OLDER AND WEAKER OR OLDER AND WISER: EXPLORING THE DRIVERS OF PERFORMANCE DIFFERENCES BETWEEN OLD AND YOUNG ADULTS ON EXPERIENTIAL LEARNING TASKS IN THE PRESENCE OF VERIDICAL FEEDBACK

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ABSTRACT

This dissertation proposes that while traditional cognitive psychology literature suggests that cognitive function decreases with age, these decreases are dependent on the types of testing being performed. While traditional cognitive tests of memory and processing speed show declines associated with age, this research suggests these declines are not robust across all types of learning. The coming pages present four studies aimed at furthering our understanding of how different age cohorts of consumers learn about products in active and complex marketplaces. Study one reveals an age advantage associated with learning experientially; an interesting and somewhat surprising result that warrants further investigation given the rapid rate at which populations are aging. The additional studies presented here begin that investigation through the application of several psychological theories. This research explores increased vigilance associated with the security motivation system (based on the principles of evolutionary psychology), the possible impact of mortality salience through the application of Terror Management Theory and a positive correlation between age and cognitive control, as possible explanations.

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CHAPTER ONE

INTRODUCTION

It is common knowledge that developed nations are “graying”, meaning that there will soon be more elderly people as a proportion of the population than ever before in history. The U.S. Census Bureau projects that by the year 2030, the number of Americans over the age of 65 will more than double to over 72 million people – 25% of the population (U.S. Census Bureau, 2008), and the percentages in other developed nations are similar (United Nations Department of Economic and Social Affairs, 2009). Moreover, seniors will control an increasing share of both total wealth and discretionary income, trends which will accelerate as current "boomers" age (AARP, 2007). Despite the growing importance of senior markets both in size and proportion of discretionary income, this group has rarely been the population of interest in consumer behavior and marketing literature.

While the elderly as consumers appear sparsely in the literature, cognitive psychology and neuroscience researchers have placed significant focus on the cognitive impacts of aging, predominantly focusing on the deficits and struggles associated with getting older. Applying the literature in cognitive psychology and neuroscience describing the negative impact of age related cognitive decline on elderly populations, coupled with the knowledge that the size of the elderly population is rapidly increasing and elderly individuals are working longer and making consumption decisions into late age, I began to wonder “Are elderly consumers always at a disadvantage compared to young adult consumers?”.

Much of the research on memory and cognition involving the elderly focus on outcomes that measure explicit memory for objects or digits (Daneman & Carpenter, 1980), a task scarcely representative of the complexity of compiling information for making decisions in daily life. In this research, I consider the dynamic properties of learning in an active marketplace (i.e. comparing prices for an item online), which often involve multiple inputs upon which I make associations and comparisons and therefore conduct this research using an experiential learning paradigm.

In this dissertation's landmark study, study one, I explore whether aged consumers will exhibit the same pattern of inferior performance compared to younger consumers as they do in more "traditional" memory tests, or if they will benefit from the more dynamic, outcome-oriented nature of the task. Additionally, I evaluate the performance of young and old adults on the experiential learning task when the environment changes (i.e. when the attribute relationships they have learned no longer hold). The results of study one, reported below, show that elderly consumers outperform their younger counterparts when learning experientially. While older adults learn to integrate the dynamic information at a slightly slower pace than the young adults, ultimately they are able to continue to improve on the task long after the young adults cease to improve. Additionally, older adults are able to integrate an unexpected change in the environment better than their younger counterparts. These results lead to a wide variety of questions regarding the underpinnings of this effect. The researchers have considered questions such as: Have older adults developed different learning strategies? Is it possible, for example, that years of experience in real marketplaces may aid older subjects in comparison to youngsters (cf., Krampe & Charness, 2006)? Can this

differentiation in performance be explained by the differences in psychological state/motivation between groups?

As study one provides evidence for the phenomenon of age-related differences in experiential learning performance, the additional follow-up studies attempt to explain the process(es) underlying these observed differences. In these studies, I employ research from cognitive, social and evolutionary psychology to provide possible explanations for our initial findings. Borrowing the theory of the security motivation system (Szechtman & Woody, 2004) from evolutionary psychology, I posit that the elderly are naturally more concerned with self-preservation as they age and thus are naturally in a heightened state of vigilance due to their feelings of increased vulnerability to environmental threats associated with aging (study 2). As a related, but alternate explanation, I consider the impact of mortality salience on task performance. Applying principles from Terror Management Theory (TMT) (Greenberg et al., 1990), I posit that as elderly adults' time horizon becomes increasingly limited, they will use anxiety defense behaviors, such as fluid compensation (Allport, 1943), to combat the negative feelings associated with thoughts of their mortality (study 3). The researchers also consider the possible impact of an increase in cognitive control as one ages, allowing the elderly to compensate for deliberate cognitive decline through the use of different learning strategies (study 4). In these additional studies, I also collect more demographic, trait-based and lifestyle information, not considered in study one, in hopes of gaining additional insight into the research question.

In summary, age-related deliberative processing deficits affect aspects of cognition that are central to learning and decision making, strongly interfering with the

ability of the elderly to learn. This interference has been amply documented in explicit memory tasks and to a lesser extent using more realistic paradigms in a consumer decision making context. However, almost no research has directly investigated elderly people's ability to learn from experience, which undergirds much human learning in real-world environments. Given the scarcity of elderly consumer research in general, and the non-existence of elderly consumer research on learning in a dynamic marketplace, this dissertation begins by reporting exploratory study one, which establishes a robust main effect demonstrating the existence of differences in experiential learning performance associated with age. I then conduct three additional studies to explore several different explanations for the results of study one.

CHAPTER TWO

LITERATURE REVIEW

Aging and Cognition

Significant research exists in psychology and neuroscience regarding the functional changes that occur in the brain as individuals age (Hedden & Gabrieli, 2004; Hedden, Lautenschlager, & Park, 2005; Reuter-Lorenz, 2002; Salthouse, 1996; Sharp, Scott, Mehta, & Wise, 2006). Much of this literature focuses on the cognitive declines associated with healthy aging (e.g., Craik, 1994; Hedden & Gabrieli, 2004; Ritchie & Touchon, 2000). One of the deficiencies most commonly associated with aging is a reduction in cognitive processing speed (Craik, 1994; Salthouse, 1996); a slowing of the speed at which information moves through the brain. This decreased, or slowed, ability to process information as one ages has been associated with the performance of other cognitive processes such as working memory (Salthouse, 1996). Short term and working memory are also prone to decline with age (Craik, 1994; Salthouse, 1996). Extensive research has documented this detrimental effect of aging on working and short term memory, popularly referred to as a "senior moment" (Craik & Jennings, 1992; Kausler, 1994; Schaie, 1994), although the causes remain under debate (Yoon & Cole, 2008). Short term and working memory experiments mostly use straightforward experimental paradigms that load heavily on "pure" explicit memory: forward and backward digit (or letter) span tasks and adaptations of the reading span task (RST) originally constructed by (Daneman & Carpenter, 1980). Age-related memory and learning deficits have also been found in more realistic tasks that involve the reading and remembering of information

explicitly identified as the memory target (Neely & Bäkman, 1993) and in tasks requiring the aged to discount irrelevant information (Daneman & Carpenter, 1980). Another cognitive function that is affected by age is one's ability to retrieve information from long-term memory (Park et al., 2002). These deficits have been further studied by neuroscience researchers who have repeatedly documented that getting older results in prefrontal cortex degeneration, which manifests itself in symptoms of reduced processing speed, declines in working memory performance, and difficulty encoding information into long-term memory (Hedden & Gabrieli, 2004; Raz, 2000). However, while cognitive psychology and neuroscience research has provided us with a relatively clear picture of which basic mechanisms affected by age-related cognitive decline, researchers are still seeking to understand why, and how, it is that these declines do not appear to have global effects on cognitive function (Salthouse & Ferrer-Caja, 2003), or decision processes (Lima, Hale, & Myerson, 1991).

More recent studies on cognition and aging have begun to shed some positive light on the overwhelmingly negative picture associated with aging and the mind. While research has continued to provide evidence for declines in processing speeds and working memory, not all cognitive function is equally impaired (Hedden & Gabrieli, 2004). A small stream of research suggests that the elderly have substantial metacognitive awareness of their deficits, and that they are capable of using a variety of compensatory strategies to mitigate associated negative effects (see Krampe & Charness, 2006 for a review of compensatory strategies; cf., Worthy, Gorlick, Pacheco, Schnyer, & Maddox, 2011). Specifically, measures of vocabulary, semantic knowledge and autobiographical memory have been found to be relatively stable throughout life (Park, et al., 2002;

Schaie, 1996). Some researchers posit that this relative stability associated with semantic memory and knowledge indicates that life experience may indeed breed knowledge (Baltes, Staudinger, Maercker, & Smith, 1995), and that older adults use this existing knowledge to develop more efficient strategies when performing tasks in which one would normally rely solely on processing capabilities (Hedden, et al., 2005; Shimamura, 1995), subsequently improving their performance on complex tasks (Charness & Bosman, 1992; Dixon, de Frias, & Bäckman, 2001; Hambrick, Salthouse, & Meinz, 1999). Essentially, a small stream of recent research suggests stored knowledge may enhance elderly adults' abilities to make better decisions (compared to younger adults) despite the significant memory and processing deficits associated with aging.

Aging and Consumer Decision Making

The cognitive deficits commonly associated with aging are often categorized as processes of deliberation (Park, et al., 2002). Significant research has linked poor decision making and learning capabilities with deficiencies in deliberative cognitive processes. While there has been very little extensive discussion around the topic of elderly consumer decision making (see John & Cole, 1986 ; Yoon, Cole, & Lee, 2009 for exceptions) much of the research that does exist, has highlighted the tendency of older adults to take in smaller amounts of information when making decisions. Elderly consumers tend to make fewer price comparisons (Deshpandé & Krishnan, 1982) and consistently engage in less exhaustive information search when making purchasing decisions (see Lambert-Pandraud, Laurent, & Lapersonne, 2005). Specifically, Cole and Balasubramanian (1993) found that elderly adults compared fewer items and subsequently made a poorer cereal choice when presented with the task of selecting a

product based on nutritional criteria than younger adults. The elderly also show less consistency in their ratings of products which is thought to be driven by a tendency to consider fewer product attributes in their evaluations (Capon, Kuhn, & Gurucharri, 1981). Elderly consumers also tend to be more influenced by distractions, and struggle with decision making tasks when accurate information is less identifiable. For example, research has shown that older adults have significantly more difficulty making accurate judgments when presented with a mixture of true and false information (Chen, 2002; Chen & Blanchard-Fields, 2000; Skurnik, Yoon, Park, & Schwarz, 2005), and tend to be more susceptible to misleading advertisements than young adults (Gaeth & Heath, 1987). These studies suggest a deficiency in older adults' ability to simultaneously process and categorize decision driving information. Additionally, Mutter and Pliske (1994) found older adults were more influenced by prior expectations when studying the impact of illusory correlations on performance in young and old adults. Older adults were especially susceptible to the impact of prior information in distraction conditions, and all groups were less likely than their younger counterparts to correct their judgments when correct information about the relationships between stimuli were pointed out. These deficiencies have been found to be more robust for memory based judgments (Mutter, 2000). Thus, many researchers associate declines in decision making and learning with these age related declines in deliberative cognitive systems such as explicit memory and information processing capability. But what happens to older consumers' abilities in a more dynamic information learning environment? Would the elderly show similar deficits in ability when their performance was based less of prior knowledge and retrieval of information from memory, and more based on a dynamic, real-time learning process?

