

## ABSTRACT

QUEEN, TARA L. Age Differences in the Effects of Conscious and Unconscious Thought on Decision Making. (Under the direction of Thomas M. Hess, Ph.D.)

Recent research has suggested that young adults make the most optimal decisions when the problem is weighed at the unconscious level, or when they engage in little deliberation (Dijksterhuis, 2004). This is an intriguing finding with important implications for older adults' decision making given normative age-related declines in deliberative processing. In the current study, I investigated age differences in the benefits of unconscious relative to conscious thought. I also examined the extent to which these benefits interact with the processing demands of the decision task, and further if age-related benefits associated with unconscious processing might be specific to certain decision making tasks. For example, if the decision task requires selective attention to relevant material, rather than simple evaluation, conscious thought may be more beneficial than unconscious thought and aging may negatively affect performance. Using a procedure developed by Dijksterhuis, young ( $N = 62$ ) and older adult participants ( $N = 63$ ) engaged in unconscious or conscious thought processing before selecting a choice from information regarding apartments and banks. The information was presented as intuitive (i.e., optimal choice contained the most positive attributes) or deliberative (i.e., optimal choice based on a subset of information). The results of the study revealed that young adults performed well on the decision task when unconsciously processing intuitive information and consciously processing deliberative information. Older adults were more influenced by the type of information rather than thought processing, which lead them to perform better when they received intuitive information rather than deliberative information, regardless of thought condition.

Additionally, both young and older adults displayed choice supportive memory, whereas neither age nor thought condition affected choice satisfaction.

Age Differences in the Effects of Conscious and Unconscious Thought in Decision Making

by  
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Adults of all ages face simple and difficult decisions that affect short-term and long-term outcomes on a daily basis. As we age, we expect changes and declines in physical health and memory, which may in turn affect our ability to make decisions. Currently, there is limited research on this topic, perhaps because on the surface, older adults do not outwardly display decision-making deficiencies as their confidence in their decision-making abilities remains high (Mather, 2006). There is some evidence, however, that with age comes a change in our ability to make decisions. Previous research has investigated the effects of emotion (e.g. Löckenhoff & Carstensen, 2004) and neurological decline (e.g. Denburg, Tranel, & Bechara, 2005) on older adults' decision making, but few studies have concentrated on the ways in which older adults process information in order to make a decision. Due to the increase of difficult decisions during later adulthood, such as those involving retirement, health plans, and end of life care, it is important that older adults maintain their ability to make optimal decisions or, at the very least, that we understand the conditions under which optimal levels of functioning are maintained. The results from previous studies have suggested that older adults' decision making abilities may be impaired due to the declines in cognitive resources and executive functions that come with age (Mather 2006). Traditionally, it has been believed that optimal decision making is dependent on careful deliberation and consideration of many options. Recent research with young adult adults, however, suggests that the best decisions are made without deliberative thought (Dijksterhuis, 2004). If this is the case, perhaps, in some contexts, older adults' decision-making abilities are not as impaired as previously indicated.

In thinking about the relationship between aging and decision-making, it is useful to first understand the processes involved in making decisions. When faced with a difficult decision, people tend to believe that the problem warrants intense thought and deliberation. This process may include various methods of active deliberation, such as comparing and contrasting attributes of alternatives or the weighing of positive and negative consequences. Moreover, deliberation is dependent upon cognitive resources and the efficiency of executive functions. It is generally recognized that our cognitive resources decline with age, which in turn suggests that our ability to make thoughtful decisions should also decline. Although this seems to be a logical conclusion, previous research has reported inconsistent results across studies, which may indicate that certain aspects of decision making are more affected by age than others. For example, due to their limited availability of cognitive resources, older adults may seek less information about choice options and rely on compensatory strategies, such as a “satisficing” strategy in which deliberation is halted once a satisfactory—but not necessarily best—choice is made (Johnson, 1990; Riggle & Johnson, 1996). Similar studies have indicated that when presented with complex tasks and an abundance of information, declines in executive function hinder older adults’ abilities in making well-informed decisions. Declines in executive skills alone, however, do not appear to be the sole explanation for observed differences in decision making (Finucane, Mertz, Slovic, & Schmidt, 2005; Peters, Finucane, Macgregor, & Slovic, 2000). Although it has been found that older adults are disadvantaged when tasks require high executive functioning, age differences are minimized when tasks are familiar, incorporate affect, or involve implicit

knowledge, and when older adults are allowed to draw on their experience (for review, see Peters, Hess, Västfjäll, & Auman, 2007).

As found in previous research, older adults' decision-making skills may be compromised when the task requires active deliberation (National Research Council, 2006), thus it would be interesting to consider how their decisions change when conscious deliberation is avoided. Contrary to earlier assumptions regarding the importance of deliberation, Dijksterhuis (2004) found that people make optimal decisions when the problem is weighed at the unconscious level, particularly when the amount of information to be considered is relatively large. Through a series of experiments in which university students evaluated housing options and potential roommates, Dijksterhuis found that participants who actively reflected on the previously presented choice options were less likely to make optimal decisions than were participants who, instead, engaged in a working memory task. In other words, attentively focusing on the precise details of a choice, or engaging in conscious thought, did not lead to optimal decision-making. In order to explain these results, Dijksterhuis and Nordgren (2006) proposed the deliberation-without-attention effect which states that conscious thought is constrained by the complexity of a decision; that is, as complexity increases, the quality of a decision made at the conscious level decreases. In contrast, decisions made at the unconscious level are unaffected by the complexity of the task, therefore making unconscious thought particularly valuable when faced with a difficult or complex decision.

It is important to note that there are some caveats to Dijksterhuis' claims. For example, across Dijksterhuis' studies, the optimal choice is consistently classified as that

with the highest number of positive attributes. In reality, our choices are rarely this obvious; thus, there may be limitations regarding the degree of superiority for unconscious thought across decision contexts. Additionally, the generalizability of the benefits of unconscious thought across age groups is brought into question. It therefore seems reasonable to ask if the benefits of unconscious thought are preserved when the decision-making situation is more complex and if the effects of unconscious thought under these circumstances can be generalized to all age groups.

Although not modeled on Dijksterhuis' studies, the results of research by Hess, Pullen, and McGee (1996) appear to be consistent with the suggestion that older adults' use of unconscious thought may be advantageous in making decisions. This study focused on the ability to learn and use new information, with young and older adults being given the task of learning the characteristics of a fictitious social group through exposure to descriptions of group members. In the arbitrary prototype condition, group membership was based on a randomly selected set of attributes that were positive, neutral, and negative in nature. In the positive prototype condition, membership was based on the evaluative content of the attributes. Therefore, the more positive traits the person had, the more likely it was that the person was a group member. In the arbitrary prototype condition, in which successful performance required active deliberation, Hess and colleagues found that young adults learned the task much better than older adults. From participants' reports, it was found that older adults relied on general impressions whereas young adults engaged in deliberative processing by utilizing a hypothesis- testing strategy in which they focused on specific rules based on the prototype. In comparison to the arbitrary prototype condition, the positive

prototype condition demanded little controlled processing in that learning could proceed through the relatively automatic processing of evaluative information. Older adults performed well on the task and learned the prototype significantly faster than the young adults. Young adults initially struggled to disregard the use of deliberative processing, and once again self-reported using a hypothesis-testing strategy. Older adults, however, were at an advantage—at least initially—as their general impressions strategy was appropriate for this task. Though the research did not explicitly focus on conscious or unconscious thought, their results are comparable to Dijksterhuis' findings. For example, the tasks that required controlled processing, such as the arbitrary prototype task, can be compared to conscious thought, which is resource demanding and requires active deliberation. Unconscious thought, on the other hand, may be compared to the positive prototype task, which required little controlled processing. Therefore, older adults performed better than young adults when the task allowed them to engage in unconscious thought processing, but young adults performed better than older adults when the task was suited for deliberative processing.

