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Are Older Adults More Attuned to Morally-Charged Information?

Darcia Narvaez Gabriel A. Radvansky

Nicholas A. Lynchard

University of Notre Dame

David E. Copeland

University of Nevada, Las Vegas

Abstract

Whereas older adults typically show declines in various cognitive processes they also typically demonstrate greater interest in social relationships. Part of this increased focus on interpersonal relations may extend to morality, which by its very nature is concerned with social contracts, obligations and the give-and-take among people. We tested whether in comparison to younger adults older adults show increased activation and memory for morally-charged information relative to nonmoral information. Three experiments examined older and younger adult comprehension and memory of moral content in stories. Participants read stories and were tested for surface form, textbase, and situation model recognition memory. In contrast to past studies that have not focused on moral content, older adults had textbase memory for moral information equal to that of young adults, suggesting an enhanced attention to morally-charged details. To examine online moral inference making, Experiment 2 used lexical decision probes. There was greater facilitation of moral inferences for older adults relative to younger adults, suggesting greater focus of processing on moral content. Experiment 3 explored methodological issues to resolve some discrepancies between the experiments, and replicated the basic findings. In general, older adults had enhanced memory for morally-charged story events and, relative to younger adults, were more likely to draw moral inferences during comprehension.

Are Older Adults More Attuned to Morally-Charged Information?

It is well established that cognitive aging involves at least two competing components. On the one hand, some cognitive abilities decline, such as speed of processing (Myerson, Hale, Wagstaff, Poon, & Smith, 1990; Salthouse, 1996), processing capacity (Craik & Byrd, 1982), inhibitory processes (Dempster, 1992; Hasher & Zacks, 1988), the ability to self-initiate processes (Craik & Jennings, 1992), and frontal lobe functioning more generally (Albert & Kaplan, 1980). On the other hand, some abilities remain stable or increase in effectiveness with age, including crystallized intelligence (Baltes, Staudinger & Lindenberger, 1999), semantic priming (e.g., Howard, McAndrews & Lasaga, 1981), and situation model use (Radvansky & Curiel, 1998; Radvansky & Dijkstra, 2007). For example, older adults tend to focus more on the gist meaning of events rather than on the details (Pratt & Norris, 1999). Although older adults are handicapped by declines in processing (e.g., Myerson, et al., 1990; Pratt, Boyes, Robins, & Manchester, 1989; Salthouse, 1996), they are also more likely to focus on the deeper meaning of stories, recalling them more succinctly in accordance with a focus on meaning and integration. In other words, the deeper symbolic and psychological meaning of narratives becomes more salient with age (e.g., Carstensen & Turk-Charles, 1994; Adams et al., 1997).

In addition to these cognitive changes, there is also a shift in interest such that, relative to younger adults, older adults become more focused on positive emotional experiences. Because emotional experiences are often socially embedded, this shift contributes to a greater emphasis on emotion regulation in social contexts (e.g., Carstensen, Isaacowitz, & Charles, 1999). That is, as one ages, positive relational behavior in terms of expressivity and negotiation is increasingly favored (e.g., Carstensen et al., 2003). For example, relative to younger adults, older adults

report fewer and less intense negative emotions in relationships (e.g., Diener, Sandvik, & Larsen, 1985; Lawton et al., 1992). According to Socioemotional Selectivity Theory (SST) these findings make sense because older adults' increasing awareness of lifespan limitations causes a motivational shift that directs their attention towards emotionally meaningful goals, especially in social situations (Carstensen, 1992; Suddendorf & Corballis, 1997). Such a focus facilitates the improvements seen in older adults regarding emotion regulation (Carstensen, Fung, & Charles, 2003) and improved memory for details of their positive emotional experiences (Labouvie-Vief, Hakim-Larson, et al., 1989).

These tendencies among older adults led us to postulate that the processing of morally-charged events, which are often both emotionally meaningful and socially embedded, would be especially salient to older adults. Morality is defined here as cooperation, sharing the benefits and burdens of the necessity to live in social groups (Piaget, 1932/1965; Rest, 1986). When elements of a situation point to the need for cooperative response, or to social responsibility, we call that morally-charged information. Of particular concern here is the degree to which older adults process and remember morally-charged content in stories. On the one hand, because there are general cognitive declines and decreased abilities for information processing, one might expect that older adults would be less effective at processing morally-charged content. On the other hand, because moral situations focus more on emotional aspects of interpersonal relations among people, we expected older adults to show preserved or superior processing of morally-charged information. This idea is supported by evidence showing that moral judgments can use some of the same neurological structures and emotion processing (Greene & Haidt, 2002; Greene, Sommerville, Nystrom, Darley, & Cohen, 2001), particularly when the moral judgments are more personal than impersonal.

To date, no one has tested whether moral information is particularly salient for older adults. There has been some work on the probability of drawing morals from fables presented to younger and older adults, but not on the on-line activation of moral information, nor the ability to retain morally charged information later (Arbuckle & Harsany, 1985). The current project explored the influence of aging on the processing of morally-charged content and the drawing of inferences related to that content.

Two areas of research are brought together here: (1) age-related changes in event comprehension and memory (e.g., Radvansky, 1999; Radvansky & Dijkstra, 2007) and (2) moral information processing, in particular the examination of individual and developmental differences in the processing of moral discourse (Narvaez, 2002). Specifically, we studied the processing of narratives that had moral events and themes. As in normal text processing, the processing of moral texts also requires drawing inferences and constructing a situation model (Narvaez, 1998).

Reading Comprehension and Aging

Three levels of mental representation have been identified in text comprehension: the surface form, the propositional textbase, and the situation model (van Dijk & Kintsch, 1983). The surface form refers to the verbatim words and syntactic structures that were originally encountered. The propositional textbase level captures the underlying ideas conveyed by the text apart from their specific wording. Both the surface form and textbase representations are mental representations of the text itself. In contrast to this, the situation model captures the gist of the events in the text and is functionally isomorphic to the events to which the text refers. As such, it

serves as a mental simulation of what the text is about. This involves integrating text elements with inferences drawn from prior knowledge (van den Broek, 1994).

In general, research on cognitive aging has shown that older adults do much more poorly than younger adults on tests that examine surface form and textbase memory. However, processing at the situation model level is relatively well-preserved (see Radvansky & Dijkstra, 2007, for a review). An aim of the current research is to assess the degree to which this pattern of deficit and preservation extends to the processing of morally-charged content.

In addition to these memory representations, readers may also draw meta-level inferences, such as evaluations of the characters and the actions that occur (e.g., "That was a stupid thing to do"). Although these evaluations may not be directly incorporated into a mental representation of the text, such thoughts often guide processing. For example, skilled readers generate more explanatory inferences while thinking aloud during reading than less skilled readers (e.g., Chi, de Leeuw, Chiu, & La Vancher, 1994; Graesser, Singer & Trabasso, 1994; Trabasso & Magliano, 1996; van den Broek & Lorch, 1993; Zwaan & Brown, 1996); moreover, readers with expert background knowledge do more explaining and evaluation of events in the text than non-experts (e.g., Chiesi, Spilich, & Voss, 1979; Lundeborg, 1987; Wineberg, 1991;Wyatt, Pressley, El-Dinary, Stein, Evans & Brown, 1993). Readers also draw meta-level inferences when reading morally charged content (Narvaez, Lapsley, Hagele & Lasky, 2006).