Learning From Experience

Consumer researchers have investigated the dynamic learning process involving feedback with traditional populations – often undergraduate students (e.g., Cunha, Janiszewski, & Laran, 2008; Eisenstein & Hutchinson, 2006; Hutchinson & Alba, 1991; Mellers, 1980; Meyer, 1987; Van Osselaer & Janiszewski, 2001; West, 1996). For example, studies by West (1996; West & Broniarczyk, 1998) investigated learning from experience through veridical feedback in agent learning tasks and showed that veridical feedback resulted in learning that was powerful enough to overcome even relatively strong priors. Others have demonstrated that the specifics of what is learned depend on the goals associated with the learning process (e.g., Eisenstein & Hutchinson, 2006; Huffman & Houston, 1993; Juslin & Persson, 2002). Many studies have investigated the effects of various manipulations on learning in categorization tasks (e.g., Cunha, et al., 2008; Van Osselaer & Janiszewski, 2001; VanOsselaer & Alba, 2000). Although these studies are substantially different in terms of psychological process (cf., Eisenstein & Hutchinson, 2006; Juslin & Persson, 2002), they collectively support the idea that experience combined with veridical feedback will allow for learning to occur. Some research has been directed toward understanding the differences between novices and experts when learning and forming overall impressions of products and services (East, 1992; Hong & Sternthal, 2010; Spence & Brucks, 1997; Sujan, 1985). Wood and Lynch (2002) extended this line of inquiry and found that experts were better at learning changes in the operating environment only when cued to do so. Additionally, this interest in better understanding consumer decisions in complicated markets has guided research focused on consumers' abilities to form judgments and make predictions regarding

preferences and price about multi-attribute products and services. There is suggestive evidence in traditional populations, that learning from outcome feedback (assuming that learning occurs at all) plateaus after a small number of exposures, with little to no improvement given additional practice (Eisenstein & Hutchinson, 2006; Mellers, 1980; Meyer, 1987; Shirai & Meyer, 1997). Overall, the literature on consumer learning leads to the stylized fact that young adults of normal cognitive function will learn experientially from veridical outcome feedback. Importantly, to the researcher's knowledge no research has explored this type learning in aging subjects.

Security As Motivation

Overall, the breadth of research surrounding the biological impact aging has on the brain provides a predominantly negative view of cognitive function in old age. However, individuals over 65 continue to live fulfilled and independent lives. In fact, many "elderly" individuals are responsible for making some of our nation's biggest decisions every day. And as shown in the first study of this dissertation, the deficits associated with aging are not necessarily global, as elderly adults retain abilities that allow them to outperform younger adults in the tasks presented. One potential explanation for seniors' superior performance in a dynamic learning environment that is explored in study 2 is based on increased vigilance as suggested by evolutionary psychology.

Evolutionary, or Darwinian, psychology (Darwin, 1859) suggests that species evolve over time developing specific adaptations that help increase their species' likelihood of surviving. Just as one's need for sustenance drives the search for food and water, the basic human needs of safety and security (Maslow, 1958) will drive one's need

for threat avoidance. If, as individuals age, they subsequently become more susceptible to threats in the environment, evolutionary psychology would suggest that as populations live longer, they adapt to mitigate these susceptibilities. This enhanced need for threat detection has lead evolutionary psychologists to propose the existence of a specialized motivation system (Boyer & Leinard, 2006; Szechtman & Woody, 2004; Trower, Gilbert, & Sherling, 1990). This security motivation system, as termed by Szechtman and Woody (2004), developed through evolution, is characterized by an increased vigilance focused around the search for environmental threats. Vigilance refers to one's ability to maintain focus of attention and alertness to stimuli over prolonged periods of time (Davies & Parasuraman, 1982; Parasuraman, 1986). While the system has been developed as a response to rare and potentially catastrophic risk (Szechtman & Woody, 2004), the minimal room for error forces individuals to engage in relatively sensitive risk assessment often without any direct evidence of the presence of a predator (Brown, Laundré, & Gurung, 1999). Due to the risk sensitivity, this vigilance is readily activated by unclear, insignificant and often relatively weak stimuli (Blanchard & Blanchard, 1988; Brown, et al., 1999). As suggested earlier, any number of varying factors may lead an individual to believe they are at greater risk of encountering an environmental threat – I propose one of these factors may be aging. Specifically, consumer research has repeatedly revealed older consumers susceptibility to being 'tricked' or 'misled' (e.g., Gaeth & Heath, 1987; Skurnik, et al., 2005). In a bustling consumer society, the possibility of being 'duped' is a real environmental threat; one that I commonly associate with elderly consumers. Thus, I propose (and test in study 2) that one reason why the elderly may adapt better to market changes in a dynamic learning context is that they are

more attuned to changes in the environment as a result of heightened vigilance that has developed from their desire to avoid being duped, or taken, as they age. In study two I thus apply an evolutionary psychology concept as a possible explanation of older adult respondents' superior performance on the experiential price prediction task under conditions of environmental change.

Terror Management, Mortality Salience & Decreased Time Horizons

As another possible explanation for why seniors perform better in a dynamic learning environment, I draw from several literature streams surrounding the psychological impact of facing one's mortality. I first consider that as one's time horizon perspective becomes more limited, research has shown that older adults may naturally engage in behaviors that reduce the anxiety associated with one's limited time (Carstensen, 1992).

A significant body of research has been devoted to furthering our understanding of the conscious and non-conscious impacts of death related thoughts. Specifically, studies in Terror Management Theory (TMT) have shown that thoughts of mortality impact a broad range of social evaluations including those of individuals partaking in activities considered to be socially unacceptable, protection of one's social and cultural values, the role of one's need for self-esteem and even one's propensity for materialistic behavior (Greenberg, Solomon, & Pyszczynski, 1997; Becker, 1973; Arndt, Solomon, Kasser & Sheldon, 2004). According to Greenberg and colleagues (1997) TMT declares death awareness as a major source of anxiety. As such, Pyszczynski, Greenberg and Solomon's (1999) "mortality salience hypothesis" claims that to the extent that a psychological entity serves as a source of protection against the anxieties associated with

thoughts of human mortality, then increased mortality salience should lead to an increased need for the defense structure (Pyszczynski, et al., 1999). While TMT has focused most of its efforts on needs for self-esteem and cultural identity, the advent of defense behaviors as a response to personal anxiety conceptually aligns with the principles of fluid-compensation. This compensatory mechanism refers to the tendency of humans to cope with anxiety by basking in any success, regardless of how unrelated to the anxiety source (Allport, 1943); a defense mechanism which allows human beings to build up feelings of self-worth or belonging in the face of an adverse event (see Taylor, 1983 for expansion on cognitive adaptations to threatening events). If, as it has been shown, mortality salience drives a wide array of defense behaviors, Allport's theory of fluid-compensation suggests that mortality salience could be responsible for defense behaviors not yet identified in the literature.

Logic may suggest that, as age is associated with a decreased time horizon, it follows that mortality would be naturally more salient and death anxiety more pronounced as an individual ages. However, the limited amount of research surrounding how thoughts of death impact the behavior of older adults suggests that the opposite may be true. It has been found that older adults, in general, report lower fear of death (Gesser, Wong & Reker, 1988) and that death anxiety actually decreases with age (Rasmussen & Brems, 1996; Fortner & Neimeyer, 1999). More recently, studies have also indicated that the responses of older subjects to traditional evaluations used in the TMT literature show less change than those of their younger counterparts when thoughts of mortality are primed (Maxfield, Kluck, Greenberg, Pyszczynski, Cox, Solomon & Weise, 2008). These findings align with the principles of Socio-Emotional Selectivity Theory (SST) –

in which it is believed perceptions of limited time drive older adults' choice not to focus attention on negative emotions (Carstensen, 1992). As much of the TMT research is based on results obtained from traditional research pools (i.e. student subjects), the scarcity of the impacts of mortality salience in older adults further supports the need for expansion of this theory into older populations.

One other characteristic of the TMT literature worth considering surrounding is that it has used primarily physiological and behavioral methods trigger thoughts of death and thus make mortality more salient in subjects. However, it has been well documented that these processes appear to be under little conscious control, indicating that these Terror Management effects occur largely outside of conscious awareness (Arndt, Allen, & Greenberg, 2001; Hirschberger, Ein-Dor, & Almakias, 2008). To this point, this research has failed to consider that feelings of death anxiety could exist without the need for a salience trigger, or that thoughts of death, or acknowledgement of a decreasing time horizon, are not necessarily linked with feelings of anxiety.

Cognitive Control

The researchers also consider the development of *increased cognitive control* as one ages, as an explanation for elderly consumers' abilities to outperform young adults on the experiential learning task (in study 4). Traditionally, elderly populations are characterized by larger fluctuations/less consistency in their cognitive performance than younger adults (Li et al., 2004; MacDonald, Hultsch, & Dixon, 2003). Research regarding cognitive and attentional control in the elderly often point to decreases in the responsiveness of brain structures associated with these cognitive tasks, especially under conditions of resource depletion (e.g., Milham et al., 2002). However, some recent

neuroscience research has aligned itself with the more positive vision of the aging brain. This research presents an adaptive picture, in which high performing older adults show increased bilateral activation when participating in complex tasks (Cabeza, 2002; Reuter-Lorenz, 2002; Reuter-Lorenz & Lustig, 2005) compared to single hemisphere activation seen in young adults and low performing older adults. This activation has been presented as a neurological compensatory process, which temporarily increases the available cognitive resources in older adults, subsequently making them able to perform as well as younger adults on resource depleting cognitive tasks. Furthermore, recent research investigating variability in cognitive performance between young and old adults has suggested that older adults' performance on a battery of cognitive tests is characterized by more stable levels of task motivation (Brose, Schmiedek, Lövdén, Molenaar, & Lindenberger, 2010) and that the elderly exhibit less variability on cognitive tasks both from trial-to-trial and day-to-day (Schmiedek, Lövden, & Lindenberger, 2013). As the vision of aging is beginning to change, research in realms of both neuroscience and cognitive psychology provide evidence that some abilities related to cognitive control and stability, may actually increase with age.

CHAPTER THREE

STUDY ONE: EXPLORING EXPERIENTIAL LEARNING AND AGING

As discussed, a vast majority of the existing cognitive psychology and neuroscience literature on aging and cognition present clear evidence for explicit memory and learning deficits associated with aging. On the other hand, some recent research provides evidence for the existence of cognitive adaptations or compensatory processes which allow elderly subjects to learn and make decisions at least as well as younger adults in the presented scenarios. However, all of the discussed research focuses on cognitive tasks associated with explicit memory and cognitive learning. These tasks fail to provide insight that can be generalized to learning in an active marketplace – a consumer behavior oriented question.

Elderly individuals can be observed daily learning about, comparing and purchasing products with little difficulty despite the proven degradation in some of their cognitive faculties. This has lead the researchers to inquire whether the elderly exhibit deficits on experiential learning tasks similar to those observed on many explicit memory and cognitive learning tasks. Study one serves to compare the performance of young and old adults on an experiential learning task which more closely resembles actual marketplace learning. Based on the above discussion, the primary proposition of study 1 is:

Prop1: Elderly individuals will outperform their younger counterparts on an experiential learning task.

Methodology

Subjects

A total of 65 undergraduate students (26 male, 39 female; mean age = 19.7) and 53 American senior citizens (18 male, 35 female; mean age = 72.3) participated in the study. Undergraduates earned extra credit in either a psychology or a business school course; senior citizens earned $5 in compensation and a chance to win a $20 gift card. Subjects were required to be capable of providing informed consent, understand the instructions, and to navigate a straightforward web-interface.

Procedure and Stimuli

Subjects were provided a cover story that asked them to predict ("as accurately as possible") the price of emeralds. I selected emeralds as the category to isolate the effects of experiential learning and to minimize the role of prior knowledge, which can have large and differential effects on older vs. younger participants (cf., Norman & Schacter, 1997; Yoon, 1997). Pretests showed that respondents were unfamiliar with emeralds and their prices. As in many previous studies involving experiential learning, I associated prices with attributes using a linear equation with error (Eisenstein & Hutchinson, 2006; Huffman & Houston, 1993; Meyer, 1987; West, 1996). Specifically, price was a linear function of three attributes: color, size, and source of the stone:

$$\text{Price} = \beta_0 + \beta_c \,\text{Color} + \beta_s \,\text{Size} + \beta_r \,\text{Source} + \varepsilon$$

Color was displayed as a score that ranged from 10 (muddy/poor color) to 80 (bright/clear color). Carat weight ranged from 0.50 to 2.50 in .25 ctw increments. Stone origin was a binary attribute that classified the emerald as being natural (mined) or synthetic (made in a lab). As a representation of real world variation beyond the scope of

specified product attributes (i.e. brand value), stimuli were generated so that the price-attribute relationship had an $R^2 = 0.80$. Emerald prices ranged from a min of $1,334 to a max of $4,943, and subjects saw an up-front description of all attributes that explained what they were and provided a cover story about shopping for emeralds. In the course of the study, each subject was presented with a total of 70 pricing decisions that were divided among two training blocks (20 stimuli each) and two test blocks (15 stimuli each). As in many previous multi-attribute learning experiments, training and test blocks were alternated and stimuli consisted of text descriptions of the stimulus attributes displayed on a computer screen (Eisenstein & Hutchinson, 2006; Meyer, 1987; Shirai & Meyer, 1997; West, 1996). During each training trial, three attributes of the emerald were presented, subjects responded with their best estimate of the price, and they were then shown the actual price as feedback. Test trials followed the same sequence with feedback omitted. Between each block a short fictional news clip was presented.

