Published in final edited form as:
J Behav Decis Mak. 2012 January 1; 25(1): 29–40. doi:10.1002/bdm.711.

To Deliberate or Not to Deliberate: Interactions Between Age, Task Characteristics, and Cognitive Activity on Decision Making

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Abstract

The effects of aging and deliberative activities on decision making were examined. In two separate tasks, young, middle-aged, and older adults were presented with four alternatives and given instructions to choose the best one. Following study, participants were either given additional time to think about their decision or were prevented from doing so. Decision quality did not benefit from additional deliberative activity when the structure of the stimuli facilitated fluent online processing. In contrast, deliberation promoted performance when such processing was more difficult. In addition, those individuals who focused on attribute information relevant to the decision context performed better than those who did not. Age differences in performance were minimal, but older adults with lower levels of education or cognitive ability tended to perform worse than the rest of the sample under conditions where deliberative skills were required to promote performance. The results are inconsistent with recent proposals regarding the benefits of passive deliberation. In addition, the results support the general assertion that the age effects in decision making will be most evident in situations dependent upon deliberative skills.

Keywords

aging; decision making; choice-supportive memory; alignability

INTRODUCTION

Most views of decision-making either implicitly or explicitly assume that active deliberation is an important aspect of this process. A recently proposed theory by Dijksterhuis and Nordgren (2006)—Unconscious Thought Theory (UTT)—provides an interesting counterpoint to this perspective by arguing that complex decisions are made better when the decision maker avoids conscious deliberation (see also Wilson & Schooler, 1991). They argue further that decision making may actually be impeded by efforts at rational thought. These propositions regarding the advantages of unconscious thought are antithetical to most views of decision making, and thus are both compelling and controversial. An additional, although unstated, implication of UTT is that unconscious thought may disproportionately benefit decision making when the cognitive resources (e.g., working memory) to support deliberation are limited or deliberative skills are inefficient. In other words, the effectiveness of unconscious thought should be unrelated to cognitive resources or deliberative efficiency.

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The present study was thus designed with two goals in mind. First, we wanted to provide a further test of the hypothesized advantages versus disadvantages of active deliberation using UTT as a departure point. Recent research has called into question the basic tenets of UTT, suggesting that there are no benefits to unconscious thought when compared to active deliberation (e.g., Newell, Wong, Cheung, & Rakow, 2009; Thorsteinson & Withrow, 2009) or that the purported benefits are reflections of specific task-related factors (e.g., Lassiter, Lindberg, González-Vallejo, Bellezza, & Phillips, 2009; Payne, Samper, Bettman, & Luce, 2008; Queen & Hess, in press). We build upon this work by examining the role of task demands in determining the relative benefits of active versus passive thought.

Second, we were also interested in whether aging moderated the relationship between active versus passive thought and effective decision making. Given that aging is associated with declines in cognitive resources and ability, engagement in active deliberation may be particularly detrimental to older adults in situations where such skills may benefit performance (Peters, Hess, Västfjäll, & Auman, 2007). In contrast, if the benefits of passive thought are independent of these factors, then aging may have little effect on the effectiveness of unconscious thought. Thus, once more using UTT as a backdrop, we investigated the impact of aging on decision-making performance under conditions that varied in their use of or dependence on active deliberation.

Testing the benefits of unconscious thought

The results of several experiments by Dijksterhuis and colleagues (2004; Dijksterhuis & van Olden, 2006) support the proposed advantage of unconscious over conscious thought in complex decision tasks. Specifically, they contrasted young adults' performance when encouraged to deliberate versus that when they were prevented from doing so, with the result being that performance was better and decision satisfaction higher under the latter. A concern with this research, however, has to do with the possibility that the supposed benefits of unconscious thought reflect the interplay between the characteristics of the stimuli and the activities of the decision-maker. For example, optimal decisions in Dijksterhuis (2004) were associated with the alternatives with the most positive features, and individuals were given instructions to form impressions of each alternative as it was presented. Thus, decisions could be based on relatively automatic evaluation processes at encoding. Contrary to expectations derived from UTT, subsequent research has demonstrated that there is little difference in decision quality between passive and active thought under such circumstances (Newell et al., 2009), and that active deliberation improves performance when individuals do not form impressions during initial exposure to choice alternatives (Lassiter et al., 2009). Queen and Hess (in press) also found that active deliberation was advantageous when individuals had to discriminate between relevant and irrelevant attributes and differentially weight attributes (e.g., use a weighted additive rule) in order to determine optimality. This type of compensatory strategy is relatively demanding, with performance being related to fluid intellectual skills (Mata, Schooler, & Rieskamp, 2007). Thus, in contrast to UTT, the results of these studies suggest that additional deliberation will be beneficial under certain conditions, and that the purported benefits of unconscious thought may simply reflect performance in situations where additional deliberation is unnecessary due to efficient online processing (e.g., Newell et al., 2009) or perhaps interferes with effective use of previously constructed impressions (Lassiter et al., 2009).

The present study adds further to the testing of UTT by examining the interaction between thought condition and test materials. We contrast the idea that unconscious thought will be generally beneficial for decision making involving complex materials with our perspective based on the interaction between decision task and thought condition. Specifically, we hypothesized that active deliberation (i.e., conscious thought) will not increase decision-making efficacy when materials are constructed in such a way to facilitate comparisons and promote fluent, online processing. In contrast, preventing individuals from active deliberation (i.e., unconscious thought) will be detrimental to decision making when the task materials are not conducive to such processing.

One stimulus characteristic relating to fluency of processing concerns the alignability of attributes. Attributes are alignable across choice alternatives if they refer to values on the same dimension (e.g., cost). Alignability allows direct comparisons across alternatives using a common metric, and has been shown to ease processing in decision tasks (e.g., Gourville & Soman, 2005; Herrmann, Heitmann, Morgan, Henneberg, & Landwehr, 2009; Markman, 1996). Research has also demonstrated that individuals naturally focus on and base decisions on alignable features because they provide the most relevant points of comparison (e.g., Gentner & Markman, 1997; Markman & Medin, 1995). When alignable features are not present, or are uninformative for distinguishing between alternatives, participants must base their decisions on nonalignable features. This results in a more complex and demanding decision task due to the lack of a common basis for comparison (e.g., Zhang & Fitzsimons, 1999).

