationship between general efficacy and memory efficacy. This test was significant, $\chi^2(1, N = 40) = 6.08709$, $p = .0099$, (see Appendix E, Table E-7). Therefore, the hypothesis predicting that there would not be an association between the participants' estimated levels for general efficacy and memory efficacy was rejected.

Table E-7 reveals that all participants with high memory efficacy also had high general efficacy, whereas some with high general efficacy had low memory efficacy. In fact, the data from Table E-6 indicates no participants had low general efficacy and high or neutral memory efficacy, whereas 11 participants had low memory efficacy, and high or neutral general efficacy. Fifty-seven percent ($n$=23) of the participants perceived their memory efficacy poorer than their general efficacy.

# CHAPTER VI

## Discussion

The purpose of this study was to explore the relationship between older individuals' self-efficacy and their effort at cognitive tasks. Bandura's (1977a, 1981) self-efficacy model was used as the conceptual framework and effort was defined here as the amount of time one persists at a task.

There are three possible interpretations of the results of the present study. One concerns methodological issues in this study. The other two other regard Bandura's (1981) model which may not have been tested definitively in this and other studies, or the model may be inaccurate.

At first the results of the present study seemed to indicate that Bandura's (1981) model was not supported. For the main hypotheses of the study there were no significant differences found in the amount of time that older individuals with high and low self-efficacy worked on the effort task. There may be methodological problems in the present study which account for the lack of significant differences in the results. Power was low in this study because of small sample size; as sample size increases, power increases. Cohen and Cohen (1975) suggest that power, which equals B, should be .80 as a convention much as significance levels are set at .05 by convention in the social sciences. Under this criteria, for a population with an assumed small effect size ($r = .10$), a very large number of participants would be required (783). For a medium effect size ($r = .30$) a sample size of 84 would be required, and for a population with a large assumed effect

size ($r = .50$), a sample of 28 would be required. Cohen and Cohen (1975) further suggest that one should look for a medium effect size as a conservative estimate of power if it is not possible to detect effect size from previous research. It would seem a sample size of at least 80 would be needed to test for medium effects. Since the differences between high and low self-efficacy participants who worked on the task approached significance at .07 with a small sample size, there may be significant differences between those with high and low self-efficacy who worked on the puzzle task with a larger sample size than that used in the present study.

Another methodological problem in the present study is indicated by the high educational and activity level of the participants. Over 57% of the participants had completed post secondary education, which is above the norm for the older population in Canada (McPherson & Kozlik, 1980). Fifteen of the participants had participated in some type of organized learning activity or course since the first study (Hurlbut, 1988) was completed. The participants can therefore be characterized as a very high functioning group as exemplified by high educational levels. It may be that those in this study with "low" self-efficacy may not have had efficacy levels that were "low" in the sense of the general older population. The difference between high and low self-efficacy in this study may not have been as large as needed, resulting in too little difference between the two groups. Other issues, which may further explain the results of this study, relate to Bandura's (1981) model of self-efficacy.

The results of this study did not show a relationship between laboratory measures of self-efficacy and effort. This is similar to previous studies which do not show a relationship for older adults between laboratory measures of efficacy and performance (Dobbs & Rule, 1987; Perlmutter, 1978; Lachman et al., 1979). Although these results may appear to indicate that Bandura's (1981) model is inaccurate and efficacy is not related to performance, the consistency with which older adults casually report memory problems cannot be ignored (Dobbs & Rule, 1987; Hultsch et al., 1987; Lachman et al., 1979; Lovelace & Marsh, 1985; Williams et al., 1983; Zarit, Cole, & Guider, 1983). In the present study the analyses of the secondary hypotheses revealed that memory efficacy was perceived more poorly than general efficacy for most of the participants. Further, when relationships are found between efficacy and performance older individuals have overestimated their performance (Bruce et al., 1982; Hurlbut, 1988; Lachman & Jelalian, 1984), not underestimated their performance as would be predicted by both older individuals' reports of memory decline and Bandura's (1981) theory of self-efficacy. The reported memory decline by older participants which is not reflected in effort in the present study, performance in other studies, and the unexpected overestimates of performance in additional research, reveals a missing link in Bandura's (1981) model.

A major issue currently under investigation by Dobbs and Rule (1987), may reveal one of these missing links. Dobbs and Rule (1987) are investigating the laypersons' concept of the term memory. They suggest that there is very little knowledge of what study participants

think they are being asked when confronted with questions about their perceived memory ability. By way of example, Dobbs and Rule (1987) relate the case of a neurological patient who reported no memory problems but could not remember the material he had just read. The patient did not interpret this as a memory problem. As illustrated by Dobbs and Rule's (1987) hypothesis it is not clear how to measure individuals' perceptions of ability. In the present study participants' understanding of the questions asking them to estimate their ability to perform tasks is not known.