Relative to younger adults, text processing studies show that older adults tend to focus on, recall, and prefer general information over details, (Labouvie-Vief, 1982; Spillich, 1983). Some argue that this synthesizing style may be a compensatory mechanism for processing limitations (Labouvie-Vief, 1982). Others suggest that the aging mind is evolutionarily conditioned to interpret new instances as familiar and to rely on existing schemas rather than

form new ones (Lachman, Lachman, & Taylor, 1983). This tendency is particularly apparent in the changing saliency of social events during aging. Gould (2004) tested recall and elaboration of younger and older adults within discussion groups of different sizes. Along with recall they measured denotative elaborations (making inferences based on story events) and annotative elaborations (making evaluative comments on events and characters or associating events to their own experience). Denotative elaborations were significantly related to recall, both of which were significantly greater among younger adults. However, annotative comments increased with age and the size of the group. Although Gould (2004) interprets this as a compensatory mechanism for declining memory skills, it could also be viewed as an increase in emphasis on the social world on the part of older adults (e.g., Carstensen, Hansen, & Freund, 1995). In the current experiments moral information processing is expected to draw on the increased emphasis on social relations.

Aging and Moral Development

Few research studies have been done with older adults in the moral domain and those that have been done typically focus on moral reasoning. Cross-sectional studies suggest there is no loss of moral reasoning function with age when educational attainment is controlled (e.g., Chap, 1986). Other studies find differences between older and younger adults. For example, in comparison to younger adults, older adults show greater reflectiveness and breadth in judgment about hypothetical moral dilemmas and tend to focus more on the meaning of personal moral dilemmas (Pratt, Golding and Kerig, 1987). Further, whereas younger adults focused on the external constraints (e.g., duty) on their behavior in personal moral dilemmas, older adults

focused on personal virtues (e.g., kindness), similar to those of any age with higher moral judgment scores. Pratt, Golding, Hunter and Norris (1988) studied the moral reasoning of 242 respondents, ages 14-92, on both objective and open-ended measures. Older respondents focused on general, not specific, information and were more likely than younger respondents to assimilate moral dilemma information to their own general cognitive frameworks, consistent with a preference for annotative elaboration, as noted earlier, and a hypothesis of greater synthesis in judgment among the elderly.

Longitudinal studies paint a different picture. Armon and Dawson (1997) present data from a longitudinal study over 13 years during which 23 participants were tested four times with moral judgment interviews. Moral reasoning stage increased sequentially through the lifespan but decreased with advancing age in a slightly curvilinear fashion. Although moral judgment was strongly correlated with education in younger participants, in old age there was only a moderate correlation. Pratt, Diessner, Pratt, Hunsberger, and Pancer (1996) tested a group of adults twice in a 4-year period for moral reasoning stage, complexity of social reasoning, and perspective taking. There were 23 middle aged adults (ages 35-54) and 27 older adults (ages 64-80). Moral reasoning did not decline for either age group, although social reasoning complexity degraded in both groups. Only in the older group did perspective taking decline but was mitigated by education level, health and social-cognitive support. That is, those with more education, better health, and supportive relationships were less likely to decline in perspective taking skills. However, Ligneaur-Herve & Mullet (2005) found that older adults generally were less able to discount information irrelevant from the perspective of another person.

In summary, moral reasoning research maps development through the lifespan finding mixed results for the stability of moral judgment. The present studies focused on a different

aspect of moral functioning, moral information processing.

Moral Information Processing

In studies of moral development, there has been a shift away from studying how people reason about hypothetical dilemmas towards a broader study of moral information processing. Like tests of moral reasoning that use dilemmas as stimuli, the ability to process moral information is also marked by developmental differences. Early studies in moral comprehension gave participants moral reasoning statements to paraphrase. Individuals successfully paraphrased reasoning at their own moral stage or below, demonstrating developmental differences in processing the discourse (Rest, 1973; Rest, Turiel, & Kohlberg, 1969; Walker, deVries, & Bichard, 1984). Studies of moral narrative recall indicates that recall of moral reasoning embedded in stories increases with age until adulthood (Narvaez, 1998). Those with moral identities or moral character orientation (i.e., attending more to other people's character rather than their attractiveness) are more likely to spontaneously infer moral traits and make evaluative judgments of others during reading (Narvaez, Lapsley, Hagele & Lasky, 2006). We expected that because older adults are more focused on interpersonal relations, it would be evident in how they process morally-charged narratives, specifically in having greater memory for moral detail.

In summary, moral information processing research has been conducted primarily with participants in graduate school or younger. Studies of reasoning about moral dilemmas show that older respondents are more likely than younger respondents to focus on general rather than specific information and are more likely to assimilate moral dilemma information to their own general cognitive frameworks, consistent with a hypothesis of greater annotative processing and

cognitive synthesis among the elderly (e.g., Pratt, Golding, Hunter & Norris, 1988). The purpose of this study is to examine moral information processing among older adults.

Social-Cognitive Approach

Social cognitive theory (see Lapsley & Narvaez, 2004, for a review) offers a framework for the research questions of this study. Social cognitive theory emphasizes the central importance of cognitive features such as mental representations or schemas and social information processing but also emphasizes the centrality of motivation in the processing of events. Moreover, it considers affect and cognition to be co-regulating interwoven processes. Affect influences memory, salience and attention (Bugental & Goodnow, 1998). Finally, the cognitive-affective social information processing system is dynamic, interacting with the situation, personal meaning, and goals.

Hess (2006) has applied a social cognitive theory to age differences in the processing of social information. If one considers social information processing to be part of adaptive functioning, one can examine how life contexts can change what is adaptive. For example with young adults, it has often been assumed that a person processes information based on current goals (Chen & Chaiken, 1999). More recently, personal meaning has been shown to influence information processing. Meaningful information is more likely to draw attention and increase performance regardless of age (Hess & Auman, 2001). However, for older adults, social information is particularly meaningful (e.g., Carstensen, 1992). We anticipate that moral information will also be salient for older adults.

Current Study

The current study examined moral text processing and memory, using recognition tests and online inference assessment methods. We hypothesized that, in comparison to younger adults, older adults would be more attuned to moral information because they are more socially oriented and more socially experienced, thus facilitating social information processing (Hess, Osowski, & Leclere, 2005), and in turn, moral information processing. Moral information in the stories would be especially meaningful, in comparison to neutral or nonmoral information, for older adults, resulting in facilitation of processing for moral information.

Experiment 1

In Experiment 1, we tested recognition memory using moral stories by examining the three levels of representation: the surface form, textbase, and situation model. For nonmoral information we expected to replicate previously observed patterns (e.g., Radvansky, Zwaan, Curiel, & Copeland, 2001). Namely, both groups should have relatively poor surface form memory, but if there is a difference it was expected that the younger adults would have better memory at this level. Also, it was expected that the young adults would have superior textbase memory, and the older adults would have superior situation model memory. In addition, we expected older adults to have better memory for moral information, relative to nonmoral information. However, at the outset we were unsure whether this would manifest itself at the textbase level, situation model level, or both.

Specifically, as noted earlier, we suspect that older adults place a greater emphasis on

social information. Thus, we might expect that this would increase attention to information in the text that more directly conveys social / moral information. As such, memory for that textbase information would be improved for the older adults for moral relative to nonmoral information. Also, because of their increased focus on social-moral information it is possible that older adults would be more likely to draw morality-related inferences, and incorporate them into the situation model. If these inferences were properly probed for in the recognition test, then the strength of the situation model level would also increase for the older adults.