In our study, participants were presented with two separate decision tasks in which they had to choose among four alternatives under conditions that either allowed or prevented additional deliberation following stimulus presentation. (These conditions corresponded to Dijksterhuis's (2004)) conscious vs. unconscious thought manipulation.) Each alternative contained five attributes that were alignable and five that were not. Based upon previous research, we assumed that participants would focus on the former. We further reinforced the importance of these alignable attributes by choosing dimensions that were previously identified by consumers as being of high importance for the decision being made. In the *alignable-focus* condition, the alternatives differed in terms of the number of positive alignable attributes each contained. Given the tendency to focus on alignable attributes, their importance for the specific decision being made in our task, and the fact that they could legitimately be used to select the best choice (i.e., the optimal choice had the most positive attributes on dimensions of high importance), we reasoned that the structure of the stimuli in this condition would ease fluency of processing and promote online evaluation. Thus, we predicted that additional active deliberation following initial exposure to the stimuli would be of minimal benefit. UTT would further predict that active deliberation would be detrimental to performance.

In contrast, alternatives in the *unalignable-focus* condition had an identical number of positive alignable attributes. This reduced the informativeness of these important features for discriminating between alternatives, increasing participants' reliance on unalignable attributes in determining their choice. The reliance on unalignable attributes makes the task more demanding, requiring participants to go against the natural tendency to focus on alignable attributes and, instead, encode and evaluate attributes on unique dimensions. In this case, we predicted that additional deliberation would prove beneficial. In direct contrast, UTT would once again predict that performance would be better under conditions in which participants are prevented from engaging in active deliberation. Further, given the assumption that the benefits of unconscious thought increase with task complexity, UTT would predict that these benefits would be greater in the unalignable- than in the alignable-focus condition.

In contrast to past research on UTT, we also required that participants think aloud in the active deliberation condition. This increased the probability that participants were actually engaging in conscious thought when told to do so, increasing the validity of any claims regarding beneficial versus detrimental aspects of active deliberation. The verbal output in this condition also allowed us to conduct some exploratory analyses relating content to participant characteristics and experimental conditions as well as to decision outcomes.

Aging and decision making

It can be reasonably argued that effective decision-making skills take on increased importance in later life given the consequential nature of many decisions (e.g., retirement finances, healthcare, living arrangements) for the maintenance of independence and well being. There is some evidence that aging is associated with a decline in the effectiveness of decision-making (e.g., Finucane, Slovic, Hibbard, Peters, Mertz, & MacGregor, 2002), and that ability may account for some of the age-related variability in performance (e.g., Finucane, Mertz, Slovic, & Schmidt, 2005; Mata et al., 2007; Meyer, Talbot, & Ranalli, 2007). Decrements in later life are not universally observed, however, with the direction and strength of age-based correlations varying with the type of decision-making task (e.g., Bruine de Bruin, Parker, & Fischhoff, 2007). Thus, it is important to identify the conditions that promote effective decision making in later life.

In keeping with the preceding discussion of UTT, we were particularly interested in examining the potentially negative impact of age-related declines in deliberative functions on decision making (Peters et al., 2007). Decreases in the efficiency of working memory and executive functions in later life may negatively affect performance when the decision task requires, for example, processing large amounts of information, discriminating between relevant and irrelevant features, and actively comparing and contrasting alternatives. Taking such declines into account, older adults—relative to younger adults—could be expected to do more poorly under conditions in which performance benefits from active deliberation. Or, put more positively, that age differences in performance will be attenuated under unconscious thought conditions or those designed to support online processing. Thus, based on our foregoing analysis, we would expect older adults to do more poorly in the active deliberation condition, particularly in the unalignable-focus condition. We also examined the degree to which performance was moderated by important resources (e.g., ability, education) that have been shown to support older adults' performance (e.g., Finucane et al., 2005; Meyer et al., 2007).

In a previous study (Queen & Hess, in press), we found support for the importance of considering the congruence between participant characteristics, nature of the stimuli, and type of thought. For example, older adults exhibited above-chance performance when task materials promoted online processing (e.g., all attributes were alignable and decisions could be based on summary evaluative information), whereas younger adults benefited most when the type of thought was complemented by the nature of the task stimuli (e.g., engaging in active deliberation when discriminating between relevant and irrelevant attributes). The results were complicated, however, by the fact that the older adults had less accurate representations of the decision parameters (i.e., which attributes were most relevant based upon the instructions provided). In the present study, we attempted to eliminate this problem by identifying relevant and irrelevant attributes based upon marketing surveys, leading to participants naturally weighting attributes without having to consider them in the context of a specific task.

We were also interested in examining the impact of age on choice supportive memory (i.e., the positive bias in memory for the chosen versus nonchosen alternatives). There is evidence that older adults exhibit higher levels of choice supportiveness (Mather & Johnson, 2000), which was attributed to an increase in emotion regulation goals in later life in support of positive affective outcomes. Research has suggested, however, that choice supportiveness is also enhanced with alignable stimuli (e.g., Mather et al., 2005) and under unconscious thought conditions (e.g., Dijksterhuis & van Olden, 2006). These findings suggest that degree of choice supportiveness is related to level of deliberation and the efficiency of related skills in later life rather than affective processes. The present study design allowed us to examine this hypothesis more fully by permitting the examination of choice-supportive memory across both age groups and experimental conditions that varied in demands on active deliberation. Thus, we predicted that choice supportiveness would increase with decreases in (a) task complexity (e.g., alignable-focus >unalignable focus), (b) active deliberation, and (c) cognitive resources and ability (e.g., old >young).

METHOD

Design

A 3 × 2 × 2 (Age Group (young vs. middle vs. old) × Thought Condition (active vs. no deliberation) × Attribute Focus (alignable vs. unalignable)) design was used, with age group and thought condition as between-participant variables and attribute focus as a within-participant variable. Participants within each age group were randomly assigned to the conscious or unconscious thought conditions. Each participant was presented with two decision tasks, one which appeared in the alignable-focus condition and the other in the unalignable-focus condition. Presentation order was counterbalanced within each Age × Thought Condition group.

Participants

A total of 163 community-residing adults were recruited for this study. Fifty four young adults (20–44), 55 middle age adults (45–64), and 54 older adults (65–85) were tested. All participants received $30 in compensation.