Efficacy measurement problems may also explain why participants in previous studies overestimated their efficacy. Participants may answer efficacy questions in terms of general efficacy and not memory efficacy. This study shows that estimates of general efficacy are higher than memory efficacy. Studies that found overestimates of ability may have been measuring general efficacy, when it was memory efficacy that was investigated. In this case, overestimates of performance would be predicted. Researchers may therefore need to clarify the concept of self-efficacy much as Dobbs and Rule (1987) have suggested clarifying participants' understanding of memory questions. Understanding how individuals understand questions relating to their perceptions of ability to perform tasks may reveal how these perceptions influence effort and performance.

Further clarification regarding the formation of self-efficacy expectations may also help explain how individuals' expectations influence performance, and why the participants' self-efficacy and effort were not related in the present study. Bandura's model (1981)

has not been tested with regard to how efficacy expectations are formed. A basic assumption of self-efficacy theory is that information from four sources is integrated into one's efficacy judgement. It is assumed that performance accomplishments and vicarious experiences have the most influence on performance. However, the last two sources, verbal persuasion and emotional arousal, may be more influential than previously thought. These two information sources were not investigated in the present study because of this basic assumption.

The relationship between efficacy and effort for the participants in the present study may have been influenced by the fourth information source, emotional arousal. West et al. (1984) have examined the relationship between affective status of participants and memory performance and found that affective status was linked to self-assessment of abilities more than actual performance. This finding indicates that the emotional component of efficacy expectations may be important. The research setting, such as the one in the present study, may lead individuals to estimate their efficacy based on the emotional arousal information they are receiving in the test situation. In addition, this emotional arousal can be so high that it may interfere with performance of the task. In the present study participants were under pressure to complete the task. According to Bandura's (1981) model, older individuals tend to re-evaluate their efficacy more than other groups. It is possible that their feelings about ability to complete the task are influenced negatively by emotional arousal in the middle of the task and they stop trying. This may have occurred in the present study, and could account for a lack of significant differences

in the scores because all participants may have given up fairly quickly due to high levels of anxiety (emotional arousal). The participants worked on the task from one minute, two seconds to 11 minutes, 21 seconds; the average amount of time that participants worked on the task was five minutes. The influence of emotional arousal and of the other efficacy information sources on the formation of self-efficacy expectations is virtually unexamined. Testing this aspect of the theory may help to clarify the concept of self-efficacy and how the different sources influence effort and performance in various settings.

Finally, the results of the present study in relation to self-efficacy theory suggests that Bandura's (1981) model may be inaccurate. Beliefs about ability may be related to performance, but not as described by Bandura's (1981) model. There are a number of variables which do not fall into the four information sources that may influence estimates of self-efficacy. Variables such as motivation to complete tasks are not taken into account in Bandura's (1981) model. It is possible that self-efficacy was not related to performance in the present study because the participants were not interested in the task, and were not motivated to try their hardest at the task.

The test situation may have influenced motivation to complete the task in the present study. Labouvie-Vief (1977) reports that test "ecology" factors which are known to influence the situational, and non-intellective factors in an experimental situation are: fear of strangers, differential familiarity with testing and the task, lack of interest, fear of evaluation, and the general threatening nature of the test environment. In this study the task was a geometric task that

many individuals would not attempt in daily life and the participants may have had little familiarity with the task. The time pressure placed on the participants may also have influenced them to reduce their motivation.

The puzzle task may not have been meaningful to the participants. If this is the case, satisfactory performance of the task will not be important to the study participants. This may have lowered the high self-efficacy participants' persistence. In other research, Bandura and Cervone (1983) found that younger subjects with higher self-efficacy had a strong motivation to complete a task when performance feedback (participants were provided with information about their performance) was combined with a personal standard or goal. The setting of a performance goal alone, or receiving performance feedback alone did not affect motivation. In addition, the participants set their own personal performance standards. Further, the setting of specific and challenging goals has been found to lead to higher performance motivation (Locke, Shaw, Saari, & Latham, 1981). In the present study, participants did not have such an "investment" in completing the task and were not asked to set a personal goal to achieve. Therefore, completion of the task may not have been meaningful enough to be an accurate measure of effort and efficacy. Those with high self-efficacy in the present study would be most affected by the need to see the task as meaningful because they are hypothesized to know what they can accomplish and may be more achievement oriented. High self-efficacy individuals might be likely to persist a shorter time when they perceive a task as meaningless,

whereas the meaningfulness of tasks may not influence low self-efficacy individuals' persistence at a task. This may be a major reason why those with high self-efficacy did not work at the task significantly longer than those with low self-efficacy in the present study.

