

Aging Impairs Inhibitory Control Over Incidental Cues: A Construal-Level Perspective



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Psychological Science

1–10

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DOI: 10.1177/0956797621998316

www.psychologicalscience.org/PS



Abstract

Age-related changes in decision making have been attributed to deterioration of cognitive skills, such as learning and memory. On the basis of past research showing age-related decreases in the ability to inhibit irrelevant information, we hypothesize that these changes occur, in part, because of older adults' tendency to give more weight to low-level, subordinate, and goal-irrelevant information than younger adults do. Consistent with this hypothesis, our findings demonstrated that young adults are willing to pay more for a product with superior end attributes than a product with superior means attributes (Study 1, $N = 200$) and are more satisfied after an experience with superior end than means attributes (Study 2, $N = 399$). Young adults are also more satisfied with a goal-relevant than with a goal-irrelevant product (Study 3, $N = 201$; Study 4, $N = 200$, preregistered). Importantly, these effects were attenuated with age. Implications for research on construal level and aging, as well as implications for policymakers, are discussed.

Keywords

construal level, choice, aging, inhibition, preregistered

Received 6/9/20; Revision accepted 2/2/21

Decision-making changes with age, sometimes to older adults' disadvantage. For example, compared with younger adults, older adults pay higher interest rates and fees on their credit cards and loans (Agarwal et al., 2009), their investments typically perform worse (Korniotis & Kumar, 2011), and they are less likely to enroll in Medicare prescription drug plans (Finucane et al., 2002). This trend is especially disconcerting because the number of older adults (age 65 or above) is expected to more than double by 2050 (United Nations Population Division, 2019).

Age-related changes in decision-making have been primarily attributed to (a) changes in cognitive abilities such as memory, learning (Salthouse, 2006; Salthouse et al., 1999), and selective attention (Hasher & Zacks, 1988); (b) older adults' tendency to rely more heavily on affective than deliberative processing (Carstensen & Turk-Charles, 1994; Peters et al., 2007); and (c) a shift in motivation toward positive emotional experiences

(Carstensen & Turk-Charles, 1994; Mather & Carstensen, 2005).

We propose that changes in decision-making through life may, in part, be due to changes in the level at which individuals represent information. Specifically, we hypothesize that older adults' judgments and choices are more likely to be influenced by lower-level, peripheral, and goal-irrelevant aspects of information, compared with those of younger adults. Our hypothesis is based on the well-established finding that the efficiency of inhibitory processes decreases with age, resulting in increased interference from irrelevant cues (Hasher & Zacks, 1988; McDowd & Shaw, 2000). These can be seen as part of a general change in executive functions, which is related to reduced cognitive resources and

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goal-directed behavior (MacPherson et al., 2002; McCabe et al., 2010).

Aging and the Level of Mental Representations

Targets (e.g., products, situations) can be mentally represented, or construed, at varying levels of abstraction (Medin, 1989; Vallacher & Wegner, 1987). Mental representations are organized hierarchically and range along a continuum from low-level to high-level construals. Low-level construals include subordinate and incidental features of targets; high-level construals focus on superordinate, goal-relevant features and ignore subordinate and secondary details (Trope & Liberman, 2010). Forming high-level construals thus relies on mental operations often referred to as *cognitive control* (Botvinick et al., 2001; MacLeod, 1991) and requires selectively attending to the superordinate, central features of the target and inhibiting the subordinate, secondary, and incidental ones. For example, a high-level construal of a nature hike requires focusing on the beauty of the scenery rather than on the details of how to get there.

Much research has demonstrated that the efficiency of inhibitory mechanisms decreases with age (for a review, see McDowd & Shaw, 2000). For example, older adults show reduced ability to inhibit well-practiced and newly learned response patterns in order to acquire new ones (e.g., Hess, 1982), higher rates of false-recognition responses to semantic associates of presented words (Rankin & Kausler, 1979; Smith, 1975), and lower success rates in suppressing an inappropriate activated thought, compared with young adults (Hartman & Hasher, 1991; Nebes et al., 1986). Neuroimaging results support these findings. For example, Gazzaley et al. (2005) had participants view a series of faces and scenes with instructions to ignore one type of stimulus and attend to (and remember) the other for a subsequent memory test. For the scene stimuli, younger adults exhibited both enhancement and suppression of the functional MRI signal in a scene-relevant brain region (parahippocampal gyrus) for the attend and ignore conditions, respectively, relative to a passive-viewing condition. However, for older adults, only the enhancement of activation in the attend condition was significant.

