THE EFFECTS OF UNCONSCIOUS THOUGHT AND DOMAIN FAMILIARITY ON YOUNGER AND OLDER ADULTS' DECISION MAKING

by

ERNEST WAYDE

SHEILA BLACK, COMMITTEE CHAIR
MARTHA CROWTHER
ANSLEY GILPIN
DEBRA McCALLUM
FORREST SCOGIN

A DISSERTATION

Submitted in partial fulfillment of the requirements
for the degree of Doctorate of Philosophy
in the Department of Psychology
in the Graduate School of
The University of Alabama

TUSCALOOSA, ALABAMA

2013

ABSTRACT

The current study examined age differences in decision making as a function of familiarity and time for deliberation. The primary goal was to determine circumstances under which older adults could make optimal purchasing decisions using intuitive thought processes. The participants made purchasing decisions regarding cell phone and houses. There were three phases involved in the process. In the acquisition phase, younger and older adult participants were presented with information related to purchasing decisions. Younger and older adults were given a limited amount of time to review the materials related to the purchasing decision. During the deliberation phase, participants were randomly assigned to a conscious condition in which they had a predetermined amount of time to deliberate or a distracted condition in which their working memory resources were taxed for the same amount of time. In the decision phase, participants were then asked to immediately choose which of the two options provided the best value for money. Results indicated that overall older adults made better quality decisions than younger adults. Older adult participants also made accurate decisions using the intuitive process of thinking. These results might be explained by the fact that the older adult participants were a unique group of older adults, given their overall cognitive abilities and level of education. Additionally, older adult participants might have been able to use intuition effectively in this study because of their extensive experience with purchasing products. Interestingly, older adults performed better than younger adults although younger adults had better episodic memory with respect to specific features associated with the products in the purchasing decision.

DEDICATION

This dissertation is dedicated to the faithfulness that has helped me complete this project. It would not have been possible without the faithfulness of GOD who always keeps his promises, the faithfulness of my advisers who were always there to guide me, my mother who always remained faithful to her belief in me, and the faithfulness of my family who were a constant support to me.

LIST OF ABBREVIATIONS AND SYMBOLS

α	Cronbach's index of internal consistency
F	Fisher's *F* ratio: A ratio of two variances
M	Mean: the sum of a set of measurements divided by the number of measurements in the set
p	Probability associated with the occurrence under the null hypothesis of a value as extreme as or more extreme than the observed value
r	Pearson product-moment correlation
t	Computed value of *t* test
$\eta^2{}_p$	Partial eta squared
n	Sample size for group
SD	Standard deviation
ANOVA	Analysis of Variance
MANOVA	Multivariate Analysis of Variance
$<$	Less than
$>$	Greater than
=	Equal to
CEST	Cognitive-Experimental Self-Theory
OLLI	Osher Life Long Learning Institute
SLUMS	Saint Louis University Mental Status
WAIS-IV	Wechsler Adult Intelligence Scale-Fourth Edition

VES-13	Vulnerable Elders Survey-13
LNS	Letter-Number Sequencing
DS	Digit Span
kb	Kilobyte
MSE	Mean Squared Error
HOA	Home Owners Association

ACKNOWLEDGMENTS

Firstly, I must thank GOD for his Grace and Power that propelled me on this path and has seen me through to this conclusion. The LORD is good.

During my time at the University of Alabama, I have been very fortunate to have been mentored by three fantastic individuals. To my dissertation chair, Dr. Sheila Black, your care and attention to detail in every aspect of research has taught me to think critically about research. I have enjoyed our many spirited debates and am blessed to have been your student. Thank you. To Dr. Forrest Scogin, it has been such an honor to have been a part of your research family. Your clarity of thought and constant desire to learn has imprinted in me a thirst to continue improving myself and my research ideas. I will always remember our meetings with great fondness and amazement at how you were able to teach us so much and yet make the process utterly enjoyable. I thank you for being the "Chief" to our tribe. To Dr. Martha Crowther, my staunch supporter and advocate, I always felt better knowing you were in my corner. I am still in awe of your unrivaled ability to balance the requirements of work, home, and self. It has been my good fortune to have learned the importance of this balance and harmony from you. Thank you. To Drs. Ansley Gilpin and Debra McCullum, the other members of my committee, I am grateful to you for your efforts in helping me make my dissertation a better product. Thank you for your help. I would also like to thank the many other faculty and staff that have supported me during this process. They number too many to name individually, but I would like to make special mention of Dr. Rebecca Allen who was pretty much a fourth advisor, Dr. James Hamilton who has always supported me, and Dr. Beverly Thorn from whom I have learned a great deal about leadership. I also extend my thanks to my fellow students and friends without whom this experience would not have been possible. You are all fantastic!

Finally, I have to thank my family. My mom not only impressed upon me the importance of education, she also worked tirelessly to provide me with the opportunities to excel and achieve. Mom, my success is your success. We made it! Thank you. To my Wife, who was brave enough to let me embark on this journey, who stood with me through every step, and believed in me without reservation, even though it’s not enough, I thank you.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

Decision making is a cognitive process that individuals of all ages engage in during the course of a day. Decisions can have long and short-term consequences, as well as long reaching implications on our lives and the lives of others. Thus it is important to make high-quality decisions as the impact of those decisions may be felt by others. The current study examined the circumstances under which older adults can make optimal purchasing decisions. Specifically, I examined age differences in decision making as a function of familiarity and time for deliberation.

Older adults, individuals aged 65 and older, are expected to become the largest population group in the United States by the year 2050 (Polyak, 2000). This group will make decisions about events in their daily lives and influence policy decisions that will affect the population as a whole. The act of decision making can often be a complex process requiring the integration of various types of information. It takes working memory to engage in this type of integration of information, and working memory declines with age (Hasher & Zacks, 1988; Moye & Marson, 2007).

Hess, Germain, Rosenberg, Leclerc, and Hodges (2005) have argued that this age-related decline in working memory resources makes it more difficult for older adults to engage in complex thought. In fact, older adults are sometimes referred to as cognitive misers (Morris, Woo, & Singh 2005) because they are more likely than younger adults to conserve working memory resources. Older adults are able to do this by focusing on peripheral cues such as source likeability and source attractiveness when making a decision instead of using working memory resources (Christensen, Ascione, & Bagozzi, 1997). In many instances, older adults' heuristics provide short cuts that lead to efficient decision making (Christensen, Ascione, & Bagozzi), but there are also instances in which these heuristics have a negative impact on the decision making process. In many instances, one needs to use working memory resources to make the optimal decision.

Working Memory

Working memory has been referred to as the work space of the mind and is thought to be used for the manipulation and temporary storage of information. It is an essential system that is necessary for higher order functioning such as reasoning, comprehension, and decision making (Lange & Verhaeghen, 2009). Baddeley and Hitch (1974) have developed a theoretical working memory model to show how working memory is intricately involved in information processing. The model has three main parts: namely the visuo-spatial sketchpad, the phonological loop, and the central executive. Of these parts, the most important component for decision making is the central executive. This area is concerned with cognitive processes such as reasoning, in-depth analysis, control, and resource allocation. Unfortunately, the central executive is the part of working memory most vulnerable to the effects of aging (Van der Linden & Bredart, 1994). It is also the part of working memory that is most necessary for complex decision making.

In fact, age-related changes in decision making quality have often been attributed to age-related changes in executive processing (Finucane, Mertz, Slovic, Scholze & Schmidt, 2005). Given the changes in working memory and processing speed (Henninger, Madden & Huettel, 2010) that occur as a function of age, one might assume that older adults would inevitably be at a disadvantage when information is presented rapidly and he/she has to quickly interpret the information to make a quick decision. However, the age-related decline is not the same for all decisions. Age-related decline will vary as a function of domain familiarity. The research shows that older adults will be able to compensate for age-related changes in working memory and processing speed by using their past experience to quickly recognize and focus upon the most relevant features when making a decision that requires choosing between two options. In other words, I predict that working memory decline in older adults may be compensated for by increased domain familiarity.

Domain Familiarity

Previous research has shown that older adults have greater domain knowledge than younger adults due to past experiences. With this greater overall knowledge base, older adults can create an expertise framework or schema that they can use as a point of reference when making decisions in familiar domains. This framework allows older adults to focus their attention on relevant cues necessary to make a good quality decision, improving their overall decision making efficiency (Hess, Osowski, & Leclerc, 2005). Thus domain familiarity can mediate the effects of decreasing working memory and facilitate cognitive functioning in the decision making process (Leclerc & Hess, 2007; Stuadinger & Baltes, 1996).

For example, Johnson and Drungle (2000) have shown that older adults are able to make better quality and faster decisions about medications with which they have previous experience as compared to decisions about medications with which they have no previous experience. Recently, Wayde and Black (2013) performed a study to investigate older adult decision making in familiar and unfamiliar domains as compared to younger adults. The familiar domain for older adults was a house-purchasing decision. The unfamiliar domain used for older adults was a cell phone purchasing decision. The reverse was true for younger adults. That is, the cell phone purchasing domain was familiar to younger adults while the house-purchasing scenario was unfamiliar to younger adults. Results of the study indicated that older adults made significantly better quality decisions in the familiar domain as opposed to the unfamiliar domain. These results also indicated that working memory partially mediated the relationship between age and decision-making performance in the unfamiliar condition. However, working memory was not related to performance in the familiar domain.

Therefore it would seem to suggest that, although working memory is a crucial part of cognitive functioning that is required to make good quality decisions, older adults are able to compensate, at least in part, for this lack of working memory resource by relying on previously acquired domain knowledge.

As stated earlier, one of the advantages that older adults have in familiar domains is that they are superior relative to younger adults at identifying crucial information with regard to decision making. For example Hess, Bolstad, Woodburn, and Auman (1999) found that older adults were better at identifying and appreciating diagnostic information when making social judgments. In a later study, Hess and Auman (2001) were able to replicate these results. Moreover, they also demonstrated that older adults' superiority in using trait-diagnostic information was unrelated to other cognitive factors (e.g., working memory) that have been shown to influence individuals' decision making abilities. This ability to quickly access information from a well-developed expertise framework is crucial for the next topic of discussion--intuition.

Intuition and Decision Making

One of the ways in which expertise can help older adults make quick decisions is through a phenomenon called intuition, which interestingly has been linked to domain expertise. The concept of intuition, which has been defined in over 20 different ways (Abernathy and Hamm, 1995), is not a new concept. Although intuition has been largely relegated to concentrations such as philosophy and management since the early 1930's (Sinclair, 2010), there has been a recent surge in interest in intuition as a scientific topic in psychology as evidenced by the publication of several books and articles by noted psychologists (Gigerenzer, 2007; Gilovich, Griffin & Kahneman, 2002; Glockner & Witteman, 2010; Hodgkinson, Langan-Fox, & Sandler-Smith, 2008; Hogarth 2001; Kahneman, & Klein, 2009; Myers, 2002; Plesssner, Betsch & Betsch, 2008). *The American Psychological Association Monitor on Psychology* (Vol.36 No. 3, 2005) has devoted a special issue to the topic. More recently, the *Psychological Inquiry* (Vol. 21, 2010) also devoted a whole issue to the subject of intuition. Though one widely accepted definition of intuition does not exist, most researchers will agree that intuition represents "direct knowing that results from non-conscious holistic information processing." With this in mind, for the purpose of this document, I have chosen to use the definition provide by Betsh (2008) which states:

> Intuition is a process of thinking. The input to this process is mostly provided by knowledge stored in long-term memory that has been primarily acquired via associative learning. The input is processed automatically and without conscious awareness. The output of the process is a feeling that can serve as a basis for judgments and decisions.

This definition is informed by the major theoretical approaches to intuition, namely the Cognitive-Experiential Self-Theory (CEST), which is characterized by "experiential" and "deliberate" processes of thinking (Epstein 1991, 1994). CEST is sometimes referred to as System 1 and System 2, respectively (Stanovich, 1999; Stanovich & West, 2000), Hogarth's (2001) "tacit" and "deliberate" model of thinking, and the cognitive continuum theory of intuition and analysis (Hammond, Hamm, Grassia, and Pearson, 1987). These theoretical approaches all make important assumptions and distinctions of intuition. One major assumption that is common to all of the above mentioned theories is the assumption that intuition is a process as opposed to a source of knowledge or a distinct system of the mind (Betsch, 2008). A distinction that is made by these theoretical models is that there are two processes of thinking: specifically, a conscious process and a subconscious/unconscious process. These two processes have become known as the dual process models.

Dual Process Models

Numerous names have been used to refer to the two processes in the dual process model, but for the purposes of this document, the first process will be referred to as the deliberative process and the second process will be referred to as the intuitive process. The deliberative process is thought to be relatively slow, associated with rational, conscious, reason-based, deliberate, analytic, inferential, and reflective processes. On the other end, the intuitive process is thought of as spontaneous, quick, automatic, holistic, effortless, and implicit. (Betsch & Glockner, 2010; Epstein, 1994; Evans, 2010; Hogarth, 2010; Loewstein, Weber, Hsee, & Welch, 2001; Plessner, Betsch, 2008; Reyna, 2004; Sloman, 1996; Peters et al, 2007). Intuitive processing is thought to resemble Greenwald and Banaji's concept of implicit cognition (1995).

The existence of the dual processing model has also been confirmed in nuero-imaging studies. The results of a fMRI study conducted by Lieberman, Jarcho, and Satpute (2004) indicated that judgments made with the evidence-based (conscious) system resulted in the activation of the lateral pre-frontal cortex, posterior parietal cortex, and the hippocampus. They collectively called these areas "C-system regions." Alternatively, judgments made with the self-knowledge (intuitive) system resulted in activation in the ventromedial prefrontal cortex, basal ganglia, and amygdala. These regions were collectively named "X-system regions." One caveat to this is that activation of the X-system regions or the C-system regions was dependent on how much experience the participants had in the relevant decision making domain. That is, when participants made judgments in domains in which they had greater experience the X-system regions were more likely to be activated than the C-system regions.

To continue, I will first outline the two major theories that attempt to explain the information processing procedures that are thought to occur during deliberative and intuitive processing. That is, I will be explaining two different views of how the dual processes (deliberative and intuitive processing systems) model is thought to function as a unit.

Parallel vs Continuum View

The first view, which is the most commonly accepted, is the parallel view, and is best represented by the previously mentioned CEST (Epstein, 1994, 2010). This theory stipulates that the two information processing systems (deliberative and intuitive/experiential) are assumed to work in parallel and these two processing systems interact seamlessly. This means that individuals engage both the deliberative and intuitive processing systems simultaneously to process information. It also means that all behavior will be influenced by both the deliberative and intuitive processing systems (Epstein, 2008). Hence, a person making a decision about buying a car will be influenced by both intuitive and deliberative processes simultaneously in the decision-making process.

On the other hand, the one-dimensional view, which is best represented by the cognitive continuum theory (Hammond, Hamm, Grassia, and Pearson, 1987), suggests the use of one process at the expense of the other process in one dimension. This means that individuals process information either using deliberative processes or intuitive processes, but never use both processing modes simultaneously. Individuals may go back and forth between the two processing modes. For example, in making a decision a person might use intuition for one component of the decision, and deliberative processing for another aspect. Thus, the continuum theory also expects most information processing to be a mixture of intuitive and deliberative processes, but one processing mode will dominate with respect to the final decision. In a recent review of the two theoretical perspectives Sinclair (2010) proposed that if examined closely, it appears that the two theories have much in common and that the differences between these two theories lies on the focus of each. At a neurological level, the parallel and continuum perspectives assume different neurological trajectories with regard to intuitive decision making.

Neurological Pathways and the Parallel vs. Continuum View

First focusing on the parallel view, this view proposes that different neurological pathways are responsible for deliberative vs. intuitive processing. The parallel view also maintains that the neurological pathways associated with each type of processing (i.e., intuitive vs. deliberative) are operating simultaneously during a decision making task. The parallel in comparison with the continuum view is more concerned with the neurological routes associated with intuitive versus deliberative processes. It assumes simultaneous activation of the neurological routes associated with each of the two types of processing (intuitive vs. deliberative). Researchers who subscribe to the parallel view have conducted extensive research to determine the neurological substrates that underlie each of the two processing routes.

On the other hand, the continuum view proposes that there is one neurological pathway that is shared by deliberative and intuitive processes. The continuum view also proposes that either deliberative processes or intuitive processes may use the neurological pathway but one process (i.e., intuitive vs. deliberative) uses the neurological pathway at the expense and exclusion of the other process (i.e., intuitive vs. deliberative) in the pathway.