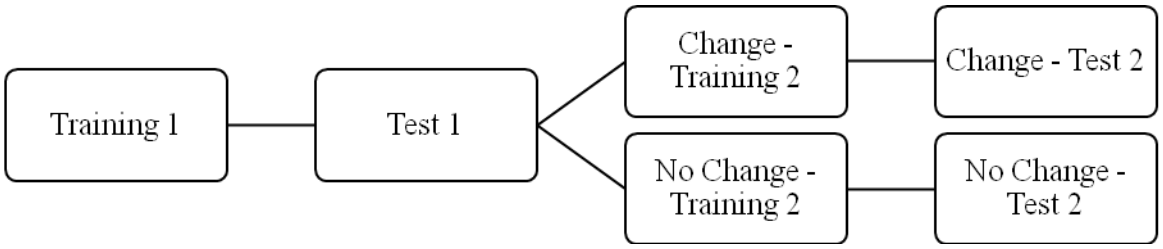

Figure 1. Graphical Depiction of Stimulus Presentation
Diverging lines indicate randomization

In order to investigate the effects of age on subjects' adaptability, young and old participants were randomly assigned to one of two Change conditions, which describe the presence or absence of a change in the attributes' relative impact on price (i.e., a change in the environment). In the change condition, the relationship between the attributes and the price changed at the start of the second training block (i.e., beginning with stimulus 36, after the first test block), such that pre-change, the color attribute was the strongest predictor of price, whereas post-change, size was the strongest predictor (cf., Eisenstein & Hutchinson, 2006; Wood & Lynch, 2002). In the No Change condition, the relationship remained constant throughout the study. I expect that the Change condition will be particularly inimical to elderly participants, because the change: (a) produces an increase in complexity of the aggregate task, (b) it requires one to notice that something has been altered, and (c) it requires an adjustment to previous learning. These characteristics are detrimental to performance for all people, and worse for the elderly (cf., Chasseigne et al., 2004; Cole & Houston, 1987; Eisenstein & Hutchinson, 2006; Howard et al., 2004; Peterson, Hammond, & Summers, 1965; Wood & Lynch, 2002). After completing all training and test blocks, subjects filled out a short demographic survey and reported their level of product familiarity with emeralds on a scale from 1 (Not at all Familiar) to 5 (Very Familiar).

Results

As expected from the pretest results, subjects reported no familiarity with the category, and therefore prior product knowledge is an unlikely contaminant of results (mean familiarity = 1.22 / 5 across all respondents, no difference by age group).

To analyze learning performance, the Absolute Percentage Error (APE) between a participant's predicted price and the actual price was computed for each trial for each subject. (Lambert-Pandraud, Laurent & Lapersonne, 2005). Data in repeated-response experiments is almost always contaminated by typographic and other input errors, which manifest as nonsensical outliers (frequently because subjects type an extra digit or two when responding). In order to mitigate this contamination and to ensure that the models fit real effects, I conducted an outlier analysis by computing the jackknife distance for every observation within subject. Observations with jackknife distances greater than 4 standard deviations from each individual's mean were excluded from analysis. The jackknife measures the distance (in units of the standard deviation) from each observation to the mean using estimates of the mean and standard deviation that do not include the observation itself. Jackknifed distances are appropriate when outliers might distort the estimate of the overall mean toward the mean itself. (i.e., extreme outliers; cf., Armstrong & Overton, 1977; Eisenstein & Hutchinson, 2006; see Miller, 1974 for a review). For both young and old participants, this procedure resulted in the removal of approximately 1.9 observations per subject (2.7%). No significant differences were found in the identification of outliers for young vs. old participants ($\Delta = .004$, Fisher's exact test $p = .29$). Inclusion of outlier-classified observations does not alter our substantive conclusions.

The data was evaluated using a linear mixed model with mean absolute percentage error (MAPE) aggregated by block as the repeated dependent measure and a compounded symmetry matrix among blocks. Age (young, old), Change (change, no

change), and Block (1-4) were independent variables (whole model -2 *ll* = -713, $\chi^2(1)$ = 80.4, $p < .0001$). The aggregate model results are displayed in Table 1.

Table 1

Study One: Linear Mixed Model Results – Main Effects

Effect	Num. df	Denom. df	*F* Value	Pr > *F*
Change	1	114	21.86	<.0001
Age	1	114	6.22	0.0141
Change*Age	1	114	0.55	0.4597
Block	3	342	25.44	<.0001
Change*Block	3	342	11.42	<.0001
Block*Age	3	342	12.75	<.0001
Change*Block*Age	3	342	3.18	0.0242

As the aggregate results supply insufficient information for interpretation, the additional analysis necessarily involves a series of planned contrasts. All participants were treated identically in blocks 1 and 2 because there was no possibility of a change in environment during this phase of the experiment. Thus, accuracy in block 2, the first test block, is a measure of the amount of information extracted and retained during training (block 1). As expected, youngsters outperformed the elderly (Δ_{APE} = .041 ≈ 11% better, $t(342) = 1.96$, $p = .05$), and this was due to the youngsters' ability to extract or retain more information – to learn better – not simply an intercept difference (a difference in starting accuracy) as shown by youngsters' greater improvement from training to test ($block_{1,2}$*age $t(342) = 2.48$, $p = .01$). However, after exposure to additional training, the elderly surpass the performance of the youngsters in the second test block (block 4 Δ_{APE} = .10, $t(342) = 4.80$, $p < .0001$). Surprisingly, elderly subjects performed better than the youngsters by significant margins in both the no change, $t(342) = 4.09$, $p < .0001$, and in

the change condition, $t(342) = 2.64$, $p = .008$ (see Figure 2). In both the change and no change conditions, this "tortoise and hare" effect is driven both by the worsening performance of youngsters *and* by the improving performance of the elderly (or at least, in the change condition, performance that shows little or no degradation, tested by the interactions showing change from block 2 to block 4, No Change: $block_{2,4}$*age $t(342) = 4.91$, $p < .0001$; Change: $block_{2,4}$*age $t(342) = 2.74$, $p = .006$). Of particular interest is the change condition, in which one would expect a substantial degradation in performance for all participants, and considerable evidentiary weight supported the prediction that the negative impact of the change would be greater for the elderly than for youngsters. Thus, it is quite surprising that the elderly remain essentially flat in performance post-change, trend $t(342) = 0.73$, $p = .46$, while youngsters experience a very large degradation in performance, trend $t(342) = 8.27$, $p < .0001$. Performance means are plotted in figure 2.

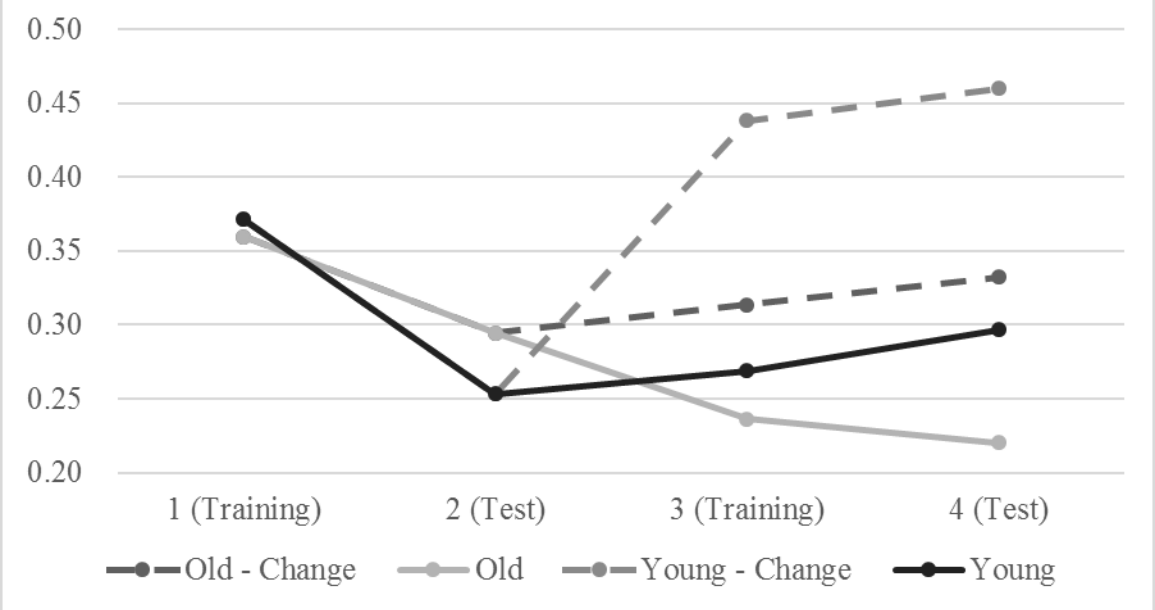

Figure 2. Study 1 - MAPE Plotted by Age Cohort and Condition by Block

Discussion

In this study, I have taken a first step in comparing the ability of young and elderly consumers to learn from experience in a complex environment that is analogous to many learning situations faced by consumers. Surprisingly, I revealed a "tortoise and hare" effect. Specifically, I found that, as expected, youngsters outperformed the elderly "out of the block". However, aged subjects demonstrated a long-run advantage in learning. With greater experience, older subjects continued to improve, even with an unanticipated change in environment, while youngsters "burned out" and suffered degraded performance. Thus, youngsters "sprint"; the aged "marathon", and the triumph of age over youth is not merely due to worsening performance of youngsters, but also to the surprising continued improvement of the older subjects.

The findings have implications for our understanding of learning in general and consumer learning in particular. The results suggest that age-related degradation of foundational cognitive capabilities, such as information processing speed and memory, does not carry over in an expected fashion to more "real world" tasks in which learning is more experiential. In addition, the fact that older consumers continue to learn through extended practice contrasts sharply with observations made in studies involving young consumers, in which subjects typically show little performance improvement from extended training. These contrasting findings suggest that younger adults may approach learning situations differently than the aged. New insights can also be drawn from the superior performance of elderly consumers on prediction tasks under conditions of market change. This result is both interesting and counterintuitive given the vast literature that demonstrates reductions in processing speed and working memory capacity

associated with aging – two components that are highly involved in updating one's prior knowledge about the world (Hedden & Yoon, 2006).

As I move forward in developing this research stream, the mechanisms underpinning our findings require further exploration. The central issue involves explaining the tortoise and hare effect that I observed. Some explanations are quite unlikely. For example, cognitive ability and associated educational attainment are very unlikely to have been determinative. Although I did not collect the data directly, 100% of young subjects were current college students, and the proportion of seniors with college degrees cannot be greater, and given the ages, gender breakdown, and demographics of our senior sample, the proportion with college degrees is likely quite a bit smaller. Based on our knowledge of the demographics of our seniors and of the nursing homes in which they live, it is also very unlikely that there was an average difference in the quality of undergraduate institution attended (if college was attended at all). Moreover, prior research has shown that measures of "processing ability", measured as fluid intelligence, information processing speed, reaction time, etc. all degrade with age. Even if the older subjects had been "smarter" than our student sample in their younger years, it would be very unlikely that they would test better today. However, there are several plausible explanations that require future testing to sort through.

