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Aging and Everyday Judgments: The Impact of Motivational and Processing Resource Factors

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Abstract

It has been hypothesized that reductions in cognitive resources might result in older adults engaging in less systematic processing than younger adults when making everyday judgments. In two experiments, we tested individuals aged from 24 to 89 years to examine the degree to which task-related information associated with more superficial versus complex processing differentially influenced performance. We also examined the hypothesis that motivational factors would moderate age differences in processing complexity. In both studies, there were no age differences in the use of simple versus complex processing. Increasing age was, however, associated with increasing selectivity in cognitive resource engagement.

Keywords

Aging; judgment; motivation; systematic processing; social cognition

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Adaptive functioning in everyday life is in part related to one's ability to effectively evaluate important information in a variety of situations. It can reasonably be argued that quality of life and the ability to maintain independent functioning are affected by the quality of judgments and decisions that result from such evaluations (Mather, 2006; Peters, Hess, Västfjäll, & Auman, 2007). An important question concerns whether the effectiveness of such processes is negatively affected by aging and associated declines in basic cognitive skills. In research on judgment and decision-making (JDM) processes in younger adults, limitations placed on cognitive resources have been shown to result in relatively simplistic processing that relies heavily on assimilative or schema-based processes (e.g., Macrae, Hewstone, & Griffiths, 1993; Srull, 1981; Webster, Richter, & Kruglanski, 1996). Given normative declines in working memory and executive functions (Braver & West, 2008), aging might have a similar effect on the nature of processing, with older adults engaging in less complex and analytic processing than younger adults under normal conditions.

To examine this possibility, we conducted two experiments in which different aged-individuals made judgments based on scenarios containing both relatively superficial, easily processed information and more complex, resource-demanding information. Of interest was

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whether aging is associated with an increase in the probability that individuals would engage in processing shortcuts by focusing on the former type of information at the expense of the latter. In some situations, it may be adaptive to use heuristics based on superficial information (e.g., Gigerenzer & Goldstein, 1996). In the present case, however, we focus on situations where easily processed information (a) is less relevant than more cognitively demanding information with respect to the judgment at hand or (b) needs to be considered together with other relevant but more complex information. In both situations, an undue focus on easily processed information may result in poor judgment and be particularly detrimental to functioning.

Three specific research questions were of interest in each study. First, do adults of different ages vary in the degree to which they rely on processing shortcuts in making judgments? Consistent with a general deficit view of cognitive aging, we tested the hypothesis that relatively superficial, easily processed information would have a stronger impact on older adults' judgments than on those of younger adults. Second, if such age differences exist, would basic cognitive abilities (e.g., working memory) mediate these effects? Finally, we were interested in the role of motivation, and whether task engagement would differentially influence performance across age. There is evidence that aging is associated with increased selectivity in engagement of cognitive resources, with older adults being disproportionately influenced by relevance or engagement in the task (Germain & Hess, 2007; Hess, Germain, Swaim, & Osowski, in press; Hess, Rosenberg, & Waters, 2001). Consistent with the selective engagement hypothesis, we predicted that self-reported interest would be positively associated with processing complexity, with this effect being stronger for older than for younger adults.

Experiment 1

In the first study, different-aged adults were presented with scenarios in which a fictitious individual was accused of a crime. Each accusation was supported by evidence varying in both strength and quantity. Quantity represented a rather superficial cue that was easily assessed through visual inspection, but that was relatively uninformative in the absence of evaluation of evidence strength. Previous research by Petty and Cacioppo (1984) demonstrated that the judgments of individuals with low task involvement (i.e., low motivation/effort) were more influenced by quantity than by quality of information, whereas the opposite was true for those individuals with high levels of involvement. In the present context, if reductions in cognitive ability influence the complexity of information processing, then it might be expected that aging would be associated with a relatively stronger influence of superficial cues (i.e., quantity) versus more substantive cues (i.e., evidence strength) on both judgments of guilt and indices of processing. Wang and Chen (2006) examined the impact of argument quantity on persuasion and found some evidence consistent with this hypothesis, but the effects varied with topic suggesting that age differences in knowledge or beliefs may have influenced the results. The present study sought to provide a clearer test by using situations that minimized the impact of beliefs and thus were less likely to engage pre-existing judgment biases.