Because the continuum theory assumes that processes are used serially rather than simultaneously, those individuals who subscribe to the continuum theory versus the parallel theory put special emphasis on which processing system has a greater influence on the outcome and to what extent a particular decision was influenced by deliberate versus intuitive thought processes (Hammond, Hamm, Grassia, and Pearson, 1987).

Thus to summarize, most researchers agree that the dual process models, which are defined by the intuitive and deliberative processing systems, work in parallel. That is, both systems work simultaneously

A third perspective (Sinclair, 2010) states that the two views are fairly similar but focus on different aspects of the decision making process. For instance, both views agree that there will be a mixture of the two information processing systems during the information processing stage, even though they disagree as to whether the two routes to information processing (intuition vs. deliberative) operate simultaneously or serially.

I shall now briefly discuss in more detail how each processing system functions independently. As described above, the deliberative processing system is thought to be relatively slow and deliberate in its operation. Information is thought to be processed in a step-by-step, serial manner. Numerous researchers postulate that this model has a low, or limited, capacity (Betsch & Glockner, 2010; Epstein, 1994; Evans, 2010; Hogarth, 2010; Loewstein, Weber, Hsee, & Welch, 2001; Plessner, Betsch, 2008; Reyna, 2004; Sloman, 1996; Peters et al, 2007). To explain the term “limited capacity,” Evans points to previous research that has linked the deliberative process to the limited attentional and executive functioning abilities as embodied in the Baddeley and Hitch (1974) working memory model described in the working memory section above. Thus, the deliberative process is limited because it relies heavily on finite working memory resources.

In contrast with the deliberative processes associated with System 2, the intuitive processes are thought to be quick, intuitive and automatic. In fact, one of the most cited attributes of intuition is related to its speed (Dane & Pratt, 2007; Sinclair et al., 2002). The intuitive process is also thought to function without conscious control and can process multiple pieces of information in parallel. That is, the intuitive process can process numerous pieces of information at the same time as opposed to the deliberative process which processes information in a serial fashion and is limited by working memory capacity. Thus, the intuitive process is thought to have a high capacity (Betsch & Glockner, 2010).

Some researchers have proposed that intuition may also rely on the use of schemas, specifically expert schemas. Dane and Pratt (2007) argue that expert schemas can make accurate intuitive decisions. That is, individuals with expertise in specific domains are able to create highly complex and domain relevant schemas or frameworks which allows them to make intuitive decisions. This process has also been referred to as "pattern matching," as individuals are thought to attempt to match patterns in the decision making process with information in their stored schemas. Thus domain familiarity may contribute to the use and effectiveness of intuitive thought processes in decision making.

Intuition vs Heuristics

Although Betsch (2008) referred to intuition as an automatic process that is performed without conscious effort, other researchers view intuition as "heuristic decision making," that does not occur as a result of automatic processes, but rather occurs as a result of quickly practiced routines. Specifically, some researchers have argued that intuition is more accurately described as the use of mental shortcuts, or simple decision rules, that reduce complex tasks in a process commonly referred to as heuristics. (Gilovich et al., 2002; Kahneman, et al., 1982; Tversky, & Kahneman,1973).

Due to the ongoing debate about the mechanisms underlying intuition, Betsch and colleagues (2001) conducted a study to differentiate processes underlying heuristics versus the processes that underlie intuition by performing a series of experiments where participants were asked unexpectedly to evaluate fictitious shares. Prior to this, the prices of the shares were displayed to them in a dual task setting. Seventy-five pieces of share information for 5 fictitious target shares were randomly displayed. The participants were told that the primary task, which was in reality a distracter task, was to memorize content presented to them in a video task. Participants were told that their memory of these videos would be assessed at a later date.

The secondary task, which was in reality the primary task, was to read information about the share prices that scrolled across the bottom of the screen in the videos out loud. Extensive pretesting showed that this method prevented participants from consciously integrating return values and forming deliberate judgments on the shares. The results of this study indicated that participants were able to correctly rate the high value shares with the most positive rating and the low value share with the less positive rating. Of greater interest was that during a recall test following the judgments, participants were unable to reliably reproduce the average sum of returns of share values. Betsch proposed that the participants used intuitive processes in making accurate judgments of the share prices. To show that participants did not use heuristics, Betsch performed two follow up experiments in which he manipulated the stock price order and values to ensure that participants could not get the correct answer by using purely a peak-end heuristic strategy in the decision making process. In other words, they could not evaluate the shares by averaging the share prices. The results mirrored those of the first experiment. Thus, Betsch (2008) makes the assertion that though people can make decisions using quick, explicit heuristic processes, they are also able to make decisions using purely implicit intuitive processes. Other researchers, such as Evans (2010), have agreed with this claim and state that intuitive judgment is based on a feeling of rightness or confidence while heuristics are based on explicit analytic rules.

Dual Processing Model and Aging

Research has shown that the deliberative processing mode is the system that is most impacted by the effects of aging (Peters, Hess, Vastftjall and Auman, 2007). A primary reason for this impact on the deliberative process can be linked to the heavy dependence on working memory during the controlled, analytical process of deliberation. Unfortunately, as individuals age, working memory capacity is decreased. There is a plethora of research that has shown age-related deficits in working memory of older adults (Finucane, Mertz, Slovic, Scholze and Schmidt, 2005; Salthouse, McGruthry & Hambrick, 1999) relative to younger adults. Additionally, as the executive processing in older adults is compromised (see working memory section above), older adults process information slower than younger adults. These factors have been shown to have a significant impact on older adults' decision making ability. In a study conducted by Henninger, Madden, and Huettel (2010), the authors were able to show that the effects of aging negatively impacted decision making quality. These age-related effects were mediated by individual differences in processing speed and memory. Thus, the deliberative processing system is likely to be compromised as we age.

However, aspects of the intuitive processing system seem to be relatively spared by aging. Abilities, such as implicit learning, memory, and other automatic processing abilities, are largely spared by age (La Voie & Light, 1994; Light & La Voie, 1993;Rybash,1996; Zacks, Hasher, & Li, 2000). In a study conducted by Salthouse et al., (1999) examining implicit sequence learning between younger and older adults, results showed that there were no significant differences between younger and older adult performance. Further support for this conclusion has been shown by meta-analysis of aging-and-memory literature, which has shown substantially smaller age effects associated with implicit memory as opposed to explicit memory (Light, Prull, La Voie & Healy, 2000). Thus, the intuitive processing system (in terms of implicit memory) is relatively untouched by the effects of aging.

Affect, Intuition and Aging

Historically, researchers have believed that intuition includes an affective component (Epstein, 1994). Recently, researchers have begun to address the specific role of affect in the intuitive thinking process. Dane and Pratt (2007) have argued that affect can influence intuition during three stages of decision-making: 1) Affect can be an antecedent to intuition; 2) Affect can be a component of decision-making; 3) Affect can affect the output component of decision-making.

Dane & Pratt (2007) have stated that intuitive processes may be triggered by emotions and affect. This assertion is supported by research that found positive mood to facilitate intuition (Elsbach & Barr, 1999; Epstein, 2010; Weiss & Cropanzano, 1996). Neuro-imaging research has also shown that the basal ganglia is activated with positive affective stimuli and experiences. As stated above, the basil ganglia is also activated as part of the X-system regions (Lieberman, Jarcho and Satpute; 2004). Recently, Sinclair (2010) has postulated that high intense mood, both of positive and negative valence can facilitate intuition. These types of emotional influences are referred to as exogenous emotions in that they are not related to the current decision but may influence the outcome of the decision (Zeelenberg & Pieters, 2006).

Before discussing affect with respect to aging and decision making, I want to outline the impact of affect on various components of cognition. When affect is directly related to the decision either as an affective component built into the information being processed by the intuitive process (Sinclair, 2010) or as a more peripheral component such as anxiety associated with making an important decision (Zeelenberg, Nelissen & Pieters, 2008) it is labeled an endogonous emotion (Zeelenberg & Pieters, 2006. On the other hand, affect may also have an output component such that affectively charged words or phrases, i.e. “gut feelings” or “gut instinct” (Sinclair et al., 2002) can be used as a synonym for intuition. These statements can also serve as a confirmatory feeling for the decision maker and helps to put them at ease. It should be noted that there is still considerable debate and disagreement regarding the roles of affect in intuition.

This notion that intuition is related to affect could be important with respect to aging because research shows that older adults rely on affect more than younger adults, which would be consistent with socioemotional selectivity theory. Socioemotional selectivity theory maintains that because older adults do not have long to live, they are invested in enhancing positive emotional experiences and minimizing negative emotional experiences. Thus an older adult might be more likely to rely on “gut reactions.” There is evidence that older adults process emotional information significantly more efficiently than information lacking emotional valence. For example, older adults can remember an emotional advertisement better than an advertisement lacking emotional valence (Carstensen, Fung & Charles, 2003).

Given the importance that emotions play in older adults' lives, they might be more likely to rely on gut feelings or affect even when they are unable to verbalize the rationale for the affect. Although intuition often has an emotional component (Dane & Pratt, 2007), I should point out that intuition is not synonymous with something referred to as the affect heuristic. The affect heuristic refers to the finding that an individual might consciously make decisions based on likes and dislikes. A person might choose not to buy from a particular salesperson because he/she dislikes the salesperson and will fail to carefully evaluate the salespersons message. A person making such a decision would not be using intuition. An example of intuition with an emotional component would be a person who feels drawn to a particular option but is unable to verbalize the reason for their feelings.

Aging, Intuition and Domain Familiarity

In the Betsch (2008) definition of intuition, it is proposed that the process of intuition relies heavily, but not exclusively, on input from domain-specific previous experiences and prior knowledge. This assertion is widely accepted and is supported by a large body of research by numerous researchers (Klein, 1998; Simon, 1992; Myers, 2010; Sinclair, 2010; Betsch & Glockner, 2010; Hogarth, 2010; Renyan, 2004). This notion that intuition relies heavily on past experience has implications for older adults. That is, research has shown that older adults have greater bodies of domain knowledge due to their extensive past experience. Moreover, Hess and colleagues (Hess & Auman, 2001; Hess, Bolstad, Woodburn, & Auman, 1999; Hess, Osowski, & Leclerc, 2005) have shown that past knowledge might help older adults build a framework that allows them to focus their attention on relevant cues necessary to make a good quality decision and improves their overall decision making efficiency. This expertise framework might allow older adults to make decisions on the basis of intuition rather than on the basis of deliberative processes.

Decision Making and Cognitive Aging

How might this information impact decision making in older adults? When processing information in the decision making process, individuals could use the deliberative process or the intuitive process to make a decision. As indicated earlier, the intuitive process is characterized by implicit, intuitive, automatic, or quick operations that are relatively effortless and spontaneous. In contrast, the deliberative process is analytical, reason-based, and relatively slow (Epstein, 1994, Loewstein, Weber, Hsee, & Welch, 2001; Reyna, 2004; Sloman, 1996; Peters et al, 2007). Deliberative processes rely heavily on working memory. Unfortunately, as mentioned above, there are a plethora of studies that indicate that there are significant age differences in working memory.

There is evidence, however, that the intuitive processing abilities (i.e. implicit memory and implicit learning) are largely unaffected by cognitive aging (La Voie & Light, 1994; Light & La Voie, 1993;Rybash,1996; Zacks, Hasher, & Li, 2000). Therefore there is ample research evidence to suggest that age differences might be nonexistent or at least attenuated in instances in which individuals could rely on intuitive processes rather than conscious information processes.

In this light, the current study follows up on work examining age differences in intuition versus deliberative processing. Would it be the case that age differences would be attenuated or even eradicated in situations in which decisions could be made through intuition? My dissertation project follows up on research conducted by Queen and Hess (2010). They presented younger and older adults with purchasing scenarios which were either complex –

requiring a great deal of deliberation or relatively simple, requiring much less processing of the information. In the condition in which the decision making was less complex or simpler, participants could make decisions based on overall impressions. They also manipulated the degree to which participants would have the opportunity to deliberate about all the options associated with their decision. In one condition, labeled the conscious condition, participants had the opportunity to carefully consider all of their options for three minutes after reading the decision content and before making a decision. The second condition was labeled as the unconscious condition but for the purposes of this document I shall refer to it as the distracted condition. In the distracted condition, participants were preoccupied with a filler task immediately following the reading of the decision content and before they were asked to make a decision.

In the complex condition which required greater deliberation, younger and older adults performed better in the conscious condition versus the distracted condition. To explain further, when greater deliberation was required, both younger and older adults performed better when given time to consider the decision material (i.e., the conscious condition) before having to make the decision. However, in the simple condition (which required less processing of the information), both younger and older adult participants performed better in what we term the distracted condition, or the condition in which the participants would not be able to deliberate.

Why would older participants perform better in the distracted condition in the simple condition? It seems counterintuitive that participants would actually perform better in any condition when their resources are exhausted by a secondary task as opposed to a condition in which they could devote all of their resources to the task at hand. The authors argued that in the simple condition, participants could make the correct decision by relying on automatic processes or their overall affective impression after reading the materials necessary for decision making. In this particular instance, the correct decision was the one that was most obvious. Participants in the conscious condition might have engaged in unnecessary analyses that might have led them astray. It should be noted that for both the complex and the simple condition, younger adults outperformed older adults.

Given age-related changes in working memory, the topic of intuition is important. It is important to know if older adults can trust their intuition in domains of expertise, especially when they are under pressure to make a fast decision. People of all ages rely on intuition and sometimes intuition results in poor judgments (Dane & Pratt, 2007) Researchers need to determine under which conditions intuition can be effectively used to make high quality decisions. Examining whether intuition can be effectively used with older adults can be especially important given age-related changes in working memory and speed of processing. Although this topic is important, there are some holes in the literature. For example, to my knowledge there have been no studies examining intuition as a function of age and domain familiarity.

Current Study

General Overview

The current study follows up on previous work (Queen and Hess, 2010) by examining age differences in decision making as a function of deliberation time and familiarity. Though this study has some similarities to the previous Queen and Hess study, it also differs from this study in a number of ways. In the Queen and Hess study, participants were presented with scenarios in which a person other than themselves was making a purchase. Participants were supposed to make purchases based on the fictitious person's wishes. Moreover, in the Queen and

Hess study, participants were given two minutes to read over the purchasing options before making a purchasing decisions based on this script. In contrast, in the current study, there was no script that participants had to consider. Participants' primary task was to choose which of two options was the best deal for the money. Thus, in the current study, there was an acquisition phase in which participants were presented with the materials, which included a list of features describing the two purchasing decision options.

Another difference between this study and the Queen and Hess (2010) study is in the time constraints in the current study. The amount of time participants were given to read the information in the initial acquisition phase differed for each age group. Younger adults were given 20 seconds to review the material during the acquisition phase and older adults were given 38 seconds.

These reading times were determined as a result of a reading and working memory pilot study which is described in pilot study 1 of Appendix A. The time limit was imposed to make sure that none of the participants had time to actually deliberate about the various options during the acquisition phase. Participants were informed that at a later time, they would be asked to make a decision based on the information they read during the acquisition phase. This initial phase of the study, in which participants reviewed their options for the purchasing decision task was labeled the acquisition phase.

Following the acquisition phase, participants began the second phase of the study, which was labeled the deliberation phase. Participants were randomly assigned to two conditions in this phase of the study—the distracted condition or conscious condition. One of the main variables that was manipulated in this phase of the experiment was deliberation time.

In the distracted thought condition, participants were presented with a filler task immediately after the acquisition phase. The filler task placed a high demand on working memory by using processes that are involved in the storage and manipulation of information in working memory (Jonides et al., 1997), and thus severely limiting the amount of available working memory resources for deliberation of the previously read material. Although participants were not able to deliberate in the distracted condition, they were given three minutes to deliberate in the conscious condition.

Finally, in the third phase of the trial, participants were asked to make a decision. The computer generated a choice on a computer screen, and participants had to indicate whether they chose option M or Z. They were not allowed to review the material presented earlier in the study. The interesting aspect of this study is that both groups of participants had to process information fairly quickly to make the "correct" decision. Young and older adults were given 1 and 1.5 seconds, respectively, to respond. More information about the operationalization of a "correct decision" is outlined in the next section.

The primary condition that allowed me to examine intuition in decision making was the distracted condition. To reiterate, in the distracted condition, participants had virtually no time for deliberation. They were exposed to information for less than a minute in the acquisition phase; they were immediately given a resource demanding filler task that exhausted their resources during the deliberation phase. Finally they were given less than two seconds to make a decision during the decision-making phase. Given the time constraints in the distracted condition, it was my belief that participants in the unfamiliar domain would be unable to prioritize information in the distracted condition. In the distracted condition, participants had to quickly distinguish between features that were crucial for decision making and features which were less crucial in order to make the appropriate decision.