Based on the previous work that emphasized the superiority of unconscious thought, Dijksterhuis and van Olden (2005) hypothesized that unconscious thought would be strongly associated with higher choice satisfaction. The researchers proposed that conscious deliberation increases introspection which, in turn, decreases choice satisfaction. Unconscious thought, however, was proposed to decrease introspection and increase choice satisfaction. In this study, young adult participants were shown several art posters and were instructed to evaluate the options consciously, by considering each choice carefully, or unconsciously, by performing a working memory distracter task. After three minutes,

participants were asked to choose a poster and, at the conclusion of the experiment, were presented with the poster of their choice. Several weeks later, the participants were contacted in order to assess their satisfaction of their choice. The researchers found that the participants who evaluated the artwork at the unconscious level were more satisfied with their choice than the participants who engaged in conscious thought. Dijksterhuis and von Olden argue that conscious thought does not lead to a lack of preferences among choices, but instead distorts the importance or unimportance of specific attributes.

Dijksterhuis and van Olden's study on post-choice satisfaction is comparable to the concept of choice-supportive source monitoring, found in the cognitive literature. Choice supportiveness refers to the extent to which our memory of past choices is biased towards positive information. More specifically, it is the measure to which people falsely attribute positive features and fail to attribute negative features to a choice they have made. Studies on choice-supportive source monitoring (see Mather, Shafir, & Johnson, 2000; Mather & Johnson, 2000) have revealed that people prefer a previously made choice over other options. Mather and Johnson (2000) examined how choice supportiveness changes with age. Participants were assigned to one of two experimental conditions and were instructed to review choices affectively, which focused on feelings towards the choice options, or factually, which focused on the details of the options. After three different time delays, participants were given a memory test for the choices, rated their confidence in their responses, and were asked to indicate which option they had previously chosen. Overall, Mather and Johnson found that older adults displayed more choice supportiveness than young adults. The researchers also found that both young and older adult participants in the

affective review condition favored their chosen option more than those in the factual review condition. Similar to the Hess et al. (1996) study, the affective review condition in the Mather and Johnson research allowed participants to intuitively process information, whereas the factual review condition demanded deliberative processing. Dijksterhuis and van Olden's (2005) finding of superior post-choice satisfaction in the unconscious thought condition may be related to the fact that unconscious thought allows for intuitive processing and conscious thought requires deliberative processing (see also Wilson, Lisle & Schooler, 1993). If true, this might also account for the age differences observed by Mather and Johnson (2000).

The purpose of the current study was to investigate age differences in the effectiveness of conscious and unconscious thought based on Dijksterhuis and Nordgren's (2006) ideas. Older and young adult participants were assigned to conscious and unconscious thought conditions and were asked to make decisions based on differing scenarios. One goal of the current study was to explore how the effects of conscious thought are strengthened or weakened by the material presented. Of particular interest was the extent to which the effects of unconscious thought found in Dijksterhuis' studies could be generalized to situations in which the optimal choice may not necessarily be identified simply on the basis summary evaluative information. In all of his studies, Dijksterhuis presented participants with three options: a positive choice, identified by mostly positive attributes, a mediocre choice with balanced positive and negative attributes, and a negative choice, identified by mostly negative attributes. Unfortunately, the daily decisions that we face are not always that straightforward. Therefore, in this study the optimal choice did not always contain the most positive attributes. In addition to replicating the structure of

Dijksterhuis' stimuli, participants were also presented with scenarios in which the optimal choice had an equal amount of positive and negative attributes and participants had to focus on a subset of information in order to make a decision. In a situation where positive and negative attributes are the same across choices, participants may have to adopt new strategies to arrive at a decision rather than calculating the number of positive versus negative attributes (e.g., inhibit irrelevant information). If the results relating to the superiority of unconscious thought identified by Dijksterhuis and colleagues are based primarily in the automatic processing of evaluative information, then it may be the case that this same superiority will not be observed in situations where the optimal decision can not be determined on the basis of such content. In contrast, if the effect is independent of the nature of the choice attributes, then the content should not matter.

The results from Hess et al. (1996) revealed that young adults performed well on the prototype learning task when it required active deliberation. Conversely, older adults performed better than young adults when the task demanded little controlled processing. Based on these results, it is hypothesized that when presented with explicit information, where the optimal choice is marked by the most positive attributes, young adults will make better decisions when engaged in unconscious thought than when engaged in conscious thought. Since this task requires little deliberative processing and young adults seem to automatically rely on deliberative processing, it is expected that they will perform well when engaged in unconscious thought, or when they are not able to engage in controlled processing. When given deliberative information, in which the optimal choice contains an equal number of positive and negative attributes, it is hypothesized that young adults will



perform better when engaged in conscious thought than when engaged in unconscious thought. Since deliberative material requires controlled processing and young adults automatically engage in this type of processing, they should perform well in comparison to those in the unconscious thought condition.

In regards to older adults, it is hypothesized that the type of material, deliberative or intuitive, will have more of an effect on performance than conscious or unconscious thought. Since the ability to process intuitive information does not necessarily deteriorate with age, it is hypothesized that older adults will make optimal decisions when presented with this type of material, regardless of engaging in conscious or unconscious thought. Aging-related reductions in deliberative processes will minimize the impact of thought type in the older adults. That is, similar to the results of Hess et al., it is anticipated that older adults will be less likely than young adults to engage in deliberative processing in all situations. Thus, the extent to which the type of information on which the optimal choice is based matches their normal processing style will be the primary determinant of performance in this group. Since deliberative material requires controlled processing, it is also hypothesized that older adults will make poorer choices when presented with deliberative information than with intuitive information, regardless of thought condition.

Choice satisfaction and choice supportiveness will also be measured. Consistent with previous work (Dijksterhuis & van Olden, 2005; Wilson, Lisle, & Schooler, 1993) it is predicted that both of these factors will be higher in situations in which performance is based on unconscious thought than in situations based on conscious or deliberative processing. In addition, consistent with Mather and Johnson (2000), it is hypothesized that both choice

satisfaction and choice supportiveness will also increase with age, with older adults reporting more choice satisfaction and choice supportiveness than young adults. This reflects the dependence of older adults' processing and the strength of supportiveness and satisfaction effects being based in the use of unconscious thought.