Initial 3 × 2 (Age Group × Thought Condition) analyses of variance (ANOVA) conducted on demographic, health, and ability measures (Table 1) revealed typical age differences in performance on tests of working memory (letter–number sequencing), speed (digit–symbol substitution), and executive functions (Wisconsin Card-Sort), with performance decreasing with increasing age. Self-reported physical health also declined with age, whereas mental health increased. There were no age differences in education or verbal ability. Only two effects associated with thought condition were obtained, with those in the active deliberation condition having higher levels of education (16.3 vs. 15.6 years), $F(1, 157) = 4.79$, $p = .03$, $\eta_p^2 = .03$, and higher Need for Cognition scores (3.4 vs. 3.3), $F(1, 151) = 4.17$, $p = .04$, $\eta_p^2 = .03$, than those in the no deliberation condition. Consideration of these variables as covariates in subsequent analyses, however, revealed that their inclusion did not alter the results.

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Materials

The two tasks were intended to represent everyday decisions relevant to adults of all ages: choosing a grocery store where they would prefer to shop and an apartment to rent. Each decision task contained four choice alternatives, and each alternative was described by 10 attributes. Five attributes were alignable, relating to common dimensions across alternatives, whereas the remaining five attributes were unalignable. Examples of alignable attributes in the grocery store task were “good value,” “frequent sales,” “expensive,” and “low prices,” which all relate to cost. Examples of unalignable attributes in the same task included “in-store coffee shop,” “no free samples,” “no video rentals,” and “open after midnight.” The dimensions associated with the alignable traits were chosen due to high levels of importance assigned to them in marketing surveys (ACNielsen, 2005; Power & Associates, 2007). The unalignable attributes were selected to represent less important dimensions.

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Two sets of materials were constructed for each decision task. In the alignable-focus condition, the number of positive and negative alignable attributes varied across alternatives so that the optimal choice could be determined based solely on these attributes. That is, given the natural tendency to focus on alignable information and the aforementioned high levels of importance of the associated dimensions, the alternative that contained the highest number of positive alignable attributes was reasonably deemed the optimal choice in this condition. The number of positive and negative unalignable attributes also varied across alternatives in such a manner that the resulting total number of positive attributes was uncorrelated with the number of positive alignable attributes (see Table 2). This was done so that an optimal decision could not be made based simply upon a tally of total positive attributes as well as to make the overall evaluative content (number of positive–number of negative attributes) of the four alternatives similar to those in the unalignable-focus condition. In the unalignable-focus condition, all alternatives had the same number of positive alignable attributes, but varied in terms of the number of positive unalignable attributes (Table 2). Thus, the optimal choice in this condition had to be determined by considering both the alignable and unalignable attributes since the alternatives all had the same number of positive features that were of high importance.[1] Changing the focus from alignable attributes to unalignable attributes was also assumed to increase the cognitive demands of the task (e.g., Herrmann et al., 2009).

Background/ability measures—Before the testing session, participants completed a demographic questionnaire as well as the SF-36 Health Survey (Ware, 1993). Participants completed the letter/number sequencing (LNS), digit symbol substitution (DSS), and Vocabulary subtests from the Wechsler Adult Intelligence Scale III (WAIS-III; Wechsler, 1997), which were administered at various times during the study. A computer-based version of the Wisconsin Card Sort Task (WCST-CV; Heaton & PAR Staff, 2000) was also administered.

Procedure

Presentation order of the alignable- and unalignable-focus conditions and the decision contexts (i.e., grocery store and apartment) was counterbalanced across participants. At the beginning of the testing session, participants were told that they would be making two decisions based on the presented information. Within each thought condition, they were also given specific instructions about what they would do immediately after viewing the choice information.

The choice information was presented on a computer. The four alternatives were presented one at a time in random order, and each stayed on the screen for 20 seconds. The name assigned to the alternative was presented at the top of the screen, and the 10 attributes were randomly ordered in a list below. The text for each alternative was presented in a unique color and was accompanied by a graphic relating to the choice name (e.g., an oak tree for Village Oaks Apartments) to help participants distinguish between options. After all four choices were viewed, the screen went blank and participants engaged in the activity specific to their thought condition.

Participants in the no deliberation condition were given a sheet of moderately difficult word scrambles to solve for 3 minutes. Those in the active deliberation condition were asked to think carefully about the materials and to discuss the pros and cons of each alternative for 3 minutes. These participants were given a digital recorder and the experimenter left the room during this time. Their oral responses were later transcribed and coded for analysis. In order

[1]Copies of the stimuli are available upon request from the authors.

to familiarize participants with the think-aloud procedure and the recorder, they were given practice discussing the choices they faced in a recent consumer purchase before beginning the study.

After completing the thought task, participants in both conditions were asked to identify the optimal grocery store or apartment. Participants then rated the attractiveness of each choice option on a 9-point scale. Although they were not allowed to review the choice information, the scale was presented in the text color of the specific choice and was accompanied by the same graphic. After a short break, participants were presented with the second decision task. Upon completion of this task, the WAIS-III Vocabulary subtest and WCST-CV were administered. This was followed by a source memory test for the attributes associated with the alternatives in each task. Each attribute was presented on the screen, and participants were asked if the attribute was associated with the option they chose.

Prior to administration of the final two WAIS-III subtests, participants rated the relevance of each choice attribute to its decision (e.g., choosing an apartment) on a 7-point scale as a manipulation check. Mean relevance ratings were subsequently examined using a 2 × 2 × 2 (Context (apartment vs. grocery store) × Attribute Type (alignable vs. unalignable) × Attribute Valence (positive vs. negative)) ANOVA. Consistent with expectations, alignable attributes received higher ratings than unalignable attributes (*M*s = 5.46 vs. 2.92), $F(1, 157) = 1864.71$, $p < .001$, $\eta_p^2 = .92$. This effect was moderated by context, $F(1, 157) = 432.63$, $p < .001$, $\eta_p^2 = .73$, with the difference being greater for the grocery store (*M*s = 5.6 vs. 2.4) than for the apartment (*M*s = 5.3 vs. 3.4) decision task. Subsequent analyses indicated, however, that decision context did not meaningfully alter our results. Several higher-order interactions were also significant (*p*s <.05), but these effects reflected relatively minor fluctuations in means that did not affect the general pattern of discrimination between alignable and unalignable attributes. Importantly, this degree of discrimination was similar across age groups: young—5.3 vs. 2.9; middle aged—5.4 vs. 2.9; and old—5.7 vs. 2.9.