Overview of materials and design of current study

All participants received one scenario that featured two house options and another scenario that featured two cell phone plan options. In each of the presented scenarios, the correct decision hinged on one feature (i.e., home scenario- *inspection* and cellular phone scenario- *internet service*). There were twelve features listed for each of the scenarios. In the house purchasing condition, scenario M included a home inspection as an included feature in the purchasing scenario. However, scenario M was slightly more expensive than scenario Z. In scenario Z of the house purchasing condition, home inspection was not listed in the purchasing scenario, but the overall price of the house was cheaper than scenario M. It was my belief that individuals (older adults) who had previous domain knowledge in purchasing a home should recognize that the inclusion of a home inspection even with a slightly higher price would make scenario M a better quality decision. Therefore, with regard to the house scenario, a good quality decision was operationalized as the selection of the purchasing option that included the home inspection.

Examples of the cell phone trials are presented in Appendix B. On the cell phone trials, participants were presented with two cell phones plans that included a number of attractive options including unlimited minutes, free text messaging, and 3G capability. As one can see upon reviewing Figure 1 in Appendix B, the cell phone plans (i.e., Z and M) were basically the same except that Scenario Z provided 3G capability and Scenario M provided 4G capability. However, in making a decision, one has to be careful, because although cell Phone M claims that it is 4G enabled, it does not provide internet access. Thus, although the cell phone in scenario M has numerous features that require internet access to function, the cell phone plan offered did not include internet access, making the internet-reliant features irrelevant.

Individuals (younger adults) who have previous domain knowledge in purchasing a cell phone should recognize that scenario Z with 3G capability and internet access is a better quality decision than scenario M. Moreover, they should recognize that it is a “red flag” when a cell phone has 4G capability but no internet accessibility as the purpose of 4G is to increase the speed of data transfers (internet usage) for a cell phone. Therefore, with regard to the cell phone scenario, a good quality decision was operationalized as the selection of the purchasing scenario with internet access and 3G capability. Likewise, with regard to the house decision, a good decision was operationalized as selecting the option that included the inspection. Participants were told to select the option that provided the best deal for the money—putting aside any personal preferences that they might have.

To summarize, to begin the study (i.e., the acquisition phase) participants were presented with a purchasing scenario. The scenario had two options and each option had 12 features associated with it. Participants were given a limited time to read the features in the two options: 20 seconds and 38 seconds for young and older adults, respectively. In some instances, the presented material was familiar to young adults (e.g., cell phone), but unfamiliar to older adults. The reverse was also true (e.g., house). Following this, during the deliberation phase, the features and options were removed and participants in the conscious condition were given three minutes to think about the scenario presented during the acquisition phase. Participants in the distracted condition were immediately engaged in a filler task which was designed to tax working memory resources. After the three minute period, all participants in all conditions were presented with a decision screen with the two options listed. Younger adults were given one second to choose the option that provides the best value for money. Older adults were given one and a half seconds to choose the option that provided the best value for money. This procedure was repeated for the house and cell phone purchasing decisions. In addition, following the decision phase of the study, participants received an episodic memory test in which they were instructed to write down all of the information that they could remember. They were also instructed to write down the justification for their decision. The episodic memory test was included because there would be a time lapse between the acquisition phase in which information would be encoded and the decision phase in which participants would use the previously encoded information. There are a plethora of studies that indicate age differences in episodic memory (McIntyre & Craik, 1987; Naveh-Benjamin, 2000; Naveh-Benjamin, Hussain, Guez, & Bar-On, 2003; Nyberg, Bäckman, Erngrund, Olofsson, & Nilsson, 1996; Nyberg, Nilsson, Olofsson, & Bäckman, 1997). Without the episodic memory measure, any age differences could be attributed to differences in episodic memory rather than age differences in decision making.

One could ask how I can be sure that my distracted condition induced intuitive cognitive processes in young and older adults. Is it possible that both young and older adults were making decisions based on deliberation rather than intuition? I believe that intuition and deliberation processes work in parallel as outlined by the parallel view of the dual processing model. Thus, it might be the case that some deliberative processes were operating in the distracted condition. However, I believe that in the distracted condition participants were more likely to use intuitive rather than elaborative processes for three reasons: 1) because of the very brief presentation of the materials during the acquisition phase 2) the brief decision making time during the decision phase, and 3) the brief time allotted to participants during the decision phase. The reason that I had participants justify their decision after selecting their product choice was to provide some type of measure of conscious processes during the decision process. If participants could select the appropriate option without being able to explain the basis for their decision, then I would have some evidence that their decision was indeed based on intuitive processing. In the next section I will outline my hypotheses with respect to the groups of participants and the dependent and independent variables in this study.

Hypotheses

Hypothesis 1: It was predicted that both younger adults and older adults would rate a high quality product more favorably than a low quality product with greater consistency in the familiar conditions as opposed to the unfamiliar conditions. That is, there would be a main effect of domain. This has been shown in previous research (Wayde & Black, 2013) that shows the benefit of domain familiarity in decision making. This should be true for both the conscious and distracted conditions. I predicted this despite the fact that features about the product would be presented very rapidly for young and older adults.

Hypothesis 2: It was predicted that the relation between age and decision making would be mediated via working memory in the conscious unfamiliar condition. I believed that working memory would mediate age differences because in the conscious condition, participants would have three minutes to deliberate. I believed that during that three minutes, younger adults would use their superior working memory resources to figure out that one option in the unfamiliar condition (i.e., the home condition for younger adults) had a home inspection while the other one did not. Moreover, younger adults would use the three minutes to think about the disastrous outcome that is possible without a home inspection. Because older adults have less working memory resources, I believed that older adults are less likely to engage in this type of deliberation in the conscious condition. Younger adults were expected to make better quality decisions than older adults in the conscious unfamiliar condition as they will have greater working memory resources to overcome their lack of domain knowledge.

Hypothesis 3: It was predicted that younger and older adults would make better quality decisions in the distracted familiar condition than the distracted unfamiliar condition. In the distracted condition, the information would be presented quickly and participants would have to recognize the "red flags" they should focus upon to make a decision. Recognizing these "red flags" would depend more on prior knowledge than working memory. Thus, I did not believe that working memory resources would mediate differences in decision making quality in the distracted familiar conditions.

Method

Pilot Study

A pilot study was performed to determine the optimum amount of time required for younger and older adults to read and understand the features associated with each of the purchasing options without engaging in extensive deliberation of the material they were reading. The results of the pilot study (first pilot study; see Appendix A for the pilot results) indicated that 20 seconds was the optimum time for most younger adults to read and remember at least 7 features of the purchasing options. Thirty eight seconds was the optimum time for most older adults to read and remember at least 7 features of the purchasing options.

I also conducted a second pilot study to examine the degree to which my prior assumptions about the knowledge base and decision making capabilities of younger adults were correct. In conducting this study, I made several assumptions about prior knowledge with regard to young and older adults. I assumed that younger adults would not implicitly know that home inspections would be necessary for buying a home. Likewise, I assumed that older adults wouldn't realize the importance of internet access. I wanted crucial information in the acquisition phase to be unfamiliar to both older and younger adults. Although I was fairly certain that older adults would be unfamiliar with the necessity of internet with respect to the 3G capable option, I was not so certain that younger adults were unfamiliar with the necessity of a home inspection. The familiarity vs. unfamiliarity of the home and internet option were crucial factors to consider in developing the hypotheses. Therefore, I wanted to conduct a pilot study to validate my assumptions.

To reiterate, one of the main predictions of my study was that younger adults would not be able to recognize the importance of a home inspection in the distracting condition because the information was presented quickly during the acquisition phase and they would not have time to deliberate during the course of the trial.

The results of the second study indicated that younger adults were able to make "correct" decisions with respect to the housing scenario in the conscious condition (time to deliberate) but not in the distracted (no time to deliberate) condition. The procedures and results of the second pilot study can also be found in Appendix A.

METHODOLOGY

Participants

Approximately 49 younger adults and 40 older adults were used in this study. The number of participants required for this study was determined by conducting a power analysis and examining the number of participants analyzed in similar studies (Queen and Hess, 2010). A power analysis indicated that a total of 54 participants were needed to achieve power of .95 for a medium effect size. Younger adults were characterized by undergraduate University of Alabama students under the age of 40 recruited using the Psychology department subject pool. Younger adults received course credit to compensate them for their time. Older adults were adults 60 or older and were recruited from the surrounding community through appeals to Capstone retirement home, The University of Alabama faculty and staff newsletter (Dialog), and fliers and appeals to the Osher Life Long Learning Institute (OLLI) at the University of Alabama. Thus a majority of older adult participants were retired faculty and staff from the University of Alabama or had some previous or current association to the University of Alabama. Compensation of 10 dollars was given to older adult participants. The experiment lasted approximately 45 – 60 minutes.

Design

The design was a 2 Age (Young vs. Old) X 2 Familiarity (Familiar vs. Unfamiliar) X 2 Thought conditions (Conscious vs. Distracted) mixed factorial design. The thought condition was manipulated between subjects. Age was also between subjects. The familiarity condition was manipulated within subjects such that all participants received all familiarity conditions.

Decision making task: The test material (see Appendix B) for this task was developed by adapting the decision making task used in a decision familiarity experiment conducted by Wayde & Black (2013). Two different trials were created. Each trial consisted of one decision making task with two options, one of high quality and one of low quality. Unlike the previous study in which participants had unlimited time to read the purchasing decision, in the current study, participants had a limited time to read the features of each purchasing decision. As stated earlier, for the house purchasing scenario, the high quality option was the purchasing option that included a house inspection for a slightly higher price than the lower quality option. In contrast, the low quality option did not include a house inspection but had a lower price. For the cell phone purchasing option, the high quality option included 3G capability as well as internet-related features. The low quality option had internet features but did not include internet access.

One trial was familiar to each age group, the inverse also being true. That is, the familiar trial for each age group was unfamiliar to the opposing age group. The information for each trial was displayed on a computer screen in 20-point Times New Roman font against a white background. The two options in each trial were presented in a two-column table format with each column representing a separate option. The top of each column was labeled and participants were required to select one of the two column options presented for each trial. As indicated earlier, I predicted that prior knowledge about a domain would allow individuals to quickly ascertain which of the features (e.g., the inspection with regard to the home option or internet access with regard to the cellular phone option) was most important for making the correct decision and which of the features was less important. It was my belief that domain familiarity in the trials would facilitate the intuitive process. The intuitive process should allow participants to quickly access the relevant information that is necessary to make a good quality decision.

Explicit Conditions: To confirm that participants were taking this task seriously, participants were also presented with purchasing scenarios that were so simple that no deliberation or prior knowledge about the subject matter would be required to make the best decision. Specifically, participants received 2 decision making scenarios that served as manipulation checks. These explicit purchasing scenarios followed the same format as the purchasing scenarios described as critical trials. For the sake of clarity, I referred to these scenarios as Explicit Familiar Distracted, Explicit Unfamiliar Distracted, Explicit Familiar Conscious and Explicit Unfamiliar Conscious. These versions contained explicitly stated information which would make it easy for both age groups to choose the high quality product across all conditions. In the explicit house purchasing scenario, one option would include a home inspection as a feature and would be cheaper overall than the other purchasing option which would not include a home inspection. The lack of a home inspection would be explicitly stated in the low quality option. Moreover, the overall price would be more expensive in the low quality option. Additionally, in both the distracted and conscious explicit conditions, the option without the home inspection would be more expensive. For the explicit cell phone purchasing scenario, one option would include internet access capability as a feature and would have 4G as opposed to the other option which would have 3G capabilities. In the explicit cell phone condition the poor option would explicitly state that internet capabilities are lacking. It was my prediction that both younger and older adults would perform well in the Explicit Condition. Thus, I was not expecting any main effects involving age nor did I predict interactions involving age.

Experimental Conditions

Familiar Conscious: For younger adults, the familiar conscious condition was a cell phone purchasing decision in which participants would be given 3 minutes to deliberate before making the decision. For older adults, the familiar conscious condition would be a house purchasing decision in which participants would be given 3 minutes to deliberate before making the decision.

Familiar Distracted: For younger adults, the familiar distracted condition was a cell phone purchasing decision in which participants would be distracted for 3 minutes before making the decision. For older adults the familiar distracted condition would be a house purchasing decision in which participants would be distracted for 3 minutes before making the decision.

Unfamiliar Conscious: For younger adults, the unfamiliar conscious condition would be a house purchasing decision in which participants will be given 3 minutes to deliberate before making the decision. For older adults the unfamiliar conscious condition will be a cell phone purchasing decision in which participants would be given 3 minutes to deliberate before making the decision.

Unfamiliar Distracted: For younger adults, the unfamiliar unconscious condition would be a house purchasing decision in which participants would be distracted for 3 minutes before making the decision. For older adults the unfamiliar unconscious condition would include a cell phone purchasing decision in which participants would be distracted for 3 minutes before making the decision.

A latin square counterbalancing procedure was used to make sure that each trial occurs in each ordinal position. That is, each purchasing scenario appeared equally in the first and second position. Furthermore, the position of the better option on the computer screen (e.g., left or right side of the screen) within each scenario was counterbalanced across participants to ensure that each option appeared equally on the left and right side of the screen.

The study was administered on a laptop in a quiet testing room in the Psychology Department of the University of Alabama. Some older adult testing occurred at various sites in the Tuscaloosa area. For example, some testing occurred at a senior citizen residential site, Capstone Village convenient to older adult participants. All older participants received the dementia screening scale SLUMS. Results were only used from those participants deemed to be free of dementia based on their SLUMS performance scores. The stimuli was presented via Inquisit 3 Software Program.

Material

Demographic questionnaire: A questionnaire was used to gather general information about the participants. The questionnaire asked questions about topics such as sex, age, health, and education. The questionnaire asked individuals to indicate the frequency with which they have bought houses and cell phones in the past. The questionnaire also asked participants to rate their familiarity with the house and cell phone purchasing process on a 7-point likert scale. The questionnaire has been used frequently in Dr. Black's Cognitive aging lab to collect demographic information.

WAIS-IV Vocabulary: The vocabulary subtest of the WAIS-IV test was used to test the verbal ability of each participant. The vocabulary subtest of the Wechsler Adult Intelligence Scale-IV is a well-established verbal ability subtest of the Verbal Comprehension scale of the Wechsler Adult Intelligence Scale-IV. This test was given to determine if younger and older adults have equal verbal intelligence. The internal consistency reliability of the composite scores of the Verbal Comprehension scale, process and composite scores is .96. The Pearson test retest reliability is .95 (Wechsler, 2008).

WAIS-IV Digit Span: The Digit Span subtest of the WAIS-IV test was used to assess the working memory capacity of each participant. The Digit Span subtest of the Wechsler Adult Intelligence Scale-IV is a well established short term memory subtest of the Working Memory Scale of the Wechsler Adult Intelligence Scale-IV. This test was given to determine the working memory span of each individual participant. The reliability of the subtest is .93 (Wechsler, 2008).

WAIS-IV Letter-Number Sequencing: The Letter-Number Sequencing subtest of the WAIS-IV test was used as a secondary working memory measure. This measure was used to assess working memory, memory span, attention, and concentration. The Letter-Number Sequencing subtest of the Wechsler Adult Intelligence Scale-IV is a well-established short term memory subtest of the Supplementary Working Memory Scale of the Wechsler Adult Intelligence Scale-IV. The reliability of the subtest is .88 (Wechsler, 2008).

Saint Louis University Mental Status: The Saint Louis University Mental Status (SLUMS) is a new screening instrument for cognitive impairment. The test examines orientation, short-delay verbal memory, visual construction, and executive functioning (Tariq, Tumosa, Chibnall, et al., 2006). The SLUMS is often used when working with older adults to test cognitive functioning. The SLUMS is used as a research tool to screen for dementia. Older adults received the exam in order to help identify individuals that might be suffering from dementia (those scoring less than twenty five on the SLUMS) and exclude their scores from the final analysis.

Vulnerable Elders Survey -13: The Vulnerable Elders Survey-13 (VES-13) (Saliba et.al. 2001) is a simple 13-item screening tool used to assess older adult self-reported age, their performance on physical and functional activities, and their self-related health (Min, Elliott, Wenger and Saliba, 2006). The VES-13 is brief and can be administered in approximately 4 minutes (4).

The aim of the VES-13 was to identify community-dwelling older adults at risk of death or decline. Scores range from 0 (lowest risk) to 10 (high risk) (Min, Elliott, Wenger and Saliba). The VES-13 has been shown to be highly accurate in identifying physical and functional impairment in older adults (Min et.al., 2009). The test-retest reliability of the total VES-13 has been shown to be 0.92 of the Pearson Correlation Coefficient (Mohile et.al., 2007).