Method

Participants. Thirty-six people were tested in each of the two age groups. The younger adults ranged from 18 to 30 (M = 21.5, SD = 3.1, 78% female), were recruited from the University of Notre Dame, and received partial course credit. The older adults ranged from 60 to 82 (M = 71.8, SD = 6.1, 56% female), were recruited via a newspaper ad, and were paid for their time. The younger adults had fewer years of education (M = 13.8, SD = 1.2) than the older adults (M = 15.8, SD = 2.6), $t(70) = 4.25$, $p < .001$, and scored lower on the Shipley vocabulary test (M = 29.4, SD = 3.3) than the older adults (M = 34.1, SD = 3.7), $t(70) = 5.66$, $p < .001$. However, the younger adults scored higher on the Salthouse and Babcock (1991) test of processing speed (M = 18.9, SD = 6.2) than the older adults (M = 10.2, SD = 3.4), $t(70) = 7.31$, $p < .001$, and on a working memory span test (i.e., comprehension span test; Waters & Caplan, 1996) (M = 19.2, SD = 13.5) than the older adults (M = 4.2, SD = 3.5), $t(70) = 6.17$, $p < .001$. In summary, consistent with most research in cognitive aging, the older adults had a higher level of education and vocabulary knowledge, as well as the usual decrements for the processing measures.

Materials. Eight stories were used. There were four experimental stories (78, 89, 95 and 97 sentences long) and four filler stories. Each story was presented one sentence at a time on a computer screen. The experimental and filler stories were randomly ordered. The experimental stories were shortened and slightly revised versions of moral stories used in previous research (e.g., Narvaez, Gleason, Mitchell & Bentley, 1999). The stories contain elements of moral sensitivity, moral reasoning, moral focus, and moral action (Narvaez & Rest, 1995). The experimental stories were the following. (a) "California and the Cattle:" On the way home from helping an elderly neighbor, Cal, from a small Western town, must decide whether she should save and guard the town's cattle through the night of thunderstorms. This story has the same structure as "The Boy and the Dike" and involves self-sacrifice for the welfare of the community (see Appendix A for the full text of this story). (b) "Home Alone with Jed." Jed is supposed to stay home one afternoon to take care of his baby brother, but neglects his responsibilities to play football in the park with the other neighborhood boys. (c) "Move to a New City." The Perez family is moving to Minneapolis in search of employment, and on the way, Mr. and Mrs. Perez's daughter, Kim, is given too much change at a convenient store. (d) "Malcolm's Neighborhood." Malcolm and Tyrone are best friends, and, when Tyrone decides to frame a special needs child for his mistakes, Malcolm wrestles with telling the truth and implicating Tyrone. The filler stories were fictional tales about a farmer rebellion, collecting beanie babies, abstaining from chocolate, and starting a rock band. No analyses were done on the filler stories as they did not contain the manipulations of interest. They were included to obscure the primary purpose of the study.

Measures. After reading all of the stories, participants had several memory and comprehension tasks. First, they were given a recognition test consisting of eight probes for each

story. An excerpt from “Move to a New City” is provided below. In this excerpt there are two sentences that were selected to assess memory for nonmoral (general actions or characteristics) and moral information (actions and characteristics about relating to others) respectively.

> … They pulled into the gas station. Everybody out for a stretch! *Mr. Perez didn't have to convince anyone to get out of the car*. They all jumped right out. As her dad filled the gas tank, Kim leaned against the car… She thought about the money. Then she heard her father's voice inside her head. *His boss had given him too much money in his paycheck.* "If you want to be a good person, you should always try to be honest. And you must always be honest because you are a Perez. We, Perez, are all honest, good people. Everybody knows that." Was she being dishonest by keeping money put in her hand by someone she didn't even know?

Using the Schmalhofer and Glavanov (1986) procedure, four versions of a recognition probe were generated for each of these sentences. For example, in the moral information condition, the sentence “His boss had given him too much money in his paycheck.” was a *verbatim* sentence. The *paraphrase* version was “Her father's boss had given him too much money in his check.” The *inference* version was “Her dad gave back the extra money from the paycheck.” Based on the context of the story, this is an inference that could plausibly be made by readers. Finally, the *incorrect version* was “Her dad's boss had not given him enough money in his paycheck.” This is thematically consistent, but at odds with the information conveyed by the story. As an example for the non-moral information condition, the sentence “Mr. Perez didn't have to convince anyone to get out of the car.” was a verbatim sentence. The paraphrase version was “Mr. Perez didn't have to tell anyone to step out of the car.” The inference version was “Everyone wanted to get out of the car and stretch.” Finally, the incorrect probe version was “Everyone stayed in the car

while Mr. Perez filled the tank." The appendix shows the moral and neutral probes for the "California and the Cattle" story as well as the full text for the story.

In addition to the probes, and unrelated to the primary memory measure, two true/false comprehension questions were created for each story (e.g., "Kim's father stopped the car at a grocery store."). Half of the questions were true and half were false.

After the measure memory and comprehension tasks, participants completed several tests of cognitive processing. First, they completed the Shipley vocabulary test (Zachary, 1986). For a measure of processing speed, participants completed Salthouse and Babcock's (1991) pattern comparison test. To measure working memory capacity, participants completed the comprehension span test based on work by Waters and Caplan (1996).

Participants were also tested for moral personality. Moral personality can be understood in terms of the chronic accessibility of moral schemas for construing social events (Lapsley & Narvaez, 2004; Narvaez, Lapsley, Hagele, & Lasky, 2006). Therefore, a person who has a moral personality would be one for whom moral constructs are chronically accessible and easily activated for processing social information. Such constructs are constantly available for discerning the meaning of social events. To determine whether participants were moral "chronics," a primacy-of-output procedure was used, a method successfully use to determine chronicity (e.g., Higgins, King, & Mavin, 1982). Participants were asked to write down the traits of someone they like, someone they dislike, someone they seek out, someone they avoid, and someone they frequently encounter. A maximum of ten traits was permitted for each question. Individuals were considered "moral chronics" if at least three of the six traits listed first for each question were traits that are highly prototypic of good moral character, as determined by Lapsley and Lasky (2000) (e.g., kind, honest). Participants who did not name any trait adjective

prototypic of good moral character were considered to be "non-chronic." Although the results indicate that there were more chronics in the older group (30%) than in the younger group (20%), scores had no correlation with age or with memory for moral information, so the variable was dropped from the analyses.

Procedure. Participants were tested individually. After consent forms and demographic sheets were completed, they were asked to read several stories and answer questions about them. First, they completed a practice text to familiarize themselves with the task, then they read the eight experimental and filler stories. The texts were presented on a computer screen. The text type was white with black background, and in 40-column mode. The experimental stories were randomized for each participant. Reading was self-paced. The texts were presented one sentence at a time. After reading a sentence, the spacebar was pressed, and the next sentence appeared.

Immediately after each story, two comprehension questions based on text events were presented one at a time in a red font. This was done to ensure that participants were reading and comprehending the stories as they progressed. These questions were answered by clicking either the left or right button on the mouse. The left mouse button was pressed for "yes, this is true," and the right mouse button for "no, this is false." There were equal numbers of "yes" and "no" answers. Apart from making sure participants were paying attention to the stories, these responses were not analyzed. All participants had error rates of 25%, or less, with younger adults (M = 5.8; SD = 5.9) and older adults (M = 7.4; SD = 7.9), performing similarly, $F < 1$.

Following story reading and comprehension testing, participants were given the Shipley vocabulary test, the Salthouse and Babcock (1991) speeded pattern comparison test, the Higgins' chronicity measure (Higgins, King & Mavin, 1982), and the Waters and Caplan (1996) working memory span test.

Finally, participants were given the recognition test of story content. The recognition test used a method developed by Schmalhofer and Glavanov (1986) and successfully used with older adults (Radvansky, Zwaan, Curiel, & Copeland, 2001; Radvansky, Copeland, & Zwaan, 2003; Radvansky, Copeland, Berish, & Dijkstra, 2003). For this test, the story title was provided for each set of sentences to remind participants to which story the items referred. The task was to indicate whether each of the sentences actually appeared in the story. This was done by clicking either the left or right button on the mouse. The left mouse button was pressed for "yes, this is true," and the right mouse button for "no, this is false." Participants were warned that some sentences may have only slight wording changes. There were eight probe sentences for each story, and there were an equal number of verbatim, paraphrase, inference and incorrect sentences for each story. For any particular probe, a participant was only presented with one version of it (e.g., if presented the verbatim version of an item, people did not see the paraphrase, inference, nor the incorrect versions for that item).