## Methods

### *Design*

This experiment used a 2 (Age Group) x 2 (Thought Condition) x 2 (Information Condition) design, with age and thought condition treated as between-participants variables and information condition as a within-participants variable. Participants in the two age groups (old and young) were randomly assigned to the conscious or unconscious thought condition. In each thought condition, participants were presented with two decision tasks, one in which the optimal decision was based on deliberatively processed information and one in which it was based on intuitively processed information. The order in which the intuitive and deliberative choice materials were presented was counterbalanced within each Age X Thought Condition group.

### *Participants*

A total of 125 participants were recruited for this experiment. Sixty two young adult participants (33 men, ages 17-28) were recruited from introductory psychology classes and received credit toward an optional course assignment. Sixty three older adults (32 men, ages 60 to 86) were recruited from the lab database of interested community-dwelling adults, and each received \$20 for their participation. The short Blessed Orientation-Memory-Concentration test (Katzman, 1983), a brief test of cognitive functioning, was used as a

screening instrument. A score of 7 or above is an indication of possible cognitive impairment. No participants met this criterion and were therefore not eliminated.

### *Materials*

Participants were asked to make two decisions in which they would choose one apartment and one checking account. Each decision-making task consisted of four choice alternatives, each of which was described by twelve attributes along the same 12 dimensions. Six dimensions were considered “core” dimensions in that they were related specifically to the decision task. The other six dimensions were considered “superficial” in that they were not necessarily relevant to the primary decision task. Decisions were based on the choice with the most positive attributes in the intuitive condition or on the number of positive attributes on the most relevant core dimensions in the deliberative condition. Materials were counterbalanced so that the banking decision and the apartment decision were presented in the intuitive and deliberative conditions equally often within age groups.

Decision making contexts were developed for both tasks and were used to determine core and superficial attributes. The contexts were short paragraphs for the apartment and bank tasks that described the attributes participants should focus on when making their decision. The decision contexts were presented as follows:

You and your spouse are searching for an apartment for yourselves and an occasional out-of-town guest. You are a physically active couple who prefer to live in a safe, well maintained community that is close in proximity to shopping. You would also prefer to have plenty of storage space.

You are searching for a secure and reputable bank that provides reliable customer assistance for your personal finances. You are interested in taking out a home equity loan, but are also looking for a bank that offers a variety of investment options. The bank and its services should be easily accessible and charge minimal fees.

The six attributes identified in each of these contexts were identified as core attributes. The core attributes for the apartment were: guest room, exercise amenities, safety, low-maintenance, proximity to shops, and storage space. For the bank, the core attributes were: reputation, customer service, loan availability, investment options, accessibility, no fees. All other attributes presented in the decision making tasks were considered superficial attributes which were not relevant to the making the optimal decision.

*Intuitive choice condition.* The four alternatives in the intuitive condition each contained four positive core attributes and two negative core attributes. The six remaining attributes for each alternative were considered less important in making a decision and the number of these that were positive or negative was not consistent through the four choices. (For a depiction of the attribute distribution across alternatives, see Table 1). As in Dijksterhuis (2004), the optimal choice in the intuitive condition was characterized by number of positive attributes (8 positive and 4 negative attributes). The three remaining choices were mediocre or less optimal options. Two of the alternative choices were mediocre choices with 4 positive and 2 negative core attributes and 2 positive and 4 negative superficial attributes. The last alternative contained 4 positive and 2 negative core attributes and 6 negative superficial attributes. By holding the number of positive and negative core attributes constant across choices, bias due to varied weighing of positive and negative attributes across core and superficial dimensions was eliminated. Identification of the most optimal choice aligned with the summary evaluative score of the choices, which was calculated by the total number of positive attributes (both core and superficial) minus the

total number of negative attributes (both core and superficial). Based on Table 1, it is evident that the first choice has the highest summary score and is therefore the optimal choice, whereas the fourth choice has the lowest summary score and should be identified as the least optimal choice.

Table 1  
*Attribute distribution: Intuitive material*

	Optimal	Mediocre 1	Mediocre 2	Least optimal
Core positive	4	4	4	4
Core negative	2	2	2	2
Superficial positive	4	2	2	0
Superficial negative	2	4	4	6
Summary score	4	4	4	4
Overall evaluative score	4	0	0	-4

*Deliberative choice condition.* In the deliberative condition, the choices varied in terms of the number of positive core dimension attributes, with identification of the optimal choice requiring participants to focus on this subset of attributes. Unlike Dijksterhuis' studies, the optimal choice was not characterized by overwhelmingly positive attributes, but rather had an equal number positive and negative attributes overall: six positive core attributes and six negative superficial attributes. (For a depiction of the attribute distribution across alternatives, see Table 2). One alternative was a lure with 8 positive and 4 negative attributes, but only 4 of the core attributes were positive and 2 were negative. This option also contained 4 positive and 2 negative superficial attributes. Another alternative also

contained 6 positive and 6 negative attributes, but was of lesser attractiveness as only 2 of the core attributes were positive and 4 were negative. This choice also included 4 positive and 2 negative superficial attributes. The last alternative contained 4 positive and 2 negative core attributes and 6 negative superficial attributes. In this condition, participants should have rated the attractiveness of the choices based on the number of positive core attributes, which in turn should be the basis for their final decision. The summary scores of the options in this condition were similar to those in the intuitive condition, but this score was uncorrelated with the information on which the optimal choice in the deliberative condition was based (i.e. number of positive core features). Based on Table 2, it is evident that the first choice has the most positive core attributes, therefore making it the optimal choice. The fourth choice, however, has few positive core attributes and should be identified as the least optimal choice.

Table 2  
*Attribute distribution: Deliberative material*

	Optimal	Mediocre 1	Mediocre 2	Least optimal
Core positive	6	4	4	2
Core negative	0	2	2	4
Superficial positive	0	4	0	4
Superficial negative	6	2	6	2
Summary score	6	4	4	2
Overall evaluative score	0	4	-4	0

*Background/ability measures.* Participants completed several background questionnaires for descriptive purposes. A standard demographic questionnaire and the SF-36 Health Questionnaire (Ware, 1993) were administered before starting the experiment in order to assess participants' general demographic information as well as their health status.

After completing the experimental part of the study, participants completed several ability measures, including the Letter/Number sequencing task, the Digit Symbol task, and the Vocabulary test from the Wechsler Adult Intelligence Scale III (WAIS-III; Wechsler, 1997).

#### *Procedure*

Participants were tested individually and were told that the researchers were interested in how people make decisions. Participants were further informed that they would be presented with two decision tasks and that each task would consist of making a choice between four alternatives. They were instructed to develop an impression of each choice as they read through the materials and were told that they would be asked to make a decision later in the study based on their impressions.

Before participants were presented with information about the choices in each task, they were instructed to read a short passage, which presented the context in which they should make their decision. There were two passages describing the decision context, one for the apartment and one for the checking account, which were standard across conditions.

The presentation format closely followed that used in Dijksterhuis (2004). As in this research, all information was presented via a computer. To be sure that all participants could read the materials clearly, information was presented on 22 inch LCD monitors in large text.