CHAPTER FOUR

STUDY TWO: EXPLORING SECURITY MOTIVATION AS MECHANISM

Overall, the breadth of research surrounding the biological impact aging has on the brain provides a predominantly negative view of cognitive function in old age. However, individuals over 65 continue to live fulfilled and independent lives. In fact, many "elderly" individuals are responsible for making some of our nation's biggest decisions every day. As suggested by the results discussed in the first study of this dissertation, the deficits associated with aging are not necessarily global, as elderly adults retain abilities that allow them to outperform younger adults in the tasks presented. Study 2 expands on the results found in study one by examining one potential explanation for seniors' superior performance in a dynamic learning environment – increased vigilance as a response to a threat on their personal security.

Following evolutionary psychology research already discussed, increases in security motivation as a defense to perceived threat susceptibility tend to be more pronounced as age increases. It is predicted that older adults will naturally experience states of superior vigilance, making them more attentive and aware of environmental changes than their younger counterparts. If this state of heightened vigilance drives the superior performance of elderly adults observed in study one, then inducing/heightening vigilance in young adults should improve their performance. This leads to the propositions evaluated in study 2:

Prop1: Elderly individuals will outperform their younger counterparts due to greater vigilance as a security motivation system response to the susceptibilities associated with aging.

Prop2: Young adults performance will increase in the scam condition compared to their counterparts in the control condition.

Methodology

Subjects and Design

The study is a 2 (threat: high, low) x 3 (age: old, mid, young) design where vigilance is manipulated and age is measured continuously and bucketed into three age categories for analysis. Approximately 180 adults were recruited from Mechanical Turk (MTurk). Following evaluation of the sample for completeness of the task and all survey measures as well as taking into account sensible responses and performance on attention checks placed throughout the study, 90 female and 56 male respondents remained, for a total of 146. (Age_{Mean} = 34.1, Age_{Min} = 19, Age_{Max} = 67)

As subjects were recruited from an open platform (MTurk), an age restriction was not in place to limit eligibility to the study. Based on theory and this dissertation's focal hypothesis, age (collected as a continuous variable) was evaluated and three categories were created. Respondents were grouped into Young (18 – 34), Mid (35-50) and Older (51+) age categories.

Procedure and Stimuli

Similar to study one, subjects in all studies were asked to predict 'as accurately as possible' the price of emeralds based on product profiles provided to them as the main

task (following the condition primer). In this study, however, only a single random order of trials was utilized (16 stimuli per block), so that learning curves could be constructed and compared over time for the older and younger consumer participant groups. This may shed additional light on the process underlying the performance differences of the older and younger consumers. The learning process was again structured around respondents' ability to extract knowledge from the veridical information (feedback) provided during a training phase and the dependent variable of interest was be the error differential between a subjects' predicted price and the actual price. As an enhancement to study one, and in order to remove incentive bias (i.e. students compensated with course credit vs. elderly adults compensated financially), a consistency in incentives between age groups and across conditions was maintained through the use of MTurk for the recruitment and payment of all study participants. This approach for participant recruitment also ensures all participants will be in a voluntary state of mind and all will experience the study in an identical way. Additionally, the use of MTurk eliminates an education bias that may exist with the use of student subjects and generally produces a subject pool that looks more like "real-world" consumers (Berinsky, Huber, & Lenz, 2012).

In this study, the security threat, or feeling of vulnerability, was induced by asking participants to tell us about a recent consumer scam of which they had knowledge and to elaborate on how vulnerable they think they are to such a scam. As a manipulation check, all participants provided responses to the following questions on a closed item scale: How likely are you to be a victim of a consumer scam? How vulnerable are you to scam artists who try to deceive consumers? How likely are you to become a victim of identity theft in the future? (from 1- Not at all, to 7 = Very). Participants not assigned to

the scam/vulnerability condition were asked to write about a neutral topic -- what they did last Tuesday -- as a control (Harmon-Jones, Greenberg, Solomon, & Simon, 1996; Harmon-Jones et al., 1997). Following the writing task, participants were then exposed to the experiential learning task, where they were first asked to guess the prices of 16 emeralds based on provided profiles and supplied with feedback on what the actual price was after each trial. Following training, participants were exposed to 16 different profiles and again asked to guess the price of the emeralds, this time without feedback between trials. Trial order was identical across subjects. This process was repeated after a short questionnaire in which subjects were asked to indicate their interest in the topic, their overall effort level and to estimate their performance. After completion of the main learning task, for statistical control (and to rule out alternative explanations), affect was measured using the PANAS (Watson, Clark, & Tellegen, 1988) to ascertain the impact of our manipulations on reported affect, if any (Harmon-Jones, et al., 1996; Harmon-Jones, et al., 1997). Additional control measures, including self-reported levels of self-control, via the Brief Self Control Scale (Tangney, Baumeister, & Boone, 2004), age and education were collected.

Results

An absolute percentage error was calculated for each trial for each respondent. These error rates were then averaged by task block to create a Mean Absolute Percentage Error (MAPE) by block for each respondent. Following further evaluation of the data, significant noise and outlier influence were identified. In light of this discovery, Median Absolute Percentage Error (MedAPE) was also calculated by block to counteract the influence of extreme outliers. Age was analyzed in three categories.

The linear mixed model was computed using MedAPE as the DV and the full factorial of Condition, Block and Age Category as the IVs with a compounded symmetry (CS) error structure. The analysis resulted in a whole model -2 log likelihood of -1101 ($\chi^2(1) = 41.41$, $p < .0001$) and revealed significant effects for Block ($F(3,420) = 5.73$, $p = 0.0007$). Additionally, the interaction of Age Category and Block ($F(6,420) = 1.95$, $p = 0.072$) as well as the interaction between Age Category and Condition ($F(2,140) = 2.6$, $p = 0.078$) were marginally significant. Aggregate model results are displayed in Table 2.

Table 2

Study Two: Linear Mixed Model Results – Main Effects

Effect	Num DF	Den DF	F Value	Pr > F
BLOCK	3	420	5.73	0.0007
AGE_CAT	2	140	0.31	0.7334
BLOCK*AGE_CAT	6	420	1.95	0.0716
CONDITION	1	140	0.32	0.5742
BLOCK*CONDITION	3	420	0.27	0.8456
CONDITION*AGE_CAT	2	140	2.6	0.0776
BLOCK*CONDIT*AGE_CAT	6	420	0.66	0.6796

Given that the interaction between Block and Age Category was moderately significant, the model least square means were evaluated to better understand the pattern the model was pointing toward. Once plotted, the estimates revealed two interesting patterns. The first being, the main effect of continuous learning improvements amongst older adults is corroborated by the data collected in study 2. The "older" pocket shows continuous improvement over each of the task blocks. The second point of interest is that the pattern of the "mid" respondents is almost identical to that of the older respondents. Suggesting that the two upper age categories could potentially be collapsed. These patterns are displayed in figure 3.

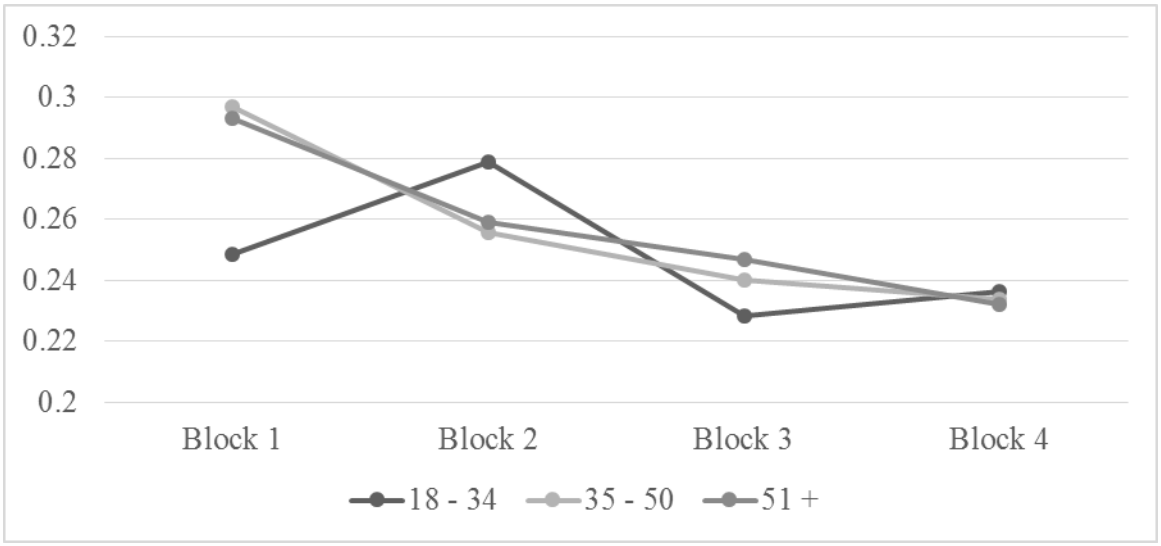

Figure 3. Study 2 - MedAPE Plotted by Age Cohort and Block

As the pattern displayed in figure 3 suggests, the two upper age categories were collapsed and the Linear Mixed Model was run again using MedAPE as the DV and the full factorial of Condition, Block and the new two-level Age Category as the IVs with a CS error structure. This analysis resulted in a whole model -2 log likelihood of -1134 ($\chi^2(1) = 44.15$, $p < .0001$). The model again reveals significant effects for Block ($F(3,426) = 7.38$, $p < 0.0001$). Additionally, the interaction between the new Age Category and Block is now significant ($F(3,426) = 3.92$, $p = 0.009$). Model results are shown in Table 3.

As there was no effect found related to the treatment condition, an analysis was also conducted to evaluate the impact of the condition manipulation. The analysis of the manipulation check revealed that the writing activity did not result in a significant difference in feelings of scam susceptibility between treatment conditions, however, a significant difference in perceived scam susceptibility was revealed when the manipulation checks were evaluated by age group. T-test results examining the manipulation checks are displayed in Table 4 and Table 5.

Table 3

Study Two: Linear Mixed Model – Two Age Categories

Effect	Num DF	Den DF	F Value	Pr > F
BLOCK	3	426	7.38	<.0001
AGE_CAT_NEW	1	142	0.63	0.4275
BLOCK*AGE_CAT_NEW	3	426	3.92	0.0088
CONDITION	1	142	0.89	0.3465
BLOCK*CONDITION	3	426	0.2	0.8983
CONDITION*AGE_CAT_NE	1	142	2.12	0.1472
BLOCK*CONDIT*AGE_CAT	3	426	0.93	0.425

Table 4

Study Two: T-Tests for Manipulation Check by Condition

Variable	Mean (Scam)	Mean (Control)	t Value	Pr > |t|
Scam_Likely1	1.974	2.000	0.14	0.8856
Scam_Likely2	2.079	1.944	-0.90	0.3697
Scam_Likely3	2.500	2.361	-0.73	0.4694

Table 5

Study Two: T-Tests for Manipulation Check by Age Cohort

Variable	Mean (< 35)	Mean (> 35)	t Value	Pr > |t|
Scam_Likely1	2.041	1.898	-1.70	0.0894
Scam_Likely2	1.949	2.041	1.34	0.1823
Scam_Likely3	2.289	2.612	3.69	0.0002

While there was no significant model effect associated with the Condition respondents were placed in, for reporting purposes the difference in performance between Age Categories by Condition were plotted to evaluate the data pattern. The results suggest an inverse relationship to the one suggested by proposition 2. While the older adults' performance improves under the scam condition, no effect is shown amongst the younger adults. The values are plotted for visualization in figure 4.