Results

Did Age Influence Memory for Moral Information? The primary data of interest here are the A' signal detection measures which are summarized in Table 1. These A' discrimination index values, for the surface form measure, were derived using proportion "yes" responses on the verbatim items as hits and on paraphrases as false alarms. For the textbase, paraphrase responses were treated as hits and inferences as false alarms. Finally, for the situation model levels, inference responses were treated as hits and responses to incorrect statements were treated as false alarms. To illustrate the logic of this procedure, consider the textbase level. Paraphrase and

inference items are used because, unlike the verbatim items, they did not actually appear in the text, and unlike the incorrect items, they both were consistent with the events described in the text. What they differ on is whether the idea was actually present in the text; for the paraphrase items they were (hits), but for the inference items they were not (false alarms). All A' values were significantly different from chance (.5), suggesting some memory at each of the three levels of representation for both age groups. Because these levels of representation are qualitatively different form one another, there are problems with directly comparing them. So, in this and the other experiments reported here, we analyze the data at each of these levels separately.

These data at each of these levels of representation were submitted to 2 (Age) X 2 (Content: Moral vs. Nonmoral) mixed ANOVA with the first factor being between subjects and the second within. For the surface form, there were no significant effects, all Fs $\leq$ 1.25. However, interestingly, for the textbase level, there were main effects of Age, $F(1,70) = 6.97$, $MSE = .066$, $p = .01$, and Content, $F(1,70) = 8.29$, $MSE = .041$, $p = .005$, as well as a marginally significant interaction, $F(1,70) = 2.76$, $MSE = .041$, $p = .10$. As can be seen in Table 1, this is because, for the textbase level, the younger adults out-performed the older adults for the nonmoral information, $F(1, 70) = 7.84$, $MSE = .065$, $p = .007$, which is a standard finding, but there was no age difference for the morally-relevant statements, $F(1,70) = 1.41$, $MSE = .041$, $p = .24$. Thus, when the text content was morally charged, older adults' memory was more accurate and similar to that of younger adults.

For the situation model level, there were main effects of Age, $F(1,70) = 7.98$, $MSE = .041$, $p = .006$, and Content, $F(1,70) = 17.75$, $MSE = .028$, $p < .001$, as well as a significant interaction, $F(1,70) = 4.64$, $MSE = .028$, $p = .04$. As can be seen in Table 1, this is because, for the situation model level, the older adults out-performed the younger adults for the nonmoral

information, F (1, 70) = 12.50, MSE = .035, p = .001, which is the standard finding, but there was no age difference for the morally-related statements, $F < 1$. There are two things to note about the nonsignificant effect for the morally-related statements. First, it is not always the case that age differences are observed at the situation model level (e.g., Radvansky et al., 2001). Second, in this Experiment the A' values are quite low (with .5 being chance performance). Essentially, people in this Experiment were less willing to accept the moral-related inference statements as having been read before. This may be because none of the text contained statements that provided explicit moral judgments of any kind. As such, the situation model would be less likely to contain well integrated moral evaluations. Moreover, this linguistic form was at odds with the form of the story sentences, and could easily have been rejected, leading to low A' values, and no age difference.

Discussion

We tested younger and older adults for recognition memory at the three levels of text memory for both moral and nonmoral information. As expected, both groups had poor verbatim memories. However, at the textbase level, although the older adults performed more poorly than younger adults on nonmoral probes, as in prior research, they performed equally well for moral probes. This is an unusual finding, suggesting that the meaningfulness of moral information enhanced processing of detail. Older adults seem to have better memory for morally-charged events that are presented in a text. In other words, they seem to attend more to the socio-moral relations in comparison to general (nonmoral) information.

Older adults outperformed younger adults on situation model memory for nonmoral information, as in prior research (e.g., Radvansky et al., 2001), but not for moral information, for which the two age groups performed similarly. As noted earlier, sometimes age effects are not observed at the situation model level, and, more importantly, none of the texts contain explicit moral evaluations (but juxtaposed events from which a reader could draw a moral inference), and so they would be easy to reject during the recognition test. Overall this had the effect of directing processing of the morally charged information in the text directed more toward the textbase level (as evidence by the higher textbase A' scores for the moral stories than then nonmoral stories). This focus on the textbase level would have taken mental resources away from processing at the situation model level (see Zwaan, 1994).

Overall, the most important finding from Experiment 1 was that the older adults do *not* show the standard decrement in textbase memory for moral information. They were equally good at recognizing moral items as were younger adults. This is in sharp contrast to the standard memory finding observed for the nonmoral information.

So, what is causing the increased memory performance for the older adults on the moral textbase items? It is possible that older adults were activating more morally relevant information, although they may not have encoded a larger number of explicit inferences into their situation models, at least to the degree that they would have (falsely) recognized them as having actually occurred in the texts. To further explore this issue, Experiment 2 used an on-line measure to assess whether such inferences were being drawn during comprehension.

Experiment 2

Because our measure of information processing in Experiment 1 was an off-line, post-stimulus measure of memory, it is not clear whether enhanced moral processing was a retrieval effect occurring at the time of testing, with an imposition of moral frameworks, or whether there was a process occurring at the time of reading. In Experiment 2, we examined online processing of moral stories, comparing moral inference generation with associative inferences using a lexical decision task. Recent work by Murphy, Wilde, Ogden, Barnard, and Calder (2009) suggests that younger adults can draw moral inferences automatically during reading, even while under a dual task load. Inferences require the reader to apply background knowledge to text information at the point of the probe (van den Broek, 1994). Moral inferences, specifically evaluations here, require an application of moral background knowledge which we anticipated to be greater among older adults. We also wanted to examine whether we could find enhanced processing for moral information among older adults when using another method.

We anticipated finding the usual facilitation for associative inferences in comparison to unrelated probes, but also in comparison to moral inferences. That is, associative inferences occur more quickly they are conceptually related to words in the sentence and, so, are more likely to be drawn when reading (Narvaez, van den Broek & Ruiz, 1999). In comparison, moral inferences require particular world knowledge to be activated while the sentence is read, so they are subject to individual differences more so than associative probes, making them more difficult to test for (van den Broek, Narvaez & Rohleder, 1994; 1996).

Method

Participants. Thirty-six people were tested in each of the two age groups. The younger

adults ranged from 18 to 22 (M = 19.6, SD = 1.1, 67% female), were recruited from the University of Notre Dame, and received partial course credit. The older adults ranged from 60 to 84 (M = 69.0, SD = 6.9, 53% female), were recruited via a newspaper ad, and were paid. The younger adults had similar years of education (M = 13.2, SD = 0.9) to the older adults (M = 13.7, SD = 2.4), $t(70) = 1.14$, $p = .26$, and similar scores on the Shipley vocabulary test (M = 28.1, SD = 4.0) than the older adults (M = 29.4, SD = 6.2), $t(70) = 1.06$, $p = .30$. However, the younger adults scored higher on the Salthouse and Babcock (1991) speed test (M = 22.8, SD = 5.2) than the older adults (M = 17.1, SD = 3.0), $t(70) = 5.71$, $p < .001$. This pattern of performance is consistent with most research in cognitive aging.