The four choice options appeared in random order as did the twelve attributes for the options. The first choice option and all twelve attributes were presented for 30 s. After 30 s, the next option appeared to the right of the first option for the same amount of time. The third and fourth options were added in the same manner. At the conclusion of the presentation, the screen went blank and the participants were given instructions based on their thought condition. Thought instructions were identical to those used by Dijksterhuis (2004).

In the conscious thought condition, participants were given 3 min to actively deliberate on the choice options. The participants were told to utilize this time to reflect carefully on their thoughts of each option. During this time, participants were not permitted to reread the materials and the computer screen was blank. Participants in the unconscious thought condition were given anagrams to solve in attempt to prevent them from reflecting on the choices. They were also given 3 min to work on this task.

After 3 min, participants in both conditions were asked to choose the apartment or bank that they considered optimal. After making a decision, participants completed an attitude questionnaire in order to assess their opinions towards each of the options. As in Dijksterhuis (2004), participants were asked to rate their judgments of the four choices on a 10-point scale (1 indicating least optimal and 10 indicating most optimal). Participants were not permitted to reread the materials for this task. These two means of assessing choice provided a more sensitive examination of decision quality.

After a brief rest period, the second decision task was presented. The presentation order of the deliberative and intuitive choice conditions was counterbalanced across thought



conditions within each age group. In addition, the type of decision (i.e., apartment vs. checking account) was also systematically varied across conditions and presentation orders.

After completion of the second task, participants were administered the aforementioned tests from the WAIS-III. Choice satisfaction and choice supportiveness were then measured following the completion of the ability tasks. Participants completed the choice satisfaction and choice supportiveness measures for the first decision task and were then administered the same tests for the second decision task. In order to measure choice satisfaction, participants were asked to rate the degree to which they were satisfied with their decision on a 10-point scale (1 indicating not satisfied, 10 indicating very satisfied). Choice-supportive memory was assessed in order to measure the extent to which participants falsely attribute positive features and fail to attribute negative features to the choice they made. All attributes from the four choice options were presented on the computer screen in random order, and participants were asked to determine whether or not each attribute was associated with option they chose.

At the conclusion of the study, participants were asked to re-read the materials. After reading each attribute, participants rated how important they felt the attribute was to the specific decision task presented in each condition. The results of this part of the study were used as a manipulation check to ensure that the core attributes were properly identified.

## Results

### *Participant Characteristics*

In order to examine the effectiveness of the random assignment procedure, 2 X 2 (Age Group X Thought Condition) analyses of variance (ANOVA) were conducted for each

of the background and ability measures. The means are shown in Table 3. There was an Age Group X Thought interaction in that older adults in the unconscious thought condition were significantly older than those in the conscious thought condition,  $F(1, 121) = 6.48, p < .05, \eta^2 = .05$ . Participants' years of education were comparable within the two thought conditions, but as expected, older adults had significantly higher levels of education than young adults due to the latter groups undergraduate status,  $F(1, 121) = 77.65, p < .001, \eta^2 = .39$ . Self-reported physical health did not differ between the age groups, but participants in the conscious thought condition were significantly healthier than those in the unconscious thought condition,  $F(1, 118) = 9.35, p < .05, \eta^2 = .07$ . Older adults had significantly better mental health than young adults,  $F(1, 118) = 36.07, p < .001, \eta^2 = .23$ . As typically found in aging research, older adults performed better on the vocabulary test than did young adults,  $F(1, 120) = 17.91, p < .001, \eta^2 = .13$ , and young adults performed significantly better on both the digit-symbol task,  $F(1, 121) = 78.85, p < .001, \eta^2 = .39$ , and the letter-number sequencing task than did older adults,  $F(1, 121) = 27.87, p < .001, \eta^2 = .19$ .

Table 3  
*Descriptive statistics for background and ability measures*

	Young			Old		
	Conscious	Unconscious	<i>M</i>	Conscious	Unconscious	<i>M</i>
Age						
<i>M</i>	19.23	19.62	19.44	68.88	73.33	71.00
<i>SD</i>	2.24	1.75	2.00	4.49	7.23	6.32
Years Education						
<i>M</i>	13.07	13.31	13.19	16.45	15.93	16.21
<i>SD</i>	1.31	1.09	1.20	2.33	2.48	2.40
SF-36: Physical Health						
<i>M</i>	50.06	46.64	48.32	48.15	46.16	47.17
<i>SD</i>	5.30	3.45	4.65	5.92	4.50	5.32
SF-36: Mental Health						
<i>M</i>	44.07	49.32	46.73	55.74	55.96	55.84
<i>SD</i>	11.16	6.29	9.33	9.49	5.45	7.70
Letter-Number Sequencing						
<i>M</i>	13.43	12.78	13.10	10.18	10.47	10.32
<i>SD</i>	3.16	3.40	3.28	2.31	2.81	2.54
Vocabulary						
<i>M</i>	42.93	43.81	43.39	51.21	50.00	50.63
<i>SD</i>	9.23	5.95	7.63	8.71	13.04	10.91
Digit-Symbol						
<i>M</i>	64.73	62.72	63.69	48.67	44.37	46.62
<i>SD</i>	11.48	10.57	10.97	10.58	10.68	10.76

Note: SF-36 data are T-scores. Letter-Number Sequencing scores could range from 1-21, Digit-Symbol scores could range from 1-133, & Vocabulary scores could range from 1-66.

### *Manipulation check*

In order to determine if participants were perceiving the importance of individual attributes relative to the decision context as intended, a 2 X 2 X 2 X 2 (Age Group X Content [bank vs. apartment] X Relevance [core vs. superficial] X Valence [positive vs. negative]) ANOVA was conducted on participants' ratings of the importance of each of the choice attributes. The mean importance ratings are presented in Table 4. There was a main effect of relevance,  $F(1, 116) = 357.59, p < .001, \eta^2 = .75$ , and a main effect of valence,  $F(1, 116) = 27.59, p < .001, \eta^2 = .19$ , which indicates that participants rated core attributes as more important than superficial attributes and positive attributes more important than negative attributes. There was a significant main effect of content,  $F(1, 116) = 78.89, p < .001, \eta^2 = .40$ , indicating that participants rated the bank attributes more important than the apartment attributes. There were also significant Content X Relevance X Valence,  $F(1, 116) = 6.67, p < .05, \eta^2 = .05$ , Age Group X Content X Relevance,  $F(1, 116) = 10.95, p < .01, \eta^2 = .09$ , and Age Group X Content X Relevance X Valence interactions,  $F(1, 116) = 15.53, p < .001, \eta^2 = .12$ . Examination of the means, however, suggests that variations reflected in the above interactions do not represent fundamental differences in the perceptions of the stimuli. The means indicate that participants in both age groups made a clear distinction between core and superficial attributes in each decision context, which was most important to the manipulation.