Filler task: The “n-back” task was used as a filler task in the distracted condition. This task was used because it places a high demand on working memory by using processes that are involved in the storage and manipulation of information in working memory (Jonides et al., 1997). This point is important as Acker (2008) has suggested that the significant results achieved by Dijksterhuis and other researchers may be attributed to the filler task used. According to Acker, the filler tasks used in earlier studies might not have been resource demanding enough to prevent deliberative thinking in the distracted conditions. The filler task chosen for the current study, the n-back test, has been used in numerous other unconscious decision making studies (Dijksterhuis, 2004; Kane, Conway, Miura, & Colflesh, 2007; Ham, Bos, & Doorn, 2009). According to the extant literature, it does a good job of exhausting working memory resources. Thus, in the distracted condition, participants were not able to deliberate much during the thought phase of the proposed experiment if the n-back is used as a filler task. In this task, participants were shown a sequence of random figures and for each figure, participants were asked to decide if that figure matches the identity of the figure that was presented n places in the series or figures (Jonides et al.).

Procedure

The sequence of events during the procedure was divided into the following phases: acquisition, deliberation, and decision. Each of these phases is discussed in turn.

Acquisition phase: To begin the study, participants were given clear instructions as to the decision making task and thought condition. They were told that they were to make decisions based on information presented in the four scenarios. If a feature was not listed, they should not assume that the feature would be available at the time of purchase. Participants received four decision making trials. They were informed that on each of the four trials, they would receive two options. They were given a limited amount of time to review the options and to decide which of the two options provides the best value for the money.

Following the instructions, participants were presented with trial 1, consisting of two options, and given a limited amount of time to read through the features of each option. Younger adult participants were given 20 seconds to read the features of both options. Research indicated that older adults process visible information 1.5 times slower than younger adults. Thus, older adults reading time was 38 seconds. After the time limit had elapsed, the options were removed from the screen.

Deliberation Phase: Immediately following the removal of the options for the computer screen, participants in the conscious thought condition were then told that they had three minutes to deliberate about the two options that were involved in the decision making task. Participants in the distracted thought condition were given the n-back task to perform during the same amount of time.

Decision Phase: After the time limit had expired in both thought conditions, participants were required to choose the option that they considered to be the best. They received a decision screen which displayed labels associated with the two options. They indicated their decision by pressing a key that corresponded to the label they had chosen. In the distracted condition, younger adults had one second to make a decision and older adults had a 1.5seconds to make the decision. This limitation in decision time was used in the Queen and Hess (2010) study and was meant to limit a participant's ability to engage in conscious deliberation of the decision making material. This condition remained consistent for all trials. To reiterate, in the conscious and distracted condition, participants were given 3 minutes to consciously deliberate on the material or engage in the n-back task. Following the deliberation stage, participants were forced to immediately make a purchasing decision. Younger adults had one second to make a decision. Older adults had 1.5 seconds to make a decision. Participants received all four (two critical and two explicit trials) of the purchasing trials and the procedure remained the same for each trial. Following each trial, participants received a sheet of paper with the labels identifying each of the two critical purchasing decisions. At this point, they were asked to circle the choice that they made earlier and were asked to write down a justification for their earlier choice for all four purchasing trials. Participants were also asked to write down the features that they remembered from the previously read material. This served as an episodic memory check.

After completion of the decision making task, participants were then presented with each individual option presented in all four trials and asked to rate the value of each of these individually. This component of the experiment was included to examine the degree to which there would be age differences in the ability to rate products consistently, independent of context. As explained earlier, earlier studies have indicated that there are age differences in the ability to maintain a consistent perception of a product's value across various contexts (Finucane, 2002). With regard to the actual procedure, as stated earlier, participants were asked to perform this task as a means of confirming that participants had been able to correctly identify the value of each option they were presented across the four trials. Participants then rated each option on a Likert evaluation scale. The scale ranged from "1" indicating a low quality option to "7" indicating a high quality option. All participants were then asked to complete the demographic questionnaire. Following this, all participants were administered the VES-13.

Following this, all participants were asked to complete the Digit Span Subtest and the Letter-Number Sequencing subtests of the WAIS-IV to examine working memory. Following this, older adult participants were administered the SLUMS. Finally, all participants were administered the vocabulary section of the *WAIS-IV*.

Debriefing

Upon completion of the study, participants were told the true purpose of the study. Any questions that participants had were answered. The participants were given their compensation for participating in the study, either in the form of course credit for younger adults or monetary compensation for older adults. Participants were thanked for their participation and given information about who they could contact if they had further questions or encounter any problems as a result of participating in the study.

RESULTS

Demographics

A total of 95 participants completed the study. As indicated earlier, all older adult participants received the SLUMS. The only participants included in the analysis were participants who showed no signs of dementia based on their performance. Because the cut off score for dementia is 25, individuals scoring less than 25 were excluded from the final analysis. Six older adult participants were dropped from the final analysis due to SLUMS scores less than 25. The final analysis was conducted on 49 younger adults and 40 older adults. Of the final 89 participants, 23.6 % were male and 76.4% were female. Results for means and standard deviations of age, education, vocabulary, working memory (LNS and DS), health (VES-13), and cognitive screener (SLUMS) scores are displayed in Table 1.

Table1

Participant Mean and Standard Deviation (SD) for age, education, vocabulary, working memory, health and cognitive functioning

	Younger adults(n=49)		Older Adults(n=40)	
	Mean	SD	Mean	SD
Age	18.33	.69	68.2	6.84
Education	13.12	.39	18.30	3.62
Vocabulary	27.63	10.29	44.98	10.00
LNS	19.47	3.49	18.87	3.05
DS	27.33	4.88	28.13	5.37
VES-13	.14	.54	1.68	3.45
SLUMS			27.67	1.72

Psychometric Tests

Psychometric tests were given to determine if younger and older adults differed on variables such as education, which might be related to performance in the experiment. I conducted *t*-tests to determine if there were age-related differences in psychometric test performance.

First, starting with age differences in education, I compared the difference in years of education of younger and older adults by using an independent *t* test. The difference in years of education between younger adults (M = 13.12, SD = .39) and older adults (M = 18.30, SD = 3.62), t (39.73) = 8.98, $p < .05$ was significant, which indicates that the two groups had markedly different years of education. As one can see from the table 1, older adults had higher education than younger adults.

Working memory of the participants was examined by administering the LNS and DS sections of the *WAIS-IV*. I compared the scores of each of these sections for young and older adults by using an independent *t* test. The difference between younger adult LNS (M = 19.47, SD = 3.49) and older adult LNS (M = 18.88, SD = 3.05) scores was not significant, t (87) = .85, $p = .40$. The difference between younger adult DS (M = 27.33, SD = 4.88) and older adult DS (M = 28.13, SD = 5.37) scores were not significant, t (87) = .73, $p = .47$. This indicates that the two groups did not have markedly different working memory capacity.

Verbal ability of participants was examined by administering the vocabulary section of the *WAIS-IV*. I compared the vocabulary scores of young and older adults by using an independent *t* test. The difference in vocabulary scores between younger adults (M = 27.63, SD = 10.29) and older adults (M = 44.98, SD = 10.00), t (87) = 8.01, $p < 05$ was significant, which indicates that the two groups had markedly different levels of verbal intelligence. In this case, the older adults had higher verbal intelligence than the younger adults.

Participant health and physical functioning was examined by administering the VES-13. I compared the scores of young and older adults by using an independent *t* test. The difference in VES-13 scores between younger adults (M = .14, SD = 0.54) and older adults (M = 1.68, SD = 3.45), t (40.56) = 3.07, $p < 05$ was significant, which indicates that the two groups had markedly different levels of reported health and physical functioning. Older adults had significantly more health problems than younger adults. To summarize the demographic and cognitive ability data, there were age differences in perceptions of health, verbal ability, and education but no age differences in working memory.

Explanation for response latencies

To assess the hypotheses of the current study, participant responses to the decision making scenarios were analyzed. When the response time of both younger and older adult participants were examined, results indicated none of the younger adult participants responded within the 1 second time limit for the decision choice in the distracted familiar condition or the distracted unfamiliar condition. Similarly, none of the older adult participants responded within the 1.5 seconds limit in the distracted familiar condition or the distracted unfamiliar condition. Thus, the response times for each age group were standardized and only responses within 1 standard deviation of the mean for younger and older adults were used in the analyses. However, analyses of results within one standard deviation of the mean response times did not yield significant power. Therefore, the analyses were conducted on all available results (49 younger adults and 40 older adults) in an effort to achieve the required power for significance. Results of the mean and standard deviation for the response times are displayed in table 2.

Table 2

Participant Mean and Standard Deviation (SD) for response time in seconds

	Younger adults		Older Adults	
	Mean	SD	Mean	SD
Implicit Familiar	2.31	2.52	2.53	1.92
Implicit Unfamiliar	1.01	1.11	1.84	1.20

Before analyses were conducted on the responses of the decision making scenarios, initial analyses were conducted on the familiarity ratings of the domain specific scenarios to examine the domain knowledge of each age group. That is, analyses were conducted to explore to what extent the younger adult participants were familiar with cell phone purchasing scenario and unfamiliar with house purchasing scenario and older adult participants were familiar with the house purchasing scenario and unfamiliar with the cell phone purchasing scenario. Participants were asked to rate their familiarity with the purchasing process for each of these scenarios on a scale of "1" to "7" where "1" represented no information and "7" represented an expert. Paired *t*-tests were conducted to determine if the study assumptions were correct. The results of the paired *t*-tests show significant results that verified the premise of the hypothesis in that younger adults were familiar with the task of purchasing cell phones and unfamiliar with the task of purchasing a house while older adults were familiar with the task of purchasing a house and unfamiliar with the task of purchasing a cell phone.

Overview

To examine any interactions among 2 Age (Young vs. Old) X 2 Familiarity (Familiar vs. Unfamiliar) X 2 Thought condition (Conscious vs. Distracted), a three way mixed factorial ANOVA was conducted. It should be noted that this analysis only included data from the implicit condition, the condition that contained the critical trials. Age and thought condition were between-subject variables and familiarity was a within-subjects variable. The means and standard deviations are displayed in Table 3. There are several interesting points to note about Table 3. First, older adults outperformed younger adults with respect to overall accuracy. Interestingly, this positive effect of age was more pronounced in the unfamiliar than in the familiar condition. Another surprising pattern is that older adults were better able to use intuitive decision making than younger adults. That is, intuition was examined in this study through performance in the distracted condition, and older adults clearly outperformed younger adults in this condition.

These observations were supported in a 2 Age (Young vs. Old) X 2 Familiarity (Familiar vs. Unfamiliar) X 2 Thought condition (Conscious vs. Distracted) ANOVA which indicated a significant main effect of age, $F(1, 85) = 4.04$, $p < .05$; $\eta^2_p = .05$, indicating that older adults performed better than younger adults. Although older adults performed better in the unfamiliar than in the familiar condition and the reverse was true for younger adults, there was no age x familiarity interaction, nor was there an age x familiarity x thought condition interaction. Additionally, there was no main effect of familiarity nor was there a main effect of thought condition.

Table 3

Participant Mean and Standard deviation (SD) proportion correct as a function of Age, Familiarity and Thought Condition

	Younger adults(n=49)		Older Adults(n=40)	
	Mean	SD	Mean	SD
Familiar				
Conscious	.72	.46	.70	.47
Distracted	.58	.50	.70	.47
Total	.65	.48	.70	.46
Unfamiliar				
Conscious	.60	.60	.80	.41
Distracted	.58	.50	.85	.37
Total	.59	.50	.82	.39

Thus far, I have conducted an ANOVA to examine the main effects and interactions with respect to the data. I will now discuss the results of each analysis in terms of each hypothesis. Although my data are essentially categorical in that participants made forced choices to determine the better of two options, I analyzed the data using ANOVAs. ANOVAs are widely used to analyze categorical data, and ANOVAs are robust to violations of normaility. I realize that there is some concern among researchers that using parametric procedures with categorical data could lead to spurious results. Thus, I also analyzed the data using nonparametric procedures such as Chi Square and Binomial tests. In no instances did the nonparametric procedures yield different findings than the parametric procedures. For the sake of brevity, I have only included the parametric analyses in this document. In the next section, I will examine the predictions raised in my hypotheses.

Hypothesis 1: The first hypothesis predicted that both younger adults and older adults would rate a high quality product more favorably than a low quality product with greater consistency in the familiar conditions as opposed to the unfamiliar conditions. This should be true across both the conscious and distracted conditions. To examine the familiar and unfamiliar conditions within each age groups, paired sample *t*-tests were conducted to determine if accuracy varied as a function of familiarity within either age group. Results indicated that for younger adults, there was no significant difference in accuracy across the familiarity conditions, familiar condition (M = .65, SD = 0.48) vs unfamiliar condition (M = .59, SD = 0.50) t (48) = .65, p = .52. I conducted the same analysis with respect to the older adult data. The analysis of the older adult data yielded similar results. For older adults, results of a paired sample *t*-test indicated no significant difference between the levels of accuracy in the familiar condition (M = .70, SD = 0.46) versus the unfamiliar conditions, (M = .82, SD = 0.39), t (39) = 2.21, p = .23.

Hypothesis 2: The second hypothesis predicted that the relation between age and decision making would be mediated via working memory in the conscious unfamiliar condition. I believed that working memory would mediate age differences in the conscious condition for several reasons: 1) There is evidence that one's capacity to deliberate and consider multiple alternatives is determined by working memory (Henninger, Madden & Huettel, 2010); 2) There is evidence that older adults have less working memory capacity than younger adults; 3) I specifically thought that working memory would be necessary in the unfamiliar domain because one would need greater working memory capacity when considering unfamiliar versus familiar information. However, as indicated earlier, independent *t*-tests indicated that there were no age differences in working memory. Nor was there a significant correlation between age and working memory. Moreover, there is no evidence that younger adults outperformed older adults in the unfamiliar condition. If anything, as one can see from Table 3, older adults outperformed younger adults. Thus, it would be inappropriate to conduct mediational analysis to examine the relation between age and decision making performance in the unfamiliar condition. Nevertheless, an important question remains. Were there significant age differences in the ability to make appropriate decisions in the unfamiliar domain? I conducted a 2 Age (young vs. old) x 2 Thought Condition (Distracted vs. Conscious) ANOVA on the data in just the Unfamiliar domain. The data yielded a significant main effect of age, $F(1, 85) = 5.80$, $p < .05$; $\eta^2_p = .06$, because older adults were more accurate than younger adults, however the data failed to yield a thought condition x Age interaction. $F(1, 85) = .12$, $p = .73$; $\eta^2_p = .0$. Additionally, there was no main effect of Though Condition. Thus, older adults were more accurate than younger adults in the unfamiliar condition but older adults' superior performance does not seem to be mediated by working memory.

Hypothesis 3: The third hypothesis predicted that younger and older adults would make better quality decisions in the distracted (i.e., no time for deliberation) familiar (i.e., cell phone-young adults; house older adults) condition than in the distracted unfamiliar (i.e., house younger adults; cell phone older adults) condition. In the distracted condition, the information would be presented quickly and participants would have to recognize the "red flags" that they should focus upon to make a decision. I believed that prior knowledge would be crucial in this condition. That is, recognizing and appreciating that certain information should serve as "red flags" would depend more on prior knowledge than working memory. Again, in the distracted condition, I assumed that participants would not have time for deliberation and thus would rely on intuitive processes to make a decision.

Table 4 displays the means and standard deviations for the distracted implicit conditions. Interestingly, as one can see, for the younger adults, there were no differences in accuracy as a function of familiarity. In contrast, for the older adults, the unfamiliar condition was actually more accurate than the familiar condition.

The aforementioned pattern of data was supported by a paired sample *t*-test in which I compared accuracy as a function of familiarity in the distracted conditions within each of the age groups. First focusing on younger adults, the results indicated that there was no significant difference (with regard to accuracy) between the distracted familiar condition (M = .58, SD = 0.50) and the distracted unfamiliar condition (M = .58, SD = 0.50), p = 1.0. In fact, as one can see, the younger adults' performance was almost exactly the same across familiarity domains in the distracted thought condition. The same analyses of the older adult data also failed to yield significant differences between the distracted familiar (M = .70, SD = 0.47) and unfamiliar (M = .85, SD = 0.37), conditions, p = .51. However, it is noteworthy that the younger adult performance is barely above chance in the distracted implicit condition. In fact, I conducted a one sample *t*-test to determine if accuracy was above chance in the distracted condition. The one sample *t*-test analysis indicated that it was not, t (23) = .81, p = .43. Thus, even though I initially predicted that younger and older adults would perform better in the familiar versus the unfamiliar domains in the distracted condition, there was no evidence that familiarity mattered with respect to the distracted condition. Further, with respect to older adults, the evidence indicates that they performed better in the distracted condition than younger adults.