Materials and Procedure. The same materials were used as in Experiment 1 (Shipley vocabulary test, a speeded pattern comparison test, working memory span test, story reading, comprehension questions and recognition test) except that a different measure of moral identity was used (Aquino & Reed, 2002) in hopes that it would better capture moral personality differences. This measure of internalized moral identity presents a short list of moral traits and has five statements (e.g., “It would make me feel good to be a person who has these characteristics”) that a respondent rates agreement using a five point Likert-type scale. Two items are reverse scored and item scores are added. Cronbach’s alpha typically is around .70. In this study, Cronbach’s alpha was .28. As a result, we did not include this measure in analyses and do not discuss it in the results.

In addition to completing the same measures that were used in Experiment 1, participants performed lexical decision tasks while reading. We slightly modified the stories to be able to test inferences at several points in a story. There were three types of lexical decision probes that were analyzed for each story: inferences which were *moral evaluations* (e.g., “honesty”); inferences

that were *nonmoral associations,* ideas that were related to events in the story (e.g., "eat" for sitting down to dinner); words *unrelated* to the text (e.g., "shovel"). Here are examples of the two key types of probes:

> It was a sunny day. Sam looked out the window at the yard. (ASSOCIATIVE INFERENCE: GRASS) Then she heard a scream. Her daughter had fallen off her scooter. Sam picked her up and rocked her (MORAL INFERENCE: CARING).

We also included an equal number of *nonwords* in each story, strings of letters that were not words where one letter was different from a real word (e.g., "lupt"). Within and across probe types, probes were matched for number of syllables and the word probes were matched for frequency. Moral and nonmoral probes were presented immediately following sentences in the story where people were likely to make inferences of these types. Unrelated and nonword probes were placed to make the distribution of the probes throughout the stories relatively even. Probes were placed at least two sentences apart.

While reading, participants kept the index and middle finger of the right hand on the two sides of the computer mouse buttons which corresponded to and were labeled as "yes" and "no" for the purpose of responding to lexical decision probes. At critical periods throughout the stories, a people were presented with a string of letters in yellow. Participants determined whether or not the string was an English word or not and pressed the corresponding "yes" or "no" mouse button. There were twelve probes per story. Six probes were nonwords, two were unrelated to the story, two were non-moral associative inferences, and two were moral inferences. Probes were counterbalanced within and across stories syllabically and by "yes" or "no" response.

After each story, participants were given three comprehension questions, followed by the

same measures as in study 1: Shipley vocabulary test, the Salthouse and Babcock (1991) speeded comparison test, and the recognition test. Participants also completed the working memory test (Waters & Caplan, 1996) but due to a programming error the working memory test data was not written to a file, so these results are not reported.

Results

Was Online Moral Inference Processing Influenced by Age? The response time data for the lexical decision probes was first trimmed using the Van Selst and Jolicoeur (1994) procedure that trims data based on the number of observations. Only correct responses were used. The trimmed response time data (see Table 2) were submitted to a 2 (Age) X 3 (Condition) mixed ANOVA, with the first variable being between subjects and the second within. This analysis revealed significant main effects of Age, F (1, 70) = 75.64, MSE = 934935, $p < .001$, and Condition, F (2,140) = 15. 29, MSE = 133051, $p < .001$. Importantly, the interaction was significant, F (2, 140) = 6.88, MSE = 133051, $p < .001$.

Of primary interest and to address the interaction, we assessed whether there was a significant facilitation effect for the moral inference and nonmoral association probes (relative to the unrelated probes) within each age group. As expected, for the nonmoral association probes the facilitation effect was significant for both the older F (1,35) = 19.07, MSE = 274019, $p < .001$, and younger adults, F (1,35) = 27.63, MSE = 9806, $p < .0001$. However, there was a significant facilitation effect for moral probes among the older adults, F (1,35) = 7. 33, MSE = 391792, $p = .01$, but not for the young adults, F (1,35) = 3.01, MSE = 8609, $p = .09$, although it was marginally significant. This suggests that older adults were more likely to apply moral

background knowledge to understanding story events.

Other than significant main effects for Age and Condition, there was no interaction among error rates. The proportions of errors were the following. Moral probe errors were .03 for younger adults and .08 for older adults. Nonmoral probe errors were .02 for younger and .06 for older adults. Unrelated probe errors were .10 for younger adults and .18 for older adults.

Did Age Influence Memory for Moral Information? As in Experiment 1, the A' signal detection measures were analyzed and are summarized in Table 1. These data were submitted to a 2 (Age) X 2 (Content: Moral vs. Nonmoral) mixed ANOVAs with the first factor being between subjects and the second within. For the surface form, there were no significant effects, all Fs $\leq$ 1.03. As can be seen in Table 1, unlike Experiment 1, there was a consistent age difference at the textbase level for both types of information, with the younger adults consistently out-performing the older adults. There were significant main effects of Age, $F(1,70) = 10.38$, $MSE = .069$, $p = .002$, and Content, $F(1,70) = 12.49$, $MSE = .041$, $p = .001$, however the interaction was not significant, $F < 1$. For the situation model level, there was a marginally significant main effect of Age, $F(1,70) = 3.73$, $MSE = .062$, $p = .06$, and a significant main effect of Content, $F(1,70) = 11.72$, $MSE = .029$, $p = .001$, but the interaction was not significant, $F < 1$. As can be seen, consistent with previous research the older adults in comparison to the younger adults showed a greater reliance on the situation model level for both types of information. The pattern, in effect, matches the usual findings with older adult enhancement of situation model memory only.

Discussion

To explore whether inferences occurred during reading, we used a lexical decision task to test online processing of moral and nonmoral associates. Consistent with previous research, we found evidence for inference generation for the nonmoral inferences in both the younger and older adults. Specifically, there was facilitation in responding to probe words that were conceptually related to events in the text. Most importantly, we found significant facilitation for moral inferences in comparison to non-moral inferences only for older adults, although the effect was marginally significant for the younger adults. This suggests that older adults are more likely to activate moral background knowledge and make moral inferences. These data are consistent with the result from Experiment 1 that text information related to moral information is more salient for older adults than nonmoral information whereas there was no difference for younger adults.

However, we did not replicate Experiment 1's findings for enhanced textbase memory for moral events among older adults. Instead, we found the usual effect of enhanced memory at the situation model level for older adults. In Experiment 2, there was a significant age difference at the textbase level for both probe types, with younger adults performing better. This suggests that the moral information enhancement effect for older adults from Experiment 1 occurs during encoding, rather than retrieval, because interference during encoding seems to have washed away the moral information enhancement effect. Specifically, by interrupting reading with the lexical decision probes, we may have compromised those cognitive processes aimed at creating those memory traces that were revealed in Experiment 1. We designed Experiment 3 to try to clarify the disparate results in recognition memory between Experiments 1 and 2.

Experiment 3

In Experiment 1, older adults showed an unusual ability to remember moral information at the textbase level; however, this was not replicated in Experiment 2. There are two likely explanations for this. The first is that the results of Experiment 1 were an anomaly. The second is that the different results were due to some variation in the method of the two experiments. Specifically, in Experiment 1 participants were allowed to read the stories uninterrupted, whereas in Experiment 2 reading was interrupted with lexical decision probes. This disruption may have been strong enough that older participants were less able to effectively process the stories as they did in Experiment 1, making the specific morally-charged information less stable or coherent. In fact, interruptions with similar information are more detrimental to text memory than interruptions with dissimilar information (Ledoux & Gordon, 2006). The interruption with moral probes may have interfered with memory for moral information.

To examine these two possibilities, anomaly versus methodological difference, Experiment 3 was designed to be a within-subjects combination of Experiments 1 and 2. To this end, half of the stories had lexical decisions probes during reading and half did not. The primary interest was the pattern of data on the memory test as a function of whether there were lexical decisions made during reading.