Table 4  
*Mean importance ratings*

	Content	Relevance	Mean	<i>SD</i>	N
Young	Apartment	Core	6.96	1.02	61
		Superficial	3.82	1.57	61
	Bank	Core	7.21	1.09	61
		Superficial	5.40	1.48	61
Old	Apartment	Core	6.62	1.02	59
		Superficial	4.58	1.57	59
	Bank	Core	6.98	1.12	59
		Superficial	5.39	1.47	59

*Note:* Ratings based on a scale of 1-10

*Performance: Correct Choice Identification*

The mean likelihood of making the correct choice for each thought and age group is depicted in Table 5. Two binomial logistic regressions were conducted in order to determine if age and thought condition were significant predictors of choosing the optimal alternative in the deliberative and the intuitive conditions.

Table 5  
*Mean likelihood of making correct decision*

	Age	Thought	<i>M</i>	<i>SD</i>	<i>N</i>
Intuitive	Young	Unconscious	.72	.46	32
		Conscious	.60	.49	30
	Old	Unconscious	.50	.51	30
		Conscious	.45	.51	33
Deliberative	Young	Unconscious	.41	.50	32
		Conscious	.50	.51	30
	Old	Unconscious	.30	.47	30
		Conscious	.33	.48	33

Age group and thought condition were entered in the first step and the Age X Thought interaction was entered in the second step. For the deliberative task, none of these factors were significant predictors of making the optimal decision (see Table 6). In the intuitive task, age group was a significant predictor of making the correct choice, indicating that young participants were 55% more likely to choose the optimal alternative. Thought condition and the interaction term were not significant predictors (see Table 7).

Table 6  
*Logistic regression: Deliberative material*

	95% CI for exp <i>b</i>		
Step 1	<i>B</i>	<i>SE</i>	<i>exp b</i>
Age group	-.58	.37	.56
Thought	.27	.37	1.31
Step 2			
Age group	-.47	.54	.63
Thought	.38	.51	1.46
Age X Thought	-.22	.75	.80

Note  $R^2 = .03$  (Nagelkerke). Model  $\chi^2 = 3.02$ ,  $p = .40$ .

Table 7  
*Logistic regression: Intuitive material*

	95% CI for exp <i>b</i>		
Step 1	<i>B</i>	<i>SE</i>	<i>exp b</i>
Age group	-.80*	.37	.45
Thought	-.30	.37	.74
Step 2			
Age group	-.94	.54	.39
Thought	-.45	.55	.64
Age X Thought	.26	.75	1.30

Note  $R^2 = .06$  (Nagelkerke). Model  $\chi^2 = 5.69$ ,  $p > .05$ . \* $p < .05$

Contrary to my predictions, the Age X Thought interactions for the deliberative and intuitive materials were not significant in the regression analyses, which may be due to a lack of statistical power. The trends in the means, however, are generally consistent with my predictions. In the deliberative condition, for example, it is apparent that young adults in the conscious thought condition made the correct choice more often than both young adults in the unconscious thought condition and older adults in either thought condition. The means for the intuitive condition also depict a trend consistent with my hypotheses. Young adults made the correct choice more often when they engaged in unconscious versus conscious thought. This finding replicates the superiority of unconscious thought found in Dijksterhuis (2005). In contrast, older adults performed better in the intuitive condition than in the

deliberative condition, but performed similarly when engaging in conscious versus unconscious thought.

Since the trends in the means fit quite well with my hypotheses, I conducted a series of binomial probability tests to determine if participants chose the optimal choice more often than would be predicted by chance within each condition. Performance was above chance in all conditions with the exception of the older adults in both thought conditions in the deliberative condition and young adults who engaged in unconscious thought in the deliberative condition. These results indicate that participants were quite variable across conditions with respect to choosing the optimal alternative, but the general pattern of variation—as reflected in better than chance selection of this alternative—was consistent with my hypotheses.

#### *Choice optimality*

I next examined decision quality by looking at the consistency of participants' attitudes toward each alternative with its appropriate optimality score for the decision context (i.e., overall evaluative score for the intuitive condition, core evaluative score for the deliberative condition). Two 2 X 2 X 4 (Thought Condition X Material X Optimality) repeated measures ANOVAs were conducted—one within each age group—in order to simplify the analyses. Alternatives on the optimality factor were ordered from worse to best choice. The presented results focus on main effects and interactions that involve optimality, since this construct was central to my hypotheses.

*Young adults.* As expected, there was a main effect of optimality,  $F(3, 60) = 49.41, p < .001, \eta^2 = .45$ , indicating that ratings varied across levels of optimality. There was also a



Material X Optimality interaction,  $F(3, 60) = 13.15, p < .001, \eta^2 = .23$ , due to young adults aligning their optimality ratings better when given intuitive material than deliberative material. There was not a significant Optimality X Thought interaction,  $F(3, 60) = 1.23, p > .05, \eta^2 = .02$ , indicating that young adults in both thought conditions aligned their ratings similarly. The predicted Material X Optimality X Thought interaction was not significant,  $F(3, 60) = 2.33, p = .076, \eta^2 = .04$ , but the trend in the means was consistent with my predictions (see Figures 1 and 2). More specifically, when considering intuitive material, young adults' ratings correspond better with optimality when engaging in unconscious thought. When they receive deliberative material, young adults align their ratings better with optimality when engaging in conscious thought.