Method

Participants—We recruited 72 men and 72 women (aged 24 to 89) through newspaper ads and paid them $20. Characteristics of the sample are presented in Table 1, and correlations between age and the various background measures revealed typically observed relationships.

Materials and procedure—Each participant read six two-sentence scenarios depicting individuals accused of crimes (e.g., vandalizing a construction site) with the goal of evaluating the strength of the evidence. Each scenario was accompanied by two, four, or six pieces of either all strong or all weak supporting evidence. Each piece of evidence was previously rated (1 [weak] to 7 [strong]) by independent groups of 27 younger (ages 18 – 38) and 13 older (ages 64 – 73) adults. Mean ratings of weak evidence ranged from 3.2 to 3.7 across scenarios, whereas mean ratings of strong evidence ranged from 5.0 to 6.0, with no age differences. Three different versions of the two- and four-item scenarios were created such that each piece of evidence appeared equally often within each set size across participants. Six presentation orders were created, with each scenario systematically rotated through conditions (2 levels of strength X 3 levels of quantity of evidence) and presentation position across orders. Pieces of evidence were similar in length, and were numbered and all fit on a single sheet of paper for each scenario. Thus, variation in the quantity of evidence presented across scenarios was readily apparent by the amount of verbiage as well as numbering. For each scenario, evaluations of guilt were based on three 7-point scales: not guilty vs. guilty, unfavorable vs. favorable, and negative vs. positive (Cronbach's αs = .74 – .85). Three additional scales were used as a manipulation check for perceptions of evidence quality: weak vs. strong, inconclusive vs. conclusive, and not at all incriminating vs. very incriminating (Cronbach's αs = .95 – .96). Participants were then given 5 min to list up to five thoughts that crossed their minds while reading and evaluating the evidence. These were later categorized as either (a) analytic thoughts that evaluated specific facts, highlighted the need for additional information, or provided alternative interpretations to existing information or (b) nonanalytic thoughts consisting of general evaluations, simple listing of evidence, or thoughts unrelated to the evaluative goals of the task. One rater scored all protocols, with reliability assessed based on a second raters' scoring of 20% of the protocols. Interrater agreement was high (94%). Finally, task engagement was indicated by the mean rating for involvement and interest (*r*s = .84 – .90), and familiarity was assessed with a single item.

Results and Discussion

Manipulation check—Analysis of ratings of evidence quality revealed that scenarios with strong evidence received higher ratings ($M = 5.7$) than did those with weak evidence ($M = 3.2$), $F(1,142) = 534.79$, $p < .001$, $\eta^2_{p=}.79$, but age did not moderate this effect ($p > .20$). There were also no age differences in self-rated familiarity with the scenario content (*p*s > .14).

Guilt ratings—Guilt ratings were examined using Hierarchical Linear Modeling (HLM) with SAS Proc Mixed to take advantage of the six observations per participant (2 levels of strength X 3 levels of quantity)[1]. For our primary analyses, we constructed Level 1 models that included our experimental manipulations of evidence strength and quantity as well as ratings of self-reported engagement (mean-centered) in order to obtain the intercepts, slopes and interactions associated with each of these variables. Level 2 models were then constructed to determine the degree to which age (mean-centered) moderated these effects. Follow-up decomposition of interactions involved examining effects (e.g., slopes) at representative points ±1 *SD* from the sample mean for the relevant variable (e.g., age).

Guilt ratings increased with both evidence strength, $\beta_1 = .97$, $t(704) = 9.48$, $p < .001$, and quantity, $\beta_1 = .34$, $t(704) = 6.36$, $p < .001$. Evidence for the differential influence of these two factors across ages was not obtained, however; neither effect was moderated by age alone (*p*s > .50), obviating the need to examine cognitive ability as a mediator. Engagement did interact with strength, $\beta_1 = .13$, $t(704) = 1.99$, $p = .05$, and this effect was further moderated by age, $\beta_1 = .014$, $t(704) = 3.94$, $p < .001$. Decomposition of the latter interaction

[1]Fully unconditional null models for this and all subsequent analyses in this and the second experiment revealed sufficient variability to proceed with tests of models involving our primary variables of interest.

revealed a pattern of performance consistent with the selective engagement hypothesis (Figure 1). Specifically, guilt ratings increased with argument strength in younger adults, $\beta_1 = 1.02$, $t(704) = 6.99$, $p < .001$, but engagement did not moderate this effect ($p = .17$). In contrast, engagement did moderate the influence of evidence strength for older adults ($p < .001$), with strength positively associated with guilt judgments at high levels of engagement ($\beta_1 = 1.52$, $p < .001$), but not at lower levels ($\beta_1 = .32$, $p = .09$). A significant Age X Engagement X Strength X Quantity interaction was also observed, $\beta_1 = -.01$, $t(703) = -3.71$, $p < .001$, due to the previously described effect for older adults being particularly strong with few pieces of evidence.