Table 4

Participant Mean and Standard deviation (SD) for decision making quality of familiar and unfamiliar purchasing scenarios in the distracted implicit condition

	Younger adults(n=24)		Older Adults(n=20)	
	Mean	SD	Mean	SD
Familiar	.58	.50	.70	.47
Unfamiliar	.58	.50	.85	.37

Explicit Condition

To confirm that participants were taking this task seriously, participants were also presented with purchasing scenarios that were so simple that no deliberation or prior knowledge about the subject matter was required to make the best decision. Table 5 displays the accuracy data as a function of thought condition and familiarity. I initially thought that the explicit condition would yield ceiling effects because judgments in this condition were so straightforward. However, as one can see upon reviewing Table 5, the younger and older adults yielded responses which were far less accurate than originally anticipated. There are several additional points to note in Table 5. Although older adults outperformed younger adults in the distracted condition when the information was presented implicitly, older adults did not outperform younger adults when the information was presented explicitly in the unfamiliar condition. In fact, older adults' performance in the distracted unfamiliar condition was quite low (55%), significantly lower than their performance in the distracted familiar (85%). This is quite surprising, given that information in the explicit condition is presented in a very straightforward way and it should be fairly simple to choose the best of two options.

Recall that I initially predicted that familiarity would have a larger impact on older adults' performance than younger adults' performance in the implicit condition. Interestingly, familiarity is having a fairly large impact on older adults' performance in the explicit condition. If one reviews Table 5, one can see that younger adults' performance remains close across the familiarity conditions.

I conducted analyses directly comparing familiar and unfamiliar conditions in the explicit condition to examine the possibility that accuracy varied in the explicit condition as a function of familiarity and age.

Performance in the Explicit Condition across Familiarity Domains

I first compared performance across familiarity conditions without considering thought condition. A paired sample *t*-test was conducted in which I compared accuracy in the unfamiliar versus the familiar conditions. The results indicated that there was no significant difference between the responses in the explicit familiar (M = .71, SD = 0.46) and the responses in the explicit unfamiliar conditions for younger adults, (M = .73, SD = 0.45), t (48) = .24, p = .81. For older adults, a paired sample *t*-test yielded a significant difference between the levels of accuracy in the familiar condition (M = .80, SD = 0.41) and unfamiliar conditions (M = .63, SD = 0.49), t

(39) = 2.21, $p < .05$. Table 5 displays the accuracy data as a function of thought condition and familiarity. As pointed out earlier, this pattern of results for older adults is surprising given their relatively good performance in the implicit condition.

Table 5

Participant Mean and Standard Deviation (SD) proportion correct as a function of Age, Familiarity and Thought Condition in the Explicit condition

	Younger adults(n=49)		Older Adults(n=40)	
	Mean	SD	Mean	SD
Explicit Familiar				
Conscious	.80	.41	.75	.44
Distracted	.63	.50	.85	.37
Total	.71	.47	.80	.41
Explicit Unfamiliar				
Conscious	.68	.48	.70	.47
Distracted	.79	.42	.55	.51
Total	.73	.45	.63	.49

Examining Age Effects in the Unfamiliar Condition

Because the data in Table 5 reveals that younger and older adults responded quite differently in the unfamiliar condition as a function of thought condition, I was interested in following up on that observation with additional analyses. I conducted a 2 Age (Young vs. Old) x 2 Thought Condition (Conscious vs. Distracted) ANOVA on the data in just the unfamiliar condition. Although older adults performed much more poorly than younger adults in the distracted unfamiliar condition, there were no significant interactions or main effects.

I then followed up with analyses in which I focused on data in the distracted unfamiliar condition. Recall that the distracted condition is the condition in which participants were unable to deliberate and thus I surmised that participants would have to use intuitive processes to make decisions in this condition. To examine the effects of age on decision making in the explicit distracted familiar condition, I used a paired sample *t*-test analysis across familiarity domains in the explicit condition. For younger adults, results indicated that there was no significant difference in accuracy in the familiar condition ($M = .63$, $SD = 0.50$) vs. unfamiliar condition ($M = .79$, $SD = 0.42$), $t\ (23) = 1.28$, $p = .21$. However, for older adults, there was a significant difference in accuracy between the responses in the explicit familiar distracted condition ($M = .85$, $SD = 0.37$) and the responses in the explicit distracted unfamiliar condition ($M = .55$, $SD = 0.51$), $t\ (19) = 2.85$, $p < .05$.

Age and Context Effects

Previous research conducted by Finucane (2002) indicates that older adults are less consistent than younger adults with respect to their evaluations. That is, earlier research has shown that older adults' ratings are more influenced by context than younger adults' ratings. In order to find out if there would be age differences in contextual bias in the current study, participants rated the products twice. In addition to participants' making decision choices about which of two products was preferable in the decision phase of the experiment, participants were also asked to rate the value of each of the items individually. As stated earlier, participants were asked to perform this task as a means of confirming that participants had been able to correctly and consistently identify the value of each option they were presented across the four trials.

Participants rated each option on a scale ranging from “1” indicating a low quality option to “7” indicating a high quality option. The means for the implicit conditions are displayed in Figure 1and the means for the explicit condition are displayed in Figure 2. To evaluate the participants’ ratings of each individual product, a multivariate ANOVA was conducted on their responses. Age group was used as the independent variable while participant ratings for the eight individual products were used as the dependent variables. The results of the MANOVA indicated there was an overall significant effect of age on the combined dependent variables, F (8, 80) = 2.69, p <.05; Wilk’s Lambda = .79; $\eta^2_p = .21$. When results of the dependent variables were considered separately, the only difference to reach significance was the implicit house option considered to be of good quality, F (1, 87) = 6.12, p <.05; $\eta^2_p = .07$. Older adults (M = 6.45, SD = 1.45) were more likely to rate high quality options more favorably than low quality items in the house condition but younger adults (M = 5.67, SD = 1.49) did not make that discrimination.

The results in this phase of the study in which participants made consistency judgments indicate that there were age differences in consistency, but not in the expected direction. As it turns out, older adults were more consistent than younger adults. That is, older adults were more likely than younger adults to rate high quality products more favorably than low quality products across familiarity domains.

To explain in more detail, although younger adults gave higher ratings to the higher quality cell phone option than the lower quality option, younger adults did not discriminate between low and high quality options with regard to the house option (i.e., the unfamiliar domain for younger adults). Younger adults did rate the high quality option more favorably than the low quality option when having to make forced choice decisions in the earlier part of the study.

Figure 1

Younger and Older adult average scores for the individual scenario ratings for the house and cell phone scores

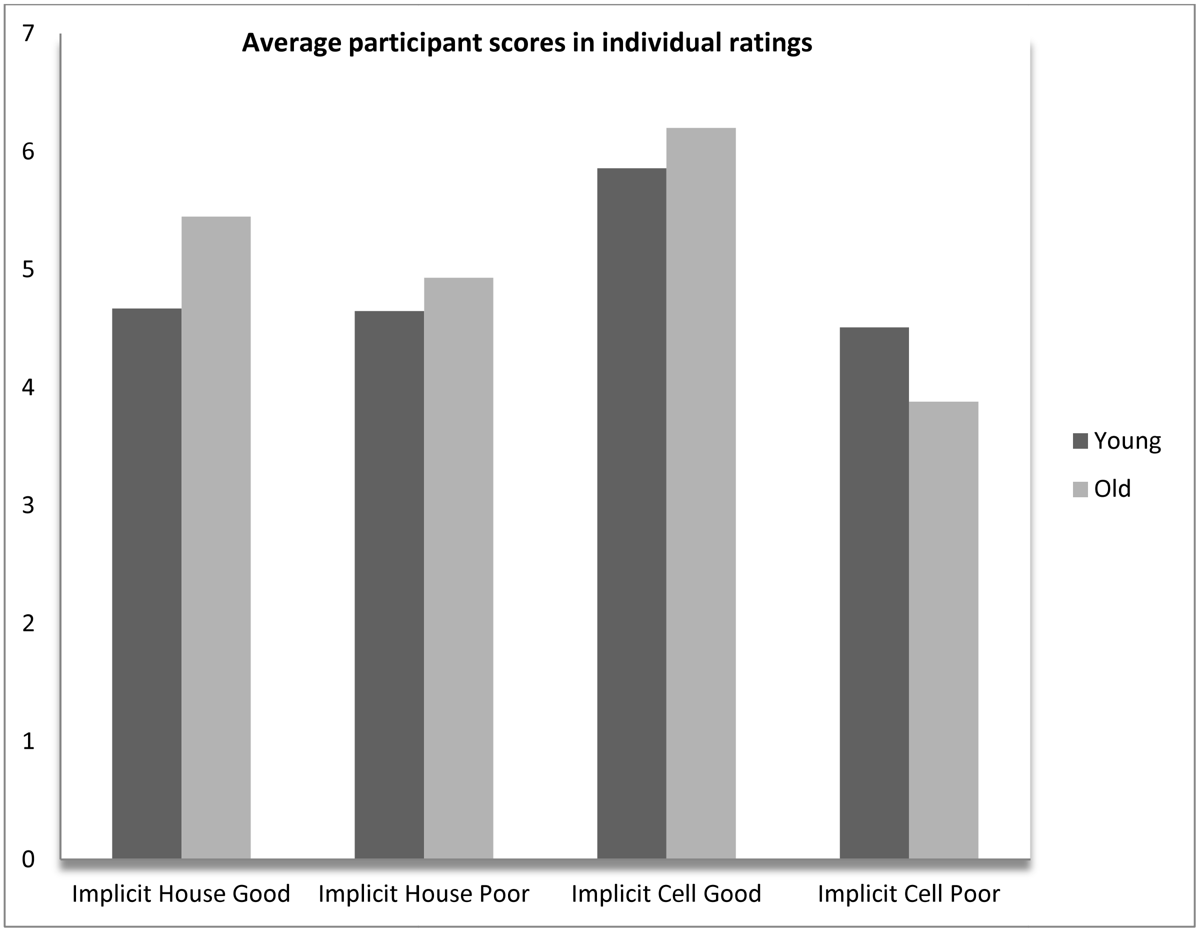
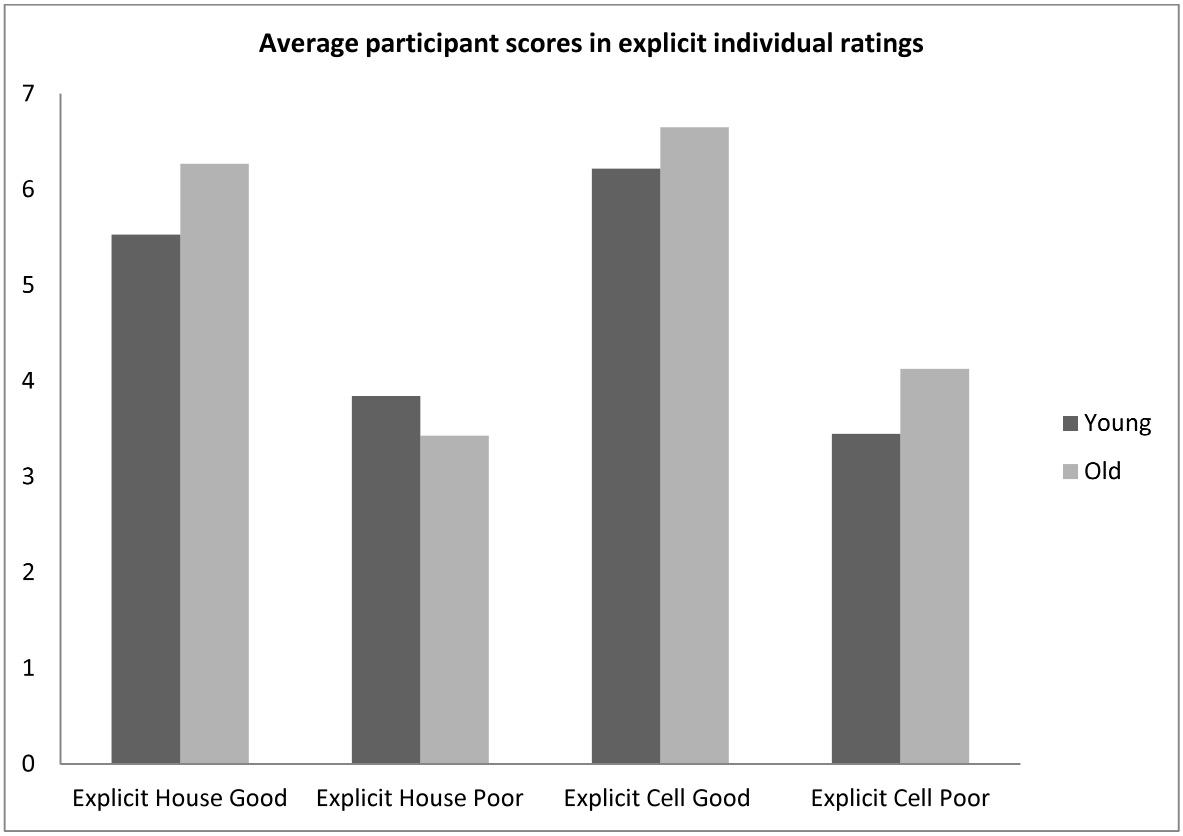


Figure 2

Younger and Older adult average scores for the explicit individual scenario ratings for the house and cell phone scores



Participants' ability to justify their decision

In addition to instructing participants to rate each option individually (independent of context), I also required participants to justify their previous evaluations. I did this because one might wonder whether individuals were making truly intuitive decisions during the phase of the experiment in which participants had to choose the better of two options. If participants were able to select the appropriate option without being able to justify their decision, then I would have some evidence that participants were being influenced by unconscious mechanisms. Thus, following participants' decisions on the purchasing scenarios, they were asked to write down a justification for their earlier choice for the purchasing trials.

The participants' responses were analyzed for "red flags." That is, I read their justification for making a decision to determine if participants referred to the critical information presented in each scenario to distinguish a good from a poor choice. With regard to the house condition, the critical information was the inspection. With regard to the cell phone condition, the critical information was the internet service. Results are displayed in table 6 below. A two-way mixed factorial ANOVA was conducted in which age was between-subjects and familiarity was within-subjects. The results indicated that there was a significant interaction between familiarity and age condition in that younger adults (*M* = 8.50, *SD* = 3.54) were more likely to list one of the critical items designated as "red flags" as reasons for their choices in the unfamiliar condition compared to older adults (*M* = .50, *SD* = .71). Interestingly, in the familiar condition, older adults (*M* = 6.0, *SD* = 1.41) were more likely than younger adults to list "red flags" as reasons for their choices (*M* = 4.0, *SD* = 4.24), Wilks Lambda = .01; $F(1, 2) = 200$, $p < .05$; $\eta^2_p = .99$. There were no significant main effects.

Table 6

The number of participants as a function of age, familiarity, and thought condition who listed "red flags" in their explanation of the basis for their decisions

	Younger Adult	Older Adult
Familiar		
Conscious	1	7
Distracted	7	5
Total	8	12
Unfamiliar		
Conscious	6	1
Distracted	11	0
Total	17	1

Interestingly, the younger but not older adults, who did indicate their rationale for their decisions were more likely to justify their decisions in the distracted rather than the conscious condition. Again, the majority of individuals did not justify their decisions.

Episodic Memory Measure

In addition to being concerned with participants' ability to justify their decisions, I was also interested in participants' episodic memory. I was concerned that age differences in episodic memory might influence decision choices. If younger and older adults produced drastically different data with respect to their decision choices, one explanation for the age differences could be age differences in episodic memory. Participants were also asked to write down any features that they remembered from the previously read material as an episodic memory check. Results for the implicit data are displayed in Table 7 below. There are several points to note with regard to Table 7. First, younger adults remembered more than older adults. Both younger and older adults remembered more items from the familiar than the unfamiliar domain. Familiarity had a larger impact on older adults' episodic memory performance than younger adults' performance.