Method

Participants. Forty-six younger and forty-six older adults were tested in Experiment 3. The younger adults ranged from 18 to 21 (M = 19.3, SD = 1.1, 61% female), were recruited from the University of Notre Dame, and received partial course credit. The older adults ranged from

61 to 89 (*M* = 72.5, *SD* = 6.1, 52% female), were recruited from a local senior center, and were paid. Three younger and four older adults were dropped from the original pool for not following instructions. The younger adults had fewer years of education (*M* = 14.1, *SD* = 1.1) than the older adults (*M* = 15.0, *SD* = 2.5), *t*(90) = 2.23, *p* = .03, and higher scores on the Shipley vocabulary test (*M* = 29.8, *SD* = 3.2) as the older adults (*M* = 33.4, *SD* = 4.8), *t*(90) = 4.22, p <.001. Finally, because of an error in the program, performance on the speed test was not properly done, and so could not be coded.

Materials and Procedure. The same materials were used as in Experiments 1 and 2. The primary manipulation was that for half of the stories, lexical decision probes were presented during reading, as in Experiment 2, and for half of the stories they were not, as in Experiment 1. The same recognition test was used as in the previous two experiments, but the results were analyzed as a function of which reading condition the story was in. For the two conditions a given story was counterbalanced across subjects.

Results

Was Online Moral Inference Processing Influenced by Age? The response time data for the lexical decision probes (see Table 2) were submitted to a 2 (Age) X 3 (Condition) mixed ANOVA, with the first variable being between subjects and the second within. There were significant main effects of Age, *F* (1, 90) = 63.05, *MSE* = 1183073, *p* < .001, and Condition, *F* (2,180) = 4.49, *MSE* = 145909, *p* = .01. Unlike Experiment 2, the interaction did not reach significance, *F* (2, 180) = 1.93, *MSE* = 145909, *p* = .15. This lack of a significant interaction is likely due to the smaller number of observations per subject in this experiment (half of that in

Experiment 2) to accommodate the manipulation of primary interest (the influence of lexical decision on the memory test data).

Although the interaction did not reach significance, as can be seen in Table 2, if the moral and baseline probes are considered alone (leaving out the related probe data), there is significant Age X Condition interaction, F (1, 90) = 4.21, MSE = 133004, p = .04. Specifically, for the moral probes, like Experiment 2, there was a significant facilitation effect for the older adults, F (1, 45) = 7.41, MSE = 234192, p =.009, but not for the young adults, F (1, 45) = 2.12, MSE = 31816, p = .15.

Unlike in Experiment 2, there were clear effects in the error analysis. There were main effects of Age, F (1, 90) = 12.91, MSE = .008, p = .001, and Condition, F (2,180) = 2.83, MSE = .006, p = .06, and interaction, F (1, 180) = 5.58, MSE = 006, p = .005. Separate analyses of the younger and older adults' error rates revealed that the older adults showed a facilitation effect for the moral probes (Unrelated = .11; Moral = .06), F(1,45) = 7.84, MSE = .009, p = .008, whereas the younger adults did not (Unrelated = .03; Moral = .04), F < 1. Similarly, the older adults showed a facilitation effect for the nonmoral probes in comparison to the baseline (Nonmoral = .05), F(1,45) = 7.92, MSE = .010, p = .007, whereas the younger adults did not (Nonmoral = .04) , F(1,45) = 1.50, MSE = .003, p = .23. This interaction likely reflects a floor effect for the younger adults, rather than differences in processing for the two age groups.

Did Age Influence Memory for Moral Information? As in Experiments 1 and 2, the A' signal detection measures were analyzed and are summarized in Table 1. All A' values were significantly different from chance (.5), except for the older adults' nonmoral surface form A' value when there were no lexical decisions during reading, t(45) = 1.28, p = .21.

These data were submitted to 2 (Age) X 2 (Reading condition: Lexical decisions or not) X 2 (Content: Moral vs. Nonmoral) mixed ANOVAs with the first factor being between subjects and the rest within. For the surface form, there were significant main effects of Age, $F(1,90) = 10.29$, $MSE = .034$, $p = .002$, with younger adults ($M = .64$) outperforming older adults ($M = .58$) and for Content, $F(1,90) = 6.87$, $MSE = .032$, $p = .01$, with better memory for Moral ($M = .63$) relative to Nonmoral verbatim information ($M = .58$).

At the textbase level there was a significant main effect of Age, $F(1,90) = 7.61$, $MSE = .034$, $p = .007$, with younger adults ($M = .75$) outperforming older adults ($M = .70$). There was also a significant main effect of Reading Condition, $F(1,90) = 5.90$, $MSE = .016$, $p = .02$, with performance being worse at the textbase level when there were lexical decision probes ($M = .71$) as compared to when there were not ($M = .74$). This suggests that, overall, the lexical decision probes compromised memory at the textbase level. There was also a main effect of Content, $F(1,90) = 32.73$, $MSE = .021$, $p < .001$, with people performing better in the Moral condition ($M = .77$) as compared to the Nonmoral condition ($M = .68$).

Finally, and importantly, there was a significant three-way Age X Reading Condition X Content interaction, $F(1,90) = 6.69$, $MSE = .021$, $p = .01$. Consistent with Experiment 1, when there were no lexical decision probes during reading, there was a significant Age X Content interaction, $F(1,90) = 3.87$, $MSE = .018$, $p = .05$, with there being an effect of Age for the Nonmoral probes, $F(1,90) = 5.64$, $MSE = .026$, $p = .02$, but not for the Moral probes, $F < 1$. Moreover, consistent with Experiment 2, when there were lexical decision probes during reading, the Age X Content interaction as not significant, $F(1,90) = 2.66$, $MSE = .018$, $p = .11$, with the older adults performing consistently worse than the younger adults, $F(1,90) = 8.53$,

MSE = .027, *p* = .004. This supports the hypothesis that the differences in memory performance on the textbase items in Experiments 1 and 2 were due to differences in the method at reading.

For the situation model level, neither the main effect of Age, $F < 1$, nor Reading Condition were significant, $F(1,90) = 2.21$, *MSE* = .046, $p = .14$. However, there was a significant main effect of Content, $F(1,90) = 6.14$, *MSE* = .027, $p = .02$, as well as a marginally significant Age X Content interaction, $F(1,90) = 3.34$, *MSE* = .027, $p = .07$. As can be seen by the data in Table 1, this likely reflects the fact that the direction of the age difference was the opposite in the Moral and Nonmoral conditions (favoring the younger adults in the Moral condition but the older adults in the Nonmoral condition). However, it should be noted that the Age difference was not significant for either the Moral recognition items, $F(1,90) = 1.37$, *MSE* = .054, $p = .25$, or the Nonmoral items, $F(1,90) = 1.29$, *MSE* = .019, $p = .26$. Overall, other than the fact that people were more willing to accept nonmoral inferences than our moral inference probes, there are no other clear patterns in this data. The absence of an effect for the Moral probes is consistent with Experiments 1 and 2. The absence of a significant effect for the Nonmoral items is inconsistent with Experiments 1 and 2, but is in the same direction, and, as noted before, has been observed in other work (e.g., Radvansky et al., 2001). Regardless, this result does not compromise our primary findings with the textbase measure.

Discussion

The results of Experiment 3 replicated the primary memory results of both Experiment 1 and 2. Specifically, unlike the usual finding of decremental performance for older adults there was no age difference in textbase level memory for morally-charged information, suggesting an

enhancement for moral information relative to nonmoral information in older adults. However, this occurred only when there was no lexical decision probes during reading, as in Experiment 1, and not when there was a lexical decision, as in Experiment 2. Thus, the difference between the patterns of memory test results of the first two experiments is likely due to methodological differences.