In addition researchers and educators have suggested that older individuals have specific motivations for completing tasks. Brady and Fowler (1988) found that of 560 older students attending Elderhostel programs those who reported the most learning and motivation had set clear goals for themselves, chose the program carefully to meet their needs, and built on previous experience with Elderhostel. Clearly, those with the highest motivation were those who had a distinct interest in completing the program because they chose it themselves to meet needs they defined themselves. This contrasts sharply with the geometric puzzle task the older volunteers completed in this study. The participants did not choose the task and may have had little to gain by attempting or completing the task. The task was selected based on previous research with young adults using Bandura's (1977a, 1981) model and the model does not take into account the characteristics of older adults' motivation, such as setting goals, and choosing the task to meet their own needs.

Brady and Fowler's (1988) work is supported by Knox (1977) who states that older adults' are motivated to learn a new cognitive task when they set their own pace and have an interest in the task; often the task is chosen because it has a specific performance outcome that the older adult wishes to attain (Knox, 1977). In the present study, the seniors had relatively high educational levels and represented an

active sample of older participants; many were recruited through "Spring Session for Seniors" at the University of Alberta and others took the initiative to participate by responding to an article in the community newspaper asking for participants. This may have given them even less reason to be interested in the task because they appeared to be a group that was used to setting their own goals and actively pursuing various interests. In addition, the task in the present study did not have an outcome chosen by the participants. Bandura's (1981) model does not take into account these aspects of motivation, especially with regard to the perceived importance of the outcomes of a task, or what individuals think they might attain by completing a task.

In summary, the results of the present study have been interpreted in terms of methodological issues in the present study and in terms of Bandura's (1981) model of self-efficacy. It was suggested that the results of the present study were not significant because of low power due to a small sample size. The high educational level of the participants may also have influenced the results so that the low efficacy participants' estimates were not significantly lower than the high efficacy participants' estimates, resulting in no significant differences between the two groups.

In terms of Bandura's (1981) model it was suggested that the model may need further testing related to two areas. Participants' understanding of the meaning of experimental questions about ability is not known so it is difficult to measure perception of memory and general efficacy. Second, the influence of the various information sources on the formation of a single efficacy estimate is unclear.

Factors such as emotional arousal and verbal persuasion which were not considered important in the past may be more influential than previously thought and merit investigation. Investigating how the information sources influence efficacy judgements may clarify how self-efficacy influences effort and performance. Finally, it was suggested that Bandura's model may be inaccurate since variables such as motivation, and specifically the characteristics of older adults' motivation (e.g., setting goals and choosing their own tasks), are not taken into account in the self-efficacy model.

# CHAPTER VII

## Implications

Although a relationship between self-efficacy and effort was not found in the present study, self-efficacy has been found to relate to older adults' adaptation to daily life. Research with older adults has demonstrated a relationship between self-efficacy and health variables, which Family Life Education Programmers may find revealing. For example, Gravelle (1985) found that self-efficacy was positively related to older adults' control of arthritic pain. Through interviews it was found that pain reduction was greatest for participants who had a positive outlook, felt a sense of control, and had increased self-efficacy (Gravelle, 1985). Woodward and Wallston (1987) found that self-efficacy mediated age differences in health related desire for control; older adults with lower self-efficacy took less responsibility for their own health care and they expected medical professionals to make all their health care decisions. This research indicates that self-efficacy is related to older adults' ability to take control of their lives. Family Life Educators should consider ways to cultivate a "positive outlook" and increase self-efficacy through programming. For example, health maintenance and nutrition programs are not beyond the scope of Family Life Education programming (Arcus, 1987).

Brady and Fowler (1988) suggest that Educators can achieve the goals of increasing older adults "outlook," but must do so as facilitators who are cognizant of the older adults' needs, not as directors who impose programming on older adults because "it is good

for them." According to Knox (1977) practitioners who work with older adults in family and community roles are often in a position to facilitate their learning, but must [redacted] from the older adults' perspective to be successful. The self-efficacy of older adults in Family Life Education programs will only be positively influenced if this perspective is observed; this includes building features into programs that build on ability and experiences and provide an environment conducive to positive encounters with others. Most importantly, Family Life Educators may need to provide more community based programs that appeal directly to older adults' experiences and go beyond "retirement planning." Such interests include health and exercise programs, human sexuality, developing personal resources, and sharing leisure interests with others (Arcus, 1987).

Finally, it can be stated that Family Life Educators have a role in providing opportunities for older adults to achieve their potential. It is important for Family Life Educators to keep abreast of developments in self-efficacy research with older adults as it may reveal new information which can be used to develop programs that meet the older adults' programming needs.

