I remember being nice: Self-enhancement memory bias in adults and children

Shaina Frieling Rowell
Boca Raton, Florida

Bachelor of Arts, Honors College of Florida Atlantic University, 2011
Master of Arts in Psychology, University of Virginia, 2015

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Abstract

Adults tend to remember themselves in a positive way. For example, they are more likely to remember their past good deeds rather than their bad deeds, which may help them to maintain good mental health and high self-esteem. In contrast, adults tend to have a negativity bias in memory for other people's actions, remembering more of their bad deeds than their good ones. This is also adaptive in that it may help them avoid harmful individuals in the future. In the studies presented here, I ask whether children are also biased to remember their own good deeds better than their bad deeds. I additionally address whether this bias is linked to children's developing self-concepts and to socialization practices during parent-child conversations about the past.

Study 1 showed that a well-known memory paradigm can be used to address questions about how well children and adults remember positively and negatively valenced material encoded in relation to themselves and others. Study 1a found that adults remembered nice verbs encoded with reference to themselves better than mean verbs encoded with reference to themselves or mean verbs encoded with reference to someone else. These memory differences were present even when statistical models were used that separated actual remembering from guessing strategies. Study 2 then found this same bias in 8- to 10-year-old children, providing some of the first experimental evidence for self-enhancement in children's memory. Study 3 replicated the findings of Study 1a and sought to address potential mechanisms of self-enhancement bias.

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Chapter 1: Introduction

Imagine that you get angry and yell at a friend, insulting her and bringing her to tears. Now imagine instead that this friend does the very same thing to you. Will your memory be similarly accurate for both events? Will you be just as likely to recall either event later on? There are many influences on memory that could help predict how well you would remember either event, such as emotional content or distinctiveness. Importantly, there are also factors that only apply to one scenario or the other—functional aspects of memory that lead to a divergence in how well these two events would be remembered.

In the first scenario, you are the perpetrator of a transgression and because of this, your self-concept will have an important influence on how you remember what happens. Adults generally have a positive view of themselves (Heine & Hamamura, 2007) which leads them to remember themselves in a positive way (Greenwald, 1980). Thus, you are more likely to remember nice things you have done than neutral or mean things. Remembering more of our positive past actions is beneficial in that it may contribute to good mental health (see Taylor & Brown, 1988) and help people in Western cultures live up to the standards of their culture by maintaining high self-esteem (Heine & Hamamura, 2007), which then continues to perpetuate memory bias.

In the second scenario, your friend is the perpetrator of the transgression and you are merely the recipient of their actions. Thus, your self-concept is less of a determinant of your memory for the event and would not bias your memory in a positive way. In fact, adults are more likely to remember the negative than positive things other people have done (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001; Rozin & Royzman, 2001). A bias to keep track of other people's negative acts has obvious adaptive value if it helps an individual to steer clear of such people in the future. Thus, different pressures influence memory for one's own actions compared to the actions of others. As a result, the same nice or mean action may be remembered very differently depending on who performs it.

Memories of our own nice and mean acts are particularly important because they may contribute to moral identity and future social interactions (Recchia, Wainryb, Bourne, & Pasupathi, 2015). For example, if someone primarily remembers times when she was prosocial, this can help to reinforce views of herself as a good person and lead to continued prosocial behavior (Aquino & Reed, 2002; Young, Chakroff, & Tom, 2012). Thus, fully understanding how children develop moral identity and what motivates them to do good deeds requires an understanding of how they remember their past actions.

Previous research on young children's memory for their own and others' nice and mean behaviors suggests that they are biased the way that adults are: Children remember being more generous than they really were (Tasimi & Johnson, 2015), and they find it easier to remember the mean rather than nice things that others have done (Baltazar, Shutts, & Kinzler, 2012). However, there have only been a few studies that directly address these kinds of memories. The present study is the first to explore whether children do in fact remember their own nice behaviors better than their mean ones and contrast this with the way they remember others' behaviors. Additionally, research has not linked children's self-concept to biased memory recall. Given the role self-concept is thought to play in adults' overly positive memory for their past actions, this is an important factor to explore to understand whether the same processes might underlie this bias in childhood.