Finally, while the results of Experiment 3 did not completely replicate the lexical decision results of Experiment 2, the pattern of data are generally consistent with that finding. The lack of significance in Experiment 3 is likely due to smaller number of observations per subject per condition (necessitated by the primary manipulation) relative to Experiment 2, and the concomitant increase in variability. That said, it should also be noted that when the response time data were analyzed considering the moral probes and the neutral baseline (the more interesting comparison), the critical interaction was significant.

General Discussion

In three studies, we examined moral information processing in younger and older adults, testing whether older adults show increased activation and memory for morally-charged information relative to nonmoral information. In each study participants read stories that included moral and nonmoral information and then were tested for surface form, textbase, and situation model recognition memory. Unlike prior studies studying nonmoral content, older adults had textbase memory for moral information equal to that of young adults, suggesting an enhanced attention to morally-charged details. In Experiment 2 we examined differences between the two age groups for online moral inference generation using lexical decision probes.

Older adults relative to younger adults showed greater facilitation of moral inferences, suggesting greater focus of processing on moral content. We used Experiment 3 to resolve methodological issues and replicated the basic findings. Across the studies, older adults had enhanced memory for morally-charged story events and, relative to younger adults, were more likely to draw moral inferences during comprehension.

Testing Method

We varied our methods across three studies that, taken together, suggest information processing in older adults is enhanced for morally-meaningful information. However the results for older adults shifted based on the method of testing. In Experiment 1 we used a recognition paradigm alone. Older adults performed exceptionally well in recognizing propositional moral information in comparison to nonmoral information. This was replicated in Experiment 3, but only when there were no lexical decision interruptions during reading. In Experiment 2, we interrupted story reading with lexical decision probes to test inference generation and also tested recognition memory as in Experiment 1. Although we found greater moral inference generation in the older group, the enhanced recognition for textbase memory of morally-charged information found in Experiment 1 was not replicated. The findings instead matched previous studies in which situation model memory was better among older than younger adults. Lexical decision interruptions appeared not to undermine situation model memory.

We can speculate on the reasons for the discrepancy between textbase memory performance with and without online reading interruptions. The online probes may have interfered with detailed memory consolidation by disrupting working memory (Hasher & Zacks, 1988). Older adults, in comparison to younger adults, may consolidate memories more slowly. They may need relatively uninterrupted experience for detailed memory to be established,

perhaps due to slower relays among memory components. Probe interruption may have disrupted the relay system, thwarting the associative networks upon which such memory relies. Further when *explicit attention* is drawn away from ongoing experience, the detailed memory consolidation may be disrupted in older adults. Further, the susceptibility of older adults to distractions during memory formation may have played a role (Connelly, Hasher & Zacks, 1991). The interruptions may have acted as irrelevant knowledge that the older adults were unable to repress at the time of memory testing, creating memory search problems (Gerard, Zacks, Hasher & Radvansky, 1991).

Memory and Inference Generation

Older adults exhibited enhanced memory for moral information in comparison to nonmoral information. Unlike with nonmoral information in previous research findings, older adults performed equally to young adults on memory for moral textbase information. That is, information processing at the textbase level did not show a decrement in older adults when the information was morally charged. They were tuned into the moral facts of the story even when they were not specifically tuned in to the nonmoral facts. The "gist-detail tradeoff" usually found in studies of cognitive aging was less evident for the moral information. That is, the neglect of detail and focus on the "big picture" that older adults typically exhibit was less true for the moral information.

We also found that older adults are more likely than young adults to make moral inferences when reading. In Experiment 2, older adults showed greater facilitation than younger adults when responding to moral inference probes compared to unrelated probes, demonstrating that older adults were generating moral inferences more often than the younger adults.

Both of these findings, greater memory for moral events and facilitated moral inference

making, support a social expertise explanation for older adult performance. Experts in a domain have greater domain knowledge, are more attuned to information in that domain and are more likely to draw inferences from domain events (Royer, Carlo, Dufresne & Mestre, 1996). The results point to motivated information processing.

Motivated Information Processing

Our results are consistent with research that older adults are more attuned to emotional meaning in events (e.g., Carstensen, 1992; Carstensen & Turk Charles, 1994; Kemper, 1990) and are more motivated to process information according to emotional meaning (Lockenhoff & Carstensen, 2004). The findings here suggest that moral information may have greater salience for older adults.

It is unclear whether morality itself was the critical feature, whether older adult performance was due to greater motivated cognition. Perhaps moral issues—about the right ways to relate to people—increase in salience with age and experience because there is more *value* in moral matters. Older adults may be motivated to pay attention to moral information because of their generativity concerns[2], maintaining cognitive capacities in these key areas.

On the other hand, the moral information may have had greater *meaning* than nonmoral information. However, it is not clear whether moral information was processed more easily by older adults because it is necessarily social—about relating to people—and therefore emotionally meaningful, or whether their social expertise made the information more meaningful.

Motivated Social Expertise

Expertise in a domain reflects extensive experience in the domain. Domain familiarity is

related to the ability to make inferences and construct relevant schematic and conceptual models of text events (Singer, Harkness, & Stewart, 1997; Spilich, Vesonder, Chiesi & Voss, 1979). Older adults have more social experience, hence greater social reasoning about social situations (Staudinger & Pasupathi, 2000). Effective reasoning about everyday interpersonal problems is known to increase with age (Cornelius & Caspi, 1987). Older adults are more sensitive to the situation in selecting problem solving strategies (Blanchard-Fields, Jahnke, & Camp, 1995), reflecting greater social expertise (Hess, 2001). Such "social expertise" (Leclerc & Hess, 2007) seems to incur greater moral awareness as well, as exhibited by their greater propensity to make moral inferences while reading and their greater attention to moral detail in memory tests.

Alternatively, moral information processing may have something to do with wisdom ("expertise in the conduct and meaning of life," Baltes and Staudinger, 2000, p. 124). Wisdom generally has been suggested as an area of cognitive strength in older adults (e.g., Baltes & Staudinger, 2000). In fact, although adults older than 75 show significant decrements in working memory (Lindenberger & Baltes, 1997), performance on wisdom tasks are less affected (Staudinger & Baltes, 1996). In fact, Narvaez, Gleason, and Mitchell (2009) found that older adults (M = 77 years) were equally skilled as young and middle aged adults in generating themes for moral stories, and superior to young adults in generating themes for stories about practical wisdom. Accordingly, it may be fruitful to map out and test the possible links between moral information processing and wisdom in older adults, especially since moral reasoning has been related to wisdom development (Pasupathi & Staudinger, 2001). Adults may exhibit less decrement in processing moral information generally.