RESULTS

Three sets of analyses are initially reported for attractiveness ratings, choice, and choice-supportive memory. Results relating to our tests of UTT and the effects of deliberation based on our primary experimental variables of focus (alignable vs. unalignable) and thought condition (active vs. no deliberation) are discussed first in each section, followed by additional effects when age was included in the analyses. This is followed by a more exploratory analysis of the think-aloud data from the active deliberation condition.

Attractiveness ratings

Our first set of analyses examined participants' attractiveness ratings of individual choice alternatives in each condition to see if participants ordered their preferences in a manner consistent with optimality. To simplify presentation of the results, separate 2 (Thought Condition) × 4 (Optimality) ANOVAs were conducted within each focus condition. In the alignable-focus condition, the only significant effect obtained was due to optimality, $F(3, 483) = 25.68$, $p < .001$, $\eta_p^2 = .14$. Follow-up tests revealed a strong linear decrease in ratings as optimality decreased (Figure 1a), $F(1, 161) = 68.34$, $p < .001$, $\eta_p^2 = .30$. Thus, the presence of informative alignable attributes resulted in relatively effective discrimination between alternatives regardless of thought condition. In the unalignable-focus condition, there was also an effect of optimality, $F(3, 483) = 11.72$, $p < .001$, $\eta_p^2 = .07$, which was further moderated by thought condition, $F(3, 161) = 2.94$, $p = .03$, $\eta_p^2 = .02$. Follow-up tests revealed a stronger linear trend in ratings in the active deliberation condition, $F(1, 83) = 31.87$, $p< .001$, $\eta_p^2 = .28$, than in the no deliberation condition(Figure 1b), $F(1, 78) = 8.04$, $p = .01$, $\eta_p^2 = .09$. Taken together, these results demonstrate minimal impact of thought condition on performance with alignable materials, but an advantage of deliberation (or disadvantage of no additional deliberation) when dealing with unalignable materials. (If analyses are conducted within thought condition with focus as a within-participants factor, the results reinforce these conclusions in showing that performance was better with alignable than with unalignable materials in the no deliberation condition, but was equivalent across attribute focus with active deliberation.) These effects are suggestive of the facilitative effects of processing associated with alignable attributes, and the increased demand on resources when alignable attributes are uninformative. In addition, they are inconsistent with the UTT prediction of unconscious thought (i.e., no deliberation) leading to better performance than active deliberation.

Age effects—The addition of age group to these analyses did not result in any significant effects involving this factor. A subsequent set of analyses using Hierarchical Linear Modeling tested a series of models examining the possibility that education and ability might influence performance. Null models revealed significant within-person variability for both the alignable- ($z = 18.04$, $p <.001$) and unalignable- ($z = 15.64$, $p <.001$) focus conditions, but nonsignificant between-person variability. (The latter would not necessarily be expected given that there is no reason to presume that mean ratings across alternatives would vary across individuals.) We then constructed Level 1 models that included ratings for each alternative—permitting the estimation of slopes in relation to optimality—along with Level 2 models that included age, thought condition, and education or ability—permitting the examination of the moderating impact of these variables on these slopes.

No effects of education were observed in the alignable-focus condition. In the unalignable-focus condition, however, a significant Age × Education × Thought Condition × Optimality interaction was obtained, $\beta_1 = -.02$, $t(481) = -2.15$, $p = .03$. Decomposition of this interaction revealed that the effects of education were specific to the older end of the sample in the no deliberation condition. Specifically, the ratings of older adults at lower levels of education (1 *SD* below the sample mean) were not systematically associated with optimality ($\beta_1 = .07$, $p = .72$), whereas those of older adults at higher education levels (1 *SD* above the sample mean) were positively associated with optimality ($\beta_1 = .66$, $p = .02$).

Ability effects were examined using a composite measure based on a principal components analysis on WAIS-III LNS and DSS scores and the number of categories completed and perseveration errors from the WCST-CV ($|r|$ between these variables ranged from .42 to .75). This component—accounting for 62% of the variance—was entered as a Level 2 variable in our analysis. No effects of ability were observed in the unalignable-focus condition. In contrast, a significant Age × Ability × Thought Condition × Optimality interaction was obtained in the alignable-focus condition, $\beta_1 = .02$, $t(481) = 2.15$, $p = .03$. Decomposition of this interaction revealed that the locus of ability effects was in the older adults in the active deliberation condition, where the impact of optimality on ratings was stronger for those with high levels of ability (1 *SD* above the sample mean), $\beta_1 = 1.03$, $p = .01$, than for those with low levels (1 *SD* below the mean), $\beta_1 = .50$, $p = .01$.

Taken together, these two analyses indicate that age differences emerged only when considering education and ability. In both cases, when these variables moderated performance, they did so only in older adults, with higher education and ability being associated with more systematic ordering of choice alternatives. In addition, the effects were only obtained in conditions associated with effortful processing (i.e., unalignable attributes or active deliberation).

Choice

We next examined the proportion of participants selecting the optimal choice in each condition (Table 3), and the results were generally consistent with those associated with ratings. As predicted, binomial tests revealed that performance in the unalignable-focus condition was above chance (i.e., .25) in the active deliberation condition, but did not significantly differ from chance in the no deliberation condition. In contrast, participants in both thought conditions performed significantly above chance in the alignable-focus condition. Logistic regression analyses performed on decision outcome (i.e., selection vs. nonselection of optimal alternative) in each focus condition were consistent with these observations. Thought condition was a significant predictor of outcome in the unalignable-focus condition, with better performance associated with deliberative thought, β = 0.78, OR = 2.17, *p* = 0.02, but not in the alignable-focus condition, β = −0.22, OR = 0.8, *p* = .48. Once again, these results are inconsistent with expectations derived from UTT: there was no evidence for the benefits of unconscious thought, with no deliberation actually resulting in worse performance in the unalignable-focus condition.

Age effects—There was some variation across age groups, with young adults performing at chance levels in the alignable-focus/active deliberation condition, whereas older adults performed above chance in the unalignable-focus/no deliberation condition. The pattern of performance across conditions, however, was very similar for all age groups. When age was entered into the logistic regression model, no unique effects of age were obtained.