To date, whether and how aging influences the level of mental representations and the downstream consequences of such changes for judgment and choice have not been tested. Here, we hypothesized that older adults are more likely to give increased weight to targets' low-level, peripheral, and goal-irrelevant aspects

Statement of Relevance

Older adults' decisions and judgments systematically differ from those of young adults, often to their disadvantage. For example, compared with younger adults, older adults pay higher interest rates and fees on their credit cards and loans, their investments typically perform worse, and they are less likely to enroll in Medicare prescription drug plans. This research offers an explanation for why this is the case. Specifically, we show that judgments and decisions made by older adults tend to be more influenced by peripheral product features than by central, goal-relevant features. Consequently, older adults' judgments and choices result in different, sometimes suboptimal, outcomes. Our findings are especially important given that the older adult population (age 65 or above) is increasing gradually and consistently and is expected to more than double by 2050.

than are younger adults. We based this hypothesis on the notion that construing targets at a high level requires efficiently inhibiting irrelevant or subordinate information and on existing empirical evidence that inhibition becomes less efficient with age.

Here, we present four studies that tested our hypotheses. In all the studies, sample sizes were determined prior to data collection and were based on existing practices in research on construal level. For more detailed information on the distribution of participants' ages, as well as all materials for the studies, see the Supplemental Material on OSF (<https://osf.io/cfdku/>). All four of the studies were reviewed and approved by the internal review board of Tel Aviv University.

Study 1

Study 1 examined whether age moderated the effect of construal level on willingness to pay for a product. Product desirability (i.e., the quality of its output) and product feasibility (i.e., the ease or convenience of attaining the output) pertain to ends and means, respectively, in goal hierarchies. Means (*how*) are subordinate to ends (*why*) because means depend on the ends they serve more than the ends depend on the means. Therefore, forming a high-level construal, compared with a low-level construal, of a product should result in giving more weight to product desirability than to product feasibility (Liberman & Trope, 1998; Trope & Liberman, 2010). If older adults are more likely to construe targets at lower levels, preference for desirable over feasible products will be attenuated with age.

Method

Participants. Participants were 200 U.S. residents (44% female) recruited and compensated via Amazon Mechanical Turk. Participants ranged in age from 20 to 73 years ($Mdn = 32$, $M = 35.56$, $SD = 11.248$).

Procedure and materials. Participants were asked to imagine they were planning to buy a new coffee maker, and they read a description of a specific model they were allegedly considering. We chose a coffee maker in this study because this product is relevant and familiar to both older and younger adults. After reading a description of the coffee maker, participants were told that the price of a coffee maker ranges from \$50 to \$250 (U.S.) and were asked to indicate the maximum price they would be willing to pay for one within this price range.

Each participant was randomly assigned to one of two coffee-maker-description conditions, adapted from Baskin et al. (2014). In the *desirability* condition, the coffee maker was described as highly desirable (a high-end coffee maker, able to brew a variety of coffee types) but not very feasible (requires a while to learn how to use, requires frequent cleaning and part replacement). In the *feasibility* condition, the coffee maker was described as highly feasible (easy to use, extremely reliable, not prone to breaking down) but not very desirable (ordinary, can make only basic coffee). In both conditions, the description of the coffee maker was followed by a statement that the price of a coffee maker ranged from \$50 to \$250. Willingness-to-pay values were bounded between these two dollar amounts.

After indicating the maximum amount they were willing to pay for the described coffee maker, participants rated the coffee maker's desirability and feasibility (ease of use) on 9-point scales (1 = *very low*, 9 = *very high*). Finally, participants indicated their gender and their age.

Results

Manipulation check. We conducted an analysis of variance (ANOVA) with product condition as the independent variable and participants' ratings of the coffee maker's desirability and feasibility as a repeated measures variable. The results revealed that ratings of the coffee maker's desirability and feasibility varied by product condition in the predicted direction, $F(1, 198) = 6.524$, $p = .011$, $\eta_p^2 = .032$. In the feasibility condition, the coffee maker was judged more feasible than desirable ($M_s = 6.736$ vs. 5.906), $F(1, 198) = 14.747$, $p < .001$, $\eta_p^2 = .069$; in the desirability condition, the coffee maker was judged more desirable