Thoughts—To examine processing complexity and simplify our analyses, we used the proportion of total thoughts that were analytic as the DV in a similar set of HLM analyses. It was assumed that individuals who were systematically processing message content would engage in analytic thought unless the evidence clearly supported the assertion of guilt (e.g., many strong pieces of evidence). We found that analytic thought declined as evidence strength increased, $\beta_1 = -.07$, $t(704) = -1.99$, $p = .05$. This effect was moderated by evidence quantity, $\beta_1 = -.08$, $t(704) = -3.25$, $p = .001$, reflecting the fact that analytical thought was negatively associated with quantity for strong evidence ($\beta_1 = -.10$, $p < .001$), but not for weak evidence ($\beta_1 = -.01$, $p = .47$). This is consistent with the expectation that individuals would be least likely to engage in analysis when the evidence in support of guilt is strong. Age did not moderate this relationship, but age did interact with self-reported engagement, $\beta_1 = -.002$, $t(704) = -2.31$, $p = .03$. This was due to engagement being negatively related to analytic thoughts in older adults ($\beta_1 = -.06$, $p = .01$), but not in younger adults ($\beta_1 = .02$, $p = .46$). This effect may reflect the stronger relationship between engagement and evidence strength observed for older adults, which in turn was negatively related to analytic thought. That is, older adults' engagement was greatest in those situations least likely to require or induce integrative processing.

In sum, age in-and-of-itself was not associated with disproportionate use of processing shortcuts. Individuals of all ages exhibited similar changes in guilt judgments with increases in both strength and quantity of evidence, thus providing no evidence in support of the hypothesis that declining cognitive resources (e.g., working memory) would result in more superficial processing in later life. Older adults were, however, less likely to be influenced by relatively difficult-to-process information (i.e., strength) if they reported little interest in the scenario; interest level did not moderate younger adults' performance. Thus, consistent with the selective engagement hypothesis, age differences in the nature of processing were most evident at low levels of motivation.

Experiment 2

The second study represented a conceptual replication of the first using a consumer judgment task. This allowed us to examine the generalizability of results from Experiment 1 within a different everyday context using different types of superficial and complex cues. Replication with a different task would also argue against the possibility that the null age differences observed in use of complex cues in Experiment 1 reflected general perceptions of low validity of the superficial cues across ages. Specifically, we adapted a task used by Maheswaran and Chaiken (1991) to examine judgments about consumer products based on two sources of relevant information. Consensus information regarding the percentage of people who liked or disliked the product was presented in simple numerical format. This was followed by a more lengthy and complex description of the product in which it was compared to other similar products. The evaluative content of each type of information was varied independently of the content of the other, and participants rated the product based on these two information sources. Both types of information are meaningful, but effective evaluation would take both into consideration given that the consensus and comparative information were not always consistent. Given the apparent face validity of the consensus information, however, individuals who are low in motivation or cognitive ability might simply focus on this relatively easily processed information, choosing not to expend additional resources to process the relatively complex comparative information. Thus, the second experiment was thought to provide a more powerful test of the hypothesis that older adults would be more likely than younger adults to engage in processing shortcuts through the use of a potentially more informative superficial cue relating to the opinions of others. We also tested whether the previously observed age-specific effects of engagement would be replicated.

Method

Participants—We recruited and compensated 75 men and 71 women (24 to 86 years) as in Experiment 1. Sample characteristics are presented in Table 1, with age-based relationships once again in the expected directions.