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# APPENDIX A

## Wechsler Memory Test Subscale Scores

Table A-1

Wechsler Memory Test Subscale Scores for High and Low Efficacy Participants

| Subscale | | n | M | SD |
|---|---|---|---|---|
| | High-Efficacy Participants (n=20) | | | |
| 1. | Logical Memory | 20 | 11.275 | 2.353 |
| 2. | Digits Forward | 20 | 6.550 | 1.276 |
| 3. | Digits Backward | 20 | 5.400 | 1.314 |
| 4. | Visual Reproduction | 20 | 9.000 | 2.675 |
| 5. | Associative Learning | 20 | 17.125 | 3.312 |
| | Low-Efficacy Participants (n=20) | | | |
| 1. | Logical Memory | 20 | 9.050 | 3.030 |
| 2. | Digits Forward | 20 | 5.700 | 1.218 |
| 3. | Digits Backward | 20 | 4.900 | 1.334 |
| 4. | Visual Reproduction | 20 | 8.350 | 2.159 |
| 5. | Associative Learning | 20 | 14.525 | 4.731 |
| | Total (n=40) | | | |
| 1. | Logical Memory | 40 | 10.162 | 2.905 |
| 2. | Digits Forward | 40 | 6.125 | 1.305 |
| 3. | Digits Backward | 40 | 5.150 | 1.331 |
| 4. | Visual Reproduction | 40 | 8.675 | 2.422 |
| 5. | Associative Learning | 40 | 15.825 | 4.240 |

# APPENDIX B

## Materials

## EFFICACY QUESTIONNAIRE

___ ___ ___
___ ___ ___

Please read each statement below and then indicate if that statement describes you by circling the number that indicates how much you agree or disagree with the statement. This is what the numbers mean:

I means strongly disagree (does not describe me)

II means disagree

III means neutral (sometimes agree, sometimes disagree)

IV means agree

V means strongly agree (this is me)

1(a) At this time in my life I have a lot of control over how well I do things.

I II III IV V

(b) This is the same as I've always been compared to the middle years of my life.

I II III IV V

ALSO CHECK ONE OF THESE: I have more control _____
I have less control _____
I have the same control _____

2(a) I have a lot of control over how I learn and remember material.

I II III IV V

(b) This is the same as I've always been compared to the middle years of my life.

I II III IV V

ALSO CHECK ONE OF THESE: I have more control _____
I have less control _____
I have the same control _____

## Puzzle Time Sheet

SS# _____ _____ _____ _____

NH# ( ) _____ _____ _____

CS# _____ Age _____

Arrival Time: _____ Date: _____

Depart Time: _____

Puzzle Start _____

Stop _____

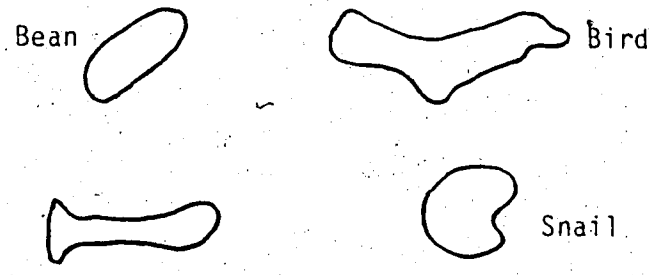
Minutes _____

Comments During Task Time Made

Overall Comments

Run By _____

## Islands Puzzle Task




Introduction: The puzzle is about four islands in the ocean. People have been traveling among these islands by boat for many years, but recently an airline began business. Carefully read the clues I give you about possible plane trips. The trips may be direct or they may include stops on one of the islands. When I say a trip is possible, it can be made in both directions between the islands.

This is a map of the four islands, called Bean Island, Bird Island, Fish Island, and Snail Island. You make notes or marks on your map to help you [illegible] the clues. Ask me if you have questions about the clues.

First clue: People can go by plane between Bean and Fish and Fish Island.

Second Clue: People cannot go by plane between Bird and Snail Islands.

Use these two clues to answer question 1.

Question 1: Can people go by plane between Bean and Bird Island?

Yes _____ No _____ Can't tell from the two clues _____

Third clue: People can go by plane between Bean and Bird Islands. Use all three clues to answer questions 2 and 3. Don't change your answer to question 1.

Question 2: Can people go by plane between Fish and Bird Islands?

Yes _____ No _____ Can't tell from the three clues _____

Question 3: Can people go by plane between Fish and Snail Islands?

Yes _____ No _____ Can't tell from the three clues _____

## Demographic Questionnaire

This questionnaire is like the one you completed in the last study. We are asking some of the same questions because we would like to know if anything has changed since you participated in the study last summer/fall 1986. That way we can clarify and update our files.