Table 7

*Number of items remembered by participants following completion of the decision making ta*sk

	Younger adults(n=49)		Older Adults(n=40)	
	Mean	SD	Mean	SD
Familiar				
Conscious	7.60	3.62	5.10	4.61
Distracted	5.46	3.35	5.45	4.24
Total	6.55	3.62	5.28	4.37
Unfamiliar				
Conscious	6.68	3.88	3.05	2.70
Distracted	6.04	3.54	3.25	3.29
Total	6.37	3.70	3.15	2.98

The aforementioned observations were supported by a 2 Familiarity (Familiarity vs. Unfamiliarity) x 2 Thought Condition (Distracted vs. Conscious) x Age (Young vs. Old) three way mixed factorial ANOVA. The ANOVA indicated a significant interaction between familiarity and age, $F(1, 85) = 8.89$, $p < .05$; Wilk's Lambda = .91; $\eta^2_p = .10$, indicating that older adults remembered significantly more familiar items ($M = 5.28$, $SD = 4.37$ than unfamiliar items (($M = 3.15$, $SD = 2.30$). The results also yielded a significant main effect of familiarity, $F(1, 85) = 12.22$, $p < .05$; Wilk's Lambda = .87; $\eta^2_p = .13$ indicating that participants remembered more familiar items (*M* = 5.98, *SD* = 4.00) than unfamiliar items (*M* = 4.92, *SD* = 3.74). There was a significant main effect of age, $F(1, 85) = 9.77$, $p < .05$; $\eta^2_p = .10$, indicating that younger adults (*M* = 6.37, *SD* = 3.70) remembered significantly more items that older adults (adults (*M* = 3.15, *SD* = 2.98). There was no significant three way interaction between familiarity, age and thought condition. These results are consistent with the episodic memory tests from the pilot study. Interestingly, older adults' performance was better than younger adults' decision making performance in the implicit unfamiliar condition, but yet their episodic memory performance was not.

I also examined age differences in episodic memory in the Explicit Condition. Although I originally thought that the Explicit Condition was a manipulation check, the explicit condition actually yielded interesting results that might shed light on the relation between age, encoding conditions, and decision making. Thus, I conducted a 2 Familiarity (Familiarity vs. Unfamiliarity) x 2 Thought Condition (Distracted vs. Conscious) x Age (Young vs. Old) three way mixed factorial ANOVA on the Explicit Data. The ANOVA yielded a significant main effect of familiarity, $F(1, 85) = 11.88$, $p < .05$; Wilk's Lambda = .88; $\eta^2_p = .12$ indicating that participants remembered more familiar items (*M* = 5.88, *SD* = 3.94) than unfamiliar items (*M* = 4.73, *SD* = 3.95). There was a significant main effect of age, $F(1, 85) = 20.46$, $p < .05$; $\eta^2_p = .19$, indicating that younger adults (*M* = 7.06, *SD* = 3.41) remembered significantly more items that older adults (*M* = 4.42, *SD* = 4.15). There were no significant interactions between familiarity, age and thought condition nor was there a significant main effect of thought condition.

DISCUSSION

This project addressed a number of important issues concerning age, familiarity, and intuition. One of the main motivations of this work was to determine if there were age differences in the ability to use intuition. As indicated earlier, intuition is used often to make important decisions. Are older adults as facile in their use of intuition as younger adults? Furthermore, is it feasible for older adults to use intuition when making daily decisions?

I examined age differences in intuitive decision making as a function of thought condition and familiarity. First, to examine the effects of intuition on decision making, I created two thought conditions. In one condition (i.e., the distracted condition), participants had little time to deliberate and in the second condition (i.e., the conscious condition), participants had three minutes to deliberate. To make sure that participants did not have time to deliberate during the acquisition and decision phases of the study, I imposed a time limit. I also manipulated domain familiarity for younger and older adults. I did this by providing younger and older adults with information related to a cell phone (familiar for young but not for older adults) or house (familiar for older but not younger adults) purchasing decision.

I also varied the degree to which the information was presented in a straightforward way. On half of the trials, critical information was presented subtly within a scenario and participants had to quickly recognize the importance of the critical information to make the optimal decision. Those trials were labeled implicit trials. On the other half of the trials, the information was presented in a very straightforward way, such that it was fairly easy to determine which of the two options was best. The very straightforward trials were labeled explicit trials. I initially assumed the explicit trials would be merely manipulation checks. Thus my predictions and hypotheses centered around the implicit trials.

In fact, the critical trials were the implicit trials. I made the following specific predictions with regard to the critical trials in my study. I predicted that both younger adults and older adults would rate a high quality product more favorably than a low quality product with greater consistency in the familiar conditions as opposed to the unfamiliar conditions. I also predicted that the relation between age and decision making would be mediated via working memory in the conscious unfamiliar condition. Finally, I predicted that younger and older adults would make better quality decisions in the distracted familiar condition than the distracted unfamiliar condition. Turning to the explicit condition, I predicted no age differences in the explicit condition, because all of the information was presented in a very straightforward way which should have made decision making easy. A number of my predictions did not turn out as predicted. However, one prediction was overwhelmingly confirmed.

I predicted that older adults could use intuitive processes under fairly stringent time constraints, despite the age-related changes in processing speed. This data from the current study indicates that, if anything, older adults were better at making intuitive decisions than younger adults when the information was presented implicitly. However, many of the specific predictions that I made about the various conditions were not confirmed. I will discuss the discrepancies between my predictions and the actual data below.

I will first address the age differences in the implicit condition. I believe that older adults outperformed younger adults because this was an elite group of older participants—a group of participants that have a unique set of cognitive resources not normally found in a random sample of older adults.

First, these older participants were highly educated and there are a plethora of studies that indicate that education protects older adults from cognitive decline. In fact, the average amount of education among older adults in this study was 18.3 years. Thus, the older participants had significantly more education than the younger participants (13.12 yrs). Additionally, it is important to consider the zeitgeist in which these older adults were seeking post graduate education. At that time, very few people pursued post baccalaureate degrees. Additionally, there are moderately-strong correlations between intelligence and educational attainment (Engle, Tuholski, Laughlin, & Conway, 1999). Thus, it is likely that this sample of older adult participants was very intelligent relative to the rest of the population.

Finally, further evidence of the superior cognitive abilities of this group is their working memory performance. In fact, there were no age differences in working memory performance. This is generally unheard of in the cognitive aging literature (Hasher & Zacks, 1988; Moye & Marson, 2007). It is true that when younger and older adults are matched on education that there is an attenuation in age differences in working memory, but the working memory difference is usually not eliminated.

One of the reasons for such superior working memory performance is that a number of participants were retired from faculty positions or from other intellectually demanding careers. There is evidence that people who work at intellectually challenging positions during midlife experience less age-related declines in cognition than individuals who have less challenging careers (Perfetti, 1985; Zacks, Hasher, Doren, Hamm & Attig, 1987).

In addition to the older adults in my sample having the advantage of a high level of education and a high level of occupational prestige, the older adults in the current sample were very active and maintained a high degree of mental stimulation post retirement. For example, one of the recruitment locations for older adult participants was the Osher Life Long Learning Institute (OLLI) at the University of Alabama. This academic cooperative provides older adults with educational programs that encourage intellectual stimulation, social interaction, and cultural development. Thus, the combination of an already highly educated older adult group, engaging in continual intellectual stimulation, and social interaction results in this being a very elite group.

A second reason that older adults might have performed well in the implicit distracted condition is that older adults relative to younger adults, have more experience at making purchases. Johnson & Drungle (2000) have conducted research indicating that older adults are better at focusing on crucial information, at least when making familiar domain purchases. Thus, when older adults were confronted with the house scenario in the implicit condition, they may have been better able to pinpoint the information that is important and worthy of their attention.

But, what makes this pattern of data in the implicit condition intriguing is that older adults outperformed younger adults when being presented with information from the unfamiliar domain. Why would this occur? First, although cell phone usage is more prevalent among younger adults, older adults who are well educated have probably had extensive experiences with cell phones and might have had more experiences than older adults with less education. Thus, the cell phone condition might not be as unfamiliar for this group of older adults as originally anticipated. Second, given that this group of older adults had superior intelligence and had some experience with cell phones, the older adults might have been able to utilize their past experience to focus upon what was really relevant in the cell phone scenarios-- internet access. There is evidence that the more able older adults have faster processing speed than the less able older adults (Henninger, Madden & Huettel, 2010). Thus, this group of participants was able to deduce the importance of internet access within the time constraints of this experiment.

Finally there was a third issue with respect to the data that requires further explanation: The finding that older adults performed better in the implicit than in the explicit condition. Interestingly, the difference between the implicit and explicit conditions is especially pronounced in the distracted thought condition. On the surface it appears that both young and older adults should produce ceiling effects in the explicit condition. After all, on every dimension, one choice is clearly superior to the other.

However, because the two lists of options in the explicit condition were so similar, older participants might have read the lists passively. They undoubtedly realized which of the two options was better immediately after reading the lists in the explicit condition. However, they might not have encoded the information extensively during the acquisition phase in the explicit condition, and the labels associated with each of the scenarios may not have been yoked together in long term memory during the acquisition phase. Moreover, in the *distracted* explicit condition, immediately after reading the list their mind was occupied. I believe that because of the time lapse between encoding and test time, they had difficulty remembering which of the labels corresponded to the good option and which of the two labels corresponded to the poor option. Thus, their performance was poor in the explicit distracted unfamiliar condition relative to the implicit distracted unfamiliar condition.

If remembering the association between the quality of the product and the label was difficult in the distracted unfamiliar explicit condition, why wouldn't that same problem arise in the distracted unfamiliar implicit condition? There is one main difference in the implicit versus the explicit conditions which might have an effect on participants' memory at decision time. Participants had to discover which of the listed specifications made one option better than the other in the implicit condition. This discovery process may have created an "aha" experience, and may have created a more durable and salient memory tag that could be retrieved later consciously or unconsciously. That is, older adults might have felt that the advertiser was trying to trick them, upon determining that a cell phone plan appeared to be offering 4G cell phone service but no internet access. Likewise, they might have felt that the advertiser was trying to trick them, upon learning that the house option that was seemingly a good deal actually did not include an inspection.

Although older adults did not perform as well as younger adults in the explicit distracted unfamiliar condition, if one looks at the whole study in its entirety, older adults outperformed younger adults (at a nonsignificant level) in this study. In particular, older adults produced superior performance relative to younger adults in the implicit condition. This was somewhat surprising, because younger adults outperformed older adults in the previous Wayde and Black (2013) study in the implicit condition. The Wayde and Black study investigated many of the same issues as the current study. The reasons for the different outcomes will be discussed in the next section.

Relation of the current study to the previous Wayde and Black study

The purpose of the Wayde and Black (2013) study was to investigate older adult decision making in familiar and unfamiliar domains as compared to younger adults. The design of the study was similar to the current study, in that the familiar domain for older adults was a house purchasing decision. The unfamiliar domain used for older adults was a cell phone purchasing decision. The reverse was true for younger adults. However, the current study and the Wayde and Black study differed in that the previous Wayde and Black study did not place restrictions on the amount of reading time during the acquisition phase nor did the previous study place time restrictions on the decision phase of the study. Additionally participants in the Wayde and Black study were not exposed to a distracted condition. However, one similarity between the two studies is that in both studies, there was an implicit and explicit condition. Results of the Wayde and Black (2013) study indicated that there were age differences with respect to the unfamiliar condition but not the familiar condition. Moreover, in the Wayde and Black study, there were age differences in the implicit but not explicit conditions.

Obviously, the results of the current study are quite different from the results of the Wayde and Black (2013.), particularly with respect to the unfamiliar implicit condition. In the current study, if anything, older adults outperformed younger adults in the unfamiliar implicit condition. Furthermore, in the previous Wayde and Black study, there were no age differences in the explicit condition.

I believe that the two studies produced disparate results due to differences in the design of the study and differences in the demographic characteristics of the older participants. With regard to the older participants, the older participants in the current study were an elite group with regard to educational levels and cognitive stimulation, which might have served as protective factors with regard to cognitive tasks such as decision making.

Turning to the issue of the disparate results between the two studies with respect to the explicit condition, I believe that the two studies yielded different results because of differences in procedure in the explicit condition. As stated earlier, in the current study, there was a time lapse between the acquisition or encoding phase of the study and the decision making phase. In the current study, the explicit condition did not elicit encoding strategies that would produce a durable memory trace for older adults. However, this durable memory trace would be necessary because there was a time lapse between the acquisition phase and the decision phase. Older adults would have to remember which label (i.e. House Z, House M) was associated with the specific scenarios. Thus, older adults did not perform well in the explicit condition in the current study. In the previous Wayde and Black (2013) study, there was no time lapse between the acquisition phase and the decision phase; thus older participants could readily select the appropriate choice.

Working Memory and Decision Making

In the Wayde and Black (2013) study, working memory mediated the relation between Age and decision making performance. That is one of the reasons that I initially predicted that working memory would mediate the relation between age and decision making performance in this study.

I initially predicted that the relation between age and decision making would be mediated via working memory in the conscious unfamiliar condition. In addition to the results of the Wayde and Black (2013) study, this prediction was based on previous research that has shown that working memory is an essential cognitive process that is necessary for higher order functioning such as reasoning, comprehension, and decision making (Lange & Verhaeghen, 2009). One of the most robust findings in the cognitive aging literature has been the age-related decline in working memory. Age-related changes in decision making quality have often been attributed to age-related changes in executive processing (Finucane, Mertz, Slovic, Scholze & Schmidt, 2005). I believed that working memory capacity would be more likely to improve performance in the conscious unfamiliar condition than in any other condition. Thus, I predicted that working memory would mediate age differences in this condition.

It was my belief that younger adult participants in the conscious condition would use their superior working memory resources to figure out that the better quality option in the conscious unfamiliar condition (i.e., the home condition for younger adults) had a home inspection. However, given the changes in working memory and processing speed (Henninger, Madden & Huettel, 2010) that occur as a function of age, I assumed that older adults would be at a disadvantage with the rapidly presented information and would be less likely to use their limited working memory resources to engage in this type of deliberation and figure out that the better quality option in the conscious unfamiliar condition (i.e., the cell phone condition for older adults) had internet access and the possibility of 4G.

My results were not as expected, given that older adults, if anything, performed better than younger adults in the conscious unfamiliar implicit condition. Moreover, there were no age differences in working memory. Therefore, results indicated that the first step of the mediation analysis (establish a relationship between age and decision making in the conscious unfamiliar condition) was not significant. Thus, no mediation analysis could be conducted on working memory and age. Further, correlational analysis between age and working memory also indicated no significant relationship between these two variables. These results are surprising given the established relationship between aging and working memory as previously mentioned (Finucane, Mertz, Slovic, Scholze & Schmidt, 2005; Henninger, Madden & Huettel, 2010). The next section focuses on older adults' ability to use a process on the opposite end of the continuum with respect to the expenditure of cognitive resources. The next section focuses on intuition.

Intuition, Decision Making, and Domain Familiarity

One of the primary goals of this study was to find out if both younger and older adults could make intuitive decisions. Intuitive decisions, or intuition is defined as making a decision or coming to a judgment without knowing why or being able to verbalize a rationale. In the current study, I forced participants to make intuitive decisions by purposely limiting deliberation time. Thus, participants had to quickly process information and choose the better of two options after reviewing it during the acquisition phase. The results indicate that older adults are fully capable of making intuitive decisions.

The results of this study are consistent with the previously mentioned research conducted by Queen and Hess (2010). Both studies suggest intuitive decision making as a viable alternative to deliberative decision making in certain conditions. Thus, the results of both studies contribute to evidence that suggests older adults are able to make intuitive decisions demonstrating that the intuitive decision making is less affected by the negative aspects of ageing than deliberative decision making.

Why would intuitive decision making but not deliberative processing be maintained across the lifespan? For one thing, one of the prerequisites for being able to make good intuitive decisions is domain familiarity. Given that age is often correlated with experience, older adults have expertise in a number of domains. I was especially interested in older adults' performance in the distracted condition because that was the condition in which older adults would not be able to deliberate about their decision.

The distracted condition was designed to examine intuitive processes. As indicated earlier, older adults had no problem making intuitive decisions in the distracted condition. One might ask: What cognitive mechanisms were responsible for intuitive decision making in this study? One way that it might have worked is by the activation of schemas. In fact, Dane and Pratt (2007) have proposed that intuition may also rely on the use of expert schemas. The researchers argue people with expert schemas can make accurate intuitive decisions. That is, individuals with expertise in specific domains (i.e., older adults with greater familiarity in the home purchasing domain), are able to create highly complex and domain relevant schemas or frameworks (i.e., identifying the importance of a home inspection) which allows them to make accurate intuitive decisions.

