

Running head: MEMORY FOR IMPRESSIONS WITH AGE

Social Relevance Enhances Memory for Impressions in Older Adults

Brittany S. Cassidy and Angela H. Gutchess

Department of Psychology, Brandeis University

In press, *Memory*

Correspondence should be addressed to Brittany S. Cassidy, Brandeis University, MS 062, Waltham, MA 02454. E-mail: bcassidy@brandeis.edu. Phone: 781-736-3283; Fax: 781-736-3291.

Abstract

Previous research has demonstrated that older adults have difficulty retrieving contextual material over items alone. Recent research suggests this deficit can be reduced by adding emotional context, allowing for the possibility that memory for social impressions may show less age-related decline than memory for other types of contextual information. Two studies investigated how orienting to social or self-relevant aspects of information contributed to the learning and retrieval of impressions in young and older adults. Participants encoded impressions of others in conditions varying in the use of self-reference (Experiment 1) and interpersonal meaningfulness (Experiment 2), and completed memory tasks requiring the retrieval of specific traits. For both experiments, age groups remembered similar numbers of impressions. In Experiment 1, using more self-relevant encoding contexts increased memory for impressions over orienting to stimuli in a non-social way, regardless of age. In Experiment 2, older adults had enhanced memory for impressions presented in an interpersonally meaningful relative to a personally irrelevant way, whereas young adults were unaffected by this manipulation. The results provide evidence that increasing social relevance ameliorates age differences in memory for impressions, and enhances older adults' ability to successfully retrieve contextual information.

Key Words: impression formation, aging, memory, social cognition

Acknowledgments

We thank Leslie Zebrowitz for helpful comments, and Michael Margolis and Todd Kirkland for research assistance.

Funding

This work was supported by the National Institute on Aging grant R21 AG032382 (to A.H.G.), NIH training grant T32-GM084907-01 and by a NSF graduate fellowship (to B.S.C.), and was conducted in part while A.H.G. was a fellow of the American Federation for Aging Research.

Social Relevance Enhances Memory for Impressions in Older Adults

People integrate behavioral information, nonverbal cues, and facial characteristics together in a seemingly automatic manner (Willis & Todorov, 2006) to form impressions of others. Although a web search on “making a strong first impression” returns over five million results, few studies have probed how these spontaneous impressions are encoded into memory for future use. Interestingly, the mechanisms underlying the encoding and retrieval of impressions (i.e., traits inferred from behavioral information and associated with an actor (Todorov & Uleman, 2002, 2003)) may utilize a memory system selective for social information (J. Mitchell, Macrae, & Banaji, 2004) rather than systems engaging the hippocampus. Preservation of this system may illustrate how older adults master social situations with age (Grossman et al., 2010; Hess & Auman, 2001), while having reduced cognitive functions in some domains (Park & Gutchess, 2005), including the ability to correctly identify sources of information.

Source memory refers to the ability to remember the context in which information is conveyed (e.g., a location) (Johnson, Hashtroudi, & Lindsay, 1993), and is particularly impaired with age compared to remembering items alone (Benjamin & Craik, 2001). This suggests a deficit in the encoding of information associated with an item, such as the *context* in which information was presented in contrast to remembering *what* was presented (Chalfonte & Johnson, 1996). Much of aging-related source memory research has utilized stimuli lacking social or emotional context. Emotional context, however, can ameliorate age differences in source memory; although older adults remember perceptual and conceptual contextual source information worse than young, this difference disappears with emotional source information (May, Rahhal, Berry, & Leighton, 2005; Rahhal, May, & Hasher, 2002), perhaps because older

adults place more emphasis on socioemotional material over young (Fredrickson & Carstensen, 1990). Even though older adults exhibit difficulty when remembering face-name pairs (Naveh-Benjamin, Guez, Kilb, & Reedy, 2004), this might be because, while socially relevant, a name serves as a label, and does not provide emotionally meaningful information. Thus, the ability to retrieve contextual information, such as an impression, or behavior, associated with a face, may be affected by aging less than memory for other types of contextual information.

Recent work (Todorov & Olson, 2008) showed that older adults and an individual with hippocampal damage remember impressions as well as young, whereas individuals with amygdala and temporal pole damage exhibit impairments. This suggests that hippocampal activation, which contributes to the retrieval of non-social source information (Cansino, Maquet, Dolan, & Rugg, 2002), does not affect the retrieval of impressions. However, the activation of socially-oriented brain regions, potentially preserved with age (Wright, Wedig, Williams, Rauch, & Albert, 2006), is necessary to successfully encode and retrieve impressions. Although Todorov and Olson (2008) suggest older adults maintain the ability to learn and retrieve impressions, this claim is inconclusive due to the size ($N = 11$) and relatively young age ($M = 57$) of the older adult cohort.

The current studies extended previous work by assessing the extent to which self-relevance and interpersonal meaningfulness affect memory for impressions across younger and older adults. Experiment 1 assessed whether self-referencing improves memory for impressions. Previous research (Gutchess, Kensinger, Yoon, & Schacter, 2007; Hamami, Serbun, & Gutchess, 2011) demonstrated that self-referencing enhances memory for older adults, although it fails to restore their memory to the level of young. We hypothesized that if self-reference affects

memory for impressions, then increasing self-relevance at encoding should enhance retrieval of impressions in both young and older adults.

We also explored how interpersonal meaningfulness affects memory for impressions in Experiment 2. Interpersonal meaningfulness differs from self-reference by emphasizing one's relationships with other individuals, rather than focusing solely on the self as an individual entity. We tested whether an interpersonally meaningful context improved memory for impressions compared with a personally irrelevant condition. Meaningful goals increase cognitive engagement in older adults to a greater extent than young (Hess, Follett, & McGee, 1998). For instance, Fung and Carstensen (2003) demonstrated that older adults remember more advertisements with emotionally meaningful over knowledge-related messages, whereas young adults do not display this bias. Social, interpersonally-meaningful contexts may enhance memory much like emotion-rich contexts. We predicted that interpersonally meaningful goals would capture older adults' attention, improving encoding over a less meaningful task (Hess, Germain, Swaim, & Osowski, 2009). Young adults should be less affected by this manipulation, given their overall information seeking framework (Carstensen & Mikels, 2005; Fung & Carstensen, 2003).

In both experiments, we predicted behavioral content could modulate memory for impressions. Both intention and consequence influence trait inferences of an actor (Newman & Uleman, 1993). We hypothesized that if a behavior's consequences affected many people (e.g., not reporting a fire in an apartment building), this behavior would be more memorable than if only affecting the actor (e.g., running every morning for marathon training).

Moreover, we addressed how valence contributed to age differences in memory for impressions. Socioemotional selectivity theory (SST) posits that with age, adults focus on and

remember positive over negative information (Carstensen, Isaacowitz, & Charles, 1999).

Although some work has found negativity biases in memory, (Rozin & Royzman, 2001), these may only emerge for extremely valenced, arousing behaviors, with positivity effects present for less arousing material (Wojciszke, Brycz, & Borkenau, 1993). Given the low-arousal nature of the impression formation task, we predicted a positivity bias for young and older adults in remembering impressions in both experiments.

Two studies examined the effects of self-referencing and interpersonally meaningful goals on memory for impressions in young and older adults. We hypothesized that older adults would be more influenced by goals than young due to the prioritization of interpersonal goals with age.