Choice-supportive memory

Attributions of individual attributes to the chosen versus unchosen alternatives were focused on next as a means of examining choice-supportive memory. For each decision task, we calculated an index of choice supportiveness based on the measure used by Mather and Johnson (2000): (proportion of positive features attributed to chosen option + proportion of negative features attributed to nonchosen options) - (proportion of negative features attributed to chosen option + proportion of positive features attributed to nonchosen options). Higher scores represented a bias toward choice supportiveness. An initial 2 × 2 × 2 (Thought Condition × Attribute Focus × Attribute Type) ANOVA on these scores revealed greater choice supportiveness with no deliberation (*M* = .72) than with active deliberation (*M* = .37), *F*(1, 153) = 7.63, *p* = .01, $\eta_p^2 = .05$, a finding consistent with the notion that more extensive processing would be associated with less memory bias. Choice supportiveness was also greater for alignable than for unalignable attributes (*M*s = 1.37 vs. −27), *F*(1, 153) = 208.13, *p* <.001, $\eta_p^2 = .58$. Thus, the more extensive processing thought to be associated with unalignable attributes appears to have resulted in less systematic bias in source attributions than observed for alignable attributes.

Age effects—Choice-supportive memory increased with age across the young, middle-aged, and old groups (*M*s = .42, .53, and .70, respectively), although the age effect was not significant (*p* = .21). However, age did interact with attribute type, *F*(1, 153) = 4.40, *p* = .01, $\eta_p^2 = .05$. This was due to choice supportiveness scores increasing from the young to middle-aged to older groups for alignable attributes (*M*s = 1.02, 1.36, and 1.71), but not for unalignable attributes (*M*s = −.19, −.31, and −.32). This effect was no longer significant, however, when our composite ability measure was used as a covariate. This suggests that observed age effects reflected ability differences rather than some other aspect of processing (e.g., goal related).

Characteristics of deliberation

In addition to ensuring that participants engaging in active deliberation were actually doing so, the think-aloud procedure also provided data that afforded the opportunity to explore the nature of this deliberation and its relationship to effective decision making. Our examination of these data was somewhat exploratory, but we were guided by three general questions that were relevant to tests of UTT and to expectations regarding the impact of our experimental manipulations. First, was there any evidence that the materials in the alignable-focus condition would promote fluent, online processing? Second, did the content of deliberations vary as a function of task materials? And third, was there a relationship between the content of the think-aloud protocols and the effectiveness of decision making? This last question was particularly relevant to contrasting our predictions that deliberation would be beneficial in certain contexts to those of UTT, which would suggest detrimental effects. To examine these questions, think-aloud sessions were transcribed and then coded by two trained assistants. Coders scored the number of times a participant mentioned specific alignable and unalignable attributes as well as the dimensions they reflected. They also indicated if participants identified their choice during deliberation. An intraclass correlation of 0.85 (95%CI 0.80–0.88, F (227) = 6.63, p <0.001) was obtained when agreement between coders was assessed, indicating adequate inter-rater reliability (see Shrout & Fleiss, 1979).

Processing fluency—Relevant to our first question, we examined whether specification of a choice during deliberations varied across conditions. If processing fluency is enhanced under alignable conditions, participants may be more likely to use the decision information to identify a choice earlier when compared to the unalignable condition. Indeed, participants were more likely to identify a choice in the alignable-focus than in the unalignable-focus condition (73% vs. 61%), $F(1, 83) = 3.98$, $p = .05$, $\eta_p^2 = .05$. This supports our contention that being able to focus on alignable attributes in arriving at a decision would promote fluent, online processing.

Contents of deliberation—Relevant to our second question, we conducted a series of 3 × 2 (Age Group × Focus Condition) ANOVAs on frequency of mentions of alignable dimensions, alignable attributes, and unalignable attributes. Consistent with the expectation that the alignable-focus condition should bias participants toward processing of alignable attributes, the dimensions associated with these attributes (e.g., cost) were somewhat more likely to be mentioned in that condition than in the unalignable-focus condition (*M*s = 1.9 vs. 1.4), although the effect only approached significance, $F(1, 83) = 3.18$, $p = .07$, $\eta_p^2 = .04$. Specific alignable attributes (e.g., "low prices"), however, were mentioned more in the alignable-focus than in the unalignable-focus condition (*M*s = 6.0 vs. 4.8), $F(1, 83) = 6.21$, $p = .02$, $\eta_p^2 = .07$. Importantly, the opposite was true for mentions of unalignable attributes (*M*s = 3.1 vs. 2.3), $F(1, 83) = 7.19$, $p = .01$, $\eta_p^2 = .08$. These data suggest that participants were sensitive to the structure of the stimuli, with participants altering their emphasis on each type of attribute based on its relevance to the decision task.

Deliberation and decision outcomes—Our final set of analyses was focused on determining whether the characteristics of deliberative activity in the conscious thought condition were actually associated with performance. Based on previous work by Zhang and Markman (2001), we explored the extent to which participants' focus on different types of attributes was related to their decisions. To do this, we conducted separate regression analyses in each focus condition using age group, the frequency of mentions of alignable and of unalignable attributes, and the interactions between age group and these two variables to predict decision effectiveness. For this last measure, we used the same measure used by Dijksterhuis (2004), namely the difference between ratings for the optimal and least optimal alternatives in each condition. In the alignable-focus condition, mentions of alignable attributes were positively associated with ratings (*B* = .26, *p* = .02), whereas mentions of unalignable attributes were not associated with performance (*B* = .00, *p* = .99). In the unalignable-focus condition, there were no significant effects of alignable or unalignable mentions (*ps* >.30). Age did, however, moderate the impact of mentions of alignable attributes on performance, $F(2, 75) = 3.40$, $p = .04$, $\eta_p^2 = .08$. This effect was localized in the middle-aged group, where more frequent mentions of alignable attributes were associated with poorer performance (*B* = −.43, *p* = .01). In other words, focusing on alignable attributes impeded performance when the task called for attention to unalignable attributes. No significant relationships were observed in the other conditions. On the surface, this last finding appears to be consistent in supporting UTT's contention that deliberation may be counterproductive to effective decision making. Taken together, however, these results suggest it is not deliberation in-and-of-itself that is problematic. In fact, the obtained effects suggest that active deliberation can be very effective in promoting decision making, especially if individuals are sensitive to the informational demands of the task.