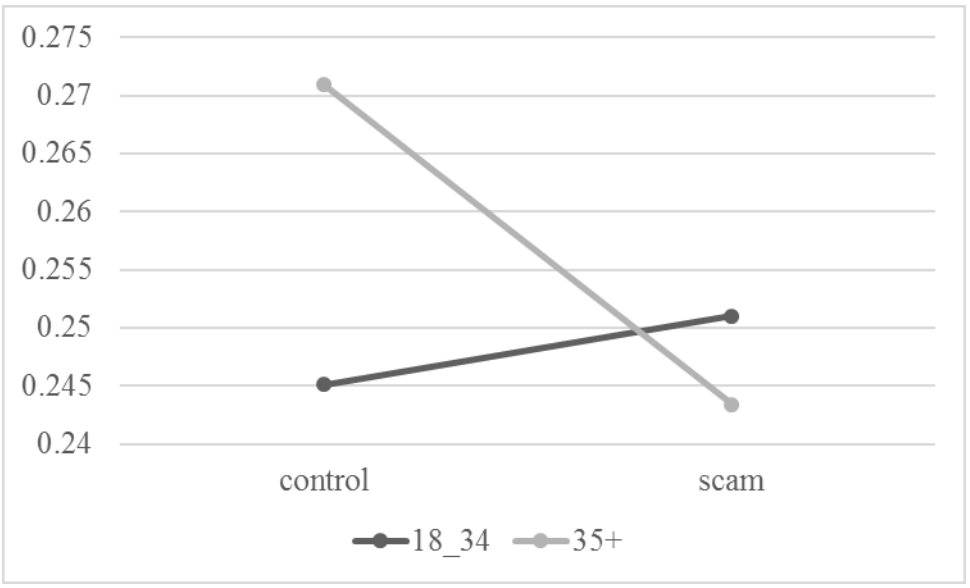

Figure 4. Study 2 - MedApe Plotted by Age Cohort and Condition

Additional analyses were performed using the control measures collected in the analysis. A Factor Analysis was performed on the emotion measures, PANAS results, and Depression Symptom results. A three factor solution was obtained. Varimax rotated factor loadings are displayed in Table 6. Measures of nervousness, fear, vulnerability and negative affect loaded on Factor 1 (Anxiousness). Measures of anger, frustration and sadness loaded on Factor 2 (Annoyance), along with negative loadings for feelings of happiness and excitement. Finally, Factor 3 (Depression) was comprised of measures relating to tiredness, feeling drained, depressive symptoms and a negative load of positive affect. The factor scores for each factor were computed for each subject and used as the IVs in a Linear Mixed Model with MedAPE as the DV and a CS error structure. This analysis resulted in a whole model -2 log likelihood of -1152 ($\chi^2(1) = 31.24$, $p < .0001$). However, none of the emotion factors were significant in the model. Aggregate model results are displayed in Table 7.

Table 6

Study Two: Emotion Factors – Varimax Rotated Loadings

Variable Name	Factor1	Factor2	Factor3
E3_NERVOUS	0.85194	-0.0458	0.10173
E1_AFRAID	0.81883	0.27853	-0.0437
E7_VULNERABLE	0.7556	0.09272	0.12443
NEG_AFFECT	0.55467	0.04747	0.17735
E5_ANGRY	0.31541	0.78541	-0.1095
E8_FRUSTRATED	0.40737	0.72008	0.13461
E4_SAD	0.44849	0.60203	-0.1151
E6_EXCITED	0.29299	-0.7149	-0.2031
E2_HAPPY	0.0537	-0.7739	-0.2068
E10_DRAINED	0.21144	0.14202	0.78861
E9_TIRED	0.19326	0.12326	0.77409
DEPRESSION_SCORE	0.16258	-0.1005	0.75685
POS_AFFECT	0.15232	-0.0981	-0.5724

Table 7

Study Two: Linear Mixed Model Results – Emotion Factors

Effect	Estimate	Std Err	DF	t Value	Pr > |t|
Intercept	0.2516	0.00492	142	51.16	<.0001
Factor1	0.00394	0.00494	142	0.8	0.4266
Factor2	0.00148	0.00494	142	0.3	0.7654
Factor3	-0.0013	0.00494	142	-0.26	0.7919

Discussion

The results of Study 2 replicate the main effect seen in study 1 and support the premise of proposition 1 – that is older adults learn steadily throughout the task and although they start at a worse performance rate than their younger counterparts, they ultimately perform as well (or better) by the final evaluation period (Block 4). Additionally, these results highlight the difference in performance between young and older adults in the presence of feedback. As can be seen in Figure 2, young participants

perform well in the presence of feedback (Blocks 1 and 3), but performance decreases when asked to evaluate the emerald prices without being provided feedback between trials (i.e., Blocks 2 and 4). One might relate this pattern to the, all too familiar, real world phenomenon of a student who performs well in class, but struggles to complete their homework problems once they are no longer under the guidance of a teacher. Tangentially, this pattern may also be indicative of the nature of the differences in the task. The supplying of feedback requires additional thought and "clicks" through the task, while simply providing emerald pricing in the test blocks can be done much more quickly. The results may simply be a symptom of the younger adults getting "bored" and just wanting to finish, an explanation this dissertation begins to examine in study 4.

While proposition 2 was not supported by the results of study 2, improvement was seen among older adults in the scam condition. This suggests there may be some validity to the application of security motivation as an explanation to increased performance in older adults, but that there may be an age barrier to when individuals are impacted by security threats.

CHAPTER FIVE

STUDY THREE: EXPLORING MORTALITY SALIENCE AS MECHANISM

As previously discussed, a shortened perceived time horizon is associated with aging (Carstensen, 1992). As individuals age, logic would suggest that constantly facing this shortened time horizon likely creates a reality in which mortality is naturally more salient, and subsequently, that death anxiety is increased. Following traditional research in Terror Management Theory, this lends itself to an environment in which older individuals, engage in anxiety defensive behaviors (i.e. heightened performance on cognitive tasks to initiate feelings of success and self-esteem; consider the popularity of crossword puzzles amongst the elderly) more readily than young adults who retain an extended time horizon and thus, a reduced salience surrounding thoughts of death. As research in TMT has evolved, it seems to have failed to evaluate two key questions. The first, whether acknowledgement (or perception) of a closer proximity of death assumes the existence of death anxiety, and second whether these feelings of death anxiety exist without the need for a salience trigger.

Therefore, study 3 seeks to contribute through two lenses: to evaluate the cognitive impact of death proximity and death anxiety (as individual constructs) in the context of a dynamic learning environment and to evaluate these between subject differences in performance without the use of a salience prime.

Prop1: Following existing TMT research in older populations, measures fear of death (death anxiety) will decrease as age increases

Prop2: If death anxiety is a performance driver, individuals who score higher in measures of fear of death (death anxiety) will perform better on the experiential learning task

Prop3: If shortened perceived time horizon is a performance driver, individuals who perceive their time horizon to be shorter will perform better on the experiential learning task

Methodology

Subjects and Design

This study compares experiential learning performance between individuals categorized as High Mortality Salience vs. Low Mortality Salience. Approximately 250 American adults were recruited via the MTurk platform, following removal of participants who failed to complete the study and those who blatantly ignored the task instructions, the researchers were left with 198 respondents. Respondents ranged in age from 18 years old to 68 years old ($Mean_{Age} = 35.94$). The average education level fell between an Associates and Bachelors Degree ($Mean_{Edu} = 4.39$; 1-Some HS, 2-HS Diploma, 3-Some College, 4-Assoc, 5-Bachelors, 6-Masters, 7-Professional Degree) and the reported familiarity with emeralds was little to none at all ($Mean_{Familiar} = 1.22$; 1-Not at all, 2-Slightly etc).

Procedure and Stimuli

The main learning task in study 3 was similar to the task presented in study 2. Subjects were asked to predict the price of emeralds and learn throughout the task via veridical feedback. The stimuli were presented four blocks – two training and two test.

In the training blocks, feedback was provided following each response. While in the test blocks no feedback was provided. Each block contained 20 trials randomly selected from a pool of 128 possible combinations. Immediately following the main learning task, respondents were asked to complete a series of questions regarding how they feel "right now". This question series included a response to the question "How soon does your death seem" as a measure of perceived time horizon, followed by the completion of the Fear of Personal Death Scale (Florian & Kravetz, 1983) as a measure of chronic death anxiety. Additional control measures included a series of questions regarding respondents' current emotional state, the Brief Self-Control Scale - a questionnaire aimed at measuring self-reported personal self-control - (Tangney, Baumeister, & Boone, 2004), and as a measure of traditional cognitive capability participants completed a shortened, written adaptation, of the Auditory-Verbal Learning Test (AVLT) (Knopman & Ryberg, 1989; Rey, 1964). Finally, age, occupation, education and familiarity with emeralds (on a scale from 1 -Not at all Familiar to 5 – Expert) were captured.

Results

Consistent with our on-going research in this area, Absolute Percentage Error was calculated for each subject, for each trial. That error rate was then averaged by block, to create one Mean Absolute Percentage Error (MAPE) value for each subject for each block. As the FPDS scale was given to serve as a measure of mortality salience, the scale was scored for each respondent. Each respondent was given an overall score – computed by summing all responses for the scale, as well as a weighted overall score – computed by taking the average of all responses. Given that the Fear of Personal Death Scale was found to measure 6 different types of fear of death (Florian & Kravetz, 1983), factor

scores for each respondent were also calculated. These values were computed by averaging all responses for the questions relating to each factor. Using the univariate procedure, these factor scores were bucketed into 3 level categorical variables.

To evaluate proposition 1, a generalized linear model was analyzed with Age as the DV and the Fear of Personal Death factor scores (treated as continuous variables) and death proximity score as IVs. While death proximity was found to be a significant predictor of age (t = 3.01, p = 0.003), no FPDS factors were found to be significant in the model. Full model results are displayed in Table 8.

Table 8

Study Three: General Linear Model Results – Age as DV

Variable	DF	Estimate	Std. Error	t Value	Pr > |t|
Intercept	1	26.2672	3.1984	8.21	<.0001
FPDS_FACTOR1_SCORE	1	-0.0997	0.89231	-0.11	0.9112
FPDS_FACTOR2_SCORE	1	0.80667	0.94346	0.86	0.3936
FPDS_FACTOR3_SCORE	1	0.29564	0.6251	0.47	0.6368
FPDS_FACTOR4_SCORE	1	0.69215	0.61643	1.12	0.2629
FPDS_FACTOR5_SCORE	1	-0.7040	0.9489	-0.74	0.459
FPDS_FACTOR6_SCORE	1	0.20292	0.52362	0.39	0.6988
DEATH_SOON	1	1.69059	0.56144	3.01	0.0029

As an evaluation of propositions 2 and 3, a liner mixed model was computed with MAPE as the DV and the categorical values for each fear factor, the categorical value for the entire FPDS, the death proximity measure, age and block as IVs. Again the error structure was compounded symmetry. This analysis resulted in a whole model -2 log likelihood of -1931 ($\chi^2(1) = 278.45$, $p < .0001$). Significant predictors in the model included block ($F(3,588) = 6.75$, $p < 0.001$) and death proximity ($F(1,181) = 5.90$, $p = 0.016$). Additionally, FPDS factor two ($F(2,181) = 2.24$, $p = 0.110$) was marginally significant in the model. As the interaction of age and block was also marginally

significant (F(3,588) = 2.47, p = 0.061), means are plotted in Figure 5. As seen in figure 5, older adults again outperform young adults on the experiential learning task over time. Aggregate model results appear in table 9.