_____ ___ ___ ___
___ ___ ___

Date: _____ 1987

Name: _____
(optional)

1. Have you completed any schooling or taken any courses since the last study (summer/fall 1986)?

   ____ no.

   ____ yes. What did you take? _____

2. How would you rate your present health? (Check one).

   ____ poor ____ fair ____ good ____ excellent

3. How would you rate your present hearing? (Check one).

   ____ poor ____ fair ____ good ____ excellent

4. How would you rate your present vision? (Check one).

   ____ poor ____ fair ____ good ____ excellent

5. Do you have any ongoing or recurring health conditions?

   ____ no ____ yes. If yes please fill in the chart for all conditions.

| Name the condition | How long have you had it (months/years)? |
|---|---|
| | |
| | |
| | |

6. Do you regularly take medicine or pills?

_____ no _____ yes If yes please fill in the chart for all the pills you take.

| Name the medication | How often taken? | | | |
|---|---|---|---|---|
| | daily | weekly | monthly | less than once month |
| _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |

7. Have you taken any medication or pills this week?

_____ no _____ yes If yes, which ones and when was the last time you took it?

| Name the medication | Last date and time it was taken |
|---|---|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

Thank you for your time today.

Tracey Fellowes
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432-5771

# APPENDIX C

## Protocol

# Protocol

## Pre-Study Preparation

Two days before session:

- confirm appointment with participant
- restate time
- restate place (participants home address or give directions if participant has elected to come to the university)
- if participant is coming to the university arrange parking
- if participant has chosen their home as the place, ensure that participant has a table and chairs or desk

Introduction to Participant

(When participant answers door total experimental session timing will begin; i.e., from time experimenter arrives, until experimenter leaves).

The experimenter will introduce herself as follows when the participants answer the door).

Good morning, I'm Tracey Fellowes, the graduate student working on this project with Dr. Nancy Hurlburt. (Thank-you for inviting me to your home for the session today OR Thank-you for coming to the university, did you find your parking spot? Was parking free [if not reimburse for parking, record amount and have participant sign parking sheet]?)

(Experimenter may at this point make polite conversation with the participant if appropriate, for example, discussion about the weather, lovely garden/home etc.).

The purpose of our meeting today is to have you complete two puzzle tasks, one which involves reading some clues and figuring out the answer, and one which involves the use of plastic pieces that fit together. The reason we have asked you to do these puzzles is to allow us to examine what people do when they work on a puzzle task. (If in participant's home say, it will probably be most comfortable at a kitchen or dining room table, or a desk. Is there a place like this here we can use?)

(Settled at a table, experimenter sitting on one side, participant on the other, experimenter will observe the participant and take notes). If you have any further questions about the specific purpose

of this session, I would prefer to wait until the session is over to answer them as some answers could change the way you do the puzzles and this may effect the results of the study. If you don't have any questions now I would like you to read and sign this consent form in ink. The signed copy is for me to keep, and this one is for you to keep. (Experimenter hands both consent forms to the participants. If the participant asks any questions at this point, experimenter will answer honestly, but not reveal the full reasons behind the puzzle tasks. If someone does not want to sign, the experimenter will politely thank them and stop the session).

If you know anyone else from the first study who might participate in this study as well, please do not tell them what you did today as that might change the way they do the puzzle-tasks.

Efficacy Questionnaire

Before we begin, I would like you to fill out this questionnaire (hand to participant). It is about your feelings regarding your ability to do things. Please read each statement and indicate how much you agree or disagree with it by circling the number from 1-4. This is what the numbers mean (review on the questionnaire with participant). Do you understand what to do? (When the participant is finished, put the questionnaire in the folder). Now we are ready to begin the puzzle-tasks.

Introduction to Puzzle Tasks

There are two different parts to this study. I will give you instructions on how to complete the puzzles before each part. If you have any questions ask me to answer them. Be sure to ask me to explain further if you are not completely sure about what to do.

Part One: Geometric (Squaring the Circle) Puzzle Task

(The experimenter will read ONE of the following sets of instructions depending on which group the participant has been preassigned).

(Group one instruction:) For this first task you are to put these plastic puzzles together to form a circle inside the square (experimenter shows participant the puzzle and the picture on the box). It is important that you work as quickly as possible because I'll be timing you. Once we begin I will not be able to answer any questions, so if you have any questions, please ask now. Do you have any questions? (Answer questions).

Are you ready to begin? (start timing when participant begins).

(Group two instruction:) For this first task you are to put these plastic puzzle pieces together to form a circle inside the square (experimenter shows participant the puzzle and the picture box). It is important that you work as quickly as possible because I'll be timing you. **This task is quite difficult**, and is somewhat like a Rubik's cube puzzle. Once we begin I will not be able to answer any questions, so if you have any questions please ask us now. Do you have any questions? (Answer questions).