To take these analyses one step further, we attempted to compare the hypothesized benefits of unconscious thought (i.e., no deliberation) relative to those of conscious thought when individuals were or were not engaging in effective (i.e., task-appropriate) deliberation. In the alignable-focus condition, participants were split into effective and ineffective deliberators using a median split on the number of times they mentioned alignable attributes while thinking aloud. Those in the effective group had an average of 8.9 mentions versus 3.0 in the ineffective group. The number of mentions of unalignable attributes was similar across groups (2.2 vs. 2.5, respectively). We then performed a 3 × 3 (Age Group × Thought Condition [unconscious vs. effective conscious vs. ineffective conscious] on the same decision effectiveness measure used in the preceding analyses. A significant thought condition effect was observed, $F(1, 154) = 5.39$, $p = .01$, $\eta_p^2 = .07$, with effective deliberation (*M* = 2.61) and no deliberation (*M* = 1.93) being associated with significantly (*p*s <.02) higher scores than ineffective deliberation (*M* = .49). This suggests that unconscious thought or the absence of deliberation may prove beneficial, but only when compared to deliberation that does not focus on the pertinent task elements. A significant Age × Thought Condition interaction was also obtained, $F(1, 154) = 2.42$, $p = .05$, $\eta_p^2 = .06$, reflecting the differential benefits of unconscious thought versus ineffective deliberation across age groups. Specifically, ineffective deliberation appeared to have the greatest negative impact on decision making in younger adults (Table 4). Although a similar pattern was observed in the two older groups, there were no significant differences between thought conditions in either one.

In the unalignable-focus condition, we initially divided participants in a similar manner but based on mentions of unalignable attributes given their importance in this task. However, no significant effects were associated with this grouping variable. Further inspection revealed that individuals who had high rates of mentions of unalignable attributes also had higher rates of mentioning alignable attributes, which our previous analysis had shown to be related to poorer performance in middle-aged adults. Thus, we used the difference between mentions of unalignable versus alignable attributes to group individuals, with those exhibiting higher relative emphasis on the former (i.e., above the median difference score) being labeled as effective deliberators in this condition. Inspection of the means revealed that effective deliberators had higher scores than ineffective deliberators (2.0 vs. 1.4), and both of these groups had higher scores than those in the unconscious condition (.8), although the group effect was not significant (*p* = .17). Given the exploratory nature of this analysis, we performed specific contrasts between groups. Effective deliberators were found to have marginally higher scores than those in the no deliberation condition (*p* = .06), but none of the other contrasts approached significance. Thus, once again there was some evidence that those who focused on decision-relevant information during deliberation benefited most from additional thought, as well as little evidence that preventing deliberation was beneficial. No age effects were obtained in this analysis.

DISCUSSION

The goals of the present research were twofold. First, we tested several predictions derived from UTT as part of a broader goal of identifying specific conditions under which active deliberation may be either beneficial or detrimental to decision making. Second, we examined the degree to which presumed demands on active deliberation moderated age differences in performance. We address the data relevant to each of these goals in turn.

The relative benefits of active deliberation

This study was designed to contrast predictions derived from UTT (Dijksterhuis & Nordgren, 2006) regarding the advantages of unconscious thought versus those derived from a perspective emphasizing the interaction between task characteristics and deliberative activity. The results were clearly supportive of the second perspective. Specifically, we obtained no evidence that would support the hypothesis that complex decision making benefits from unconscious thought or that active deliberation is detrimental to performance. In no condition did preventing participants from engaging in additional thought result in demonstrably better decisions than when they were allowed additional time to actively process the decision materials. In both the alignable- and unalignable-focus conditions, participants who engaged in active deliberation selected the optimal alternative at above-chance levels and exhibited clear discrimination between alternatives based on optimality. In addition, these same individuals performed as well as participants who were prevented from engaging in additional deliberation—when unconscious thought should be occurring—in the alignable-focus condition, and better than those individuals in the unalignable-focus condition.

This pattern of performance provides clear support for our hypothesis that it is the task characteristics in conjunction with the nature of deliberative activity that determines performance. When decisions could reasonably be based on alignable attributes, thereby tapping into and reinforcing natural tendencies to use a common metric for comparing alternatives and thus facilitating online processing, decision making was not benefitted—nor harmed—by additional deliberation. In contrast, when task difficulty was increased by requiring participants to consider unalignable attributes as well, performance was enhanced by active deliberation.

It is interesting to contrast the results of our study with those of Queen and Hess (in press). In that study, active deliberation was most effective when individuals were forced to consider only a subset of attributes in making their decision as opposed to using all attribute information. In the present case, just the opposite was observed. The difference in results had to do with the fact that the relevant and irrelevant attributes in the Queen and Hess study were both alignable. Thus, in contrast to the present study where alignability overlapped with relevance, the tendency to focus on alignable attributes may have worked at cross-purposes when participants were required to simply focus on a subset of these attributes. Taken together, it appears that when the task requires discrimination between attributes and integration of information, additional deliberation facilitates performance.

Our think-aloud procedure also provided interesting insights into the benefits of active deliberation. First, we found that individuals adapted their responses to the task conditions. In the alignable-focus condition, participants mentioned alignable attributes more than unalignable attributes, whereas the opposite was true in the unalignable-focus condition. In addition, decision-making performance improved when individuals were focused on the attributes most relevant for discrimination purposes. We also found that participants were more likely to mention a specific choice in the alignable-focus condition, which we believe is consistent with our assumption that processing was more efficient in this condition than in the unalignable-focus condition.

Perhaps the most interesting data with respect to UTT were obtained when we compared performance of participants in the no deliberation condition with that of participants deemed to be either effective or ineffective deliberators based on the degree to which they focused on attributes that were relevant to the task at hand. These data suggest that any presumed benefits of unconscious thought—when gauged in comparison to conscious thought—may be based partly in the degree to which individuals engage in effective deliberation when given the chance. Ineffective deliberators exhibited inferior performance to those in the no deliberation condition in the alignable-focus condition. This finding appears to support the conjecture by Lassiter et al. (2009) that additional deliberation in situations conducive to online processing may be detrimental due to, for example, initial accurate impressions being modified by retrieval of faulty information from memory.[2] We might further suggest that discrepancies in our findings regarding the benefits of deliberation with those of Dijksterhuis (2004) might partially be based in our use of the think-aloud procedure, which may have increased the probability of engaging in effective deliberation when compared to the silent, unmonitored thought by participants in this previous research. In spite of the finding that inefficient deliberation can occasionally be detrimental, however, our results do not support the general UTT prediction regarding the negative effects of deliberation in complex decision-making situations in that (a) those individuals who focused on the relevant decision attributes in both focus conditions made the best decisions and (b) even ineffective deliberators in the unalignable-focus condition made better decisions than those in the no deliberation condition.