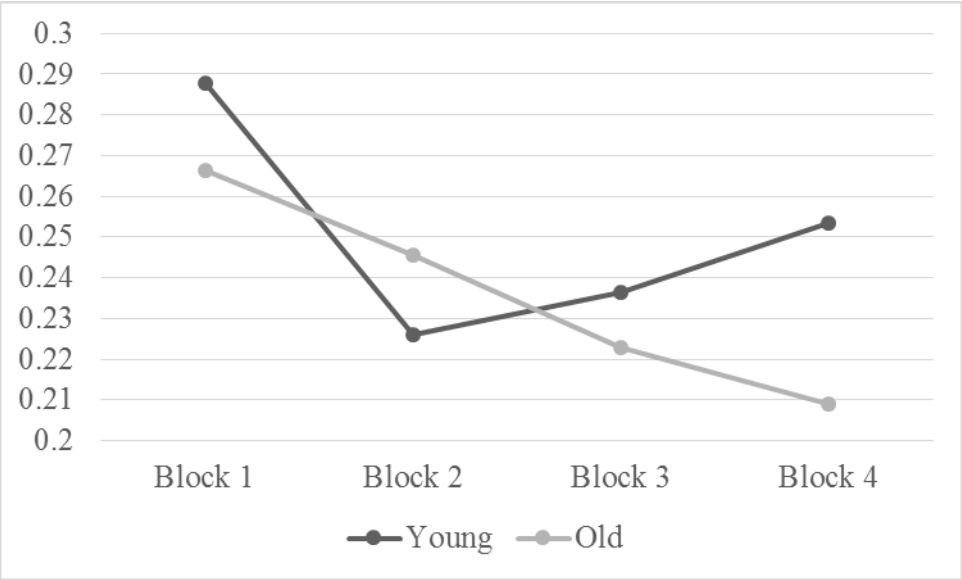

Figure 5. Study 3 - MAPE Plotted by Age Cohort and Block

Table 9

Study Three: Linear Mixed Model Results – Main Effects

Effect	Num DF	Den DF	F Value	Pr > F
BLOCK	3	588	6.75	0.0002
DEMAGE	1	181	0.00	0.9523
DEMAGE*BLOCK	3	588	2.47	0.0613
FPDS_FACTOR1	2	181	0.3	0.7444
FPDS_FACTOR2	2	181	2.24	0.1096
FPDS_FACTOR3	2	181	0.12	0.8864
FPDS_FACTOR4	2	181	0.62	0.5393
FPDS_FACTOR5	2	181	0.71	0.4925
FPDS_FACTOR6	2	181	0.62	0.5371
FPDS	2	181	0.26	0.7705
DEATH_SOON	1	181	5.90	0.0161

Also of interest to the researcher was the effect of the emotion measures captured during the study. To evaluate this effect, an additional linear mixed model was run with

MAPE as the DV and the emotion measures as IVs with a CS error structure. This analysis resulted in a whole model -2 log likelihood of -1781 ($\chi^2(1) = 213.64$, $p < .0001$). Aggregate model results appear in table 8. Significant predictors in the model included "feeling inspired" ($F(1,172) = 8.06$, $p = 0.005$) and "feeling nervous" ($F(1,172) = 3.95$, $p = 0.048$). As responses for "feeling inspired" increased, performance decreased. Conversely, those who reported feeling nervous showed improvement in their performance. Additionally, while only marginally significant, those who reported having higher levels of attention throughout the task displayed superior performance ($F(1,172) = 3.63$, $p = 0.059$). Aggregate model results are displayed in Table 10.

Table 10

Study Three: Linear Mixed Model Results – Control Measures

Effect	Num DF	Den DF	F Value	Pr > F
FPDS_TOTAL_WGT	1	172	0	0.9705
SELFCONTROLSCORE	1	172	0.01	0.9329
E1_INTERESTED	1	172	0.61	0.4377
E2_DISTRESSED	1	172	0.71	0.3998
E3_EXCITED	1	172	1.73	0.1906
E4_UPSET	1	172	0.01	0.9103
E5_STRONG	1	172	0.69	0.4079
E6_GUILTY	1	172	0.23	0.6299
E7_SCARED	1	172	0.29	0.5908
E8_HOSTILE	1	172	0.05	0.8298
E9_ENTHUSIASTIC	1	172	1.46	0.2282
E10_IRRITABLE	1	172	0.95	0.3315
E11_ALERT	1	172	2.09	0.1503
E12_ASHAMED	1	172	0.35	0.5554
E13_INSPIRED	1	172	8.06	0.0051
E14_NERVOUS	1	172	3.95	0.0484
E15_DETERMINED	1	172	0.31	0.5771
E16_ATTENTIVE	1	172	3.63	0.0585
E17_JITTERY	1	172	2.04	0.1553
E18_ACTIVE	1	172	0.48	0.4893
E19_AFRAID	1	172	0.39	0.5339
E20_PROUD	1	172	0.05	0.8315
E22_VULNERABLE	1	172	0.44	0.5074
E24_SAD	1	172	1.56	0.2129
E25_ANGRY	1	172	0.13	0.7238

Discussion

Upon review of the regression model results, I find no evidence that measures of fear of death decrease with age. Therefore, I am unable to confirm proposition 1.

As a whole, measures of death anxiety (FPDS Factors) were not found to be significant predictors in the model. However, worth discussion is the finding that FPDS

Factor 2 (fear of the loss of social identity) was found to be marginally significant. This factor is characterized by items that express a concern for the threat of one's identity and likeness. The rise of this particular factor suggests to the researchers that while death anxiety as a construct does not appear to drive performance, there is a sense of threat to the self that seems to be, at least directionally, related to task performance. This finding supports the notion that a defense mechanism may indeed be in play. However, the model suggests the defense mechanism is only triggered when the threat is related to one's identity. This result warrants further investigation into constructs related to self-identity and identity threat.

Death proximity was found to be significant in the model, however, the model reveals an inverse relationship between death proximity and performance. While researchers proposed that a shortened time horizon would improve performance, results show that a shortened perceived time horizon actually decreased performance. Future research may seek to evaluate participants' feelings toward the task as one potential explanation for this result could be that the task is seen as a waste, especially when one perceives their time as limited. Understanding the importance of time to each respondent is also critical in further evaluation of the theories discussed in study 3.

CHAPTER SIX

STUDY FOUR: EXPLORING COGNITIVE CONTROL AS MECHANISM

As another potential explanation for the results observed in studies 1 – 3, study 4 proposes an explanation predicated on the idea that as people age they develop cognitive skills that allow them to compensate for their growing cognitive declines. If we consider the neurobiological evidence presented previously for compensatory adaptations in older adults, it is plausible that the "wisdom" we often associate with the elderly is a product of an enhanced ability to maintain cognitive control and focus. This leads us to the hypothesis tested in study 4:

> Prop1: Elderly individuals will outperform their younger counterparts, following the cognitive depletion task, due to an enhanced ability to maintain prolonged attention over time.

Methodology

Subjects and Design

A panel of 90 adults (48 over the age of 65, 42 under the age of 25) were recruited via a Qualtrics panel. Each subject volunteered of their own will and was compensated a qualtrics determined rate for their time. The mean age of the young respondents was 21.88 years old, 68.73 years old for the elderly respondents. Of all respondents, 61% were female and the average education of the group was at the associates degree level.

Study 4 was a 2 (cognitive depletion: yes, no) by 2 (age: old, young) design where cognitive depletion was manipulated and age was measured as a continuous variable belonging to two cohorts.

Procedure and Stimuli

In this experiment, the main learning task was designed similarly to study one. However, in order to better assess the impact of time and incremental learning from one trial to the next, the task order was kept consistent for all participants. This varies from study one in which the order was randomized. To test study four's main hypothesis regarding an increased cognitive control amongst the elderly, cognitive depletion was manipulated using a task which participants were asked to write about a recent trip they took without using the letters 'A' or 'N' (Schmeichel, 2007). Following the writing task feelings of depletion were evaluated by asking respondents to rate their feelings on two depletion questions (manipulation check): "I feel emotionally drained" and "I feel tired" (Rated from 1 – Disagree completely to 7 – Agree completely) (Finkel et. al, 2006).

Similar to studies two and three, participants not partaking in the cognitive depletion task were asked to write about "what they did last Tuesday" as a control condition (Harmon-Jones, et al., 1996; Harmon-Jones, et al., 1997). Following the learning task, described in detail in study one, several control measures were collected. These measures included the Brief Self Control Scale (Tangney, Baumeister, & Boone, 2004) - collected to provide insight into the relative differences in one's perceived self-control between age groups – as well as a self-reported affect measure using the PANAS (Watson, Clark, & Tellegen, 1988). Additionally, researchers also collected a measurement of our respondents' current depressive symptoms using a 9-item scale for

depression as developed by Goldberg and colleagues (Goldberg, Bridges, Duncan-Jones, & Grayson, 1988). Finally, as a measure of "traditional" memory task performance, participants completed a word related memory task. This task was positioned at the end of study four, so as not to impact the main learning task. Participants completed a shortened, written adaptation of the Auditory-Verbal Learning Test (Knopman & Ryberg, 1989; Rey, 1964); A short memory task which measures recall, recognition and memory interference. In this task, an initial list of 15 words (List A) was presented one word at a time for one second each to the respondents. Respondents were then asked to record all of the words they could recall from the list. Respondents were then exposed to a second list of 15 words (List B), and subsequently asked to record all of the words they could recall from that list. Participants then complete 3 short addition and subtraction equations as a filler task. Following the time lag, participants were then asked to complete a series of tasks related to the word lists they have previously seen. The first task, the recall task required the participants to list all words they could remember from list A, blocking out the words from List B (the list they had seen most recently). In the second task, the recognition task, participants were provided a list of 50 words, this list contained words from both lists, as well as words associated with the words from lists A and B. They were asked to identify only the words they recognized as being from List A. The inclusion of these standard memory tasks allow us to determine if a difference in performance exists between subjects on the experiential learning vs. explicit memory tasks.

Results

Similarly to study one, I calculated absolute percentage error for each trial, for each participant as a measure of learning performance. After cleansing the data for individuals who dropped out (or gave up) before completing the entire task, the remaining participants were categorized as being under the age of 25 (N=42) and placed into the "young" category, or over the age of 65 (N=48) and placed into the "old" category.

A linear mixed model, with a CS error structure, was run testing the model's main effects with Mean Absolute Percentage Error (MAPE) as DV and the full factorial of Age, Block and Condition as IVs. Aggregate model results are displayed in table 11.

Table 11

Study Four: Linear Mixed Model Results – Main Effects

Effect	Num DF	Den DF	F Value	Pr > F
AGE	1	86	4.43	0.0382
CONDITION	1	86	0.9	0.3467
AGE*CONDITION	1	86	1.59	0.2114
BLOCK	3	258	13.27	<.0001
BLOCK*AGE	3	258	0.55	0.6455
BLOCK*CONDITION	3	258	0.99	0.3998
BLOCK*AGE*CONDITION	3	258	0.32	0.8094

This analysis resulted in a whole model -2 log likelihood of -477 ($\chi^2(1) = 152.99$, $p <$ .0001). Age, categorized as a binary variable (old, young) is significant in the model ($F(1,86) = 4.43$, $p < 0.038$). The time variable, block, which categorizes each training and test period, is also significant in the model ($F(3,258) = 13.27$, $p < 0.001$). While condition, depletion vs. control, is not significant in the model. As age is a significant

predictor in the model, in order to further understand the differences between age cohorts, as well as the differences within age cohorts, means by block were plotted and evaluated.

Between Age Groups By Condition

While both groups show similar learning performance under the control condition, older respondents perform better in the learning task from the initial training phase (block 1) and thus outperform younger respondents in all 4 blocks (Figure 6). Similar to the impact of the environmental change condition in Study 1, under the depletion condition, the young adults' starting performance improves, while the older adults experience a small negative impact in their average performance in block 1. However, older adults are able to improve more than their younger counterparts throughout the task and ultimately outperform the young adults in the final test phase (Figure 7).