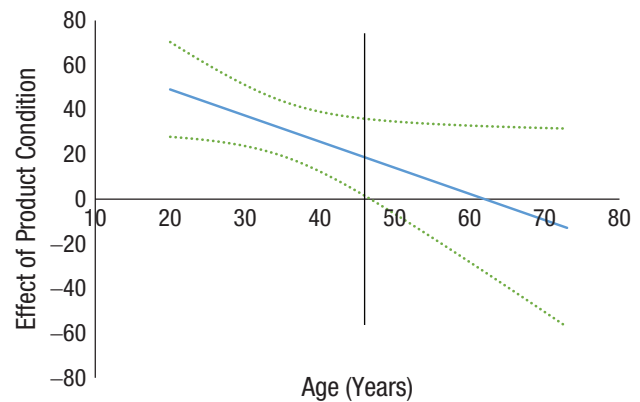


Fig. 1. Study 1: estimated simple effect (solid line) of product condition (desirability vs. feasibility) as a function of age. The vertical line represents the Johnson-Neyman point. The dotted lines indicate the upper and lower limits of the confidence intervals around the effect.

than feasible, though this difference was not statistically significant ($M_s = 5.574$ vs. 5.511), $F(1, 198) = 0.966$, $p = .327$, $\eta_p^2 = .005$.

Importantly, the ratings of the coffee maker's desirability and feasibility were not correlated with participants' age¹ ($r = .014$, $p = .840$, and $r = .071$, $p = .320$, respectively). In other words, the coffee maker was not perceived as less feasible by older adults compared with young adults.

Maximum willingness to pay. We regressed participants' maximum willingness to pay for the coffee maker on the description condition (effect coded), on age (mean centered), and on their interaction (using PROCESS Model 1; Hayes, 2013). The analysis revealed the predicted interaction effect, $b = -1.170$, 95% confidence interval (CI) = $[-2.302, -0.037]$, $SE = 0.574$, $t(195) = -2.037$, $p = .043$: Younger participants were willing to pay more for the desirable coffee maker than for the feasible coffee maker; however, these differences were attenuated with age. A floodlight analysis revealed that participants younger than 46.76 years old (11.198 years, mean centered), $b_{\text{Johnson-Neyman}} = 17.862$, 95% CI = $[0.000, 35.724]$, $SE = 9.057$, $t(195) = 1.972$, $p = .050$, were willing to pay more for the desirable coffee maker than for the feasible coffee maker. However, maximum willingness to pay was not significantly different across product descriptions for older participants (see Fig. 1).

There was also a significant main effect of description whereby participants were willing to pay more for the desirable coffee maker than for the feasible coffee maker, $b = 30.960$, 95% CI = $[18.679, 43.241]$, $SE = 6.227$, $t(195) = 4.972$, $p < .001$. The main effect of age was not significant, $b = -0.449$, 95% CI = $[-1.008, 0.110]$, $SE = 0.283$, $t(195) = -1.577$, $p = .115$.

Discussion

The results demonstrate that the effect of high-level versus low-level features on willingness to pay changes with age. An alternative explanation is that older adults may find operating and maintaining products more difficult than do young adults and therefore view the product as less feasible. Consequently, their willingness to pay may be similar for desirable and for feasible products, despite the fact that product feasibility is subordinate to its desirability. Additionally, operation of electronics may induce an age-based stereotype threat (Lamont et al., 2015), deterring older participants from hard-to-use products. Although our finding that feasibility ratings of the coffee maker were unaffected by age argues against this claim, we addressed this interpretation more directly in Study 2 by using a task in which older adults typically perform similarly to or better than young adults.

Study 2

Participants classified words as nouns, verbs, or both. This task offered a potential high reward but consisted of many trials (*high-desirability/low-feasibility* condition) or offered a potential small reward but consisted of fewer trials (*low-desirability/high-feasibility* condition). Prior research indicates that older adults perform similarly to or even better than young adults in tasks involving vocabulary skills (Ben-David et al., 2015). The word-classification task should therefore have been equally easy or difficult for young adults and older adults. Nevertheless, we predicted that, as before, satisfaction with the high-desirability/low-feasibility task over the low-desirability/high-feasibility task would be attenuated with age.

Method

Participants. Participants were 399 U.S. residents recruited and compensated via Amazon Mechanical Turk. Sample size was determined prior to data collection. Because of missing data, the following analyses are based on the responses of 397 participants (53.9% female). Participants ranged in age from 20 to 75 years ($Mdn = 38$, $M = 42.491$, $SD = 13.994$).