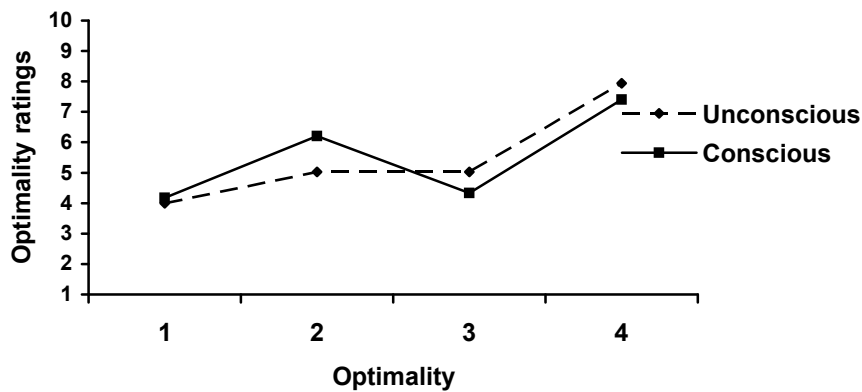


Figure 1. Young adults' optimality ratings of intuitive material

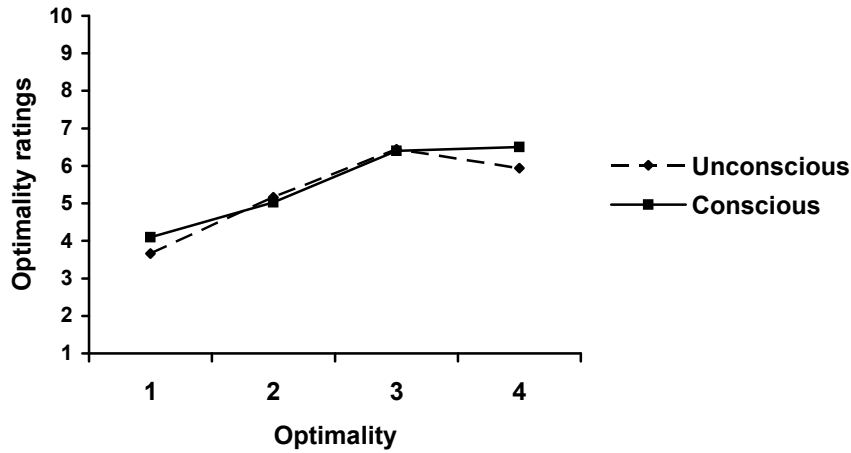


Figure 2. Young adults' optimality ratings of deliberative material

To understand the effects of thought condition further, I examined the consistency of ratings with my a priori optimality scores by testing linear and polynomial trends within each Thought X Material condition. In the unconscious thought-intuitive material condition, there were significant linear,  $F(1, 31) = 118.42, p < .001, \eta^2 = .79$ , quadratic,  $F(1, 31) = 8.20, p < .01, \eta^2 = .21$ , and cubic effects,  $F(1, 31) = 4.79, p < .05, \eta^2 = .13$ . For those engaging in conscious thought with intuitive materials, significant linear,  $F(1, 29) = 33.44, p < .001, \eta^2 = .56$ , and cubic,  $F(1, 29) = 29.36, p < .001, \eta^2 = .50$ , effects were obtained. From Figure 1, it is apparent that those in the unconscious thought condition were more successful at aligning their ratings with the correct optimality scores than those in the conscious thought condition.

When presented with deliberative material, young adults engaging in unconscious thought displayed significant linear,  $F(1, 31) = 31.92, p < .001, \eta^2 = .51$ , and quadratic trends,  $F(1, 31) = 7.75, p < .05, \eta^2 = .20$ . For young adults in the conscious thought condition, there was only a significant linear effect,  $F(1, 29) = 38.56, p < .001, \eta^2 = .57$ . It is

evident from Figure 2 that those in the conscious thought condition aligned their ratings more consistently with the optimality of the alternative than did those in the unconscious thought condition.

*Older adults.* Similar to the young adults, older adults showed a significant main effect for optimality,  $F(3, 60) = 9.63, p < .001, \eta^2 = .14$ , which indicates that there was a clear ordering of optimal to least optimal choices collapsed across conditions. Consistent with my predictions, however, there was a significant Material X Optimality interaction,  $F(3, 60) = 9.34, p < .001, \eta^2 = .14$ , indicating that older adults aligned their ratings best when they received intuitive material. Also consistent with my predictions, the Optimality X Thought interaction was not significant,  $F(3, 60) = 0.42, p > .05, \eta^2 = .01$ . Together, these two effects support my prediction that the nature of the material would be a more important determinant of older adults' performance than thought condition. Interestingly, the Material X Thought interaction approached significance,  $F(3, 60) = 3.68, p = .06, \eta^2 = .06$ , suggesting that unconscious thought may have been beneficial to older adults' optimality ratings.

To evaluate the relationship between material and optimality further, a 2 (Thought) X 4 (Optimality) repeated measures ANOVA was conducted for each type of material. For intuitive material, there were significant linear,  $F(1, 59) = 16.72, p < .01, \eta^2 = .22$ , quadratic,  $F(1, 59) = 10.27, p < .01, \eta^2 = .15$ , and cubic effects,  $F(1, 59) = 7.36, p < .01, \eta^2 = .11$ . As illustrated in Figure 3, older adults in the conscious and unconscious thought conditions performed quite similarly and aligned their ratings with optimality scores reasonably well. Although there were significant nonlinear trends, it is clear that the optimal choice was generally preferred. For the deliberative material, there were significant linear,  $F(1, 61) =$

16.35,  $p < .00$ ,  $\eta^2 = .21$ , and cubic effects,  $F(1, 61) = 9.02$ ,  $p < .01$ ,  $\eta^2 = .13$ . From Figure 4, it is apparent that older adults in both thought conditions performed similarly and aligned their ratings quite poorly compared to their ratings of the intuitive material. Interestingly, the alternative receiving the highest overall mean rating was the one with the highest overall evaluative score, suggesting that older adults were focusing more on overall evaluative content than on the subset of core features. Again, these findings are consistent with my prediction that older adults' performance would be affected more by the type of material than by the type of thought.

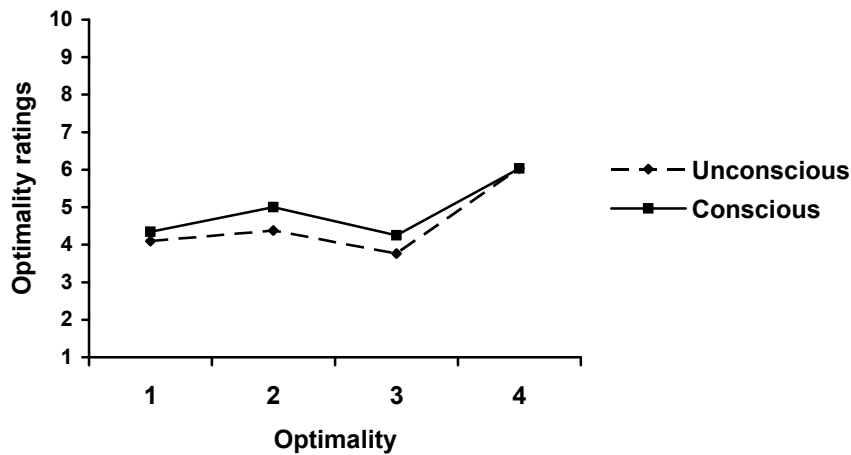


Figure 3. Older adults' optimality ratings of intuitive material

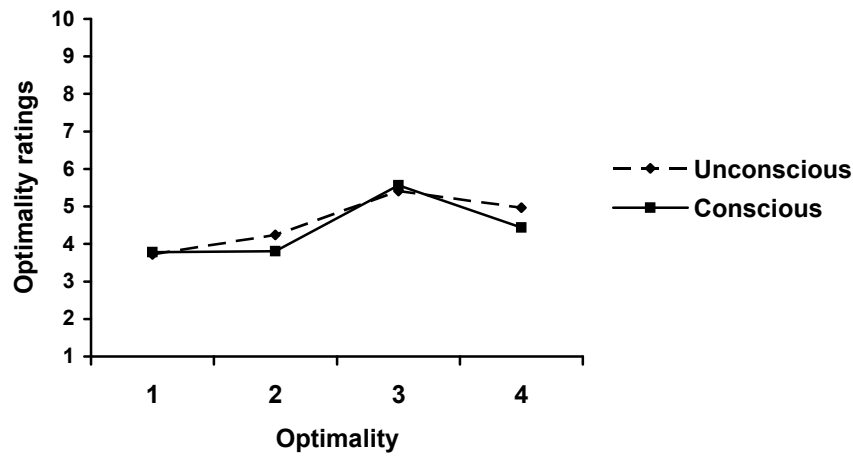


Figure 4. Older adults' optimality ratings of deliberative material

#### *Choice supportive source monitoring*

I next examined the extent to which memory for positive and negative attributes was influenced by the choice of the optimal alternative. In order to analyze choice supportiveness, four summary scores were calculated for both the deliberative and intuitive materials: the proportion of positive and negative correct attributions to the choice option and the proportion of positive and negative incorrect attributions to the choice option. These scores were then examined using a 2 X 2 X 2 X 2 (Age Group X Thought X Material X Attribution Status [correct vs. incorrect]) repeated measures ANOVA. The descriptive statistics are reported in Table 8. Based on Mather and Johnson (2000), I predicted that older adults would be more choice supportive than young adults. I also hypothesized, based on Dijksterhuis and van Olden (2005), that unconscious thought would lead to greater choice supportiveness than conscious thought.