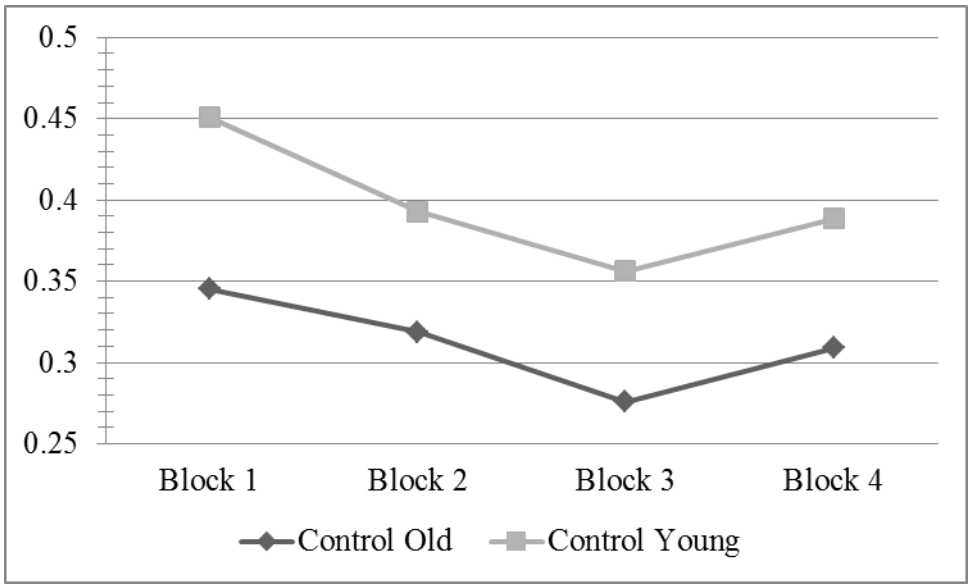

Figure 6. Study 4 – MAPE Plotted by Age Cohort – Control Condition

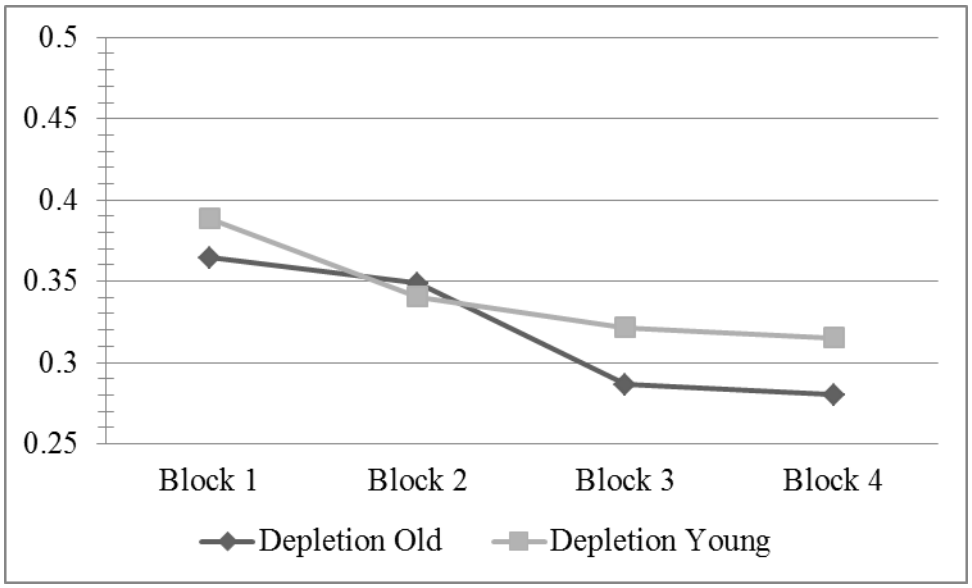

Figure 7. Study 4 – MAPE Plotted by Age Cohort – Depletion Condition

Within Age Group By Condition

Amongst both the young and old respondents, those exposed to the cognitive depletion task ultimately outperformed their respective age groups under the control condition in the final test phase (block 4). Specifically, under the depletion condition youngsters performed better than youngsters in the control condition through all four blocks (Figure 8), while older respondents in the depletion condition performed slightly worse than older respondents in the control condition in blocks 1 and 2. However, older respondents in the depletion condition ultimately outperformed older respondents in the control condition in the final test phase (Figure 9).

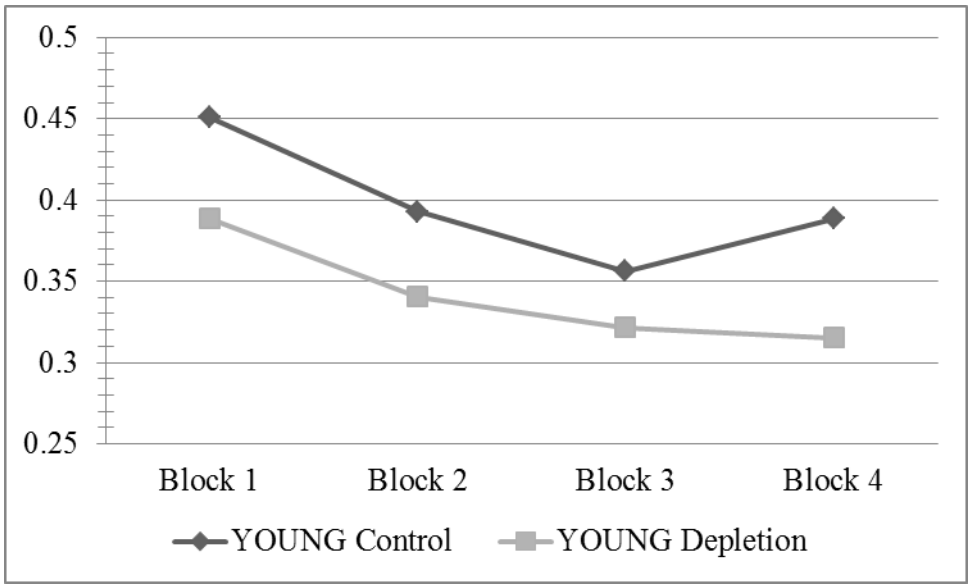

Figure 8. Study 4 – MAPE Plotted by Condition – Young Cohort

In addition to comparing raw performance numbers, improvement throughout the task (i.e. learning) was also evaluated. For both the old and young respondents, those in the depletion condition showed continuous improvement from block 1 to block 4. Conversely, those in the control condition, for both young and old respondents, showed a decrease in performance (a spike in error rates) in block 4. This counterintuitive result of consistent improvement under depletion in both groups drove the researchers to further evaluate the impact of the manipulation.

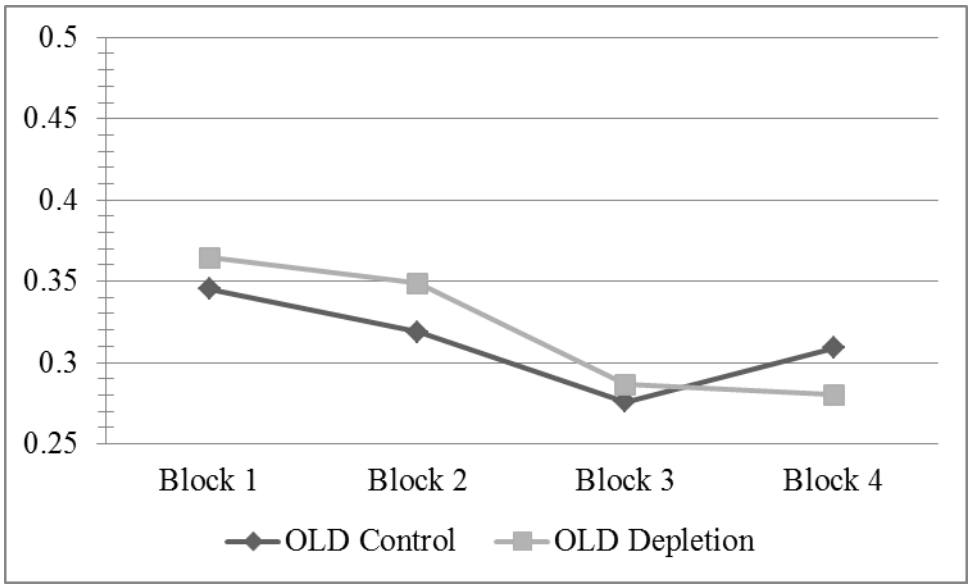

Figure 9. Study 4 – MAPE Plotted by Condition – Old Cohort

Control Measures

While analyzing the manipulation checks it was discovered that respondents showed no significant difference in their reported measures of feeling tired ($t = -0.85$, $p > 0.39$) or drained ($t = -0.72$, $p > 0.47$) between conditions. However, depletion subjects did report being significantly more frustrated ($t = -5.12$, $p < 0.0001$), vulnerable ($t = -2.37$, $p < 0.03$) and nervous ($t = -3.10$, $p < 0.003$) than those in the control condition suggesting the manipulation produced a different psychological effect than expected. T-test results displayed in Table 12.

Table 12

Study Four: T-Test Results for Control Measures by Condition

Effect	Control	Depletion	t Value	Pr > t
Drained	2.9216	3.2308	-0.72	0.4758
Tired	3.2941	3.6667	-0.85	0.3999
Frustrated	1.5294	3.0769	-5.12	<0.0001
Vulnerable	1.3137	1.8462	-2.37	0.0211
Nervous	1.5098	2.3333	-3.10	0.0026

In an attempt to better understand between group differences, the control measures were tested for between group differences. Results showed that older respondents had significantly lower positive affect scores ($t = -2.78$, $p < 0.008$), depression scores ($t = -2.97$, $p < 0.004$), feelings of being drained ($t = -5.33$, $p < 0.0001$), feelings of being afraid ($t = -2.70$, $p < 0.0001$), feelings of nervousness ($t = -2.02$, $p < 0.05$) and feelings of tiredness ($t = -3.70$, $p < 0.001$). Conversely, older respondents scored significantly higher on the self-control scale ($t = 3.48$, $p < 0.001$) than their younger counterparts. There was no difference between age groups in feels of frustration or vulnerability. Additionally, no difference between age groups in performance on the recall, recognition, or interference components of the traditional memory task. T-test results are displayed in Table 13.

Table 13

Study Four: T-Test Results for Control Measures by Age Cohort

Effect	Young	Old	t Value	Pr > t
Pos Affect	23.1429	18.4583	2.78	0.0073
Depression	4.5714	2.8542	-2.97	0.0038
Drained	4.1190	2.1250	-5.33	<0.0001
Afraid	1.7143	1.1667	-2.70	0.0093
Frustrated	2.4762	1.9583	-1.59	0.1165
Nervous	2.1667	1.6042	-2.02	0.0473
Tired	4.2619	2.7500	-3.70	0.0004
Self-Control	37.5000	45.3542	3.48	0.0008

Discussion

As hypothesized, older adults did outperform their younger counterparts under the depletion condition. While older adults appear to be slightly negatively impacted by the depletion task, they are ultimately able to overcome that impact and learn more than the

young respondents. I believe this result is consistent with our theory that older adults are better at maintaining cognitive control than their younger counterparts.

While it appears the depletion task did not induce the expected feelings of fatigue that were intended for this study, the impact of the depletion task "closing the gap" in the initial training phase between young and old adults indicated the task did indeed have an impact on the respondents. Upon evaluating the control measures, the results suggest the task may have instead lead to a state of dissonance (i.e. increased frustration, feelings of vulnerability and nervousness) which the respondents combatted through increased focus and subsequently improved performance on the learning task. This result, though unexpected, suggests a need for continued research surrounding the impacts of emotional states on one's ability to focus and learn.

CHAPTER SEVEN

GENERAL DISCUSSION AND FUTURE RESEARCH

Contributions

The research presented here contributes to consumer psychology literature through several streams. The primary contribution presented here revolves around the population being researched. As a community, consumer psychology researchers have historically neglected elderly populations when conducting research. While accessibility of elderly subjects continues to pose a challenge, especially when compared to student subjects, the rapidly growing size of this consumer population requires that consumer psychology researchers devote research effort to better understanding, and accommodating, this population. This dissertation answers that call by focusing the entirety of its research on the experiential learning performance of older consumers. This research pulls from a body of already existing research that examines learning in the presence of veridical feedback. However, this existing research stream fails to evaluate the impact of age (primarily old age) on learning patterns and performance. The research presented here is the first evaluation of this type of learning in elderly populations. The results of study one (and subsequent studies) demonstrate that there is indeed a difference in both the learning pattern and in learning performance between young and old adults. Here I begin the discussion of just a few if the various future research streams related to this topic. Beyond the research age gap this dissertation contributes to, this research applies the evolutionary and social psychology theories of security motivation and mortality salience respectively, in a consumer learning context. These research streams

previously focused primarily on social evaluations of one's self and others and the impact of these psychological states on decision making. Applying these theories as explanations for observed differences in learning performance begins to fill the gap between the social and psychological application of these theories and the breadth of literature on consumer learning.