Procedure and materials. Participants completed a word-classification task in which they indicated, for a series of words, whether each word was a noun, a verb, or both. Each participant was randomly assigned to one of two conditions: Those in the high-desirability/low-feasibility condition were informed that they would classify 120 words and that two randomly selected participants would win

additional compensation of \$10 (U.S.) each. Participants in the low-desirability/high-feasibility condition were informed that they would classify only 20 words and that two randomly selected participants would win additional compensation of \$0.50 (U.S.) each. In other words, task desirability was manipulated through the size of the potential reward (\$10 vs. \$0.50), and task feasibility was manipulated through the length of the task (120 vs. 20 trials). After completing the word-classification task, participants evaluated the task, our main dependent variable, using three items (“What is your overall evaluation of the word-classification task?” 1 = *very low*, 9 = *very high*; “I would recommend participating in this survey to other people,” 1 = *not at all*, 9 = *very much*; “I would like to complete a similar task in future studies,” 1 = *not at all*, 9 = *very much*). Results of the three items were averaged to create a task-satisfaction index ($\alpha = .877$). Next, participants completed six items used as a manipulation check. Three items measured perceived task desirability (“The task offers a desirable monetary outcome,” “The task offers an attractive monetary outcome,” and “The monetary outcome of this task is high”; 1 = *not at all* to 9 = *very much*). Three items measured task feasibility (“The task was easy to complete,” “The task was convenient to complete,” and “The task was reasonable to complete”; 1 = *not at all*, 9 = *very much*). These items were averaged to create task-desirability ($\alpha = .889$) and task-feasibility ($\alpha = .868$) indices. Finally, participants indicated their gender and age.

Results

Manipulation checks. We conducted an analysis of covariance with task condition as the independent variable, the proportion of correct responses as a covariate, and participants’ ratings of the task’s desirability and feasibility as a repeated measures variable. Participants’ ratings of task desirability and feasibility varied by condition in the predicted direction, $F(1, 394) = 73.365$, $p < .001$, $\eta_p^2 = .157$: Task desirability was judged as higher in the high-desirability/low-feasibility condition ($M = 7.296$) than in the low-desirability/high-feasibility condition ($M = 6.822$), $F(1, 394) = 6.580$, $p = .011$, $\eta_p^2 = .016$. In contrast, task feasibility was judged as higher in the low-desirability/high-feasibility condition ($M = 7.856$) than in the high-desirability/low-feasibility condition ($M = 6.943$), $F(1, 394) = 33.880$, $p < .001$, $\eta_p^2 = .079$.

Importantly, the ratings of the coffee task’s desirability and feasibility were not correlated with participants’ age ($r = -.044$, $p = .379$, and $r = .081$, $p = .107$, respectively). The proportion of correct responses influenced participants’ ratings of task desirability and feasibility, $F(1, 393) = 4.459$, $p = .035$, $\eta_p^2 = .011$. The proportion of correct responses was positively correlated with

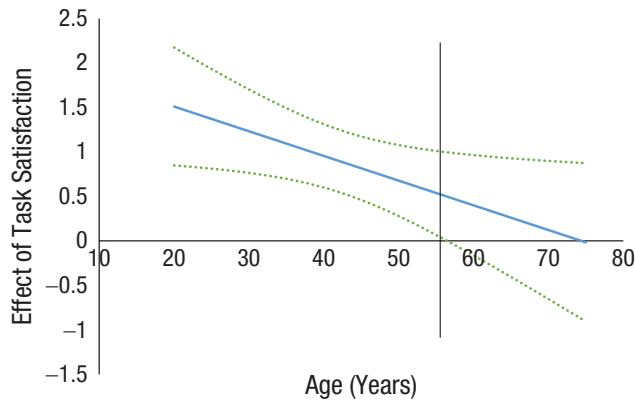


Fig. 2. Study 2: estimated simple effect (solid line) of task satisfaction (high-desirability/low-feasibility task vs. low-desirability/high-feasibility task) as a function of age. The vertical line represents the Johnson-Neyman point. The dotted lines indicate the upper and lower limits of the confidence intervals around the effect.

ratings of task feasibility ($r = .207, p < .001$), but it was uncorrelated with task desirability ($r = .089, p = .078$).

Consistent with previous evidence that older adults perform similarly to or even better than young adults in tasks involving vocabulary skills (e.g., Ben-David et al., 2015), our results showed a positive correlation between participants' age and the proportion of correct responses ($r = .226, p < .001$).