Aging and decision making

Our focus on aging in this study was to test an implication of UTT that individuals with reduced cognitive resources or inefficient deliberative processes (e.g., older adults) might disproportionately benefit from unconscious thought as well as test the general hypothesis that age differences would be most likely under conditions placing demands on deliberative processes. Little support was obtained for either idea, however, with young, middle-aged, and older adults affected similarly by the nature of the decision materials and the opportunity to deliberate. Age differences did emerge when we considered the effects of education and ability. In the unalignable-focus condition, education moderated older adults' performance, with those individuals with less education being less likely to discriminate between alternatives than were those with more education. There was no impact of education in the alignable focus condition. This is consistent with our expectation that age differences are most likely to emerge under conditions that put more demands on cognitive resources (e.g., working memory), but the effects were only evident in those of low education. This education effect is consistent with other aging research showing that education serves as a protective factor (e.g., Pratt, Diessner, Pratt, Hunsberger, & Pancer, 1996), per haps reflecting the influences of knowledge or experience.

Ability also influenced performance, but only for older adults in the alignable-focus condition. Specifically, low ability older adults evidenced poorer discrimination between

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[2]Although the statistical tests were not entirely supportive, a pattern consistent with the prediction made by Lassiter et al. (2009) can be seen in Table 3, where choice accuracy was generally greater under active deliberation than under no deliberation in the unalignable-focus condition, whereas the opposite was true in the alignable-focus condition.

alternatives than did high ability older adults only after active deliberation. Localization of the ability effect in the alignable-focus condition and not in the more difficult unalignable condition may just reflect a statistical power issue. It may also be that higher levels of ability are required to filter out the unalignable attributes. Of greater significance is the fact that the age-based interactions with ability and education did occur in conditions where deliberative thought was assumed to be necessary to support performance. This provides some support for our hypothesis that age differences would be more likely under such circumstances, and is consistent with other research (e.g., Finucane et al., 2005) suggesting that ability factors at least partly account for age decrements in decision-making when they are observed.[3]

Finally, we hypothesized that age differences in choice-supportive memory (e.g., Mather and Johnson, 2000) might partially reflect cognitive mechanisms, with choice supportiveness decreasing as the degree of deliberative activity, and the ability to engage in such activity, increases. Consistent with expectations, increasing age was associated with an increase in choice supportiveness involving alignable attributes, but was eliminated when controlling for ability. Choice supportiveness was also greater (a) for alignable versus unalignable attributes and (b) in the no deliberation versus active deliberation conditions. A common thread among these three effects is that supportiveness was stronger in the cases where deliberative skills were either less likely to be engaged (e.g., no deliberation condition) or weaker (e.g., old age). This suggests that choice supportiveness will decrease as deliberative processing increases and, presumably, memory for the information presented increases.

It is interesting that the age effects in choice supportiveness were not necessarily reflected in decision-making performance. This may suggest that the processing components associated with evaluating alternatives and supporting choice were not dependent on the source-monitoring skills reflected in choice-supportive memory. Age differences in such skill may be more important in influencing decisions in conditions involving memory-based processing, where information is retrieved and evaluated after initial exposure.

Conclusions

The results of this study add to a growing body of research that calls into question UTT assertions about the efficacy of unconscious thought (e.g., Lassiter et al., 2009; Newell et al., 2009; Payne et al., 2008; Queen & Hess, in press; Thorsteinson & Withrow, 2009). Based on these findings and ours, the most reasonable interpretation is that additional deliberation is not beneficial when the structural aspects of the stimuli promote fluent online processing resulting in formation of general impressions of the choice alternatives. Prevention of additional deliberation for a period of time, however, does not necessarily lead to better decisions (Newell et al., 2009), although it may have a negative impact as individuals modify initially accurate impressions (e.g., Lassiter et al., 2009). In contrast, there is clear evidence for the benefits of active deliberation in situations not conducive to online processing. These benefits are particularly evident in those individuals who are sensitive to the structure of the information presented about decision alternatives. These findings are clearly inconsistent with the ideas proposed by Dijksterhuis and Nordgren (2006).

The reasons for the discrepancies of ours and other recent findings with those by Dijksterhuis and colleagues is unclear, particularly since some studies were direct

[3]A reasonable assumption based on our theorizing is that the effects due to education and ability were based in inefficient deliberation. Examination of the measures derived from the think-aloud data (e.g., mentions of alignable and unalignable attributes), however, did not reveal significant relationships with education or ability in the relevant conditions. Note that this is just one way of examining deliberation efficiency using these data. Other possible ways of assessing deliberation are possible, but beyond the scope of this paper.

replications (e.g., Newell et al., 2009). As we noted before, the nature of the active deliberation condition may be important in determining what individuals are doing under "conscious thought" conditions. Our data also indicate that the content of active deliberation is meaningful, which is not inconsistent with UTT. Finally, it seems quite clear that there are situations where additional deliberation is unnecessary, if not detrimental. It appears possible, however, to explain such findings without reference to passive thought mechanisms (e.g., Lassiter et al., 2009).

Our findings with respect to the effects of aging are consistent with the general theme that age decrements are not universally observed in decision-making performance. We had predicted that aging would have the greatest negative impact on performance in situations where active deliberation was advantageous to performance. This effect was not observed unless education and ability were taken into account. It may be that the relatively small age effects in the present study were associated with the emphasis on immediate evaluation (as opposed to memory-based processing) of alternatives. The age differences we observed in source memory for choice attributes suggest that age differences may be more likely to occur if retrospective analyses are required in arriving at a decision. The use of a relatively familiar decision context may have also been beneficial. Age-related experience does seem to help older adults to counteract certain biases commonly observed in younger adults, such as sunk-costs (Bruine de Bruin et al., 2007; Strough, Mehta, McFall, & Schuller, 2008) and the attraction effect (Tentori, Osherson, Hasher, & May, 2001). In the present case, experience may help counteract normative declines in deliberative skills. The results are consistent with previous findings that age differences are minimal—and in some cases reversed in favor of older adults—if judgments can be made based on online processing of summary evaluative information (e.g., Hess, Pullen, & McGee, 1996; Queen & Hess, in press; see also Peters et al., 2007). Taken along with other research, it is clear that simple characterizations of the impact on aging on decision-making cannot be made, and that the form of such age functions depends on a complex interaction between task (e.g., familiarity, complexity) and age-related individual (e.g., wisdom, knowledge, motivation) characteristics.