Materials and procedure—Participants were presented with three-page information packets about four consumer products (refrigerator, digital camera, coffee maker, and cell phone). The first page contained the name and picture of the product. The second page contained a brief description of a market survey followed immediately by simple consensus information conveying either a clear positive (e.g., 43% extremely satisfied, 14% extremely dissatisfied) or negative (e.g., 15% extremely satisfied, 45% extremely dissatisfied) view of the product. A full page of information about the product in comparison to other similar products along six dimensions was then provided. This information was also either positive (four positive, one negative, and one neutral comparisons) or negative (four negative, one positive, and one neutral comparisons). The four product descriptions presented to each participant represented a crossing of positive and negative consensus and product information, with products systematically rotated through conditions across participants. Eight different presentation orders were used.

For each product, participants read through the descriptive information at their own pace and then provided an evaluation using four scales: usefulness, favorableness, evaluation, and purchase consideration (Cronbach's αs = .93 – .95). Task engagement was assessed as before. Participants then rated level of consumer satisfaction as a consensus manipulation check, and the mean response to two items assessing the number of positive vs. negative features and comparability to similar products (*r*s = .78 – .89) was used as a product-description manipulation check. Finally, participants were given 3 min to write down as much as they could remember about the product. Maheswaran and Chaiken (1991) found higher levels of memory to be associated with more systematic processing of descriptive information and integration with consensus information. Thus, recall served as an additional measure of processing complexity.

Results and Discussion

Manipulation checks—An Age X Consensus Valence X Description Valence ANOVA revealed that positive consensus information was associated with higher perceptions of consumer satisfaction than was negative information (*M*s = 2.4 *vs*. −2.1), $F(1,144) = 590.32$, $p < .001$, $\eta_p^2 = .80$. A similar analysis revealed that perceptions of product descriptions were more positive for descriptions with a majority of positive attributes than for those with more negative attributes (*M*s = 2.1 *vs*. −1.3), $F(1,144) = 446.28$, $p < .001$, $\eta_p^2 = .76$. Neither rating was reliably influenced by age. Thus, our two primary experimental manipulations were successful.

Primary analyses—The analytic plan was similar to that used in Experiment 1, with HLM analyses being used to examine the impact of consensus valence, product description valence, engagement (Level 1), and age (Level 2). In testing our main model, product evaluations were found to be positively associated with the valence of both the product description, $\beta_1 = 2.57$, $t(428) = 16.86$, $p < .001$, and consensus information, $\beta_1 = .82$, $t(428) = 6.41$, $p < .001$. Once again, age by itself did not moderate either effect, indicating no differential influence of either factor on ratings as a function of age alone. Task engagement, however, moderated the impact of both product description, $\beta_1 = .18$, $t(428) = 2.29$, $p = .02$, and consensus, $\beta_1 = .18$, $t(428) = 2.39$, $p = .02$, with those reporting more engagement being more sensitive to both types of information. The fact that both factors were affected by engagement supports our assumption that the superficial cue relating to consensus was high in face validity. Age did not reliably moderate this effect, but based on the results of Experiment 1 and predictions of the selective engagement hypothesis, we examined the relative strength of these two effects at representative points ($M \pm 1$ SD) in our age distribution. Once again, the results were consistent with the selective engagement hypothesis (Figure 2). As in Experiment 1, engagement did not moderate the performance of younger adults (ps > .15), with description and consensus valence having relatively constant effects on judgments regardless of engagement. In contrast, engagement moderated the impact of both variables on the judgments of older adults (ps < .05), with the effects of both increasing in magnitude with increased levels of task engagement.

Memory was examined next as an indicator of processing complexity. Participant responses were scored by two independent raters for the accurate recall of the six comparative statements contained in each product description (interrater agreement = 91%). An HLM analysis of proportion recall that included our primary predictors along with original valence of the recalled information (Level 1) revealed that recall decreased with age, $\beta_1 = -.003$, $t(144) = -1.99$, $p = .05$, and was positively associated with the valence of both the product description, $\beta_1 = .13$, $t(1000) = 5.16$, $p < .001$, and the information, $\beta_1 = .09$, $t(1000) = 2.76$, $p = .01$. The interaction between these variables was also significant, $\beta_1 = -.18$, $t(1000) = -4.93$, $p < .001$, with information valence being negatively associated with recall for positive product descriptions ($\beta_1 = -.11$, $p = .01$) and positively associated with recall for negative descriptions ($\beta_1 = .11$, $p = .01$). In other words, information that was inconsistent with the overall valence of the descriptive information about the product was recalled better than was consistent information. The relative recall advantage of message-inconsistent over consistent information is typically viewed as an indication of the disproportionate elaborative processing accorded to the former (Srull & Wyer, 1989). The fact that age did not moderate this effect again suggests age-invariance in message processing. A significant Age X Engagement interaction was also obtained, $\beta_1 = .002$, $t(1000) = 2.38$, $p = .02$, with engagement level positively associated with memory in older adults ($\beta_1 = .05$, $p < .001$), but not in younger adults ($\beta_1 = -.006$, $p = .74$). Once again, this result is consistent with the age-related selective engagement hypothesis.