Are you ready to begin? (start timing when participant begins).

(Debriefing statement to be read if/when:)

- after 20 minutes the participant is still working on puzzle
- the participant appears at all uncomfortable
- the participant stops working

Debriefing: (to be read at the end of part one to all participants)

(RECORD STOP TIME)

(For anyone who experimenter stops say: I think we should stop now).

(For all participants say) Thank-you for your hard work. This puzzle is a very difficult puzzle. It is so difficult that we had to write to the manufacturer to get the solution. None of the staff and students at the university who have tried this puzzle have put it together! In fact this puzzle is considered practically unsolvable.

In this part of the study we were interested in finding out how long someone would work on a very difficult puzzle.

(If participant persists for a short time (less than five minutes) the experimenter will say: You seemed to discover early that this task was practically unsolvable and stopped working on it. That is very good, since this task is almost impossible to solve.

(If participant persists for a long time and/or has to be stopped by the experimenter, the experimenter will say:)

You really persisted and stuck out this task. You worked on it a long time without giving up. That is very good, since this task is almost impossible to solve.

(To all participants: Offer puzzle solution sheet so participant can see how it goes together).

(Next say) Before I leave and after the next task I will leave an information form that explains what I've just told you, and further explains the purpose of having you attempt tasks that no one has ever solved. Do you have any questions?
(Experimenter answers participant's questions and ensures that the participant is comfortable about not completing the task).

Part Two: Islands Puzzle Task

This task is easier than the first task, but still a little tricky. You need a pencil (experimenter hands pencil to participant) to complete it. This is the task (hands page to participant) and it is explained on the sheet how to do it. Let's read it over together. You can ask me questions at any time while doing this task, unlike the previous puzzle. Are you ready to start? Do you know what to do?
(Experimenter makes sure the participant completes the task successfully, giving assistance if necessary.)

Debriefing

(Experimenter reads to all participants at the end of part two, when islands task is complete).

This task was quite different from the first task. How did you find it? Did you like it? Some of the questions in the islands puzzle are a little tricky, aren't they? (Discuss the task with participant after asking these questions, pause so he or she has time to answer). The answers were not clear cut. The reason you did this task was to discover what people do when they persist at an easier task that

doesn't have a clear cut answer. While this task was easier than the first unsolvable task, it was still a little difficult. Do you have any questions? (Answer questions and discuss answers with participant if they want to do so).

One last thing--could you please fill out this form so we can update our records about our participants. Most of the questions concern your present health and ask you about any school courses or workshops you may have attended recently. (Give participant demographic sheet)

This information, as will the rest of the information from the session, will be kept confidential. You do not need to put your name on the sheet if you do not want to. If you want to receive the general results of the study sign this form (give participant request for result form) and I will mail them to you.

Before you (I) leave I would like to thank you for participating and give you this information sheet (give participant debriefing take home sheet with the words Puzzle Task Study at the top). Let me summarize what it says so that I can answer all your questions before you (I) leave.

Today's study was done to examine what people do when they work on puzzle tasks that are very difficult - practically unsolvable-and what they do when they work on puzzle tasks that are easier but still tricky because they have answers that are a little unclear. The study is being done with seniors because while similar studies have been done with younger people no one has examined what older people do when they work on these kinds of puzzles. I want to find out how people your age work on these puzzle tasks.

Last year you participated in Dr. Hurlbut's study and estimated how many questions on a learning exercise you would answer correctly. In this study I am looking at how the estimates the participant's made in Dr. Hurlbut's study relate to the amount of time they worked on the puzzle tasks in this study. Also, as in the first study, you received different instructions than some of the other participants. Half of you were told how hard the first puzzle was, and half were told nothing about the difficulty of the first puzzle. Everyone received the same instructions regarding the Islands puzzle. The reason the instructions are different is so that I can find out if instructions influence how long people as a group, worked on the puzzles.

Do you have any questions? (FULLY ANSWER questions)

(Experimenter should be fully satisfied that participant's questions have been answered and that the participant is comfortable about participating in the study before leaving).

Thank-you

Finally, I would like to thank-you for inviting me to your home (or, for coming to the university) today. Your contribution to this research has been invaluable. Without volunteers like yourself new ideas could not be tested, and methods for improving people's learning might remain undiscovered. In addition, the group results from this research will help me complete my Master's program because I will be using them for my Master's thesis. I'd like to ask you not to tell anyone you might know from the first study who might also participate

in this study what you did today as that might change the way they do the puzzle tasks. Thank-you for participating in this study.

If you have anymore questions about the study phone me, Tracey Fellowes, or Dr. Hurlbut, our numbers are on the consent form I gave you to keep.