Experiment 1

Method

Participants

Twenty-four older adults (64 to 83 years old, 5 males; $M = 73.83$, $SD = 5.91$) and 24 undergraduates (17 to 22 years old, 7 males; $M = 18.96$, $SD = 1.40$) recruited from Brandeis University and the surrounding community participated. Older adults had Mini-Mental State Examination (MMSE) scores > 26 (Folstein, Folstein, & McHugh, 1975) ($M = 28.75$, $SD = 1.07$), and were characterized on cognitive measures to ensure comparability to other samples in the literature. Older adults had more years of education ($M = 16.54$, $SD = 1.89$) than young ($M = 12.92$, $SD = 1.07$), $t(46) = 8.18$, $p < 0.001$, and higher vocabulary scores (Shipley, 1986) ($M = 36.42$, $SD = 2.64$) than young ($M = 32.71$, $SD = 3.83$), $t(46) = 3.91$, $p < 0.001$. Young adults exhibited faster processing speed ($M = 75.17$, $SD = 14.67$) than old ($M = 59.46$, $SD = 13.91$),

$t(46) = 3.81, p < 0.001$, using a digit-comparison measure (Hedden et al., 2002) and higher letter-number sequencing scores (Wechsler, 1997) ($M = 11.92, SD = 2.41$) than old ($M = 10.04, SD = 2.68$), $t(46) = 2.55, p < 0.05$.

Stimuli

The full face dataset consisted of 96 pictures of Caucasian faces (evenly distributed across young/old and male/female) with neutral expressions drawn from the PAL database (Minear & Park, 2004). Faces were equated for attractiveness, distinctiveness, and trustworthiness (Gilron & Gutchess, in press). The full sentence dataset consisted of ninety-six behavioral sentences (distributed equally among positive and negative inferred traits) drawn from a dataset normed for trait convergence (Uleman, 1988). Ratings from ten young (M age = 18.80, $SD = 0.63$) and nine older adults (M age = 79.00, $SD = 3.77$) confirmed the reliability of impressions. For these sentences, young and older adults similarly rated the sentence as inferring the trait (i.e., averages at the extreme end of a 7-point scale), and average ratings for each sentence did not differ by age group. In Experiment 1, a subset of 48 Caucasian faces (evenly distributed across young/old and male/female) was randomly paired with unique behavioral sentences (equally divided between positive and negative valence across the four age/gender face groups). Twelve faces of each age-gender group were chosen at random from the full set of 96 faces for this subset. The same subset of 48 faces was used for all participants, and was equated for attractiveness, distinctiveness, and trustworthiness.

To characterize the stimuli, ten different young (M age = 18.80, $SD = 0.63$) and ten older (M age = 78.70, $SD = 3.68$) adults rated sentences for arousal and valence on a 9-point scale. Older adults ($M = 5.42, SD = 1.18$) rated sentences as more arousing than young ($M = 5.09, SD = 0.83$), $F(1, 188) = 5.17, p < .05, \eta_p^2 = .03$, and negative sentences ($M = 5.40, SD = 1.14$) were

marginally more arousing than positive ($M = 5.11$, $SD = 0.89$), $F(1, 188) = 3.78$, $p = .053$, $\eta_p^2 = .02$. No other effects approached significance. We assessed whether young and older participants agreed on the extent to which a behavior was positive or negative by calculating the absolute value of each sentence valence rating from the scale's neutral point. Older adults ($M = 1.99$, $SD = 1.24$), rated sentences more extremely than young ($M = 1.55$, $SD = 0.88$), $F(1, 188) = 8.03$, $p < .01$, $\eta_p^2 = .04$. No other effects approached significance. Sentences were additionally rated for interpersonal consequences (i.e., the extent to which behaviors affect other people), which did not differ with age, $F(1, 888) < 1$, *ns*, or vary by valence, $F(1, 888) < 1$, *ns*.

To select sentences for low (e.g., “She usually studied until 2am”) and high (e.g., “He asked everyone which movie they wanted to see”) interpersonal consequences, we chose 24 positive and 24 negative sentences that were extremely rated on the interpersonal consequences dimension and did not have large differences in arousal or valence extremity ratings between the age groups. We confirmed that there were no significant age differences in arousal, valence extremity, and interpersonal consequences ratings for this 48-sentence subset.

Procedure

Participants were told they would be forming impressions of others, and were unaware of the memory test. After providing informed consent, participants practiced the encoding task. Stimuli were presented via E-Prime (Psychology Software Tools, Pittsburgh, PA).

At encoding, participants viewed a face-behavior pair, and were instructed to form a one-word behavior-based impression for 5000ms. Immediately following, participants viewed the same face coupled with one of three prompts indicating encoding context for 5000ms. The prompt was non-social (“Did the sentence contain any three-syllable words?”), social but not

explicitly self-related (“Is this behavior common?”), or social and self-related (“Would I do this behavior?”) (Figure 1A). Participants indicated yes or no via button press.

(Figure 1 about here)

There were three task versions, with subsets of sentences matched for valence (positive, negative) and interpersonal consequences (low, high), to counterbalance face-sentence across the three prompts. To improve performance, each face-behavior pair appeared twice, with the same encoding context, once per run in a random order. Participants were not told why each face-behavior pair appeared twice. Trials of each encoding context were evenly and randomly distributed within four 12-trial blocks, with a 6000ms delay between blocks.

After encoding, participants counted back by 7s for 60 seconds to reduce recency effects. Next, participants completed a self-paced retrieval task, where all viewed faces were presented in one block, one at a time in a random order. Two trait adjectives were listed below each face. One was the correct response, inferred from the encoding behavior, and the other was a non-inferred lure unrelated to the inferred trait. Target traits were the most commonly generated impressions from norms (Uleman, 1988). Lure traits were experimenter-generated. Participants indicated which trait they remembered as associated with the face. Half of the presented lure traits had matching valence of the inferred trait without being synonyms (e.g., friendly vs. generous), and half had unmatched valence of the inferred trait, but were not antonyms (e.g., friendly vs. dull). Participants then completed additional cognitive measures.

Results

Retrieval Accuracy

We analyzed participants’ accuracy (proportion of correct responses in remembering trait associations) in the retrieval task using a 2x3x2x2 ANOVA with Age Group (young, old) as a

between-groups factor and Encoding Context (word, common, self), Interpersonal Consequences (low, high), and Inferred Trait Valence (negative, positive) as within-group factors (See Table 1A).

Older ($M = 71.86\%$, $SD = 10.53\%$) and younger ($M = 75.95\%$, $SD = 9.85\%$) adults similarly remembered trait associations, $F(1, 46) = 2.30$, $p > 0.10$, $\eta_p^2 = 0.05$. There was a main effect of Encoding Context, $F(2, 92) = 7.54$, $p < 0.001$, $\eta_p^2 = 0.14$ (Figure 2A). Contrasts showed that performance in the word context ($M = 69.50\%$, $SD = 13.80\%$) was worse than performance in both the common ($M = 74.70$, $SD = 15.03\%$), $F(1, 47) = 4.98$, $p < 0.05$, $\eta_p^2 = 0.10$, and self ($M = 78.00$, $SD = 11.14\%$) contexts, $F(1, 47) = 15.97$, $p < 0.001$, $\eta_p^2 = 0.25$. Performance in common and self encoding contexts did not differ, $F(1, 47) = 2.37$, *ns*. No interactions with Age Group approached significance.

There were no main effects of Inferred Trait Valence, $F(1, 46) = 2.23$, *ns*, or Interpersonal Consequences, $F(1, 46) = 1.92$, *ns*. However, analyses revealed a marginally significant interaction between Interpersonal Consequences and Inferred Trait Valence, $F(1, 46) = 3.75$, $p = 0.06$, $\eta_p^2 = 0.08$ (Figure 2B). Participants remembered more positive ($M = 78.0\%$, $SD = 12.47\%$) than negative ($M = 72.20\%$, $SD = 13.86\%$) associations when behaviors had high, $F(1, 47) = 5.23$, $p < 0.05$, $\eta_p^2 = 0.10$, but not low, interpersonal consequences, $F(1, 47) < 1$, *ns*.