In what follows, I review research on adults' memories for their own and others' actions. Then I show why it is likely that children's memories are biased by the same pressures as those observed in adulthood. Afterwards, I consider in more detail specific factors that may contribute to memory biases in childhood. Finally, I present an experimental paradigm that provides a controlled way to study these memory biases and describe findings from four studies with adults and children.

Self-Enhancement in Adulthood

In Western cultures, adults tend to have overly positive perceptions of themselves, feel they have greater control over external events than they really do, are overly optimistic about the future, and attribute more good things than bad things to themselves (for a review, see Sedikides & Gregg, 2008). This tendency to view oneself positively—a self-enhancement bias—is thought to help Western adults maintain high self-esteem (Falk & Heine, 2015; Heine & Hamamura, 2007; Sedikides & Gregg, 2008), and can lead them to see their past selves as having been better in certain ways[1] (Greenwald, 1980).

This memory bias can be seen in three different ways: 1) People remember being better than they objectively were—for example, when asked to estimate past task performance, adults think that they solved more anagrams or scored more basketball points than they really did (Oishi & Diener, 2003); 2) They recall their own positive behaviors more easily or more often than their negative ones. For instance adults who are asked to recall as many successes and failures from their lives as they can recall more instances of success compared to failure (Endo & Meijer, 2004); and 3) They remember their own behavior and experiences as more positive than someone else's. For example, adults remember more pleasant than unpleasant experiences from their own lives, but show no such effect when remembering the experiences of close others (Betz

[1]While I have limited my discussion here to instances where self-enhancement leads people to think better of their past selves, if people consider their past self as distant from who they are now, they will sometimes think worse of that self in order to feel good about their current self (M. Ross & Wilson, 2000).

& Skowronski, 1997). In these ways, current self-concept influences the way that people remember themselves in the past and recalling primarily positive memories helps them to maintain a generally positive self-concept (Wilson & Ross, 2003).

Several studies have found support for self-enhancement bias specifically in memory for prosocial and transgressive behavior. For example, when asked to generate things that they and others do that are fair or unfair, adults tend to generate more examples of fairness than unfairness for themselves and more examples of unfairness than fairness for others (Gelfand et al., 2002; Liebrand, Messick, & Wolters, 1986; Messick, Bloom, Boldizar, & Samuelson, 1985). Interestingly, twins will sometimes confuse their memories in a self-enhancing way (Sheen, Kemp, & Rubin, 2006): Both individuals recall the details of the event, but they dispute who was the protagonist, generally with both convinced that they were the recipient of a misfortune and not the perpetrator of a wrongdoing.

In a series of studies using both real autobiographical memories and memories of controlled lab experiences, Kouchaki and Gino (2016) showed that adults remembered their own past unethical behavior less clearly than their ethical behavior. For example, people who recalled an autobiographical memory of doing something that made them feel bad or guilty rated this memory as less clear and vivid than people who recalled a time when something negative had happened to them or when they had done something nice. In a more controlled procedure, participants read a story either about cheating or about being honest from either a first-person perspective (i.e., self) or third person perspective (i.e., other). When they rated the clarity of their memory of the story several days later, those who had read the cheating story from the first-person perspective gave lower clarity ratings than those who had read the honest story from the first-person perspective and this finding was further supported by better performance on a memory test about the story details. Importantly, for the third person conditions, there was no difference between clarity ratings for the cheating and the honest story.

As mentioned, this bias in memory is thought to be driven by self-concept and there is, in fact, good evidence from cultural comparisons and studies of individual differences to suggest a link between self-concept and self-enhancement. In many Western cultures, people see themselves as independent entities whose goals are to distinguish themselves from other people (Markus & Kitayama, 1991). In this context, pursuing high self-esteem is a valued goal and people tend to have an overall positive self-concept (Heine & Hamamura, 2007). However, in collectivist cultures, such as in Japan and China, people are seen as interdependent parts of a larger whole whose goals are to fit in with others (Markus & Kitayama, 1991). In such cultures, the pursuit of self-improvement is highly valued, which requires an accurate assessment of oneself and so their self-concept is not overly positive (Heine & Hamamura, 2007; Wang, 2013).