General Discussion

The two studies presented here were designed to investigate age differences in the use of processing shortcuts in making judgments in everyday contexts. Inconsistent with a general deficit view of old age, there were only minimal differences in the degree to which different-aged adults based their judgments on simple versus more complex information. This result appears inconsistent with some previous JDM studies that have found increased reliance on processing shortcuts with age (e.g., Klaczynski & Robinson, 2000; Wang & Chen, 2006), but it is in keeping with others that have found that older adults are as effective as—if not better than—younger adults in many JDM contexts (e.g., Hess, Osowski, & Leclerc, 2005; Kim & Hasher, 2005). The reasons for the variability across studies may center on

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knowledge. For example, the tasks used in Klaczynski and Robinson (2000) were intended to examine motivated reasoning biases and were designed to tap into pre-existing beliefs. If schemas are available to guide processing, and older adults' have faith in their effectiveness after extensive use over a lifetime, age differences based in the use of these schemas may be highly probable and have little to do with cognitive deficits. In a different way, older adults' vast store of knowledge may also benefit performance by focusing processing on relevant aspects of the problem-situation, thereby easing processing (e.g., Hess et al., 2005; Meyer, Talbot, & Ranalli, 2007).

We designed our judgment tasks to be reflective of everyday contexts and relatively engaging across a wide age range. We also used scenarios in which we assumed there was likely to be minimal impact of strong belief systems or age-related knowledge. Based upon reports of familiarity, we appear to have been successful in this regard. Given such materials, knowledge may play less of a role in performance, with individuals focusing on potentially relevant structural aspects of the situation (e.g., argument strength and quantity) to guide processing. From a JDM perspective, different-aged adults appear to have similar perceptions of the heuristic value of the cues utilized in our research when making judgments. Given evidence that structural aspects of discourse in the processing of text and construction of mental models have qualitatively similar effects across adulthood (for review, see Thornton & Light, 2006), it might also not be too surprising that there were no strong age effects obtained in our studies.

One possible caveat that should be mentioned in interpreting the observed effects is that our sample was rather advantaged in terms of education. Note, however, that the adults who participated in both studies exhibited typical normative age-related trends for factors such as physical health, processing speed, and working memory. Thus, the fact that variability in judgments was not associated with age is still noteworthy.

An important aspect of both studies is that motivation had effects within and across age groups that were not reflected in more general trends in performance. Consistent with past research, interest in the task—as reflected in ratings of engagement—had a disproportionate impact on older adults' performance: older adults reporting higher levels of engagement exhibited behavior suggestive of more analytic processing. This differential impact of interest across age groups has been observed elsewhere (e.g., Germain & Hess, 2007; Hess, Germain, Rosenberg, Leclerc, & Hodges, 2005; Hess et al., 2001), and is hypothesized to reflect age differences in selective task engagement (Hess, 2006; Hess et al., in press) as older adults conserve resources in response to the relatively greater costs associated with cognitive activity in later life (e.g., Neupert, Miller, & Lachman, 2006; Seeman & Robbins, 1994). Older adults are assumed to reserve high levels of resource engagement—as reflected in effort or complexity of processing—for situations of high interest or personal relevance. It could be argued that engagement effects are less predictive in younger adults due to the task being relatively easier for them when compared to older adults. To examine this possibility, we went back and re-ran our primary analyses while controlling for cognitive ability. The previously reported age-based effects associated with engagement were not affected, however, suggesting that the differential impact of engagement is not simply a reflection of age differences in ability.

In conclusion, the present research observed that older adults were no more likely than younger adults to focus on easily processed information to formulate everyday judgments. This suggests that hypotheses about aging and JDM processes based simply in declines in basic cognitive skills (e.g., working memory) without fully considering the performance context may be inadequate. This conclusion is reinforced by the present findings regarding the disproportionate impact of motivational factors on performance in later life, which suggest that factors associated with task engagement may be more important determinants of age differences in everyday judgments.