(Figure 2 about here)

Discussion

Memory for impressions was stable with age. Across age groups, self-referencing affected memory for impressions. Performance was enhanced in the self and common encoding contexts relative to the word context, consistent with self-referencing literature (Symons & Johnson, 1997).

The similar performance in the self and common encoding contexts suggests that participants may have utilized similar mechanisms in these conditions. In a post-task questionnaire, a majority of participants responded that they considered whether they or close others performed the behavior to decide whether it was common. Thus, a self-reference effect may have extended into the common encoding context, reducing or eliminating potential differences across the two conditions. Because the prompts appeared after participants viewed face-behavior pairs, participants may have also utilized a general encoding strategy in preparation to answer any of the prompts. However, given the differential retrieval accuracy between the self and common relative to the word context, the data still suggest that self-relevance improves memory for impressions. If anything, a general encoding strategy would result in underestimating differences across conditions in the present study.

Alternatively, these data may indicate a general mnemonic enhancement from the two social conditions, or a level of processing (LOP) effect. This experiment was designed to test the effects of self-reference on memory for impressions, which seems to engage separate mechanisms than LOP (Kelley et al., 2002). However, the word prompt may function as a shallow condition in LOP paradigms (Lockhart & Craik, 1990), whereas the self and common prompts are more semantic-based, potentially enhancing performance due to a LOP manipulation. The conditions of our self-referencing manipulation were similar to those used in fMRI studies that implicate midline cortical activity (Northoff et al., 2006), rather than the lateral prefrontal activity indicative of LOP effects in memory (Kapur et al., 1994). This suggests that self-referencing, rather than LOP, caused improvements in memory, although we cannot conclusively rule out a contribution from LOP effects.

Because the stimuli were inherently social, they differ from other work showing age-related source memory impairments (Benjamin & Craik, 2001). While memory for impressions framed with the non-social prompt may be decreased relative to the self and common conditions, the social nature of the stimuli themselves, through the use of faces and behaviors, may enhance older adults' memory for impressions to be comparable to young adults' memory, even when framed with the non-social prompt. The prompt may help participants to re-encode their impressions, perhaps orienting to additional aspects of the information, and this may have happened more in the self and common relative to the non-social prompts.

Additionally, we assessed whether behavioral content affected memory for impressions. Interpersonal consequences and valence operated in combination to increase participants' tendency to remember more positive than negative trait associations when a behavior was high in interpersonal consequences. People selectively remember more positive than negative self-related information (Mischel, Ebbesen, & Zeiss, 1976), and the self-referencing nature of the task may have biased participants toward remembering positive attributes. Although the current data did not support the presence of an overall positivity bias, we did find a bias in both young and older adults when a behavior's interpersonal consequences were high. Due to this interaction's marginal significance, future research is necessary to understand this finding.

Experiment 2

In Experiment 2, we manipulated interpersonal meaningfulness at encoding, which differs from self-referencing in that it emphasizes relationships rather than focusing on the self in isolation. Calling attention to relationships may lead to a richer encoding experience with age, as self-focus broadens to include more interpersonal information (Freund & Smith, 1999; K.

Mitchell et al., 2009) and self-concept emphasizes interdependence and relationships (Reichstadt, Depp, Palinkas, Folsom, & Jeste, 2007). We hypothesized that an interpersonally meaningful context would engage attention and memory processes in older adults, strengthening memory for impressions. We anticipated this difference would affect older over young adults, who prioritize information acquisition rather than emotional meaning at encoding (Fredrickson & Carstensen, 1990; Fung & Carstensen, 2003).

We also examined how intentionality affects older adults' memory for impressions. Implicit impressions occur spontaneously, involving few attentional resources (Todorov & Uleman, 2003), while explicit impressions reflect controlled behavior (Uleman, Chaiken, & Trope, 1999). If implicit processing mechanisms are relatively spared with age (Craik, 1994), older adults might display enhanced memory for implicitly formed impressions relative to an explicit condition requiring controlled processing. However, explicit conditions emphasizing a meaningful goal could increase memory compared to an implicit condition in older adults, given that older adults perform better in the presence of a personally salient goal (Hess, 2006; Hess, et al., 2009). Thus, intentionality could impact older adults in one of two different ways, although young adults, who more flexibly deploy cognitive resources in explicit conditions, should be unaffected.

Aging-related research has suggested that performing concurrent tasks ameliorates attentional biases toward positive information (Knight et al., 2007; Mather & Knight, 2005). This may suggest that while age-related biases might occur in an implicit encoding context, making judgments in an explicit task may reduce biases toward positive information. Given that Experiment 2 also tested whether intentionality (explicitly or implicitly forming impressions) affects memory for impressions, we tested how memory for positive and negative impressions

differed based on intentionality at encoding. Although some work finds that biases emerge under controlled conditions (Mather & Carstensen, 2005), we expected that for older adults, positive and negative traits would be equally remembered when intentionality was explicit, with participants forming and overtly stating their judgments, although a positivity bias would emerge in an implicit context.

Method

Participants

Twenty-four older adults (66-84 years old, 9 males; $M = 77.08$, $SD = 4.56$) and 24 (18-28 years old, 7 males; $M = 20.42$, $SD = 2.72$) undergraduate and graduate students who did not participate in Experiment 1 were recruited and completed the same cognitive measures. Older adults completed the MMSE ($M = 28.63$, $SD = 1.21$), had more years of education ($M = 16.00$, $SD = 1.98$) than young adults ($M = 13.92$, $SD = 1.74$), $t(46) = 3.88$, $p < 0.001$, and had higher vocabulary scores ($M = 35.46$, $SD = 2.89$) than young ($M = 32.00$, $SD = 4.25$), $t(46) = 3.30$, $p < .01$. Young adults exhibited faster processing speed ($M = 71.83$, $SD = 9.00$) than old ($M = 52.96$, $SD = 10.32$), $t(46) = 6.76$, $p < 0.001$, and had higher letter-number sequencing scores ($M = 12.29$, $SD = 2.69$) than old ($M = 9.08$, $SD = 2.80$), $t(46) = 4.05$, $p < 0.001$.

Stimuli

All ninety-six sentences and faces from the dataset were used. Although this included the 48 used in Experiment 1, the faces and sentences were randomly re-paired (equally divided between positive and negative valence across the four age/gender face groups) for Experiment 2.

Procedure

Procedures were modified from Experiment 1, with the following differences. Participants completed 12 trials in a row with the same intentionality instruction at encoding.

Intentionality instructions appeared for 5000ms before each block. Explicit instructions were “Form and state your impression of this person out loud” and implicit instructions were “Read the sentence out loud.” For each trial, a face was presented alone for 1000ms. Next, intentionality instructions reappeared while the same face and a trait-inferring sentence were presented for 5000ms. Participants generated a one-word impression of the person based on the sentence, and stated it aloud during the explicit condition. Immediately following, participants viewed the face coupled with a meaningfulness prompt for 5000ms. The interpersonally meaningful prompt read, “Do I want this person to play a role in my life?” and the irrelevant prompt read, “Does this person have a pet?” (Figure 1B).

Face-sentence pairs were counterbalanced among intentionality and meaningfulness conditions, totaling four task versions. An experimenter was present at encoding to ensure that participants generated traits in the explicit condition. Face-behavior pairs appeared twice, in random order once per run. Participants were not told why face-behavior pairs were repeated, and were not told to generate the same impression in each run. There were eight blocks (alternating explicit and implicit intentionality), with a 4000ms delay between each block. Meaningfulness was manipulated evenly within each block.

The retrieval and additional tasks were administered in the same manner as Experiment 1.