Satisfaction with the task. We regressed participants' satisfaction with the task on the task-description condition (effect coded), on age (mean centered), and on their interaction (using PROCESS Model 1; Hayes, 2013). The analysis revealed the predicted interaction effect, $b = -0.028$, 95% CI = $[-0.053, -0.003]$, $SE = 0.013$, $t(393) = -2.175$, $p = .030$: Younger participants who completed the high-desirability/low-feasibility task were more satisfied with the task than were younger participants who completed the low-desirability/high-feasibility task. However, this difference was attenuated with age. A floodlight analysis revealed that participants younger than 56.45 years (13.963 years, mean centered), $b_{\text{Johnson-Neyman}} = 0.498$, 95% CI = $[0.000, 0.995]$, $SE = 0.253$, $t(393) = 1.966$, $p = .050$, were more satisfied with the high-desirability/low-feasibility task than with the low-desirability/high-feasibility task. However, satisfaction with the task was not significantly different across task-description conditions for older participants (see Fig. 2).

The main effect of task condition was significant. Participants were more satisfied with the high-desirability/low-feasibility task than with the low-desirability/high-feasibility task, $b = 0.885$, 95% CI = $[0.534, 1.237]$, $SE = 0.179$, $t(393) = 4.955$, $p < .001$. The main effect of age was also significant: Task satisfaction increased with age, $b = 0.018$, 95% CI = $[0.005, 0.030]$, $SE = 0.006$, $t(393) = 2.748$, $p = .006$.

Discussion

The results replicate our previous findings, demonstrating that satisfaction with a high-desirability/low-feasibility task over a low-desirability/high-feasibility task is attenuated by age. We found this effect although our vocabulary task yielded better performance by older participants and similar difficulty ratings across age groups. In Study 3, instead of manipulating construal level through desirability and feasibility features, we used goal-relevant and goal-irrelevant product features as high-level and low-level product features, respectively.

Study 3

Goal-relevant features are more central than goal-irrelevant features and therefore constitute a higher construal level (Trope & Liberman, 2000). In this study, we defined a purchase goal for the participants and manipulated whether product features were positive or negative on goal-relevant versus goal-irrelevant attributes. We predicted that young adults would be more satisfied with a product positive on the high-level (goal-relevant) feature and negative on the low-level (goal-irrelevant) feature than with a product negative on the high-level feature and positive on the low-level feature. However, we expected this preference to be attenuated with age.

Method

Participants. Participants were 201 U.S. residents (42.3% female) recruited and compensated via Amazon Mechanical Turk. Participants ranged in age from 18 to 85 years ($Mdn = 32$, $M = 35.60$, $SD = 12.216$).

Procedure and materials. Participants were asked to imagine ordering a new laptop computer. They were told they needed a laptop that had a long battery life. Each participant was randomly assigned to one of two conditions: Those in the *goal-relevant* condition were informed that on receiving the laptop, they realized it had a long battery life but that it was heavier than they had expected; participants in the *goal-irrelevant* condition were told that the laptop had a short battery life but that it was lighter than they had expected. Participants then indicated their satisfaction with the laptop computer they had ordered (1 = *not at all satisfied*, 9 = *very satisfied*). They also provided their gender and their age.

Results

We regressed participants' satisfaction with the computer on goal-relevance condition (effect coded), on age (mean centered), and on their interaction (using

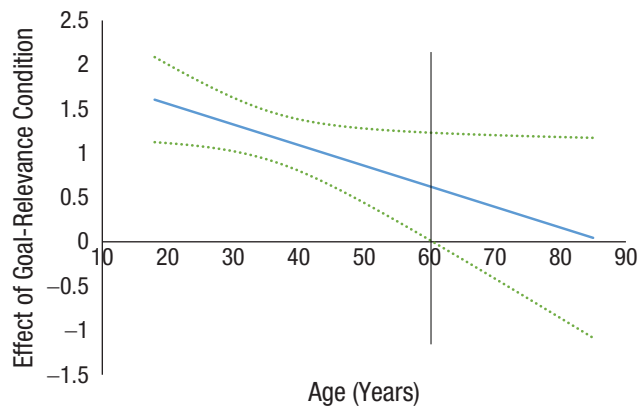


Fig. 3. Study 3: estimated simple effect (solid line) of goal-relevance condition as a function of age. The vertical line represents the Johnson-Neyman point. The dotted lines indicate the upper and lower limits of the confidence intervals around the effect.