(Experimenter leaves, note end time of entire session).

# APPENDIX D

## Information to Participants

## Informed Consent

The purpose of this study is to examine what people do when they work on a puzzle task. Your task will be to do two puzzles: one which involves reading and one which involves the manipulation of puzzle pieces. From studies such as this I hope to discover what people do when they work on puzzles that use words and sentences and what they do when they work on puzzles that involve the use of plastic puzzle pieces and do not involve reading.

Please try to do your best. The whole study will take less than two hours and you may withdraw at any time. I will be happy to explain the purpose of the study further, but would prefer to wait until after you have finished the study. That way my explanation will not influence the way in which you respond.

Information from studies such as this may contribute to future attempts to facilitate learning and problem solving for people, although there will probably be no direct benefit to you from participating in this study. All the information collected in this study will be kept confidential. Only myself, Dr. N.L. Hurlbut, and my research assistants will see individual answers or individual scores. All the scores will be reported as statistical group summaries. I will be happy to mail you a copy of the general results, however I cannot give you a copy of your scores. If you have any questions, please call Tracey Fellowes or Dr. Hurlbut at 432-5771.

I consent to take part in this study.

_____ _____

Signature of Participant Date

Puzzle Task Study: Information

Today's study is being done to examine what people do when they work on a puzzle task. I am interested in finding out how long people over sixty, as a group, work on two types of puzzle tasks; one very difficult task that has not been solved, and one that was easier but still a bit tricky because there was not always a clear cut answer. Studies like this have been done with people under sixty years of age but no one has examined how long people over sixty years persist at these kinds of tasks.

People who participated in this study were chosen at random from the group of people who participated in Dr. Hurlbut's study in the summer and fall of 1986. Thus, if you know someone who was in Dr. Hurlbut's study, as you were last year, but who was not asked to participate in this study, it was because his or her name was not drawn.

In this study I want to look at the relationship between how long people over sixty participate at puzzle tasks and some of the answers they gave in the first study with Dr. Hurlbut. For example, in that study the people who participated gave estimates about how many questions on a learning exercise they would answer correctly and I want to look at how those estimates relate to the amount of time the participants in this study persisted at the puzzle tasks. As in the first study with Dr. Hurlbut, you received different instructions than some other participants. Half the people were told nothing about how hard the first puzzle was, and half were told that the first puzzle was very hard. Everyone received the same instructions regarding the Islands Puzzle Task in this study. The instructions were different because I want to find out how these instructions may have influenced how long people, as a group, persisted at the puzzle tasks.

To summarize, in this study I want to find out what people do when they work on puzzle tasks so I can look at the relationship between the estimates people made in the first study, the different instructions they had in this study, and the amount of time spent on the puzzle tasks. Your participation as part of a group (I am not looking at individual scores) will enable me to study these relationships. Although there is no direct benefit to you from participating in this study, your participation enables me to look at things which might influence how long people work on difficult tasks. This information may eventually contribute to finding ways to improve people's performance on other difficult tasks.

Thanks for your participation!

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Informed Consent

The purpose of this study is to examine what people do when they work on a puzzle task. Your task will be to do two puzzles: one which involves reading and one which involves the manipulation of puzzle pieces. From studies such as this I hope to discover what people do when they work on puzzles that use words and sentences and what they do when they work on puzzles that involve the use of plastic puzzle pieces and do not involve reading.

Please try to do your best. The whole study will take less than two hours and you may withdraw at any time. I will be happy to explain the purpose of the study further, but would prefer to wait until after you have finished the study. That way my explanation will not influence the way in which you respond.

Information from studies such as this may contribute to future attempts to facilitate learning and problem solving for people, although there will probably be no direct benefit to you from participating in this study. All the information collected in this study will be kept confidential. Only myself, Dr. N. Hurlbut (my research supervisor), and my research assistants will see individual answers or individual scores. All the scores will be reported as statistical group summaries. I will be happy to mail you a copy of the general results, however I cannot give you a copy of your scores. If you have any questions, please call Tracey Fellowes or Dr. N.L. Hurlbut at 432-5771.

Thank-you for your time.