Results

Retrieval Accuracy

We analyzed participants’ retrieval accuracy using a 2x2x2x2 ANOVA with Age Group (young, old) as a between-groups factor and Intentionality (explicit, implicit), Interpersonal Meaningfulness (meaningful, irrelevant), and Inferred Trait Valence (negative, positive) as

within-group factors (See Table 1B). We confirmed these findings on a subset of sentences matched for young and older adults' arousal and valence extremity ratings.¹

Older ($M = 69.00\%$) and younger ($M = 72.00\%$), adults similarly remembered trait associations, $F(1, 46) = 2.66, p > 0.10, \eta_p^2 = 0.06$. There were no main effects of Intentionality or Interpersonal Meaningfulness, and no interaction of Intentionality by Age Group, $F_s < 1, ns$. There was a significant Age Group by Interpersonal Meaningfulness interaction, $F(1, 46) = 5.99, p < 0.05, \eta_p^2 = 0.12$ (Figure 3A). While young adults performed similarly in the meaningful ($M = 71.00\%, SD = 8.81\%$) and irrelevant conditions ($M = 73.00\%, SD = 8.33\%$), $F(1, 23) = 1.94, ns$, older adults had marginally enhanced memory in the meaningful ($M = 70.70\%, SD = 8.81\%$), over the irrelevant ($M = 66.60\%, SD = 8.33\%$) condition, $F(1, 23) = 4.06, p = 0.056, \eta_p^2 = 0.15$.

Analyses revealed a main effect of Inferred Trait Valence, $F(1, 46) = 8.25, p < 0.01, \eta_p^2 = 0.15$. More positive ($M = 72.40\%, SD = 9.00\%$) than negative ($M = 68.40\%, SD = 8.31\%$) impressions were remembered. This was qualified by an interaction with Intentionality, $F(1, 46) = 8.29, p < 0.01, \eta_p^2 = 0.15$ (Figure 3B). Implicitly, participants remembered more positive ($M = 74.50\%, SD = 9.70\%$) than negative ($M = 66.30\%, SD = 11.09\%$) impressions, $F(1, 47) = 16.77, p < 0.001, \eta_p^2 = 0.26$, but explicitly, positive ($M = 70.20\%, SD = 11.78\%$) and negative ($M = 70.40\%, SD = 11.09\%$) did not differ, $F(1, 47) < 1, ns$.

(Figure 3 about here)

(Table 1 about here)

Sentence Subset Counterbalanced for Interpersonal Consequences

Experiment 1 showed that a behavior's interpersonal consequences, that is, whether a behavior affected few or many people, influenced memory. Specifically, impressions formed from behaviors high in interpersonal consequences were better remembered than low. We

assessed whether this effect was also present in Experiment 2. Because the full set of 96 sentences were not counterbalanced for interpersonal consequences, we created a counterbalanced subset by removing 16 face-behavior pairs. This 80 pair subset was also counterbalanced by valence and matched for arousal and valence extremity. We re-analyzed participants' retrieval accuracy in a 2x2 ANOVA using Inferred Trait Valence (negative, positive) and Interpersonal Consequences (low, high) as factors. There was a main effect of Interpersonal Consequences $F(1, 47) = 24.96, p < 0.001, \eta_p^2 = 0.35$ such that participants remembered more pairs with high interpersonal consequence ($M = 73.30\%, SD = 9.01\%$ vs. $M = 66.60\%, SD = 9.01\%$). Interpersonal Consequences did not interact with Valence, $F(1, 47) = 1.84, ns$.

Reliability of Generated Impressions When Compared with Target Traits

Participants generated impressions for 95.78% ($SD = 6.06\%$) of trials in the explicit condition. Impressions matched the targets from norms for 73.84% of trials ($SD = 12.09\%$). Young adults gave marginally more responses ($M = 97.42\%, SD = 3.66\%$) than older adults ($M = 94.15\%, SD = 7.50\%$), $t(40) = 1.80, p < 0.10$. Young adults' responses matched targets less ($M = 69.42\%, SD = 7.03\%$) than older adults' responses ($M = 78.24\%, SD = 14.48\%$), $t(40) = 2.48, p < 0.05$.²

Discussion

Experiment 2's results suggest that memory for impressions is spared with age, establishing that interpersonal meaningfulness mediates the extent to which older adults remember impressions. Older adults had increased memory for impressions when the context emphasized interpersonal meaningfulness, whereas young adults were unaffected by this manipulation. This emphasis potentially made source material more meaningful to older adults

and, consistent with other work (Fredrickson & Carstensen, 1990; Rahhal, et al., 2002), resulted in enhanced memory.

Although intentionality did not affect performance on its own, task design may have contributed to the null result. Because participants alternated between blocks of explicit and implicit intentionality, carryover effects could have led participants to utilize similar processes. Using intentionality as a between-groups factor could better discern its contribution to memory for impressions.

While positive impressions were remembered more often than negative, this was especially true for the implicit condition. Although SST (Carstensen, et al., 1999) suggests that older, more than younger, adults preferentially focus on positive information to optimize emotional experience, younger and older individuals may be less engaged by negative traits when they are low-arousal. Although some research evidences negative biases when remembering impressions (Rozin & Royzman, 2001), this might be limited to extremely negative and arousing behaviors (Wojciszke, et al., 1993). Given the low-arousal nature of the task and behavioral sentences, participants may have tended to overweight positive and underweight low-arousal negative information (Nickerson, 1998) when forming impressions.

Moreover, the positivity bias elicited in the implicit condition was not caused by differences across the age groups in the extremity of arousal or valence ratings between positively and negatively valenced sentences. Although negative sentences were rated marginally more arousing than positive, if anything, this should make the negative sentences more memorable (Doerksen & Shimamura, 2001; Kensinger & Corkin, 2003).

The lack of a positivity bias in the explicit intentionality condition complements findings that concurrent tasks at encoding can disrupt a focus on positive information (Knight, et al.,

2007; Mather & Knight, 2005), and that performing concurrent tasks may also interrupt a positivity bias when forming impressions in low-arousal circumstances. Unlike Experiment 1, where the manipulation occurred after forming impressions, the explicit intentionality condition in Experiment 2 required generating an appropriate adjective while forming an impression at the same time, while the implicit condition did not require such a task. In Experiment 2, explicitly generating a trait word within the five seconds before answering the prompt may have also added the pressure of an explicit concurrent task to those trials. This differs from Experiment 1, which did not have additional instructions requiring participants to speak aloud while forming impressions before the prompt.

Interpersonal consequences contributed to memory, with impressions better remembered for behaviors having high relative to low consequences for others. Traits high in interpersonal consequences affect perceived trust (Singh et al., 2009), and may be prioritized in memory given that inferred traits can be useful in predicting the future behaviors of others in relation to the self.

General Discussion

Two studies examined the contribution of contextual factors to memory for impressions in young and older adults. Our data indicate that memory for socioemotional source material, the traits inferred from behavioral information and associated with actors, is spared with age under some conditions. This finding extends research positing that emotional context ameliorates age-related source memory impairments (May, et al., 2005) to the social information underlying impressions.

Our results elaborate on Todorov and Olson's (2008) suggestion that memory for impressions is spared with age, using larger samples of older participants. Experiment 1 assessed

the benefit of self-referencing on impression memory, indicating that self-related as well as social, but not explicitly self-related, encoding contexts improve memory for young and older adults. This potentially suggests that social meaning deepens encoding of source information, which may be conceptually similar to work showing that emotional context enhances source memory (May, et al., 2005; Rahhal, et al., 2002). Self-report, however, indicated considerable overlap in the processes engaged for self and common contexts at encoding, suggesting these contexts did not differ enough to elicit a self-reference effect in memory for impressions, relative to the common condition.