This expertise framework might explain older adults' superior performance relative to younger adults' performance in the implicit distracted condition. Older adults might have a purchasing schema that allows them to focus upon the critical features that distinguish a high quality product from a low quality product. In fact, Johnson and Drungle (2000) found that older adults looked longer at fewer features than younger adults but nevertheless made the same decisions at younger adults. Experience may have taught them which features were crucial for making the best purchase. This overall purchasing schema may have also helped them with respect to the cell phone purchase. As indicated earlier, although most older adults have had more experience with purchasing homes than purchasing cell phones, most of the older adults had some level of experience with a cell phone, and given their activity level and education, the older adults probably have used their cell phone for internet access. Thus, the group of older adults in this study had enough expertise to employ their rich purchasing schema to cell phone purchases and thereby make better decisions than younger adults in the distracted unfamiliar condition.

The aforementioned discussion concerning experience and expertise schemas begs the question: Could younger adults' poor performance in the implicit distracted unfamiliar condition be due to their lack of experience with home purchases? One could argue that although older adults had some experience with cell phones, younger adults more than likely have had no experience with home purchases. However, if one looks at the data in Table 3, one can see that younger adults performed poorly in the distracted condition across familiarity domains. In the implicit condition, younger adult had problems relative to older adults in making intuitive decisions—even when the decisions involved cell phones. Thus, their poor decision making relative to older adults may hinge upon being able to recognize relevant features very quickly.

Another possible explanation for my pattern of results revolves around the concept of long-term working memory. This explanation is similar to the notion that older adults relative to younger adults have expert schemas with regard to decision making. Ericsson and Kintsch (1995) have proposed the existence of a mechanism based on skilled use of storage in long-term memory, referred to as long-term working memory. These researchers propose that long-term working memory is an addition to short-term working memory. They propose that through practice and training, individuals with expertise in particular domains and activities are able to quickly recognize familiar patterns when presented with a task and access relevant information stored in long-term working memory. This additional information stored in long term working memory expands their capabilities to interpret and process information pertaining to their current task. The relevant information stored in long term memory can be accessed through the use of relevant retrieval cues that arise from the task at hand. For example in the current study, it is possible that "home inspection" may serve as a retrieval cue. If it does, according to Ericcson and Kintsch, all of the information related to the phrase will become available and will help participants prioritize and interpret the information. It is also possible that a cue can activate a strategy or template for a particular procedure. Thus, upon comparing two products, the older adults' decision making strategy stored in long term memory for purchasing products might be activated. The decision making strategy might include searching for key elements associated with the overall quality of a purchase. By accessing long term working memory, individuals increase their capacity to absorb information and their ability to employ appropriate strategies upon encoding information.

How would long term working memory affect intuition? It doesn't impact intuition directly. However, in the current study, it might have helped older adults, in particular to process information quickly and pay attention to relevant cues during the acquisition phase of the experiment. It should be pointed out that it is my contention that long term working memory would only impact performance during the acquisition phase of this experiment. In fact, much of the information accessed during the acquisition phase was probably not available at the time participants made decisions in the distracted condition.

To explain further, with regard to the current study, in the distracted condition within the acquisition phase, participants may have spotted a very relevant word that served as a retrieval cue to information in long term working memory. In that instant, related information became available that could assist with categorizing options as good or bad. In the distracted condition, participants were involved with a very resource demanding filler task immediately following the acquisition phase, so they would not be able to further consider their options. However, upon receiving the decision task they might have had a vague sense of one option being better than other.

Rahhal, May, & Hasher, (2002) found that both younger and older adults could remember association tags (e.g., good or bad) between options even when they could not remember the exact content of the options. Older adults, in particular, frequently remembered affective tags associated with an option without remembering the specific details associated with the option. Nevertheless, although older adults frequently did not remember specifics associated with an option, they could make appropriate judgments based on the association tags.

I believe that the aforementioned notion of emotional tags is relevant to the pattern of results in the distracted explicit unfamiliar condition. I believe that older adults were capable of making appropriate intuitive decisions in the explicit condition; after all, this condition was easier than the implicit condition. However, I believe that the strength of the implicit association between the option label (i.e., M vs. Z) and the quality of the product was not as strong in the explicit condition. In the implicit condition, older participants might have felt as if the advertiser were trying to trick them by advertising 4G but not offering internet access. Moreover, the older adults have learned from experience that when a deal is too good to be true, it usually is, and thus they may have associated the low quality option with “bad.” At decision time, as stated before, they relied on those negative or positive associations. On the other hand, in the explicit condition, there was no sense that the advertiser was trying to trick the consumer. One option was simply better than the other. Thus, a strong association between the label and the options associated with the label may not have been made for older adults. As indicated earlier, at test time in the distracted condition, they may have been at a loss with respect to which label was associated with the more favorable set of options. There is in fact data which indicate that there are age differences in the ability to incidentally bind information so that it can be remembered later (Johnson, 1996; Mitchell, Johnson, Raye, & D’Esposito, 2000; Naveh-Benjamin, 2000; Oberauer, 2005).

Finally, one might wonder the degree to which I can be sure that participants were making intuitive judgments. Is it possible that participants were depending on conscious recollection and/or deliberation to make judgments in the distracted condition (the condition designed to examine intuition)? In addition to reasons outlined earlier (e.g., lack of deliberation time in the distracted condition), I believe that participants made intuitive judgments in the distracted condition because of participants’ performance on the decision justification task. Very few participants actually listed the critical features in justifying their decision. In fact, very few people justified their decisions. Moreover, even though older adults outperformed younger adults on the implicit decision task, fewer older adults justified their decisions than younger adults. In addition, younger adults outperformed older adults on the episodic memory test in the implicit condition; nevertheless, older adults performed better than younger adults on the task. Thus, even though older adults could not remember as much information about the two options as younger adults, they could somehow select the better of two options.

Although the data from the justification and episodic memory tasks do not provide definitive evidence that intuition played a role in decision making in this study, the data from the two aforementioned tasks along with other data, indicate to me that it is more likely than not that participants were using intuition in the distracted condition.

CONCLUSION

To summarize, it is clear that overall, older adults made better quality decisions than younger adults. Older adults also made accurate decisions using the intuitive process of thinking. The older participants were a unique group of older adults, given their overall cognitive abilities and level of education. This might explain the finding that if anything, older adults outperformed younger adults in the unfamiliar condition and in the distracted condition (the condition designed to measure intuitive processing). Older adults might have been able to use intuition effectively in this study because of their extensive experience with purchasing products. This study provides evidence that older adults with high levels of cognitive functioning, under certain circumstances, might be able to make better intuitive decisions than younger adults—even if the younger adults have better episodic memory with respect to the specific features associated with the product.

REFERENCES

Abernathy, C.M. & Hamm, R.M. (1995). Surgical intuition: *What is it and how to get it*. Philadelphia, PA: Hanley & Belfus.

Acker, F. (2008). New findings on unconscious versus conscious thought in decision making: additional empirical data and analysis. *Judgment and Decision Making,3*,292–303.

Baddeley, A. D., & Hitch, G. J. (1974). Working Memory. In G. Bower (Ed.), The psychology of learning and motivation, Vol. VIII, 47-90, New York: Academic Press.

Betsch, T. (2008). The nature of intuition and its neglect in research on judgment and decision making. In H. Plessner, C. Betsch,& T. Betsch (Eds.*), Intuition in judgment and decision making* (pp. 3–22). New York, NY: Erlbaum.

Betsch, T., & Glöckner, A. (2010). Intuition in judgment and decision making: Extensive thinking without effort. *Psychological Inquiry, 21*, 1-16.

Betsch, T., Plessner, H., Schwieren, C., & Gutig, R. (2001). I like it but I don't know why: A value-account approach to implicit attitude formation. *Personality and Social Psychology Bulletin*, 27, 242-253.

Carstensen, L. L., Fung, H. H., & Charles, S. T. (2003). Socioemotional Selectivity Theory and the Regulation of Emotion in the Second Half of Life. *Motivation & Emotion, 27*, 103-123.

Christensen, T., Ascione, F., Bagozzi, R. (1997). Understanding how elderly patients process drug information: A test of a theory of information processing. *Pharmaceutical Research*, *14*, 1589-159.

Dane, E. & Pratt, M.G. (2007) Exploring Intuition and its role in Managerial Decision Making. *Academy of Management Review*. 32, 33-54

Dijksterhuis, A. (2004). Think different: The merits of unconscious though in preference development and decision making. *Journal of Personality & Social Psychology, 87,* 586–598.

Elsbach, K. D., & Barr, P. S. (1999). The effects of mood on individuals' use of structured decision protocols. *Organization Science*, 10: 181–198.

Engle, R. W., Tuholski, S. W., Laughlin, J. E., & Conway, A. R. (1999). Working memory, short-term memory, and general fluid intelligence: a latent-variable approach. *Journal of Experimental Psychology: General*, *128*(3), 309.

Epstein, S. (1991). Cognitive -experiential self-theory: an integrative theory of personality. In R. Curtis (Ed.), *The relational self: Convergences in psychoanalysis and social psychology* (pp. 111-137). Ney York: Guilford.

Epstein, S. (1994). Integration of the cognitive and the psychodynamic unconscious. American Psychologist, 49, 709–724.

Epstein, S. (2008). Intuition from the perspective of cognitive experiential self-theory. In H. Plessner, C. Betsch, & T. Betsch (Eds.), *Intuition in judgment and decision making* (pp. 23–37).New York, NY: Erlbaum.

Epstein, S. (2010). Demystifying Intuition: What it is, What it does, and How it Does it. Psychological Inquiry, 21, 313 -326.

Ericsson, K. A., & Kintsch, W. (1995). Long-term working memory. *Psychologial review, 102*(2), 211.

Evans, J .St. B.T., (2010). Intuition and Reasoning: A Dual-Process Perspective. Psychological Inquiry, 21, 313 -326.

Finucane, M. L. (2002). Mad cows, mad corn and mad communities: the role of socio-cultural factors in the perceived risk of genetically-modified food. In *Proceedings-nutrition Society if London* (Vol. 61, No. 1, pp. 31-37). CABI Publishing; 1999.

Finucane, M., Mertz, C., Slovic, P., & Schmidt, E. (2005). Task Complexity and Older Adults' Decision-Making Competence. *Psychology and Aging*, *20*, 71-84.

Gigerenzer, G. (2007). *Gut feelings: The intelligence of the unconscious.* New York, NY: Viking Penguin.

Gilovich, T., Griffin, D., & Kahneman, D. (Eds.). (2002). *Heuristics and biases: The psychology of intuitive judgment*. New York,NY: Cambridge University Press.

Glockner, A., & Witteman, C. L. M. (2010). Beyond dual-process models: A categorisation of processes underlying intuitive judgement and decision making. *Thinking & Reasoning, 16*, 1–25.

Greenwald, A.G., & Banji, M.R. (1995). *Implicit social cognition: attitudes, self-esteem, and stereotypes.* Psychological Review, 102, 4-27

Ham, J., Bos, K. v. d., & Doorn, E. A. V. (2009). Lady justice thinks unconsciously: Unconscious thought can lead to more accurate justice judgements. *Social Cognition. 27,* 509 – 521.

Hammond, K.R. (1996). Human judgment and social policy: Irreducible uncertainty, inevitable error, unavoidable injustice. New York: Oxford University Press.

Hammond, K. R., Hamm, R. M., Grassia, J., & Pearson, T. (1987). Direct comparison of the efficacy of intuitive and analytical cognition in expert judgment. IEEE Transactions on Systems, Man, and Cybernetics, SMC-17, 753–770.

Hasher, L., & Zacks, R. T. (1988). Working memory, comprehension, and aging: A review and a new view. In G. H. Bower (Ed.), *The Psychology of Learning and Motivation, Vol. 22* (pp. 193-225). New York, NY: Academic Press.

Henninger, D. E., Madden, D.J., & Huettel, S. A. (2010). Processing speed and memory mediate age-related differences in decision making. *Psychology and Aging*, 25, 262-270.

Hess, T.M., & Auman, C. (2001). Aging and social expertise: The impact of trait-diagnostic information on impressions of others. *Psychology and Aging, 16*, 497-510.

Hess, T.M., Bolstad, C.A., Woodburn, S.M., & Auman, C. (1999). Trait diagnosticity versus behavioral consistency as determinants of impression change in adulthood. *Psychology and Aging*, 14, 7-89.

Hess, T., Germain, C., Rosenberg, D., Leclerc, C., & Hodges, E. (2005). Aging-Related Selectivity and Susceptibility to Irrelevant Affective Information in the Construction of Attitudes. *Aging, Neuropsychology, and Cognition*, *12*, 149-174.

Hess, T.M., Osowski, N.L., & Leclerc, C.M. (2005). Age differences in sensitivity to diagnostic cues and the flexibility of social judgments. *Psychology and Aging, 20*, 447-459.

Hodgkinson, G. P., Langan-Fox, J., & Sadler-Smith, E. (2008). Intuition: A fundamental bridging construct in the behavioral sciences. British Journal of Psychology, 99, 1–27.

Hogarth, R. M. (2001*). Educating intuition.* Chicago, IL: The University of Chicago Press.

Hogarth, R. M. (2010). Intuition: A Challenge for Psychological Research on Decision Making. *Psychological Inquiry, 21*, 338 - 353.

Johnson, M. K. (1996). Feature memory and binding in young and older adults.*Memory & Cognition*, *24*(4), 403-416.

Johnson, M. S., & Drungle, S.C. (2000). Purchasing Over-The-Counter Medications: The Influence of Age and Familiarity. *Experimental Aging Research*, *26*, 245-261.

Jonides, J., Schumacher, E.H., Smith, E.E., Lauber, E.J., Awh, E., Minoshima, S., and Koeppe, R.A. (1997). Verbal-working-memory load affects regional brain activation as measured by PET. *Journal of Cognitive Neuroscience* 9, 462-475.

Kahneman, D., & Klein, G. (2009). Conditions for intuitive expertise: A failure to disagree. American Psychologist, 64, 515–526.

Kahneman, D., Slovic, P., & Trvesky, A. (Eds.). (1982). *Judgment under uncertainty: Heuristics and biases.* Cambridge, England: Cambridge University Press.

Kane, M. J., Conway, A. R., Miura, T. K., & Colflesh, G. J. (2007). Working memory, attention control, and the n-back task: A question of construct validity. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 33,* 615–622.

Klein, G. (1998). Sources of power: How people make decisions. MIT Press: Cambridge, M.A.

Lange, E., & Verhaeghen, P. (2009). No age differences in complex memory search: Older adults search as efficiently as younger adults. *Psychology and Aging*, *24*(1), 105-115.

La Voie, D., & Light, L.L. (1994). Adult age differences in repetition priming: A meta-analysis. Psychology and Aging, 9, 539–553.

Leclerc, C., & Hess, T. (2007). Age differences in the bases for social judgments: tests of a social expertise perspective. *Experimental Aging Research*, *33*, 95-120.

Light, L. L., & La Voie, D. (1993). Direct and indirect measures of memory in old age.

Light, L. L., Prull, M, W., LaVoie, D, J., Healy, M, R., Perfect, T, J and Maylor, E, A., (2000). Dual-process theories of memory in old age. (Ed) *Modules of cognitive aging debates in psychology*, (pp 238 – 300). Ney York, Oxford University Press.

Lieberman, M. D., Jarcho, J. M. & Satpute, A.B. (2004) Journal of Personality and Social Psychology,87, 421-435.

Loewenstein, G.F., Weber, E.U., Hsee, C.K., & Welch, E.S. (2001). Risk as feelings. Psychological Bulletin, 127, 267–286.

McIntyre, J. S., & Craik, F. I. (1987). Age differences in memory for item and source information. *Canadian Journal of Psychology/Revue canadienne de psychologie*, *41*(2), 175.

Min, L., Elliott, M., Wenger, N., & Saliba, D. (2006). Higher vulnerable elders survey scores predict death and functional decline in vulnerable older people. *Journal Of The American Geriatrics Society, 54*, 507-511.

Min, L., Yoon, W., Mariano, J., Wenger, N., Elliott, M., Kamberg, C., & Saliba, D. (2009). The Vulnerable Elders-13 survey predicts 5-year functional decline and mortality outcomes in older ambulatory care patients. *Journal Of The American Geriatrics Society*, *57*,, 2070-2076.

Mitchell, K. J., Johnson, M. K., Raye, C. L., & D'Esposito, M. (2000). fMRI evidence of age-related hippocampal dysfunction in feature binding in working memory. *Cognitive brain research*, *10*(1), 197-206.

Mohile SG, Bylow K, Dale W et al. (2007). A pilot study of the vulnerable elders survey-13 compared with the comprehensive geriatric assessment for identifying disability in older patients with prostate cancer who receive androgen ablation. *Cancer*;109, 802–810.

Morris, J., Woo, C., & Singh, A. (2005). Elaboration likelihood model: A missing intrinsic emotional implication. *Journal of Targeting, Measurement & Analysis for Marketing, 14*, 79-98.

