

Negative Images, Regardless of Task Relevance, Distract Younger More Than Older Adults

Participant-visible method context. Results, discussion, captions, and the target figure are excluded.

Transparency and Openness The experimental material, code, and data are available on the Open Science Framework (Kennedy & Mather, 2023). We report how we determined our sample size, any data exclusions, all manipulations, and all measures. Data were preprocessed using custom R scripts (Version 4.3.1), and analyses were conducted using SPSS (Version 29). The experiment was not preregistered.

Participants In total, 225 participants took part in the experiment. All participants were recruited online via CloudResearch TurkPrime and Amazon MTurk in November–December 2019. We aimed to recruit at least 184 participants with at least 45 participants in each Age $\times$ Task relevance group, based on a priori power analyses of within-between repeated measures interactions using data from our previous research, $\alpha = .05$, power $(1 - \beta) = 0.8$, using Age $\times$ Distractor interactions from Kennedy et al., 2020, Experiments 1 and 2; and Age $\times$ Distractor $\times$ Lag $\times$ Group Comparisons from Kennedy et al., 2020, Experiment 4 calculated with G*Power;

KENNEDY AND MATHER

Faul et al., 2007. A sensitivity analysis indicated that our final sample ($N = 187$) was powered to observe an Age $\times$ T1/Distractor Type interaction with effect sizes as small as $f = .12$, with $\alpha = .05$ and power $(1 - \beta) = 0.8$ (calculated with G*Power; Faul et al., 2007). Participants' data were removed from the final data set if they did not complete all trials in the experiment ($N = 3$), reported an age outside of the age ranges for younger or older adults ($N = 3$), or performed poorly on the task ($N = 32$; see the Data Screening section). The final sample was comprised of 187 participants: 96 younger adults (aged $M = 28.5$ years, $SD = 3.7$ years, range = 20–35 years old) and 91 older adults (aged $M = 65.9$ years, $SD = 4.3$ years, range = 58–78 years). We used categories recommended by the National Institutes of Health to gather race and ethnicity data for our participants: Younger adults self-identified as 75 White/Caucasian, 11 Black/African American, four Asian, one Pacific Islander/Native Hawaiian, two biracial, two stated "other," and one declined to state; 15 identified as Hispanic. Older adults self-identified as 86 White/Caucasian, two Black/African American, two Asian, and one stated "other"; two identified as Hispanic. Younger and older adults reported a similar number of years of education (younger: $M = 14.7$ years, $SD = 2.1$ years, 11–25 years; older: $M = 15.5$ years, $SD = 2.1$ years, 12–21 years). The University of Southern California Institutional Review Board approved the study, "Emotion and Cognition," protocol UP-12-00019. Participants received compensation (US \$4) for their participation, which took approximately 30 min to complete.

Materials The online experiment was programmed with Inquisit (Inquisit 5, 2016) and participants completed the experiment on their own computers.

Figure 1 Example Trial Structure

Note. Depending on their random group assignment, participants were instructed to either report about only the second bordered image (taskirrelevant condition) or about both yellow bordered images (task-relevant condition). The trial structure was otherwise the same for all participants. Images depicted in this figure are examples only and were not used in the experiment. See the online article for the color version of this figure.

All images (T1/distractors, T2/targets, and scrambled/filler images) were submitted to the SHINE Toolbox on Matlab to normalize levels of luminance (Willenbockel et al., 2010).

Stimuli Stimuli in the experiment were 320×240 colored images. T1/distractor1 images were collected from the International Affective Picture System (Lang et al., 2008). We chose 27 negative, 27 positive, and 27 neutral T1/distractor images that clearly depicted people or animals. To choose images, we used normative emotion ratings from the International Affective Picture System related to valence on a scale of 1 (very negative) to 9 (very positive), and arousal on a scale of 1 (low arousal) to 9 (high arousal). An additional six images were used as T1/distractor images in practice trials, which were emotionally neutral. More information about the T1/distractor images is available in Supplemental Material 1. T2/target images were from a set of 52 landscape images rotated 90° to the left and 90° to the right (104 images total), and an additional 80 landscape images were used to create "scrambled/ filler" images. Images of both types were sourced from previous emotion-induced blindness

experiments (Most et al., 2005), and the scrambled/filler images were created by submitting landscape images to the Matlab JigSaw function (Ouseph, 2020). These were segmented into either 20×20 , 30×30 , 40×40 , or 50×50 equal parts and scrambled randomly, with 20 images per segmentation size. Since the images used by Most et al. (2005) were sourced with attributions unknown, we cannot share the images; however, examples of similar images are depicted in Figure 1.