While older adults benefit from self-relevant strategy use (Glisky & Marquine, 2009; Gutchess, et al., 2007), the results of Experiment 2 indicate that older adults may receive disproportionate benefits in memory when a context emphasizes interpersonal relationships, contrasting the self-reference conditions used in Experiment 1. Although older adults have difficulty initiating retrieval processes (Luo & Craik, 2009), they may more easily initiate these processes when encoding contexts address their socioemotional goals, contrasting young adults' emphasis on novelty and information acquisition (Carstensen & Mikels, 2005; Fung & Carstensen, 2003). Emphasizing interpersonal relationships did not improve memory for young adults, who showed slightly greater memory for associations encoded in the personally irrelevant context (Figure 3A). This pattern could reflect young adults' information acquisition focus regardless of social relevance, in that young adults may have recruited resources to consider the possibilities given ambiguous information (e.g., pet ownership).

Although Experiment 2 identified that interpersonal meaningfulness improved memory for impressions in older adults, it is likely one of several memory-enhancing factors. Future research must address the role of other factors, such as morality or personal identification with a

behavior, in enhancing memory for impressions across the lifespan. Additionally, while the current studies are recognition-based, recall-based tasks may be more difficult for older adults; future work should address this distinction when considering the preservation of the mechanisms underlying the retrieval of impressions.

Our retrieval measure in the current studies assumes that target traits were inferred from the presented behaviors and associated with actors. Behavioral (Todorov & Uleman, 2002, 2003) and event-related potential (Jinkyung & Kitayama, 2011) work supports the idea that after viewing face-behavior pairs, inferred traits are spontaneously bound to actors and later retrieved. Given that our paradigm is similar to those used in previous work (Todorov & Uleman, 2002), utilized the same behavioral sentences used in prior experiments, and that in Experiment 2, a majority of generated impressions matched the targets, it seems unlikely that implicitly generated impressions significantly deviated from the inferred traits. To explore this claim, future work could test memory for specific behaviors, rather than memory for behavior-related traits, to examine whether exact behaviors or more general impressions are remembered when endorsing a trait at retrieval. However, there is evidence that individuals may recognize inferred impressions even when the original behaviors are not recalled or recognized, suggesting that the trait inferences are quite robust (Todorov & Uleman, 2002). While the question of whether participants inferred and remembered these target impressions is important, given previous work, we believe the current findings are a valid representation of potential age similarities and differences when remembering impressions.

Aging-related research illustrates that with increasing meaningfulness, older adults engage more available resources, potentially signifying that the activation of these mechanisms improves memory (Hess, et al., 1998; Hess & Tate, 1991). Using fMRI, one can elucidate these

mechanisms, comparing whether medial prefrontal cortex, fundamental in impression formation (J. Mitchell, Macrae, & Banaji, 2005), is functionally intact with age and contributes to memory for impressions, or if other regions mediate these processes in older adults.

These studies also emphasize the influence of content on remembering impressions. In Experiment 2, high interpersonal consequences led to higher levels of memory than behaviors with less interpersonal relevance. This is consistent with work showing that people project themselves into situations as if behaviors affect them (Vonk, 1999), such that good or bad social judgments are more extreme for behaviors with high interpersonal consequences.

Although Experiment 2 evidenced a positivity bias, contrasting work evidencing a prioritization of negative information (Rozin & Royzman, 2001), Experiment 1 did not show this effect. Experiment 2 may be more cognitively taxing than Experiment 1 due to a larger number of trials, allowing a positivity bias to emerge when participants must more selectively allocate cognitive resources. However, this difference could be due to encoding strategies. In Experiment 1, participants potentially encoded more positive than negative self-related impressions from the self and common conditions due to similar processing, because our manipulation emphasized the self. These behaviors may have been especially salient if they affected many people, as people may be less likely to think of themselves as performing behaviors that negatively impact others. This potentially is manifested in a positivity bias qualified by interpersonal consequences. The encoding contexts employed in Experiment 2 may better tease apart these effects by emphasizing interpersonal relationships over self-reference, causing participants to prioritize high interpersonal implications while also highlighting positive information, instead of potentially associating positive information with the self. These differing findings illustrate the need for additional research investigating how these characteristics shape the encoding of impressions

into memory, and if using more extremely valenced and arousing behavioral material reduce these positivity biases (Wojciszke, et al., 1993).

Alternatively, the effects involving positivity illustrated in both of the current studies may reflect a guessing bias in that people, particularly older adults, tend to endorse positive over negative responses (Isaacowitz et al., 2007). While exploratory analyses show some evidence of this, the study was not designed to examine this.³ Additional studies systematically comparing lures and employing different retrieval tasks (e.g., recall) are needed to assess whether the positivity finding reflects guessing or attentional biases toward encoding positive over negative information.

Because older adults' memories improve with repeated presentation (Light, Patterson, Chung, & Healy, 2004), the presentation of each face-behavior pair twice at encoding might potentially enhance memory among older, but not necessarily younger adults. Thus, the lack of age differences in these studies may have resulted from repetition, the social nature of the stimuli, or a combination of both. Repetition, however, did not improve older adults' memory for impressions encoded in an irrelevant context to the level of those encoded in an interpersonally meaningful context, making it unlikely that improvements resulted from repetition alone.

These findings add to an emerging literature that supports the preservation of the cognitive processes underlying impression formation, and provide evidence that memory for social information, such as impressions, is spared with age in some conditions. Future research assessing the neural bases of impression formation can further characterize the mechanisms through which socioemotional processing involved in impression formation shapes memory with age.

References

- Benjamin, A., & Craik, F. I. (2001). Parallel effects of aging and time pressure on memory for source: Evidence from the spacing effect. *Memory and Cognition, 29*, 691-697.
- Cansino, S., Maquet, P., Dolan, R., & Rugg, M. (2002). Brain activity underlying encoding and retrieval of source memory. *Cerebral Cortex, 12*(10), 1048-1056.
- Carstensen, L., Isaacowitz, D., & Charles, S. (1999). Taking time seriously: a theory of socioemotional selectivity. *American Psychologist, 54*(3), 165-198.
- Carstensen, L., & Mikels, J. (2005). At the intersection of emotion and cognition. *Current Directions in Psychological Science, 14*(3), 117-121.
- Chalfonte, B., & Johnson, M. (1996). Feature memory and binding in young and older adults. *Memory and Cognition, 24*(4), 403-416.
- Craik, F. I. (1994). Memory changes in normal aging. *Current Directions in Psychological Science, 3*(5), 155-158.
- Doerksen, S., & Shimamura, A. (2001). Source memory enhancement for emotional words. *Emotion, 1*(1), 5-11.
- Folstein, M., Folstein, S., & McHugh, P. (1975). Mini-mental state: A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research, 12*, 189-198.
- Fredrickson, B., & Carstensen, L. (1990). Choosing social partners: How old age and anticipated endings make people more selective. *Psychology and Aging, 5*, 335-347.
- Freund, A., & Smith, J. (1999). Content and function of the self-definition in old and very old age. *The Journals of Gerontology: Series B: Psychological Sciences and Social Sciences, 54*(1), 55-67.