Table 8  
*Proportion of features attributed to choice*

	Attribution	Valence	Mean	SD	N
Young	Chosen	Positive	.71	.18	60
		Negative	.52	.22	60
	Nonchosen	Positive	.40	.14	60
		Negative	.21	.13	60
Old	Chosen	Positive	.67	.19	63
		Negative	.47	.23	63
	Nonchosen	Positive	.48	.13	63
		Negative	.27	.13	63

There was a main effect of Attribution Status,  $F(1, 118) = 253.02, p < .001, \eta^2 = .68$ , indicating that there were more correct than incorrect attributions made to the choice. There was also a main effect of Valence,  $F(1, 118) = 115.77, p < .001, \eta^2 = .49$ , suggesting that there were more positive than negative attributions made to the choice. Collapsed across age groups, this main effect is evidence for general choice supportiveness. There was also a significant main effect of Thought,  $F(1, 118) = 4.86, p < .05, \eta^2 = .04$ , which indicates that engaging in conscious thought lead to more attributions to the choice.

Additionally, there was a significant Age Group X Attribution Status interaction,  $F(1, 118) = 12.31, p < .01, \eta^2 = .09$ , which indicates that young adults made more correct attributions to the choice than older adults. Collapsed across age groups, the Thought X Attribution Status interaction approached significance,  $F(1, 118) = 3.67, p = .06, \eta^2 = .03$ ,

which may suggest that participants who engaged in conscious thought were more likely to make correct attributions to the choice than those who engaged in unconscious thought.

Overall, the results lend general support to choice supportive memory in that both young and older adults' memories favored their choices. Unlike Mather and Johnson, however, there was not a clear effect of age. Interestingly, the marginally significant interaction between Attribution Status and Thought suggests that conscious thought leads to improved memory of the choice, though this effect did not interact with valence so no conclusions regard choice supportive memory can be made.

### *Choice Satisfaction*

A 2 X 2 X 2 (Age Group X Thought Condition X Material) repeated measures ANOVA was conducted to examine choice satisfaction ratings. These results are reported in Table 9. Based on Dijksterhuis and van Olden (2005), I predicted that unconscious thought would be associated with higher choice satisfaction than conscious thought. Since older adults are more likely to rely on unconscious thought than young adults, young adults in the conscious thought condition were expected to report the lowest choice satisfaction ratings. Contrary to my predictions, neither the Age Group X Material,  $F(1, 117) = 0.001, p > .05, \eta^2 = .00$ , nor Thought X Material,  $F(1, 117) = 0.17, p > .05, \eta^2 = .00$ , interactions were significant. The three way interaction was also not significant,  $F(1, 117) = 0.002, p > .05, \eta^2 = .00$ . Although there was a significant main effect of Age Group,  $F(1, 117) = 24.63, p < .001, \eta^2 = .17$ , the difference between the young and older adults is more likely a function of use of the scale rather than a meaningful difference. The averages of the satisfaction ratings indicate that choice satisfaction was consistent across conditions.

Table 9  
*Mean satisfaction ratings*

	Age Group	Thought	Mean	<i>SD</i>	N
Intuitive	Young	Unconscious	7.52	.96	31
		Conscious	7.50	1.11	30
	Old	Unconscious	6.52	1.40	27
		Conscious	6.52	1.44	33
Deliberative	Young	Unconscious	7.39	.88	31
		Conscious	7.47	1.01	30
	Old	Unconscious	6.37	1.76	27
		Conscious	6.48	1.64	33

### Discussion

The goal of the present study was to examine age differences in decision making, with a specific focus on the differential benefits of unconscious versus conscious thought. Specifically, I was interested in testing the generalizability of the effects observed by Dijksterhuis (2004) regarding the benefits of unconscious thought to older adults. I was also interested in examining the generalizability of these effects to decision making situations varying in processing demands.

### *Summary of findings*

The results of this study lend partial support for Dijksterhuis' (2004) claims regarding the benefit of unconscious thought. More specifically, Dijksterhuis' results were replicated in that young adults made optimal choices after engaging in unconscious thought for intuitive



decision making problems. These benefits, however, were moderated by the decision making situation. Consistent with my hypotheses, unconscious thought was most beneficial when decisions could be based on the overall evaluative content of the choices, which can be processed in a relatively automatic fashion. These conditions, as reflected in the intuitive materials conditions of the present study, appear to most closely match those contained in Dijksterhuis. When the task demanded that the decision maker carefully discriminate between subsets of information, however, engaging in conscious thought was more beneficial than unconscious thought. This calls into question claims regarding the general benefits of unconscious thought (e.g., Dijksterhuis & Nordgren, 2006)

In addition to the decision-making context, age also moderated the strength of unconscious thought. The processing demands of the decision-making task impacted older adults' decisions more than instructions to engage in conscious or unconscious thought. Specifically, older adults made optimal decisions, regardless of thought condition, when the decision situation used materials through which a choice could be based on automatically processed evaluative information. When presented with materials that required more deliberative processing, however, their decisions were less optimal. These effects are assumed to reflect older adults' less efficient deliberative processing, resulting in a propensity to rely on less effortful modes of processing. As evidenced by the contrast in their performance across information content conditions, older adults perform best in situations where there is a match between the demands of the decision task and their dominant mode of processing (i.e., with intuitive materials requiring little active deliberation). Young adults, on the other hand, perform well when there is a congruency

between the processing demands of the task and type of thought in which they choose to engage. These effects are similar to those observed by Hess et al. (1996) in a category learning task.

These results were evident not only in participants' choices, but also in their optimality ratings of each alternative. When presented with intuitive material, young adults in the unconscious thought condition aligned their ratings of each choice quite well with the overall evaluative scores. This indicates that they were able to differentiate the optimal, mediocre, and least optimal choices. Those in the conscious thought condition were more irregular with their ratings, reinforcing the notion that younger adults will be most efficient when there is congruence between the nature of the materials and the type of thought in which they engage. Consistent with my hypotheses, older adults aligned their ratings according to the overall evaluative scores regardless of thought condition. Since automatic processing is less affected by age-related declines, and the intuitive materials involved the relatively automatic processing of evaluative information, older adults performed well in this condition.