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# APPENDIX E

## Results Tables

Table E-1

ANOVA Summary for Efficacy and Instructions by Effort

| Source | SS | Df | MS | F | P |
|---|---|---|---|---|---|
| Self-efficacy | 20.221 | 1 | 20.221 | 3.59 | .066 |
| Instructions | 17.450 | 1 | 17.450 | 3.095 | .087 |
| Self-efficacy by instructions | 0.812 | 1 | 0.812 | 0.144 | .707 |
| Residual | 202.993 | 36 | 5.639 | | |

Table E-2

Mean Effort Scores as a Function of Efficacy Groups and Instructions

| Efficacy Group | n | M | SD |
|---|---|---|---|
| High | | | |
| Experimental Instructions | 10 | 6.60 | 1.76 |
| Control Instructions | 10 | 5.56 | 2.76 |
| Across Instructions | 20 | 5.56 | 2.76 |
| Low | | | |
| Experimental Instructions | 10 | 5.46 | 2.98 |
| Control Instructions | 10 | 3.86 | 1.71 |
| Across Instructions | 20 | 4.66 | 2.50 |
| Total | 40 | 5.37 | 2.49 |

Table E-3

ACV Summary for Efficacy and Instructions by Effort with the Five Covariates of the Wechsler Memory Test

| Source | SS | Df | MS | F | p |
|---|---|---|---|---|---|
| Self-efficacy | 9.76 | 1 | 9.76 | 1.57 | .220 |
| Instructions | 19.05 | 1 | 19.05 | 3.06 | .090 |
| Self-efficacy by instructions | .89 | 1 | .89 | .14 | .709 |
| Within Cells | 193.11 | 31 | 6.23 | | |
| Regression | 9.88 | 5 | 1.98 | | |

Table E-4

Mean Effort Scores as a Function of Efficacy and Instructions with the Five Covariates of the Wechsler Memory Test

| Covariate | n | M | SD |
|---|---|---|---|
| Logical Memory | | | |
| High Efficacy/High Instruction | 10 | 11.150 | 2.583 |
| High Efficacy/Low Instruction | 10 | 11.400 | 2.234 |
| Low Efficacy/High Instruction | 10 | 9.300 | 2.751 |
| Low Efficacy/Low Instruction | 10 | 8.800 | 3.417 |
| Total | 40 | 10.162 | 2.905 |
| Digits Forward | | | |
| High Efficacy/High Instruction | 10 | 6.800 | 1.229 |
| High Efficacy/Low Instruction | 10 | 6.300 | 1.337 |
| Low Efficacy/High Instruction | 10 | 5.900 | 1.287 |
| Low Efficacy/Low Instruction | 10 | 5.500 | 1.179 |
| Total | 40 | 6.125 | 1.305 |
| Digits Backward | | | |
| High Efficacy/High Instruction | 10 | 5.200 | 1.317 |
| High Efficacy/Low Instruction | 10 | 5.600 | 1.350 |
| Low Efficacy/High Instruction | 10 | 5.100 | 1.370 |
| Low Efficacy/Low Instruction | 10 | 4.700 | 1.337 |
| Total | 40 | 5.150 | 1.331 |
| Visual Reproduction | | | |
| High Efficacy/High Instruction | 10 | 8.900 | 2.470 |
| High Efficacy/Low Instruction | 10 | 9.100 | 2.998 |
| Low Efficacy/High Instruction | 10 | 8.800 | 1.932 |
| Low Efficacy/Low Instruction | 10 | 7.900 | 2.378 |
| Total | 40 | 8.675 | 2.422 |
| Associative Learning | | | |
| High Efficacy/High Instruction | 10 | 17.050 | 3.760 |
| High Efficacy/Low Instruction | 10 | 17.200 | 3.002 |
| Low Efficacy/High Instruction | 10 | 14.550 | 4.065 |
| Low Efficacy/Low Instruction | 10 | 14.500 | 5.543 |
| Totals | 40 | 15.825 | 4.249 |

Table E-5

Anova Summary for General Efficacy and Memory Efficacy by Effort

| Source of Variation | SS | Df | MS | F | p |
|---|---|---|---|---|---|
| General Efficacy | 3.285 | 2 | 1.643 | .254 | .777 |
| Memory Efficacy | 6.468 | 2 | 3.234 | .500 | .611 |
| Residual | 213.662 | 33 | 6.475 | | |

Note. No interaction due to empty cells.

Table E-6

Three-way Crosstabulation of Memory and General Efficacy Estimates

| General Efficacy | Memory Efficacy: Agree | Disagree | Neutral | Totals |
|---|---|---|---|---|
| Agree | 11 | 5 | 12 | 28 |
| Disagree | - | 3 | - | 3 |
| Neutral | 1 | 6 | 2 | 9 |
| Totals | 12 | 14 | 14 | 40 |

Table E-7
Two-Way Crosstabulation of Memory and General Efficacy Estimates

| General Efficacy | Memory Efficacy: Agree | Disagree | Totals |
|---|---|---|---|
| Agree | 6 | 0 | 10 |
| Disagree | 14 | 17 | 30 |
| Totals | 23 | 17 | 40 |

| Chi-Square | Df | Significance (with Yates Correction) |
|---|---|---|
| 6.08709 | 1 | 0.0434 |