Moye, J., & Marson, D. (2007). Assessment of decision-making capacity in older adults: An emerging area of practice and research. Journals of Gerontology Series B: Psychological Sciences & Social Sciences, 62B, 3-11.

Myers, D. G. (2002). *Intuition: Its powers and perils*. New Haven, CT: Yale University Press.

Myers, D. G. (2010). Intuition's Powers and Perils. *Psychology and Inquiry*, *21*, 371-377.

Naveh-Benjamin, M. (2000). Adult age differences in memory performance: Tests of an associative deficit hypothesis. Journal of Experimental Psychology: Learning, Memory, and Cognition, 26, 1170 –1187.

Naveh-Benjamin, M., Hussain, Z., Guez, J., & Bar-On, M. (2003). Adult age differences in episodic memory: further support for an associative-deficit hypothesis. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *29*(5), 826.

Nyberg, L., Bäckman, L., Erngrund, K., Olofsson, U., & Nilsson, L. G. (1996). Age differences in episodic memory, semantic memory, and priming: Relationships to demographic, intellectual, and biological factors. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *51*(4), 234-240.

Nyberg, L., Nilsson, L. G., Olofsson, U., & Bäckman, L. (1997). Effects of division of attention during encoding and retrieval on age differences in episodic memory. *Experimental aging research*, *23*(2), 137-143.

Oberauer, K. (2005). Binding and inhibition in working memory: individual and age differences in short-term recognition. *Journal of Experimental Psychology: General*, *134*(3), 368.

Perfetti, C. A. (1985). *Reading ability*. Oxford University Press.

Peters, E., Hess, T. M., Vastfjall, D., & Auman, C. (2007). Adult age differences in dual information processes. *Perspectives on Psychological Science*, *2*, 1–23.

Peters, E., & Slovic, P. (2007). Affective asynchrony and the measurement of the affective attitude component. *Cognition and Emotion*, *21*, 300–329.

Plessner, T., Betsch, C., & Betsch, T. (Eds.). (2008). *Intuition in judgment and decision making*. Mahwah, NJ: Erlbaum.

Polyak, L. (2000). The Center of attention. *American Demographics*, *22*, 30-33.

Queen, T.L., & Hess, T.M. (2010). Age differences in the effects of conscious and unconscious thought in decision-making. *Psychology and Aging. 25, 251 – 261.*

Rahhal, T. A., May, C. P., & Hasher, L. (2002). Truth and character: Sources that older adults can remember. *Psychological Science*, *13*(2), 101-105.

Reyna, V.F. (2004). How people make decisions that involve risk: A dual-processes approach. *Current Directions in Psychological Science, 13,* 60–66.

Rybash, J. M. (1996). Implicit memory and aging: A cognitive neuropsychological perspective. *Developmental Neuropsychology, 12,* 127-179.

Saliba, D., Elliott, M., Rubenstein, L. Z., Solomon, D. H., Young, R. T., Kamberg, C. J., & ... Wenger, N. S. (2001). The Vulnerable Elders Survey: A Tool for Identifying Vulnerable Older People in the Community. *Journal Of The American Geriatrics Society, 49*, 1691-1699.

Salthouse T, A., McGurthy K, A., & Hambrick, D, Z. (1999) A framework for analyzing and interpreting diVerential aging patterns: application to three measures of implicit learning. *Aging Neuropsychol*ogy *Cognition* 6, 1–18.

Simon, H. A. (1992). What is an “explanation” of behavior? *Psychological Science, 3,* 150–161.

Sinclair, M. (2010). Misconceptions about Intuition. *Psychological Inquiry, 21,* 378 - 386.

Sinclair, M., Ashkanasy, N. M., Chattopadhyay, P., & Boyle, M. V. (2002). Determinants of intuitive decision-making in management: The moderating role of affect. In N. M. Ashkanasy,W. Zerbe, & C. E. J. Ha¨ rtel (Eds*.), Managing emotions in the workplace*: 143–163. Armonk, NY: M. E. Sharpe

Sloman, S.A. (1996). The empirical case for two systems of reasoning. *Psychological Bulletin, 119,* 3–21.

Stanovich, K. E. (1999). Who is rational? Studies of individual differences in reasoning. Mahwah, NJ: Erlbaum.

Stanovich, K. E., & West, R. F. (2000). Individual differences in reasoning: Implications for the rationality debate? *Behavioral and Brain Sciences, 23,* 645–726.

Staudinger, U. M., & Baltes, P. B. (1996). Interactive minds: A facilitative setting for wisdom-related performance?. *Journal of Personality and social psychology*, *71*(4), 746.

Tariq, S, H., Tumosa, N., Chibnall, J. T., Perry, M. H., Morley, J. E., (2006). Comparison of the Saint Louis University Mental Status Examination and the Mini-Mental State Examination for Detecting Dementia and Mild Neuro cognitive Disorder-A Pilot Study. *American Journal of Geriatric Psychiatry. 14*, 909-910.

Tversky, A., & Kahneman, D. (1973). Availability: A heuristic for judging frequency and probability. *Cognitive Psychology, 5*, 207-232.

Van der Linden, M., & Bredart, S. (1994). Age-related differences in updating working memory. *British Journal of Psychology, 85*, 145.

Wayde, E., & Black, S. R., (2013). Decision Making of Younger and Older Adults in Familiar and Unfamiliar Domains. *Psychology and Aging.* Manuscript submitted for publication.

Wechsler, D. (2008). *Wechsler Adult Intelligence Scale–Fourth Edition*. San Antonio, TX: Pearson.

Weiss, H. M., & Cropanzano, R. (1996). Affective events theory:A theoretical discussion of the structure, causes and consequences of affective experiences at work. *Research in Organizational Behavior*, 18: 1–74.

Zacks, R. T., Hasher, L., Doren, B., Hamm, V., & Attig, M. S. (1987). Encoding and memory of explicit and implicit information. *Journal of Gerontology, 42*(4), 418-422.

Zacks, R.T., Hasher, L., & Li, K.Z.H. (2000). Human memory. In F.I.M. Craik & T.A. Salthouse (Eds.), The handbook of aging and cognition (2nd ed., pp. 293–357). Mahwah, NJ: Erlbaum.

Zeelenberg, M., Nelissen, R. M, Breugelmans, S. M., & Pieters, R. (2008). On emotion specificity in decision making: Why feeling is for doing. Judgment and Decision Making, 3, 18 – 27.

Zeelenberg, M., & Pieters, R. (2006). Feeling is for doing: A pragmatic approach to the study of emotions in economic behavior. In D. DeCremer, M. Zeelenberg & J. K. Murnighan (Eds.), Social psychology and economics (pp. 117–137). Mahwah, NJ: Erlbaum.

LIST OF APPENDICES

APPENDIX A

Pilot Results

Pilot Study 1

Pilot Study 1 was conducted to determine the optimum amount of time required for younger and older adults to read and understand the features associated with each of the purchasing options without engaging in extensive deliberation of the material they were reading.

Participants. Fifteen older adult participants aged 65 or older and twenty two younger undergraduate participants were tested for this study. Older adult participants were recruited from a retirement home in the Tuscaloosa community. Older adult participants received $5 for their participation. Younger adult participants were recruited from the Subject Pool at the University of Alabama and received course credit for their participation. Two older adult participants who scored less than 21 on the SLUMS and one additional older adult participant who could only remember 1 item were dropped from the final analysis. The individuals were dropped because of suspicion of severe cognitive impairment. Two younger adult participants were dropped from the final analysis. These 2 individuals remembered less than 4 items suggesting that they did not take the task seriously. Thus, the final data analysis was conducted on 13 older adults and 20 younger adults.

Procedure. Younger adult participants were given varying times (10 seconds, 15 seconds or 20 seconds) to read the decision making material. This range is representative of the majority of the times allotted in previous studies (Acker, 2008; Dijksterhuis, 2004; Queen & Hess, 2010). Once participants completed the reading of the features in a purchasing scenario, a memory test was administered to examine the amount of features each participant could remember in each time session (10 seconds, 15 seconds and 20 seconds). Older adults only received one time period (38 seconds) as this minimum time was found to be adequate. As with younger adults, immediately following the reading, older adult participants were asked to recall as many items as possible in a memory test.

Results. For younger adults, the timeframe that allowed the majority of participants (65%) to read the features of both purchasing options and remember at least 7 features was 20 seconds. These younger adult participants remembered an average of 8.7 words. For older adults, the majority of participants (67%) remembered at least 7 features in 38 seconds. These older adult participants remembered an average of 8.6 words.

Pilot Study 2

Plot Study 2 was conducted with younger adults to determine that the desired interaction between domain knowledge and thought condition could be achieved with younger adult participants.

Participants. Twenty six younger adult participants were recruited from the Subject Pool at the University of Alabama and received course credit for their participation. Participants completed the second phase of the pilot task (13 completed the conscious decision making task and 13 completed the distracted decision making task). Part of the scores of six participants in the conscious decision making condition were dropped as they did not respond in the time frame permitted. Thus, the final analysis of the main decision making task was conducted on 20 participants.

Procedure. Thirteen participants in the conscious condition were presented with two options for a cell phone purchasing scenario and given 20 seconds to read through the features of each option. After the time limit elapsed, the options were removed from the screen. Participants were then instructed to take 3 minutes to deliberate about the two options. Immediately following this time limit, participants were given one second to choose one of the options they had seen. This procedure was repeated for the house purchasing choice. As a manipulation check, participants also completed explicit versions of the cell phone and house purchasing choice. Participants were then asked to rate the quality of each of the 8 individual options they had seen. Participants then completed a demographic questionnaire.

For the distracted condition, 13 participants were first introduced to the *n-back* task and given instructions on how to perform the task. They then completed a practice trail to ensure they understood the instructions on how to perform the task. Following this, participants were presented with two options of a cell phone purchasing scenario and given 20 seconds to read through the features of each option. After the time limit elapsed, the options were removed from the screen. Participants were then instructed to perform the *n-back* task for 3 minutes to occupy their working memory capacity. Immediately following this time limit, participants were given 1 second to choose one of the options they had seen. This procedure was repeated for the house purchasing choice and again for explicit versions of the cell phone and house purchasing choice. Participants were then asked to rate the quality of each of the 8 individual options they had seen. Participants then completed a demographic questionnaire.

Results. Initial results examined accuracy during the decision making task. Across the entire main task, participants demonstrated a mean accuracy of 65% (SD = 48.8%), for the familiar condition and a mean accuracy of 60% (SD = 50.3%), for the unfamiliar condition, suggesting participants made better quality decision in familiar conditions as opposed to unfamiliar conditions. Within the familiar condition, individuals in the conscious condition demonstrated a mean accuracy of 50% (SD = 53.5%), and individuals in the distracted condition demonstrated a mean accuracy of 75% (SD = 45.2%). Within the unfamiliar condition, individuals in the conscious condition demonstrated a mean accuracy of 75% (SD = 46.3%), and individuals in the distracted condition demonstrated a mean accuracy of 50% (*SD* = 52.2%). This suggests that participants in the distracted condition made better decisions about familiar scenarios as opposed to the unfamiliar scenarios, while in the conscious condition, participants made better decisions about unfamiliar scenarios as opposed to familiar scenarios.

Results of a mixed factorial 2 Familiarity (Familiar vs. Unfamiliar) X 2 Thought condition (Conscious vs. Distracted) indicated that while the interaction between familiarity and thought condition, was not significant, $F(1,18) = 3.76$, $MSE = .60$, $p = .07$, $\eta^2_p = .0173$, there was a general trend towards significance.

The explicit decision making task was used as a manipulation check to ensure that participants are taking the task seriously. In this task, no prior knowledge about the subject matter is required to make the best decision. For the explicit decision making task, across the entire explicit task, participants demonstrated a mean accuracy of 100% (*SD* = 0%), for the familiar condition and a mean accuracy of 84% (*SD* = 37.4%), for the unfamiliar condition, suggesting participants made better quality decision in familiar conditions as opposed to unfamiliar conditions. Within the familiar condition, individuals in conscious and the distracted condition demonstrated a mean accuracy of 100% (*SD* = 0%). Within the unfamiliar condition, individuals in the conscious condition demonstrated a mean accuracy of 92% (*SD* = 28.9%), and individuals in the distracted condition demonstrated a mean accuracy of 77% (*SD* = 43.9%). This suggests that both participants in the distracted and conscious condition made better decisions about familiar scenarios as opposed to the unfamiliar scenarios. Additionally, participants in the conscious condition made better decisions about familiar scenarios than participants in the unfamiliar condition. Results of a mixed factorial 2 Familiarity (Familiar vs. Unfamiliar) X 2 Thought condition (Conscious vs. Delayed) indicated that while the interaction between familiarity and thought condition, was not significant, $F(1,23) = .97$, $MSE = .07$, $p = .34$, η^2_p = .040, there was a significant main effect of familiarity, $F(1,23) = 4.39$, $MSE = .31$, $p < .05$, η^2_p = .160.

Appendix B

Decision Making Tasks

Figure 1: Critical Cell Phone Task

Cell Phone Z	**Cell Phone M**
Unlimited minutes	Unlimited minutes
Video enabled	Video enabled
Free nights	Free nights and weekends
Free international roaming	Free international roaming
Free text messaging	Free text messaging
8 Mega pixel camera	8 Mega pixel camera
3G enabled	4G enabled
Roll over minutes	Roll over minutes
Mp3 Player	Mp3 Player
Blue tooth enabled	Blue tooth enabled
Internet access enabled	No internet access
$110	$110

Figure 2: Critical House Task

House M	**House Z**
$204,000	$198,000
Dish Washer included	Dish Washer included
3 bathrooms	3 bathrooms
Home inspection included	Potted plants
3 bedrooms	3 bedrooms
$400 Home Owners Association fees	$400 Home Owners Association fees
Washer and Dryer included	Washer and Dryer included
Handicap accessible	Handicap accessible
2 car garage	2 car garage
Central air conditioning	Central air conditioning
1800 sq feet	1800 sq feet
Basement	Basement

Figure 3: Explicit Cell Phone Task

Cell Phone Z	**Cell Phone M**
Unlimited minutes	800 minutes
Video enabled	Video enabled
Free nights and weekends	Free nights and weekends
Free international roaming	Free international roaming
Free text messaging	20c/text message
8 Mega pixel camera	8 Mega pixel camera
4G enabled	3G enabled
Roll over minutes	Roll over minutes
Mp3 Player	Mp3 Player
Blue tooth enabled	Blue tooth enabled
Unlimited Internet access	2MB of free Internet access
$110	$110

Figure 4: Explicit House Task

House Z	**House M**
$204,000	$198,000
Dish Washer included	Dish Washer included
3 bathrooms	3 bathrooms
Home offered as is	Home inspection included
3 bedrooms	3 bedrooms
$400 Home Owners Association fees	$250 Home Owners Association fees
Washer and Dryer hook ups	Washer and Dryer included
Handicap accessible	Handicap accessible
Car port	2 car garage
Central air conditioning	Central air conditioning
1800 sq feet	1800 sq feet
Basement	Basement

APPENDIX C

Institutional Review Board Approval

Office for Research

Institutional Review Board for the Protection of Human Subjects

THE UNIVERSITY OF ALABAMA
RESEARCH

July 5, 2012

Ernest Wayde
Department of Psychology
College of Arts & Sciences
Box 870348

Re: IRB#: 11-OR-245-R1 "The Effects of Unconscious Thought and Domain Familiarity on Younger and Older Adult Decision Making"

Dear Mr. Wayde:

The University of Alabama Institutional Review Board has granted approval for your renewal application.

Your protocol has been given expedited approval according to 45 CFR part 46. You have also been granted the requested waivers. Approval has been given under expedited review category 7 as outlined below:

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Your application will expire on July 4, 2013. If your research will continue beyond this date, complete the relevant portions of the IRB Renewal Application. If you wish to modify the application, complete the Modification of an Approved Protocol Form. Changes in this study cannot be initiated without IRB approval, except when necessary to eliminate apparent immediate hazards to participants. When the study closes, complete the appropriate portions of the IRB Request for Study Closure Form.

Please use reproductions of the IRB approved stamped consent forms/information sheets to obtain consent from your participants.

Should you need to submit any further correspondence regarding this proposal, please include the above application number.

Good luck with your research.

Sincerely,

Carpantato T. Myles, MSM, CIM
Director & Research Compliance Officer
Office of Research Compliance
The University of Alabama

358 Rose Administration Building
Box 870127
Tuscaloosa, Alabama 35487-0127
(205) 348-8461
FAX (205) 348-7189
TOLL FREE (877) 820-3066