PROCESS Model 1; Hayes, 2013). The analysis revealed the predicted interaction effect, $b = -0.055$, 95% CI = $[-0.099, -0.011]$, $SE = 0.022$, $t(197) = -2.465$, $p = .015$: Younger participants who were informed that the laptop was positive on the goal-relevant feature were more satisfied with the laptop than young participants who were told the laptop was positive on the goal-irrelevant feature. However, these differences were attenuated with age. A floodlight analysis revealed that participants younger than 58.73 years old (23.127 years, mean centered), $b_{\text{Johnson-Neyman}} = 1.153$, 95% CI = $[0.000, 2.306]$, $SE = 0.585$, $t(197) = 1.97$, $p = .050$, were more satisfied with the laptop that was positive on the goal-relevant feature than with the laptop that was positive on the goal-irrelevant feature. However, satisfaction with the laptop was not significantly different across conditions for older participants (see Fig. 3).

The main effect of the goal-relevance condition was significant: Participants were more satisfied with the laptop that was positive on the goal-relevant feature than with the laptop positive on the goal-irrelevant feature, $b = 2.428$, 95% CI = $[1.891, 2.966]$, $SE = 0.272$, $t(197) = 8.915$, $p < .001$. The main effect of age was not significant, $b = 0.005$, 95% CI = $[-0.017, 0.027]$, $SE = 0.011$, $t(197) = 0.465$, $p = .643$.

Discussion

The results of Study 3 show once again that the effect of high-level features over low-level features on product satisfaction is attenuated with age. These results were obtained with goal-relevant versus goal-irrelevant product features as high-level and low-level features, respectively, instead of with features pertaining to the target's means and ends.

Study 4

Study 4, which was preregistered, was designed to replicate the effect of age on satisfaction with goal-relevant versus goal-irrelevant product features. Importantly, in Studies 1 through 3, participants' age distribution was skewed in favor of young adults. Therefore, the observed interactions between age and construal level may have been driven by small sample sizes for older adults. In Study 4, we recruited equally large samples of young adults and older adults.

Method

The preregistration for Study 4 can be seen at <https://aspredicted.org/rx4mv.pdf>.²

Participants. Participants were 200 U.S. residents (56% female) recruited and compensated via a Qualtrics online panel. We recruited two groups of participants: 100 young adults ranging in age from 20 to 30 years old ($Mdn = 28$, $M = 26.93$, $SD = 2.728$) and 100 older adults ranging in age from 60 to 70 years old ($Mdn = 65$, $M = 64.91$, $SD = 3.185$). Participants were native-English speakers. All participants had normal or corrected-to-normal vision. All but five participants had completed high school. For detailed demographic statistics, see the Supplemental Material on OSF.

Procedure and materials. Participants were informed that they would complete two unrelated tasks—a consumer evaluation and a task examining perception of physical versus numerical size (a numerical Stroop task).³ The consumer evaluation task preceded the numerical Stroop task because we were concerned that the long and possibly depleting numerical Stroop task would influence a subsequent consumer evaluation task.

In the consumer evaluation task, participants were asked to imagine ordering a new lighting fixture. They were instructed that they needed a lighting fixture that would illuminate their entire large living room. Each participant was randomly assigned to one of two goal conditions: Those in the *goal-relevant* product condition were informed that on receiving the lighting fixture, they discovered it illuminated their living room much better than they had anticipated but that the color of the lighting fixture did not perfectly match the colors in their living room; participants in the *goal-irrelevant* product condition were told that the lighting fixture did not illuminate their living room well at all and that their living room was quite dark; however, the color of the lighting fixture perfectly matched the colors in their living room. Participants then indicated their satisfaction with the purchased lighting fixture

(1 = *not at all satisfied*, 9 = *very satisfied*). Next, participants indicated the extent to which it was important to them that the lighting fixture illuminate their entire large living room and that it perfectly match the colors in their living room (1 = *not important at all*, 9 = *very important*).

Demographics. Participants indicated their employment status, marital status, and level of education. They were also asked to indicate whether they had been diagnosed with any illness or medical condition that might influence their intellectual functioning and whether they suffered from any attention-deficit disorder.

Results

Five participants indicated that they had been diagnosed with an illness or medical condition that might influence their intellectual functioning, 10 participants indicated that they suffered from an attention-deficit disorder, and four participants indicated both. The responses of these participants were removed from subsequent analyses. The following analyses are thus based on the responses of 181 participants—83 young adults and 98 older adults.