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Appendix

California

Cal nodded at her mother as she looked at what was in the basket on her arm. M: Cal's mother had asked her to take dinner to Mr. Greeley. "And remember, California, you come straight home after you drop this dinner off. Oh, but stay and talk to him while he eats. Make sure he can reach it all--you know how hard it is to find things when you can't see them." Cal walked off the porch and stretched. She was tall for her age and hadn't stopped growing yet-- her ankles were beginning to peek from under her jeans. She stepped out into the sunshine and looked at the sky. There was plenty of time to walk the four miles to Mr. Greeley's ranch and back. She couldn't ride because all the horses were being used for the final cattle round up. The cattle were just arriving in the county from the long trip across the plains. Every available man and horse were out helping the cowboys gather the cattle into the corral. She walked by the large, wooden corral on the way and waved at the cowboys. M: As usual, the cowboys ignored Cal. She could hear them singing to calm the cattle as they led them into the corral. They would finish rounding up the cattle into the corral by tonight and have them on the train tomorrow. Halfway to Mr. Greeley's, she noticed that the wind was picking up. Gray clouds were beginning to appear as she turned into Mr. Greeley's gate. "Howdy do, is that you, Cal?" "Sure is, Mr. Greeley." He reached out and gave her a hug. Cal thought that he held her a little too close for a little too long. She pulled away and told him, "My mother fixed fried chicken, beans, biscuits, and apple pie for you." "It will be good to eat something other than dried beef and crackers." Cal stepped into the cabin. Mr. Greeley still had the bandages around his head and eyes from the ranching accident. But he was walking now, with a cane. He felt his way around to the table. "Come sit by me, girl,

and tell me the news." M: Cal thought it was better to sit across the table from Mr. Greeley. Cal set the food out in front of Mr. Greeley and then took a seat. She talked about the new preacher in town who brought his wife and five children by wagon. She told him about the cattle roundup. N: The cattle yard was almost full. She told him about the train coming tomorrow for the cattle. All the families in town were invested in the cattle, including her family. Everyone was expecting high prices for the sale of the cattle. N: It was getting dark when Mr. Greeley finished the dinner. When Cal opened the door to leave she noticed that it was dark because of a storm that had gathered. She took the empty basket and started to run home. Just then, she heard what sounded like a huge rumbling wagon with a cracking whip. Light flashed. She felt like she was being poked with ice. The rain had started. Cal was soaked by the time she came to the cattle yard. She couldn't see any of the cowboys, just the cattle, and they were upset by the thunder. In the distance, in the direction of town, she could see a small light. “Is something on fire?” she wondered. The cattle moaned and mooed. Then she noticed something disturbing. N: The cattle yard gate was blowing open. The rain was coming down so hard that it had washed some of the dirt away under the main gate post. The wind had the gate slamming open against the fence. Cal knew that one more burst of lightning might scare the cattle so much that they would bolt out the opening. If they did that they might stampede to the cliff nearby. Some people had their life savings invested in these cattle. Cal moved toward the corral gate. She pulled and pushed it using her full strength. She finally pulled it closed. Lightning struck and the cattle got frantic. They began to push against the fence causing it to open. She didn't have any rope and there were no rocks -- only she could hold the gate in place by gripping the end post in one arm and the gate post in the other arm. It was good that she was strong. I'll hold it until someone comes, she thought. She looked around but still couldn't see any cowboys. She watched the cattle, who

looked as miserable as she felt in the pouring rain. As night came, Cal shivered from the continuing rain. She thought of home, the wood stove and her warm bed. She wished for some of the chicken dinner she had given to Mr. Greeley. Even some dry crackers sounded good. The hours passed. M: Cal's arms grew numb and her neck stiff. She shivered and her teeth chattered. She would probably catch a cold. As the storm subsided towards early morning, the stars appeared. Cal tried to keep herself awake by finding the constellations. Yes, there was Orion with his three-star belt -- and there was the Big Dipper. There must have been some cloud cover left because the stars began to disappear. Just then she heard horses coming and voices. "What's this?" her father said as he found the wet shivering huddled girl. "Why, Cal, what are you doing?" Cal told him what had happened. Her father explained that lightning had struck the church steeple in town and had started a fire that spread to several houses. All the men had been up through the night putting out the fires. "You saved the cattle, Cal." Mr. Jones tied the gate to the post while her father lifted her up on his horse and wrapped a blanket around her. N: California coughed and sneezed. "Let's get you home," said her father.

True/False Comprehension Questions:

Cal walked to Mr. Greeley's house to bring him a dinner.

Cal found the cattle yard gate locked tight.

The cowboys were singing to the cattle to keep them calm.

Sentences Used in Recognition Memory Test (V=verbatim; P=paraphrase; I=inference; W=wrong)

Moral Information Sentences

SET 1

V: Cal's mother had asked her to take dinner to Mr. Greeley.

P: Cal's mother asked if she would take dinner to Mr. Greeley.

I: Cal's mother was a generous person.

W: Cal's mother did not like helping Mr. Greeley.

SET 2

V: As usual, the cowboys ignored Cal.

P: The cowboys ignored Cal as usual.

I: The cowboys were rude to Cal.

W: The cowboys waved and smiled at Cal.

SET 3

V: Cal thought it was better to sit across the table from Mr. Greeley.

P: Cal thought it was better if she sat across the table from Mr. Greeley.

I: Cal sat away from Mr. Greeley because she didn't trust him.

W: Cal sat right next to Mr. Greeley at the table.

SET 4

V: Cal's arms grew numb and her neck stiff.

P: Cal's neck grew stiff and her arms numb.

I: Cal ignored her discomfort to keep the gate shut.

W: Cal left the gate open and went home.

Neutral Information Sentences

SET 1

V: The cattle yard was almost full.

P: The cattle yard was nearly full.

I: There were a lot of cattle.

W: The cattle yard was empty.

SET 2

V: It was getting dark when Mr. Greeley finished his dinner.

P: The sky was getting dark when Mr. Greeley finished his dinner.

I: It took Mr. Greeley a little while to finish eating.

W: Mr. Greeley finished his dinner when it was still light.

SET 3

V: The cattle yard gate was blowing open.

P: The gate of the cattle yard was blowing open.

I: The wind was very strong.

W: The cattle gate stood still.

SET 4

V: California coughed and sneezed.

P: California sneezed and coughed.

I: California caught a cold.

W: California was healthier than ever.

Author Note

Darcia Narvaez, Gabriel A. Radvansky, Nicholas A. Lynchard, Department of Psychology, University of Notre Dame.

David E. Copeland, Department of Psychology, University of Nevada, Las Vegas.

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Correspondence concerning this article should be addressed to Darcia Narvaez, Department of Psychology, University of Notre Dame, Notre Dame IN 46656. Electronic mail may be sent to dnarvaez@nd.edu.

Table 1

A' Signal Detection Scores for the Recognition Test of Experiments 1, 2, and 3 (Standard Deviations are in Parentheses)

	Moral			Nonmoral		
Age Group	Surface Form	Textbase	Model	Surface Form	Textbase	Model
Experiment 1						
Young	.61 (.23)	.80 (.18)	.63 (.17)	.58 (.27)	.76 (.27)	.69 (.20)
Old	.54 (.25)	.74 (.23)	.66 (.20)	.55 (.22)	.59 (.24)	.84 (.18)
Experiment 2						
Young	.63 (.22)	.83 (.16)	.60 (.17)	.64 (.20)	.69 (.26)	.68 (.21)
Old	.61 (.29)	.67 (.26)	.66 (.27)	.57 (.22)	.57 (.25)	.78 (.19)
Experiment 3						
No Lexical Decision During Reading						
Young	.66 (.21)	.79 (.17)	.82 (.21)	.61 (.22)	.73 (.15)	.82 (.11)
Old	.58 (.19)	.80 (.10)	.76 (.17)	.53 (.18)	.65 (.17)	.84 (.10)
Lexical Decision During Reading						
Young	.67 (.20)	.80 (.10)	.76 (.17)	.61 (.21)	.69 (.16)	.79 (.14)
Old	.62 (.18)	.69 (.17)	.75 (.20)	.57 (.18)	.65 (.16)	.82 (.13)

Table 2

Lexical Decision Mean Reaction Times (in Milliseconds) for Experiments 2 and 3, with Standard Deviations in Parentheses

	Type of Probe			
Age Group	Moral	Nonmoral	Unrelated	Non-Words
Experiment 2				
Young	1030 (227)	945 (188)	1068 (231)	1180 (371)
Old	2074 (727)	1932 (668)	2471 (1135)	2425 (1251)
Experiment 3				
Young	1121 (499)	1123 (515)	1175 (467)	1324 (490)
Old	2056 (874)	2152 (895)	2330 (808)	2553 (1144)