Modified Emotion-Induced Blindness Task The experiment included four blocks of 30 trials for a total of 120 trials. On every trial of the experiment, participants viewed a rapid serial visual presentation of 17 images presented at a rate of 100 ms per image in the center of the screen against a white background. Each trial contained 15 scrambled/filler images in addition to one T1/distractor image and one T2/target image. Both the T1/distractor image and T2/target image appeared with a 20-px yellow border surrounding it. All other scrambled/filler images appeared with no border (see Figure 1). The T2/target image appeared either two (Lag 2) or five (Lag 5) images after the T1/distractor image; previous emotion-induced blindness studies indicate that impairment from emotional T1/distractors is robust at Lag 2 and less pronounced by Lag 5 (e.g., Kennedy et al., 2020; Most et al., 2005), and by including both lag conditions, participants would not feel sure about when the T2/target would appear after seeing the T1/distractor. T1/distractor images were presented so that there was an equal number of each type on each block, but no constraints otherwise. Unlike most

We adopted labels of “T1/distractor” and “T2/target” to mimic terms used in the attentional blink and emotion-induced blindness literatures.

POSITIVITY EFFECTS REGARDLESS OF TASK RELEVANCE

emotion-induced blindness studies, we chose not to include additional “baseline” trials with no distractor present, because this could not accommodate a task-relevant condition. Scrambled/filler images were presented such that no segmentation size would follow an image with the same segmentation size. Participants’ tasks varied based on their randomly assigned condition. We chose to manipulate task relevance between participants to minimize demand effects and to ensure that participants in the task-irrelevant condition would always disregard the T1/distractors as task irrelevant. Half of participants (task-irrelevant condition; 48 younger and 46 older) were told that their task was to ignore the first bordered image and to indicate the direction the second bordered image was rotated. They made this response via keypress at the end of each trial, to a screen that read “Rotated left(F) or right(J)?” The other half of participants (task-relevant condition; 48 younger and 45 older) were told that their task was to identify the number of people in the first bordered image and then indicate the direction the second bordered image was rotated. To make their responses, these participants first responded to a screen that read, “No people(0), One person(1), or Two people(2)” and then to a screen that read, “Rotated left(F) or right(J)?” The trials were otherwise the same for all participants. Participants’ responses were self-paced. After participants made a response, a screen appeared for 1,000 ms to indicate if they answered correctly or not. The next trial started after a 1,000-ms fixation cross.

for both younger ($M = 89.3\%$, 95% confidence interval [86.5%, 92.0%]) and older ($M = 83.7\%$, 95% confidence interval [81.0%, 86.3%]) adults. There was a group difference; older adults were worse at identifying the T1/distractor images than younger adults, $t(91) = 2.95$, $p = .004$, $d = .61$. For more details about T1/distractor accuracy, see Supplemental Material 2. Importantly, we were satisfied that participants of both age groups were following instructions in the task-relevant condition.

T2/Target Performance Accuracy In our main analysis, we examined T2/target performance accuracy (see Figure 2). A 2 (age: younger vs. older) $\times$ 2 (task relevance: irrelevant vs. relevant) $\times$ 3 (T1/distractor type: negative vs. neutral vs. positive) $\times$ 2 (lag: 2 vs. 5) analysis of variance revealed a significant main effect of T1/distractor type, $F(2, 366) = 33.62$, $p < .001$, $\eta^2p = .15$, with worse performance overall on negative and positive trials compared to neutral. There was also a significant effect of lag, $F(1, 183) = 329.44$, $p < .001$, $\eta^2p = .64$, with worse performance at Lag 2 compared to Lag 5 overall, and a significant effect of task relevance, $F(1, 183) = 57.71$, $p < .001$, $\eta^2p = .24$; performance was better when Figure 2 T2/Target Performance Accuracy Results

Procedure Participants were invited to the complete the study via CloudResearch services. After reading the consent form and indicating that they were comfortable with graphic images, participants continued to the Inquisit program to read the task instructions. Participants completed six practice trials, in the way that they would complete the rest of the experiment (i.e., either the task-irrelevant or taskrelevant condition instructions). Participants were told that they could take a break between blocks. After the task, participants indicated their

demographic information, were debriefed, and provided the code to enter into MTurk for compensation.