Goal-manipulation check. In a nonpreregistered analysis, we conducted an ANOVA with age group as the independent variable and participants' ratings of the importance of the goal-relevant feature and the goal-irrelevant feature as a repeated measures variable. Consistent with the goal participants were instructed to adopt, results showed that they indicated it was more important for them that the lighting fixture illuminate their entire large living room ($M = 7.580$) than that it perfectly match the colors in their living room ($M = 6.481$), $F(1, 179) = 39.688$, $p < .001$, $\eta_p^2 = .181$. This effect did not interact with age group, $F(1, 179) = 3.202$, $p = .075$, $\eta_p^2 = .018$.

Product satisfaction. We conducted an ANOVA in which we examined the effects of goal-relevance condition, age group, and their interaction on participants' satisfaction with the lighting fixture. The analysis revealed the predicted interaction effect, $F(1, 177) = 5.168$, $p = .024$, $\eta_p^2 = .028$: Young adults were more satisfied with the goal-relevant lighting fixture ($M = 6.745$) than with the goal-irrelevant lighting fixture ($M = 5.250$), $F(1, 177) = 13.211$, $p < .001$, $\eta_p^2 = .069$. However, among older adults, the effect of goal condition was not significant ($M_s = 5.229$ vs. 5.00, respectively), $F(1, 177) = 0.373$, $p = .542$, $\eta_p^2 = .002$ (see Fig. 4).

The main effect of goal-relevance condition was significant: Participants were more satisfied with the goal-relevant lighting fixture ($M = 5.987$) than with the

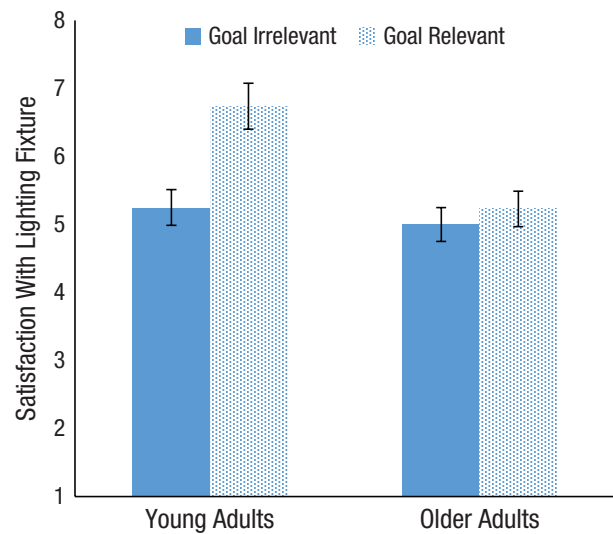


Fig. 4. Study 4: average product satisfaction for each goal-relevance condition (goal relevant vs. goal irrelevant) and age group (young adults vs. older adults). Error bars indicate 95% confidence intervals.

goal-irrelevant lighting fixture ($M = 5.125$), $F(1, 177) = 9.590$, $p = .002$, $\eta_p^2 = .051$. The main effect of age was also significant; product satisfaction was higher among young adults ($M = 5.997$) than among older adults ($M = 5.115$), $F(1, 177) = 10.059$, $p = .002$, $\eta_p^2 = .054$.

Discussion

The results of Study 4 replicate our previous findings, demonstrating that although young adults were more satisfied with a product that had a positive high-level (goal-relevant) feature and a negative low-level (goal-irrelevant) feature than with a product that had a negative high-level feature and a positive low-level feature, older adults did not show a difference in satisfaction between these two products. This effect was obtained when we controlled for sample size across age groups in a preregistered study.

General Discussion

We extended research documenting an age-related decrease in efficient inhibition by suggesting that it may account, in part, for age-related changes in judgment and choice. Specifically, we showed that older adults, compared with younger adults, construe targets at lower levels, giving more weight to targets' peripheral and goal-irrelevant aspects than to goal-relevant and superordinate features. This, in turn, led older adults in our studies to make choices with suboptimal outcomes. Young adults were willing to pay more for a desirable product than for a feasible product (Study 1), expressed

more satisfaction with a desirable task than with a feasible task (Study 2), and were more satisfied with a goal-relevant product than with a goal-irrelevant product (Studies 3 and 4). These differences were attenuated with age, suggesting that older adults give similar weight to high-level features and low-level features.