- Fung, H., & Carstensen, L. (2003). Sending memorable messages to the old: Age differences in preferences and memory for advertisements. *Journal of Personality and Social Psychology, 85*(1), 163-178.
- Gilron, R., & Gutchess, A. (in press). Remembering first impressions: Effects of intentionality and diagnosticity of subsequent memory. *Cognitive, Affective, and Behavioral Neuroscience*.
- Glisky, E., & Marquine, M. (2009). Semantic and self-referential processing of positive and negative adjectives in older adults. *Memory, 17*(2), 144-157.
- Grossman, I., Na, J., Varnum, M., Park, D., Kitayama, S., & Nisbett, R. (2010). Reasoning about social conflicts improves into old age. *Proceedings of the National Academy of Sciences, 107*(16), 7246-7250.
- Gutchess, A., Kensinger, E., Yoon, C., & Schacter, D. L. (2007). Aging and the self-reference effect in memory. *Memory, 15*(8), 822-837.
- Hamami, A., Serbun, S., & Gutchess, A. (2011). Self-referencing processing and memory specificity with age. *Psychology and Aging, 26*, 636-646.
- Hedden, T., Park, D., Nisbett, R., Ji, L., Jing, Q., & Jiao, S. (2002). Cultural variation in verbal versus spatial neuropsychological function across the lifespan. *Neuropsychology, 16*, 65-73.
- Hess, T. M. (2006). Adaptive aspects of social cognitive functioning in adulthood: Age-related goal and knowledge influences. *Social Cognition, 24*(3), 279-309.
- Hess, T. M., & Auman, C. (2001). Aging and social expertise: The impact of trait-diagnostic information on impressions of others. *Psychology and Aging, 16*(3), 497-510.

- Hess, T. M., Follett, K. J., & McGee, K. A. (1998). Aging and impression formation: The impact of processing skills and goals. *The Journals of Gerontology: Series B: Psychological Sciences and Social Sciences*, 53(3), 175-187.
- Hess, T. M., Germain, C. M., Swaim, E. L., & Osowski, N. L. (2009). Aging and selective engagement: The moderating impact of motivation on older adults' resource utilization. *The Journals of Gerontology: Series B: Psychological Sciences and Social Sciences*, 64(4), 447-456.
- Hess, T. M., & Tate, C. (1991). Adult age differences in explanations and memory for behavioral information. *Psychology and Aging*, 6(1), 86-92.
- Isaacowitz, D., Lokenhoff, C., Lane, R., Wright, R., Sechrest, L., Riedel, R., & Costa, P. (2007). Age differences in recognition of emotion in lexical stimuli and facial expressions. *Psychology and Aging*, 22(1), 147-159.
- Jinkyung, N., & Kitayama, S. (2011). Spontaneous trait inference is culture specific. *Psychological Science*.
- Johnson, M., Hashtroudi, S., & Lindsay, D. (1993). Source Monitoring. *Psychological Bulletin*, 114(1), 3-28.
- Kapur, S., Craik, F. I., Tulving, E., Wilson, A., Houle, S., & Brown, G. (1994). Neuroanatomical correlates of encoding in episodic memory: levels of processing effect. *Proceedings of the National Academy of Sciences*, 91(6), 2008-2011.
- Kelley, W. M., Macrae, C. N., Wyland, C. L., Caglar, S., Inati, S., & Heatherton, T. F. (2002). Finding the self?: An event-related fMRI study. *Journal of Cognitive Neuroscience*, 14(5), 785-794.

- Kensinger, E., & Corkin, S. (2003). Memory enhancement for emotional words: Are emotional words more vividly remembered than neutral words? *Memory & cognition*, 31(8), 1169.
- Knight, M., Seymour, T., Gaunt, J., Baker, C., Nesmith, K., & Mather, M. (2007). Aging and goal-directed emotional attention: distraction reverses emotional biases. *Emotion*, 7(4), 705-714.
- Light, L., Patterson, M., Chung, C., & Healy, M. (2004). Effects of repetition and response deadline on associative recognition in young and older adults. *Memory and Cognition*, 32(7), 1182-1193.
- Lockhart, R., & Craik, F. I. (1990). Levels of processing: A retrospective commentary on a framework for memory research. *Canadian Journal of Psychology*, 44(1), 87-112.
- Luo, L., & Craik, F. I. (2009). Age differences in recollection: Specificity effects at retrieval. *Journal of Memory and Language*, 60(4), 421-436.
- Mather, M., & Carstensen, L. (2005). Aging and motivated cognition: the positivity effect in attention and memory. *Trends in Cognitive Sciences*, 9(10), 496-502.
- Mather, M., & Knight, M. (2005). Goal-directed memory: the role of cognitive control in older adults' emotional memory. *Psychology and Aging*, 20(4), 554-570.
- May, C., Rahhal, T., Berry, E., & Leighton, E. (2005). Aging, Source Memory, and Emotion. *Psychology and Aging*, 20(4), 571-578.
- Minear, M., & Park, D. (2004). A lifespan database of adult facial stimuli. *Behavior Research Methods, Instruments, & Computers*, 36(4), 630-633.
- Mischel, W., Ebbesen, E., & Zeiss, A. (1976). Determinants of selective memory about the self. *Journal of Consulting and Clinical Psychology*, 44(1), 92-103.

- Mitchell, J., Macrae, C., & Banaji, M. (2004). Encoding-Specific Effects of Social Cognition on the Neural Correlates of Subsequent Memory. *Journal of Neuroscience*, 24(21), 4912-4917.
- Mitchell, J., Macrae, C., & Banaji, M. (2005). Forming impressions of people versus inanimate objects: social-cognitive processing in the medial prefrontal cortex. *Neuroimage*, 26(1), 251-257.
- Mitchell, K., Raye, C., Ebner, N., Tubridy, S., Frankel, H., & Johnson, M. (2009). Age-group differences in medial cortex activity associated with thinking about self-relevant agendas. *Psychology and Aging*, 24(2), 438-449.
- Naveh-Benjamin, M., Guez, J., Kilb, A., & Reedy, S. (2004). The associative memory deficit of older adults: further support using face-name associations. *Psychology and Aging*, 19(3), 541-546.
- Newman, L., & Uleman, J. S. (1993). When are you what you did? Behavior identification and dispositional inference in person memory, attribution, and social judgment. *Personality and Social Psychology Bulletin*, 19(5), 513-525.
- Nickerson, R. (1998). Confirmation bias: A ubiquitous phenomenon in many guises. *Review of General Psychology*, 2, 175-220.
- Northoff, G., Heinzl, A., de Greck, M., BERPohl, F., Dobrowolny, H., & Panksepp, J. (2006). Self-referential processing in our brain--a meta-analysis of imaging studies of the self. *Neuroimage*, 31(1), 440-457.
- Park, D., & Gutchess, A. (2005). Long-term memory and aging: A cognitive neuroscience perspective *Cognitive neuroscience of aging: Linking cognitive and cerebral aging* (pp. 218-245): Oxford University Press.

- Rahhal, T., May, C., & Hasher, L. (2002). Truth and character: sources that older adults can remember. *Psychological Science, 13*(2), 101-105.
- Reichstadt, J., Depp, C., Palinkas, L., Folsom, D., & Jeste, D. (2007). Building blocks of successful aging: a focus group study of older adults' perceived contributors to successful aging. *American Journal of Geriatric Psychiatry, 15*(3), 194-201.
- Rozin, P., & Royzman, E. B. (2001). Negativity bias, negativity dominance, and contagion. *Personality and Social Psychology Review, 5*(4), 296-320.
- Shipley, W. (1986). *Shipley Institute of Living Scale*. Los Angeles: Western Psychological Services.
- Singh, R., Simons, J., Young, D., Sim, B., Chai, X., Singh, S., & Chiou, S. (2009). Trust and respect as mediators of the other- and self-profitable trait effects on interpersonal attraction. *European Journal of Social Psychology, 39*, 1021-1038.
- Symons, C. S., & Johnson, B. T. (1997). The self-reference effect in memory: A meta-analysis. *Psychological Bulletin, 121*(3), 371-394.
- Todorov, A., & Olson, I. (2008). Robust learning of affective trait associations with faces when the hippocampus is damaged, but not when the amygdala and temporal pole are damaged. *Social Cognitive and Affective Neuroscience, 3*, 195-203.
- Todorov, A., & Uleman, J. (2002). Spontaneous trait inferences are bound to actors' faces: Evidence from a false recognition paradigm. *Journal of Personality and Social Psychology, 83*(5), 1051-1065.
- Todorov, A., & Uleman, J. (2003). The efficiency of binding spontaneous trait inferences to actors' faces. *Journal of Experimental Social Psychology, 39*(6), 549-562.