As evidenced by the steady rise in a call for, and existence of research on this population (e.g., Schmiedek, Lövden and Lindenberger, 2013), answers to these research questions are of interest to both consumer behavior researchers and psychology researchers, as well as being of high importance to society. When viewing this research through a wider lens, the understanding of the impact of these psychological motivations on how individuals (old and young) absorb information, aligns with the interests of journals that align more closely with psychology as a discipline.

As research surrounding the learning of elderly populations expands in the psychology discipline it is important to note the contributions that can be made by taking a more consumption centric view of this population. As an example, I take a comparative look at the research reported by Schmiedek, Lövden and Lindenberger in the September 2013 issue of Psychological Science. In this report, the researchers were interested in evaluating the performance of young and old adults on varying cognitive tasks which employed a variety of cognitive processes over a span of ~100 days. The experiment was specifically concerned with comparing performance variation in young and old adults from day to day. Despite finding that the overall cognitive performance averages amongst the old adults was still lower than that of the young, researchers do conclude, according to their results, that older adults actually show less variability not only from day-to-day,

but also from block-to-block on tasks within the same day. While no underlying processes for these results are researched, the researchers offer several possible explanations based on existing research including, but not limited to: more stable levels of motivation, a lesser need to engage in cognitively demanding acts of self-regulation and less variation in the use of cognitive strategies. While, the approach presented in this research investigates a similar phenomenon (task performance differences between blocks by age groups), I am interested specifically in measures of the dynamic process of active-marketplace learning. In the closing of their article, Schmiedek, Lövden and Lindenberger note that the cognitive performance consistency seen in their results may prove to be an advantageous attribute to the elderly in vocational and leisure settings; a statement supportive of the findings I have presented. Contrary to the results presented by Schmiedek, Lövden and Lindenberger however, I find that older adults have the ability to actually outperform younger adults on the experiential learning task presented. The explanatory processes I have chosen to investigate in this dissertation were fully aligned with two of the possible explanations presented by Schmiedek, Lövden and Lindenberger for their findings. The publication of this article serves as another example of the importance and relevance of research regarding the impact of aging on cognition across many disciplines. Ultimately, the research presented in this dissertation provide an extended investigation into this population which is increasing in importance every day and presents an argument for the continued application of cognitive, social and evolutionary psychological principles to the construct of consumer learning.

Implications

This dissertation seeks to further our understanding of how aging impacts learning in complex marketplaces. Study one, which takes the inductive, phenomenon-driven path being called for at an increasing rate by consumer psychologists (Janiszewski, 2009; Lynch, 2011; Pham, 2013), presents robust and interesting findings with real-world implications. Studies 2 and 3 applied two psychological theories in an attempt to explain the phenomenon observed in study one. Although results did not fully corroborate either explanation, the results of both studies demonstrate a clear impact to older adults under conditions where a threat to the self is perceived (i.e. scam vulnerability, mortality salience). Expanding on the overarching construct of perceived threat to the self presents an interesting research path.

If, as study one suggests, elderly consumers excel in action based learning environments compared to static learning environments this suggests it may be beneficial to make changes to the way companies market complex products (retirement products, health insurance etc) to this population. For example, marketers may find interactive modules available in the home, drug store, or grocery store to be better education tools than the traditional paper 'packets', or 'booklets' companies often distribute. These modules have the potential to benefit companies not only through improving education amongst consumers, but also reducing printing and administrative costs associated with the design, creation and distribution of the aforementioned reference materials. Additionally, the proposed future research will help us better understand not only the differences in the impact of psychological states and motivations associated with how

elderly individuals learn in dynamic environments, but also call for potentially drastic impacts for the way we teach elderly consumers about complex products today.

Future Research

This dissertation addresses some critical components surrounding the question of "Are elderly consumers always at a disadvantage compared to young consumers?" Traditional research surrounding age related cognitive decline suggests the answer is yes because the elderly possess cognitive deficits that make them less able to collect, store and integrate product information. I present initial evidence here that refutes that generalization and apply three unique psychological theories to better explain this real world observation that elderly individuals continue to live active lives and make successful decisions into old age, in a controlled research environment. This dissertation is to serve as the beginning of a programmatic investigation into the intricacies surrounding how elderly consumers learn about products in active marketplaces. Taking into account the results of the research presented above, there are still a considerable amount of outstanding questions that can be addressed in future research. For example, current research discussions with colleagues and at conferences have included questions regarding the impact of goal-orientation to the learning paradigm, such as: How do different goal orientations impact experiential learning between groups? Can we use goal primes to improve performance? Better understanding of the impact of the psychological motivations presented in study two will assist in the decision to look at such processes. Questions have also arisen surrounding the impact of depressive realism on learning performance. Ultimately, the scarcity of existing research on this topic allows for a wide array of interesting and relevant questions to be addressed in the future.

Closing Remarks

It is common knowledge that developed nations are graying. However, despite the heavy documentation of cognitive impairments associated with aging, most elderly individuals continue to make successful, informed, and often impactful (e.g. Congressmen, Senators, Supreme Court Justices) decisions every day. The rapidly increasing size of this market, in numbers and discretionary income, only exacerbates the importance of better understanding how they behave as consumers. Expanding our understanding surrounding how they learn about products could have a significant impact in the way companies market to this consumer group in the future. Furthermore, increasing awareness regarding the impact of feelings and motivations on how elderly consumers take in product information has implications for all aspects of marketing efforts from product packaging and design to brand messaging and information distribution.

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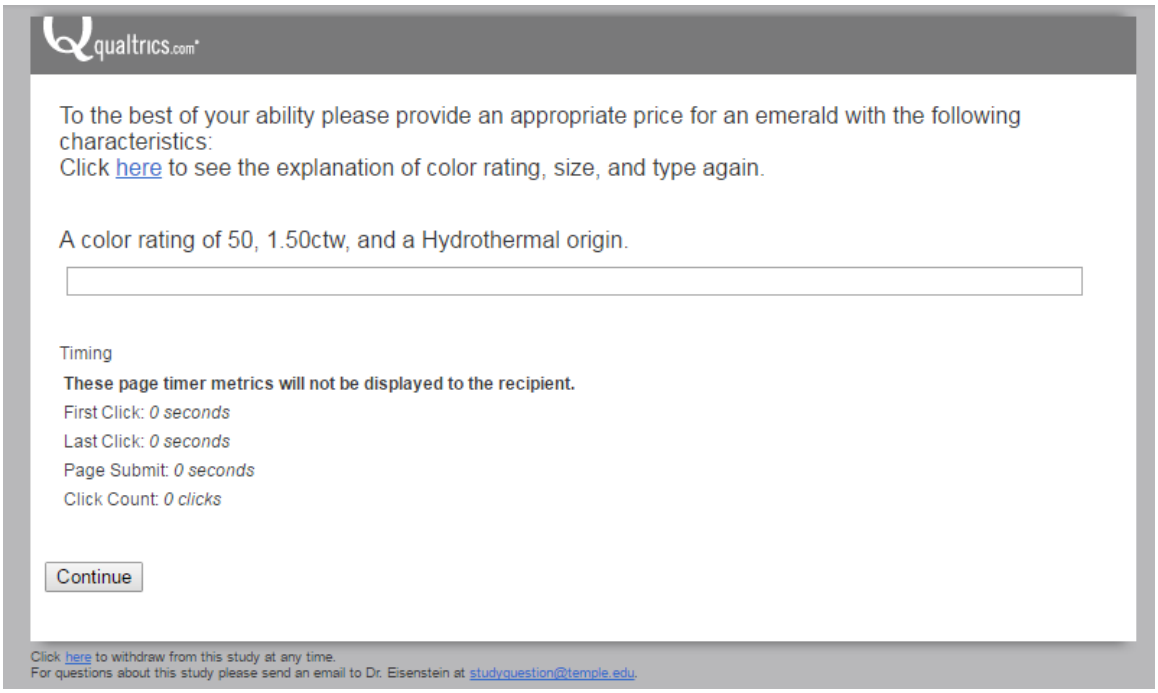
APPENDIX A

EXPERIENTIAL LEARNING STIMULI EXAMPLE



APPENDIX B

FEAR OF PERSONAL DEATH SCALE

Appendix X

Fear of Personal Death Scale (Florian & Kravetz, 1983)

Item	Factor	Factor Name
Death frightens me because of the cessation of creative activities	1	Loss of Self-Fulfillment
Death frightens me because of the cessation of all plans and activities	1	Loss of Self-Fulfillment
Death frightens me because of the cessation of all spiritual activities	1	Loss of Self-Fulfillment
Death frightens me because of the cessation of the ability to think	1	Loss of Self-Fulfillment
Death frightens me because my life will not have been exploited	1	Loss of Self-Fulfillment
Death frightens me because of the severance from life itself	1	Loss of Self-Fulfillment
Death frightens me because of the missing of future events	1	Loss of Self-Fulfillment
Death frightens me because of my necessity of realizing life goals	1	Loss of Self-Fulfillment
Death frightens me because of the severance of ties with loved ones	1	Loss of Self-Fulfillment
Death frightens me because of the loss of life's pleasures	1	Loss of Self-Fulfillment
Death frightens me because my absence will not be felt	2	Loss of Social Identity
Death frightens me because events will take place without me	2	Loss of Social Identity
Death frightens me because I will be forgotten	2	Loss of Social Identity
Death frightens me because my loss will not hurt close ones	2	Loss of Social Identity
Death frightens me because of the burial deep in the earth	2	Loss of Social Identity
Death frightens me because life will go on without me	2	Loss of Social Identity
Death frightens me because of the loss of human semblance	2	Loss of Social Identity
Death frightens me because of the fate of my body	2	Loss of Social Identity
Death frightens me because my family will still need me	3	Consequences to Family and Friends
Death frightens me because my relatives will not overcome the sorrow	3	Consequences to Family and Friends
Death frightens me because of the sorrow to relatives and friends	3	Consequences to Family and Friends

Death frightens me because of the inability to provide for my family	3	Consequences to Family and Friends
Death frightens me because of the uncertainty of what to expect	4	Transcendental Consequences
Death frightens me because of the uncertainty of existence after death	4	Transcendental Consequences
Death frightens me because of its mysteriousness	4	Transcendental Consequences
Death frightens me because of the unknown associated with it	4	Transcendental Consequences
Death frightens me because of the decomposition of the body	5	Self-Annihilation
Death frightens me because of the loss and destruction of my self	5	Self-Annihilation
Death frightens me because of the state of everlasting sleep	5	Self-Annihilation
Death frightens me because of the destruction of personality	5	Self-Annihilation
Death frightens me because of the punishment in the hereafter	6	Punishment in the Hereafter

APPENDIX C

POSITIVE AND NEGATIVE AFFECT SCHEDULE (PANAS)

Appendix C *PANAS: Positive and Negative Affect Schedule*					
Indicate to what extent you feel each of the following emotions right now, that is, at the present moment.					
	1. Very slightly or not at all	2. A little	3. Moderately	4. Quite a Bit	5. Extremely
interested					
distressed					
excited					
upset					
strong					
guilty					
scared					
hostile					
enthusiastic					
proud					
irritable					
alert					
ashamed					
inspired					
nervous					
determined					
attentive					
jittery					
active					
afraid					

APPENDIX D

EMOTION MEASURES

Appendix D *Study 2 - Emotion Measures*					
While sharing your story to what extent did you feel:					
	1 Not at all	2	3	4	5 Very much
Afraid					
Happy					
Nervous					
Sad					
Angry					
Excited					
Vulnerable					
Frustrated					

APPENDIX E

BRIEF SELF-CONTROL SCALE

Appendix E

Brief Self Control Scale

Please indicate to what extent the following statements describe you.

	Not at all like me	Not like me	Not much like me	Somewhat like me	Like me	Just like me
Pleasure and fun sometimes keep me from getting work done.						
I refuse things that are bad for me.						
I am good at resisting temptation.						
I am able to work effectively toward long-term goals.						
I say inappropriate things.						
I have a hard time breaking bad habits.						
I have trouble concentrating.						
I do certain things that are bad for me, if they are fun.						
I often act without thinking through all the alternatives.						
Sometimes I can't stop myself from doing something, even if I know it is wrong.						
People would say that I have iron self-discipline.						
I am lazy.						
I wish I had more self-discipline.						