When presented with deliberative materials, young adults in the conscious thought condition aligned their ratings better than those in the unconscious thought condition. In order to make an optimal decision in the deliberative condition, participants had to engage in controlled processing to focus on the subset of information that was vital to the decision making situation. Young adults who engaged in unconscious thought were presumably not focusing on the appropriate subset of information, and thus falling back on more intuitively processed evaluative content. Older adults, although once again unaffected by thought

instructions, aligned their ratings quite poorly regardless of thought condition. This may in part reflect age-related declines in deliberative functions, which may have resulted in older adults having a more difficult time focusing on the relevant subset of information or inhibiting information about overall evaluative content.

In addition to examining participants' optimal choices and their ratings of each choice, two hypotheses were made regarding participants' choice-supportive source monitoring and choice satisfaction. My predictions were based on previous research which has indicated that engaging in unconscious thought increases choice satisfaction (Dijksterhuis & van Olden, 2005; Wilson, Lisle, & Schooler, 1993) and that older adults are more choice supportive than younger adults (Mather & Johnson, 2000); thus, these hypotheses were mostly exploratory and less direct than my primary hypotheses. Overall, there was no effect of age or thought condition on choice supportive memory or choice satisfaction. Participants in both age and thought conditions reported similar correct and incorrect choice memory attributions. Likewise, young and older participants in both thought conditions reported similar satisfaction ratings. Past research on choice satisfaction has involved participants actually owning their choice (e.g. Dijksterhuis & van Olden; Kim et al., 2008). Perhaps if choice satisfaction were not hypothetical, as it was in the current study, there would have been an effect of thought condition.

#### *Caveats and future directions*

Although my results replicate Dijksterhuis' (2004) findings in the young adult group, these effects are not as strong as his original findings. In fact, there were no effects of thought condition in the binary logistic regressions for either of the decision-making tasks. It

is quite possible that these nonsignificant findings may be due to low statistical power. It is also possible, however, that participants' exposure to the decision-making materials was too long in the current study—at least for the younger adults. In Dijksterhuis' original study, participants were given only 15s to view the information for each choice option. With only enough time to read through the information, participants were not able to deliberate about the choices while they were being presented. In the current study, we allowed participants 30s to view each choice option. Since the current study included older adults, participants' exposure to the choice information was extended to allow substantial time for all participants to read. Although it is possible that this extended time period also allowed participants to deliberate about the choices while they were reading, it is unlikely that deliberation affected the results because unconscious thought was not beneficial in the deliberative condition. In the future, it may be possible to change the exposure time proportionally so that each age group is allowed ample time to read but not enough time to deliberate. A shortened exposure time may strengthen the results found for young adults in the deliberative materials condition. Since the task requires conscious thought processing, lessened exposure time would not allow for efficient deliberation. In addition to being a methodological consideration, the length of exposure to the decision making information may also be an important boundary condition for the benefits of unconscious thought. Prolonged exposure to decision making information may increase deliberation which would in turn negate the benefits of unconscious thought. If, in fact, the effect of unconscious thought is based in limited exposure to deliberation, Dijksterhuis' real world implications for the effect are

hindered. Thus, the generalizability of the effects found in his studies may be weakened due to the varying amount of time people spend deliberating in real life.

In the current study, I closely followed Dijksterhuis' methodology in both the presentation of the decision-making stimuli and the instructions used in the conscious and unconscious thought conditions. In his studies, Dijksterhuis did not measure participants' adherence to their thought instructions. More specifically, participants in the conscious thought condition were simply told to deliberate about the choices for three minutes, and participants' thoughts during this time period were not monitored. His results indicated, however, that whatever participants were doing in the conscious thought condition was negatively impacting their ability to make an optimal decision. In the current study, participants' thoughts were also not measured and, therefore, there is not strong evidence that those in the conscious thought condition were actually engaging in active deliberation. Before generalizations about conscious thought are made, it is important to understand what it is about this type of thought that affects decision making. In particular, it is important to determine whether the effects of conscious thought are due to the decision maker's level of consciousness or what they are actually doing during active deliberation. Since my results were not as clear as Dijksterhuis', it may have been beneficial to have monitored participants' thought processes while they engaged in conscious deliberation. One way to do this would be to ask participants to write down the details of each option or to think aloud about the costs and benefits of each option after they viewed their choices. This would eliminate the possibility that some participants were not deliberating and would also keep the type of deliberation consistent thus eliminating any age differences between young and older

adults. Once the deliberation process is monitored, strong conclusions about conscious thought may be made.

### *Conclusions*

Overall, the results of this study indicate that older adults are not always impaired decision makers. Based on previous research, it may be assumed that age-related cognitive declines, such as decreased working memory capacity, would lead older adults to become poorer decision makers. Within the parameters of this study, the findings argue otherwise; more specifically, when older adults can rely on the automatic processing of evaluative information, they are able to make optimal decisions. In the current study, their decisions are hindered only when they are instructed to incorporate deliberative thought into their decision making process. These results speak against the general belief that cognitive declines negatively impact older adults' decisions. It seems that older adults' inefficiencies in deliberative functioning result in a fallback on automatic processes. Thus, if the decision problem can be processed at an automatic level, it is likely that older adults' decisions will be less impaired.

Although the results of this study highlight older adults' decreased tendency to engage in deliberative processing, this does not eliminate the possibility that, in some contexts, older adults may be relatively efficient in deliberation. Recent research has found that older adults are quite adaptive decision makers, even when faced with decisions that lend themselves to controlled processing (Mata, Schooler, & Rieskamp, 2007). Consistent with previous research (e.g. Johnson 1990; Riggle & Johnson, 1996), Mata, Schooler, and Rieskamp (2007) found that older adults engage in simpler processing strategies and tend to

use compensatory strategies, especially when the decision task is more cognitively demanding, in order to make more optimal decisions. In the current study, participants were presented with complete sets of information about each choice and were limited in the time they were exposed to each set of information. This method actually makes the task more difficult, because participants were exposed to information that was both pertinent and not pertinent to the decision-making situation. Perhaps older adults would make better decisions when they are allowed to choose which information they are exposed to, as was the case in the Mata et al. research. In this context, older adults may choose to attend to only pertinent information and may ignore or quickly discard information that is not important to the decision making situation. Therefore, even when older adults are presented with detailed information regarding a choice, they may use compensatory strategies to sort through the information to make a more optimal decision. Mata et al. suggest that deliberative processes may be further optimized by providing older adults with decision aids. The current study focused on decisions that were made in a shorter time span. If the goal of the study were to examine decisions made without a time limit, however, decision aids may be particularly helpful for older adults. Providing such aids may minimize age differences such as working memory capacity and may enhance older adults' ability to deliberate.

Overall, this study answered several interesting questions regarding aging and decision making. First, this study confirmed that unconscious thought processing allows young adults to make optimal decisions in certain decision-making situations. The results further reveal that unconscious thought is not beneficial in all decision-making contexts, especially when the task requires controlled processing. From a developmental standpoint,

this study suggests that older adults are not necessarily impaired decision makers. Their ability to make optimal decisions is preserved, especially when the task can be successfully assessed through their dominant mode of processing.



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