Uleman, J. (1988). Trait and gist inference norms for over 300 potential trait-implying sentences.

Unpublished raw data.

Uleman, J., Chaiken, S., & Trope, Y. (1999). Spontaneous versus intentional inferences in impression formation *Dual-process theories in social psychology*. (pp. 141-160). New York, NY US: Guilford Press.

Vonk, R. (1999). Effects of other-profitability and self-profitability on evaluative judgements of behaviours. *European Journal of Social Psychology*, 29(7), 833-842.

Wechsler, D. (1997). *Wechsler Memory Scale* (3 ed.). San Antonio, TX: The Psychological Corporation.

Willis, J., & Todorov, A. (2006). First Impressions: Making Up Your Mind After a 100-Ms Exposure to a Face. *Psychological Science*, 17(7), 592-598.

Wojciszke, B., Brycz, H., & Borkenau, P. (1993). Effects of information content and evaluative extremity on positivity and negativity biases. *Journal of Personality and Social Psychology*, 64(3), 327-335.

Wright, C., Wedig, M., Williams, D., Rauch, S., & Albert, M. (2006). Novel fearful faces activate the amygdala in healthy young and elderly adults. *Neurobiology of Aging*, 27(2), 361-374.

Footnotes

¹ By removing 16 sentences, we verified this pattern of results in a subset of sentences better matched for arousal and valence extremity across age groups. Although our counterbalancing scheme should have eliminated these effects across conditions, we wanted to ensure that older adults' tendency to rate sentences as higher in arousal and valence extremity than young did not account for the pattern of recognition data. Results did not deviate in significance or direction from the full sentence set.

² We examined whether the number of matches between of spoken and target impressions affected our pattern of results. We classified participants as having high or low match level by using a median split the percentage of matched impressions, and used Match Level as an addition between-groups factor in our ANOVA to determine whether the extent of matched impressions influenced memory performance. There was no main effect of Match Level, $F(1, 38) = 1.30$, *ns*, and no interaction between Age Group and Match Level, $F(1, 38) < 1$, *ns*. Match Level did not significantly interact with any of the discussed findings of Experiment 2. This suggests that the extent to which spoken traits matched the target in the explicit intentionality condition did not affect memory performance.

³ ANOVAs using inferred trait valence (negative, positive) and the valence match of the lure (same, e.g., both positive; different, e.g., one positive, one negative) were conducted to determine a potential positive guessing bias in the retrieval task. Statistical support for positive guessing biases was consistent across both experiments, with participants tending to endorse the positive adjective when choosing between traits of different valence. Such a bias was not apparent when choosing between valence-matched traits. Data available upon request to authors.

Figure Captions

Figure 1. (A) Example encoding stimuli for Experiment 1: The impression formation stage, followed by the second stage (one of three encoding contexts (self [shown], common, or word).

(B) Example encoding stimuli for Experiment 2: Each level of the intentionality (explicit, implicit) and interpersonal meaningfulness (meaningful, irrelevant) conditions.

Figure 2. Accuracy in Experiment 1: (A) The self and common encoding contexts produced enhanced memory for impressions relative to the word context. (B) When behaviors were low in interpersonal consequences, participants remembered similar numbers of impressions, whereas when interpersonal consequences were high, participants remembered more positive than negative impressions. * $p < 0.05$

Figure 3. Accuracy in Experiment 2: (A) Older adults had enhanced memory for impressions encoded in the interpersonally meaningful over irrelevant context, whereas young adults did not display this bias. (B) In the explicit intentionality condition, participants remembered similar numbers of negative and positive impressions, but in the implicit condition, there was a bias to remember more positive than negative impressions. * $p = 0.056$, ** $p < 0.001$

Table 1.

Proportions of correctly retrieved impressions (means and standard deviations) for Experiments 1 and 2.

A. Experiment 1						
	Low Interpersonal Consequences			High Interpersonal Consequences		
	Word	Common	Self	Word	Common	Self
Young Adults						
Negative	0.74 (0.21)	0.76 (0.24)	0.82 (0.20)	0.74 (0.24)	0.72 (0.29)	0.79 (0.20)
Positive	0.69 (0.24)	0.75 (0.22)	0.80 (0.18)	0.72 (0.23)	0.79(0.20)	0.83 (0.20)
Older Adults						
Negative	0.67 (0.26)	0.73 (0.23)	0.67 (0.23)	0.65 (0.28)	0.72 (0.26)	0.72 (0.20)
Positive	0.66 (0.22)	0.71 (0.25)	0.78 (0.22)	0.71 (0.25)	0.80 (0.16)	0.82 (0.19)
B. Experiment 2						
	Explicit		Implicit			
	Meaningful	Irrelevant	Meaningful	Irrelevant		
Young Adults						
Negative	0.71 (0.18)	0.74 (0.13)	0.66 (0.12)	0.70 (0.13)		
Positive	0.72 (0.12)	0.74 (0.15)	0.75 (0.13)	0.75 (0.12)		
Older Adults						
Negative	0.72 (0.14)	0.66 (0.14)	0.67 (0.15)	0.61 (0.15)		
Positive	0.69 (0.14)	0.66 (0.16)	0.75 (0.15)	0.73 (0.11)		

Note: Standard deviations are in parentheses.