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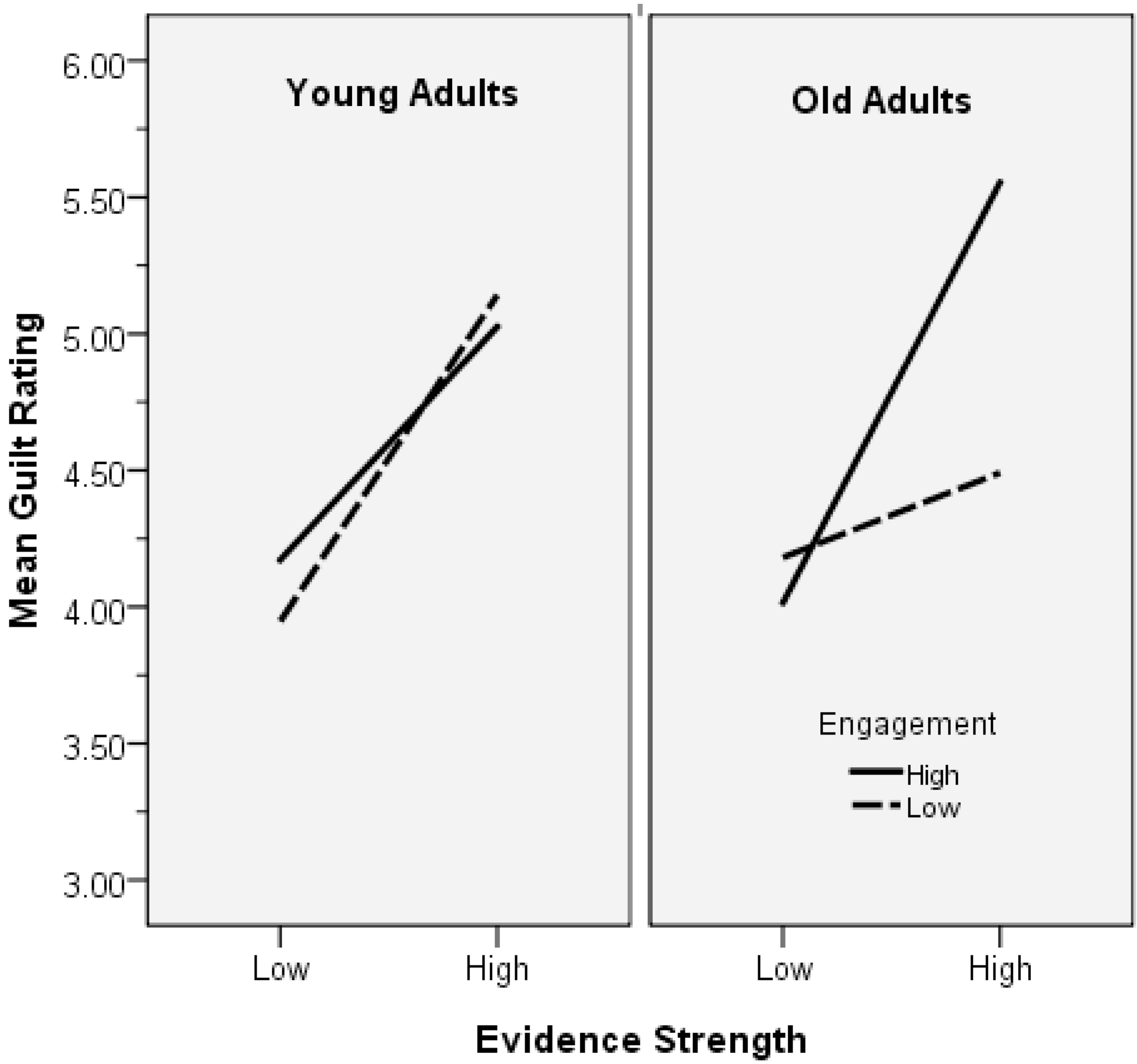
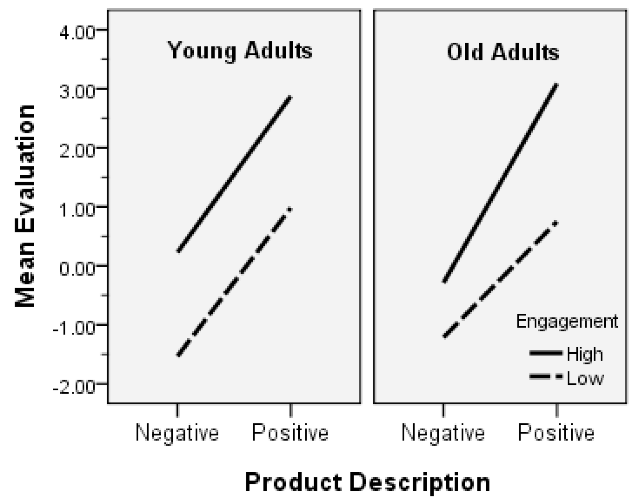