Acknowledgments

Support for this study was provided by NIA grant AG05552 awarded to Thomas M. Hess. The authors thank the following individuals for their assistance during various stages of this project: Dana Kotter-Grühn, Don Johnson, James Kornegay, Melissa Markell, Se Young Han, Elyse Kline, and Margaret Laney.

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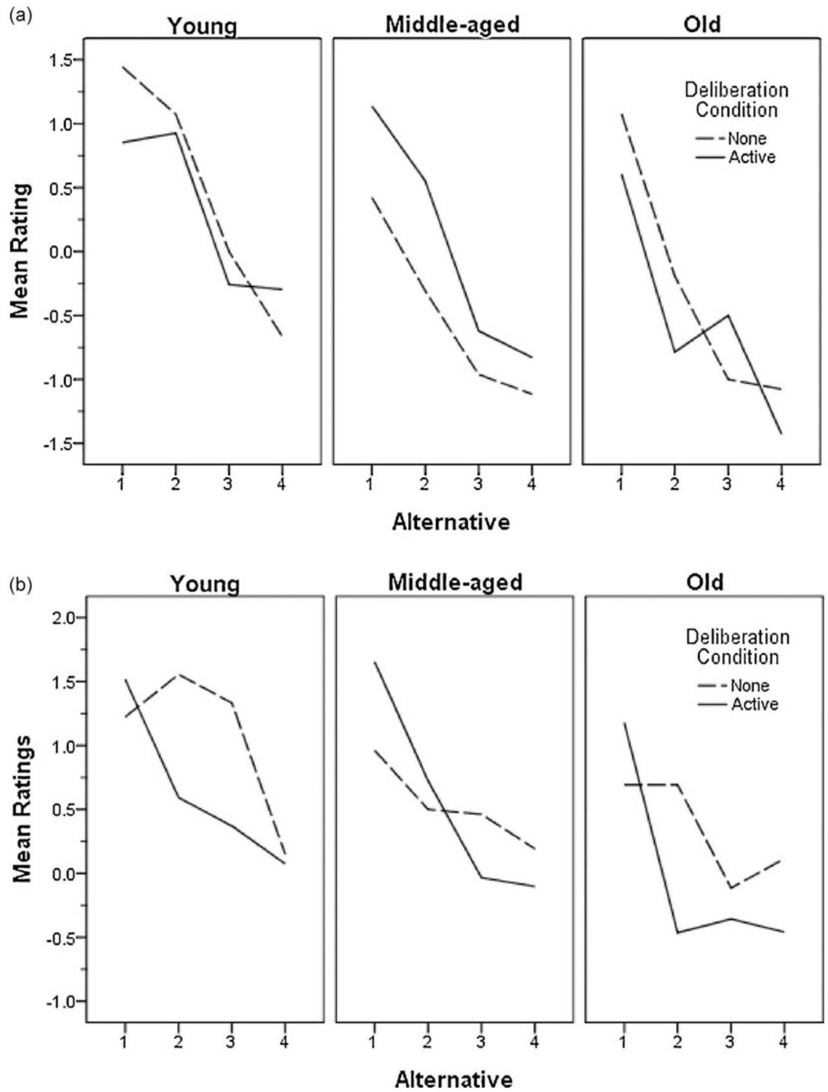

Figure 1.
Attractiveness ratings as a function of optimality in the (a) alignable-focus condition and (b) unalignable-focus condition. Optimality decreased from alternatives 1–4

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Table 1

Participant characteristics

	Young		Age group middle aged		Older	
Measure	***M***	***SD***	***M***	***SD***	***M***	***SD***
Age*	33.9	7.4	54.3	6.4	73.6	6.2
Education (years)	16.1	1.8	16.2	2.1	15.7	2.4
SF-36 physical Health*	51.6	4.7	47.5	7.7	44.6	8.6
SF-36 mental health*	49.3	8.8	49.7	10.2	57.5	5.3
Vocabulary	49.2	9.4	50.5	9.5	50.4	8.2
Digit–symbol substitution*	84.5	17.7	70.7	14.8	58.5	13.3
Letter–number sequencing*	11.9	3.3	10.8	3.0	9.7	2.8
WCST perseverative errors*	7.4	5.1	10.7	5.8	14.9	9.4
WCST categories completed*	3.7	1.4	2.3	1.6	2.0	1.5
Need for cognition	2.5	.3	3.3	.4	3.3	.4

Note: SF-36 scores represent scaled *T*-scores. Vocabulary scores could range from 0 to 66. Letter–number sequencing scores could range from 0 to 21. Digit–symbol scores could range from 0 to 133. Need for cognition scores represent the mean response across items and could range from 1 to 6.

*Significant difference between age groups (p <.05).

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Table 2

Information about choice alternatives: distribution of positive and negative attributes (top) and evaluative content (bottom)

	Condition and alternative							
	Alignable focus				**Unalignable focus**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Number of Positive/Negative Attributes								
+/− Alignable Attributes	4/1	3/2	2/3	1/4	4/1	4/1	4/1	4/1
+/− Unalignable Attributes	1/4	5/0	2/3	5/0	4/1	2/3	1/4	0/5
Evaluative content								
Alignable attributes only	3	1	−1	−3	3	3	3	3
All attributes	0	6	−2	2	6	2	0	−2

Note: Evaluative content was determined by subtracting the number of negative attributes from the number of positive attributes. Ordering of alternatives from optimal to least optimal was based on the evaluative content for alignable attributes in the alignable-focus condition and for all attributes in the unalignable-focus condition.

Table 3

Proportion of participants selecting the optimal alternative

Age group	Condition	Alignable focus	Unalignable focus
Young	No deliberation	.48*	.30
	Active deliberation	.41	.48*
Middle aged	No deliberation	.50*	.27
	Active deliberation	.48*	.54*
Old	No deliberation	.58*	.46
	Active deliberation	.50*	.57*
All participants	No deliberation	.52*	.34
	Active deliberation	.46*	.53*

* $p<.05$—performance greater than chance.

Table 4

Contrast of effective and ineffective deliberators with the no deliberation condition in the alignable-focus condition

Age group		Effective deliberators	Ineffective deliberators	No deliberation
Young	*M*	2.88	−1.80	2.11
	SD	2.91	2.35	2.33
Middle aged	*M*	2.25	1.62	1.54
	SD	2.86	3.36	3.44
Old	*M*	2.70	1.67	2.15
	SD	2.87	2.99	3.06

Note: Score represents the rating for the optimal alternative minus the rating for the least optimal alternative. Possible range of scores: −6 to 6.