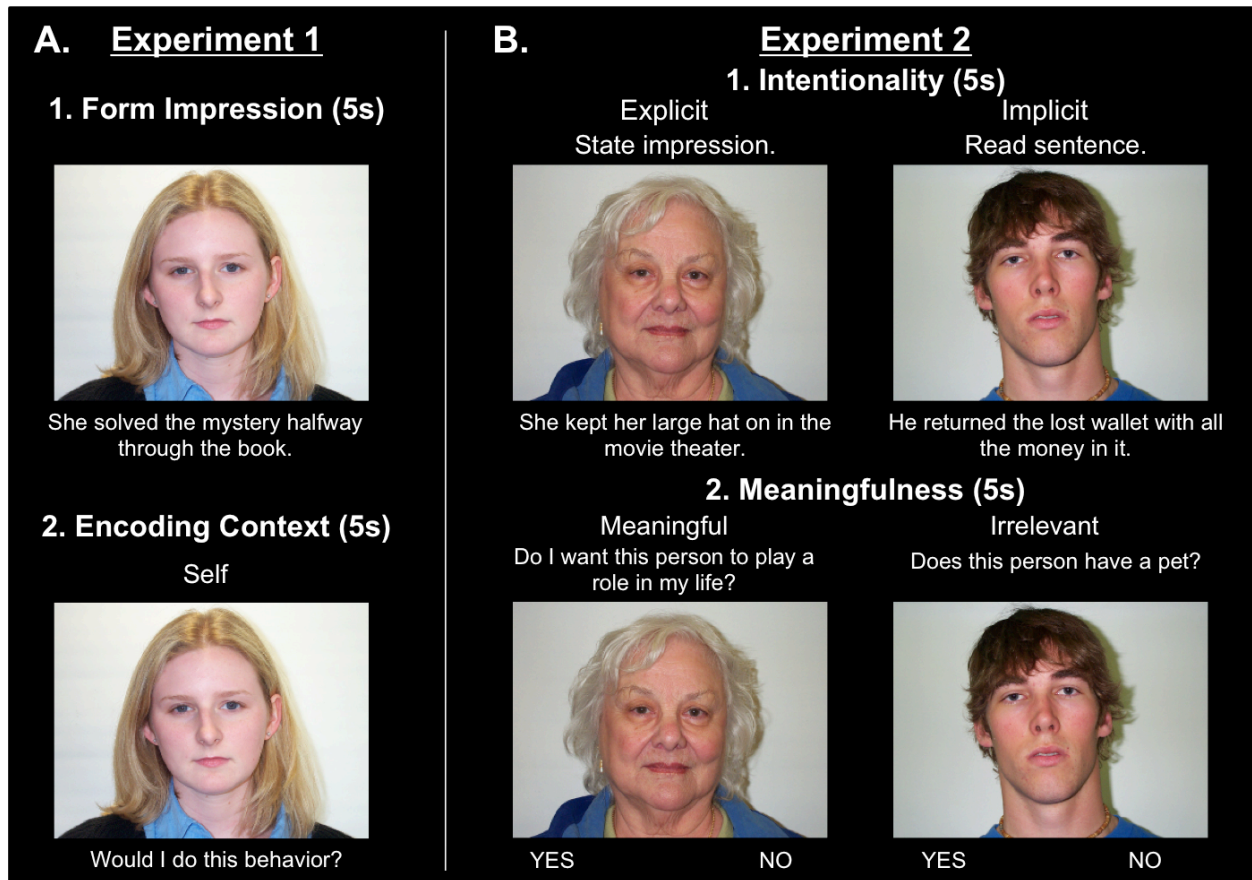


Figure 1.

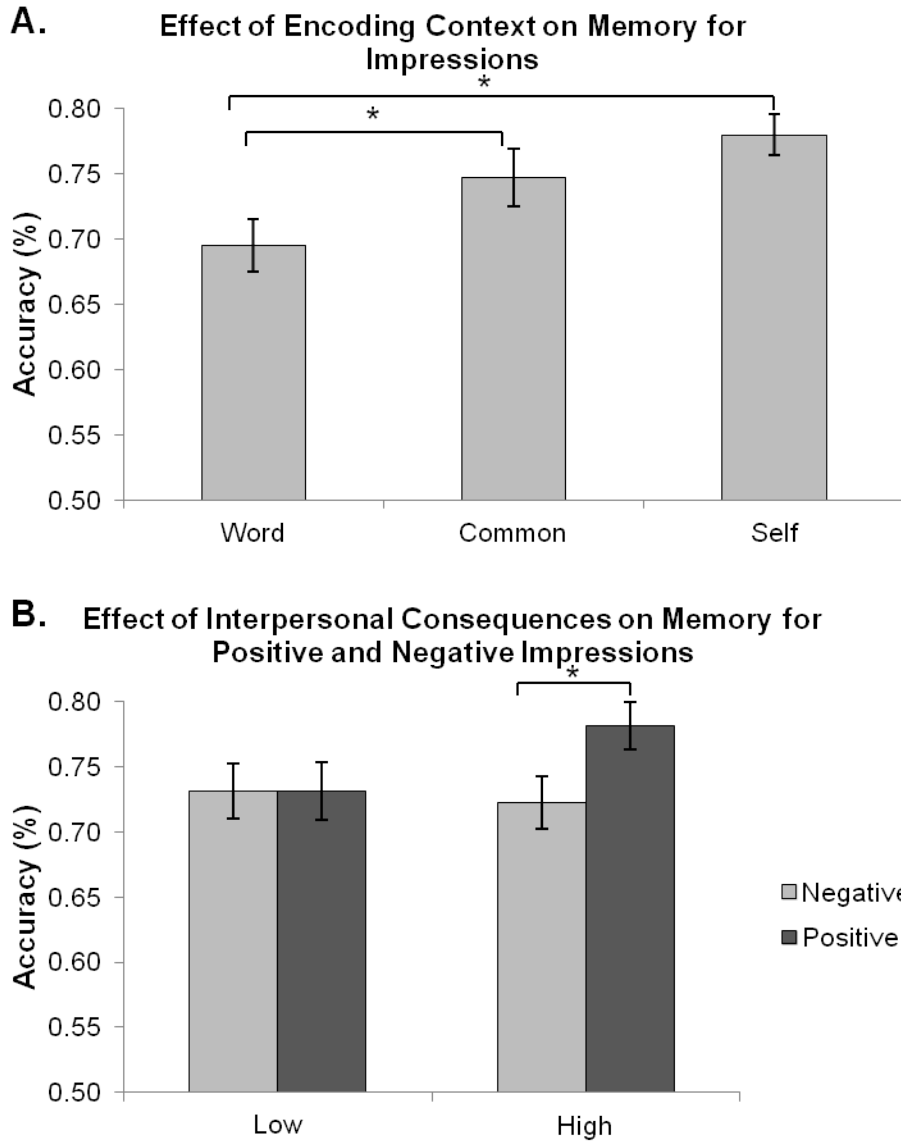
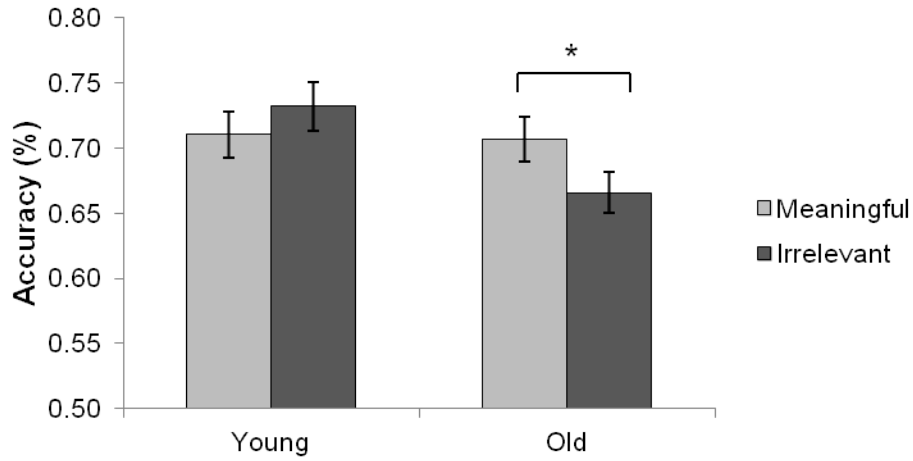


Figure 2.

A. Effect of Interpersonal Meaningfulness on Memory for Impressions



B. Effect of Intentionality on Memory for Positive and Negative Impressions

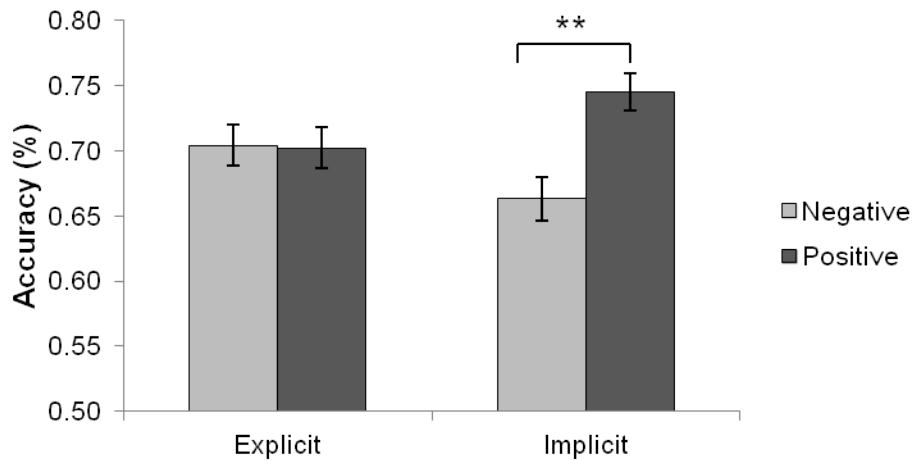


Figure 3.