Figure 1.
Experiment 1: Estimates of guilt ratings as a function of age, self-reported engagement, and evidence strength. Plots based on estimated scores for age and engagement scores at ±1 *SD* from the sample mean.

a. Product description effects



b. Consensus effects

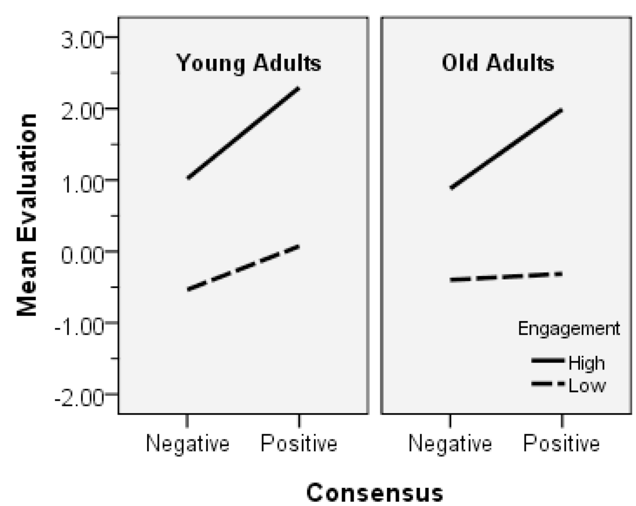


Figure 2.

Experiment 2: Estimates of product evaluations as a function of age, self-reported engagement, and (a) product description or (b) consensus valence. Plots based on estimated scores for age and engagement scores at ±1 *SD* from the sample mean.

Table 1

Experiment 1: Correlations between Background Measures

Measure	*M*	*SD*	2.	3.	4.	5.	6.	7.
Experiment 1								
1. Age	54.6	18.2	.13	−.48**	.35**	−.31**	−.62**	.34**
2. Years education	16.4	2.4	--	−.10	.10	.11	−.06	.34**
3. SF-36 Physical Health	43.1	6.3		--	−.72*	.15	.29**	−.16
4. SF-36 Mental Health	44.6	9.0			--	.04	−.15	.16
5. Computation span	40.7	18.0				--	.41**	.14
6. Letter/Pattern Comparison	0.0	.9					--	−.11
7. Vocabulary	29.8	3.7						--
Experiment 2								
1. Age	56.1	16.9	−.08	−.37**	.31**	.32**	−.24**	−.61**
2. Years education	16.1	2.3	--	.16	−.01	.24**	.21*	.18*
3. SF-36 Physical Health	46.8	8.0		--	−.32**	−.06	.17*	.28**
4. SF-36 Mental Health	52.6	10.0			--	.10	−.08	−.26**
5. Letter/Pattern comparison	0.0	.9				--	.37**	−.08
6. Letter-Number Sequencing	11.3	3.0					--	.21*
7. Vocabulary	29.5	3.5						--

Note: Scoring information: (a) SF-36 (Ware, 1993) scores are norm-based *T* scores; (b) computation span (Salthouse & Babcock, 1991) could range from 0 to 75; (c) Letter/Pattern comparison (Salthouse & Coon, 1994) scores are the means of the two sample-based standardized scores for each measure; (d) in Experiment 1, Vocabulary Test II scores (Kit of Factor-Referenced Tests; Ekstrom, French, Harman, & Derman, 1976) could range from 0 to 36; in Experiment 3, WAIS III Vocabulary (Wechsler, 1997) could range from 0 to 66; and (e) WAIS III Letter-Number Sequencing (Wechsler, 1997) scores could range from 0 to 21

* $p < .05$.

** $p < .01$.