Our results are consistent with past findings showing an age-related decrease in the efficiency of inhibitory processes and an age-related increase in interference by irrelevant cues (Hasher & Zacks, 1988; McDowd & Shaw, 2000). Future research should test this proposed mechanism by, for example, examining whether individual-level inhibition mediates the effect of aging on mental representations and decision-making.

The current research makes contributions to multiple literatures. First, it contributes to the literature on construal level. Past research identified psychological distance as a moderator of construal level, with greater psychological distance being associated with higher construal level (Goldsmith et al., 2016; Soderberg et al., 2015; Szu-chi et al., 2015; Trope et al., 2007; Trope & Liberman, 2010). The present research proposes age as an important and previously unexplored moderator of construal level and its downstream consequences.

Our finding that construal level decreases with age is consistent with the notion that older adults' subjective time horizon is relatively contracted (Fung et al., 1999). High-level construals serve to expand individuals' mental scope across temporal, spatial, social, and hypothetical distances (Trope et al., 2021). Therefore, older adults' tendency to construe targets at lower levels might contract their mental scope, focusing them on the present and near future, on socially close others, on their immediate locality, and on highly probable outcomes rather than on hypothetical ones. Future research may examine whether expanding older adults' mental scope to include more remote points in time, places, people, and hypothetical scenarios may lead them to construe targets at higher levels and improve their ability to inhibit irrelevant information. If so, an expansive mental scope may serve as a debiasing mechanism for the disadvantageous choices older adults might make.

Our findings also contribute to research on the positivity effect (Mather & Carstensen, 2005). We demonstrate that older adults' greater tendency to focus on positive information (compared with that of young adults) occurs without discriminating between positivity derived from high-level features and low-level features. Finally, our findings may help explain why older adults sometimes make poor choices. For example, older adults may give more weight to the ease of using their present prescription drug plan (because of its familiarity) than to its benefits, which may explain their reluctance to join superior plans offered by Medicare

(Finucane et al., 2002). Future research may empirically test these explanations.

Finally, our study participants were recruited via Amazon Mechanical Turk and via a Qualtrics online panel. We acknowledge that our findings may have limited generalization, given the population from which they were drawn.

Transparency

Action Editor: M. Natasha Rajah

Editor: Patricia J. Bauer

Author Contributions

All the authors contributed to the studies' concept and design. Testing and data collection were performed by L. Hadar. L. Hadar analyzed and interpreted the data for all the studies. B. M. Ben-David helped in the design and data analysis of Study 4. L. Hadar drafted the manuscript, and Y. Trope and B. M. Ben-David provided critical revisions. All the authors approved the final manuscript for submission.

Declaration of Conflicting Interests

The author(s) declared that there were no conflicts of interest with respect to the authorship or the publication of this article.

Funding

This research was supported by the Henry Crown Institute of Business Research in Israel, by the Jeremy Collier Foundation, by The Solomon Lew Center for Consumer Behavior, and by the United States-Israel Binational Science Foundation under Award No. BSF 25-91551-S0114.


Open Practices

Materials for all of the studies have been made publicly available via OSF and can be accessed at <https://osf.io/cfdku/>. Data for the studies have not been posted. The design and analysis plans for Study 4 were preregistered at <https://aspredicted.org/rx4mv.pdf>. See main text and Note 2 for changes to the preregistration. This article has received the badges for Open Materials and Preregistration. More information about the Open Practices badges can be found at <http://www.psychologicalscience.org/publications/badges>.



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Acknowledgments

We thank Shai Danziger, Daniel Algom, and Joseph Tzelgov for their helpful comments.

Notes

1. One participant failed to indicate age. Therefore, the analyses that include participants' age were based on the responses of 199 participants.

2. A preregistered mediation analysis is not reported because of failure to replicate age-related differences in the Stroop task.

3. As indicated in the preregistration of this study, we collected the numerical Stroop data in order to examine whether the effect of age on satisfaction with the goal-relevant versus the goal-irrelevant product was mediated by individual-level difficulty in inhibiting irrelevant information (as measured by the Stroop task). Because of our difficulty in generating reliable reaction time data in online data and in replicating the well-established age differences in the Stroop task (e.g., Hasher & Zacks, 1988; McDowd & Shaw, 2000), we do not report this task or its results in the main text. The description of the numerical Stroop task and the analysis of its results are reported in the Supplemental Material on OSF.

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