These differences in self-concept influence how people remember themselves. For example, Gelfand et al. (2002) found that when asked to recall examples of their own fair and unfair behavior, Japanese adults did not show the tendency toward recalling more fair examples that American adults do. Gelfand et al. argue that because Japanese adults' self-concept is not overly positive, they are not influenced by the same positive lens that Americans are when recalling their own behaviors.

Along a similar line of reasoning, there is evidence that individuals with higher self-esteem show stronger self-enhancement bias. For example, when asked to recall a memory of being cooperative, people with higher self-esteem had greater subjective feelings of remembering, as measured by self-ratings on questions such as, "As I remember the event I can see it in my mind" (Jones, Norville, & Wright, 2016). When instead asked to recall a memory of being rude, people with higher self-esteem had lower subjective feelings of remembering. The researchers also found that participants more quickly generated memories of their positive actions (prompts: sympathetic and romantic) than negative ones (prompts: dishonest and annoying) and that people with higher self-esteem were faster to recall those positive memories than people with lower self-esteem.

One question that the cultural comparisons and self-esteem findings raise is whether self-concept influences autobiographical memory at encoding, consolidation, and/or retrieval. One could imagine, for example, that self-concept acts as a lens through which adults interpret and encode their own behaviors, primarily focusing in on positive acts. Self-concept may also provide a well-elaborated structure that can be used to more easily retrieve certain, primarily positive, memories once stored.[2] Theories of autobiographical memory propose that self-concept influences memory at all stages—encoding, consolidation, and retrieval (Conway & Pleydell-Pearce, 2000). It is notoriously difficult for research to separate influences that occur at encoding and retrieval (for a review see E. J. Marsh & Roediger, 2003), but there is some evidence that self-enhancement occurs at both encoding and retrieval.

For example, Sanitioso, Kunda, and Fung (1990) found that when adults were led to believe that introverted behaviors are more indicative of success than extraverted behaviors, they tended to recall more of their own introverted than extraverted behaviors. Sanitioso et al. suggested that participants' search through their memories was unintentionally biased by their desire to have this positive trait. Importantly, when they were led to believe that extraversion is

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[2]There are also motivational processes that may cause self-enhancement bias more generally (e.g., Sedikides & Gregg, 2008) and specifically in memory (mnemic neglect; for a review see Sedikides, Green, Saunders, Skowronski, & Zengel, 2016). It is likely that both cognitive and motivational processes contribute to self-enhancement in adulthood (Schriber & Robins, 2012). For the moment, I focus on cognitive mechanisms, but I discuss motivational mechanisms in greater detail when I introduce Study 3.

related to success, this effect was reversed and they recalled more of their own extraverted behaviors.

In another study (Sedikides & Green, 2000), when adults were instructed to read descriptions of behaviors considered to be trustworthy (e.g., "would keep secrets when asked to") or untrustworthy (e.g., "would lie to their parents") as though these were descriptions of their own behavior from someone who knew them well, participants later recalled fewer of the untrustworthy behaviors. When given less time during encoding to think about the behaviors, however, there was no difference between recall of untrustworthy and trustworthy behaviors. This may indicate that effortful processes during encoding led to the original discrepancy in recall of the behaviors.

It would seem, then, that self-concept may influence adults' memory at both encoding and retrieval such that positive items related to the self are remembered more often than negative ones.

Self-Enhancement in Childhood

Having shown how adults' self-concept influences their memories for their own actions and specifically how this leads to self-enhancement, I turn now to the literature on self-concept and memory in children. I begin by describing research showing that children as young as 3 years have a self-concept but that this continues to develop considerably across childhood. As I will show, the evidence of the role of self-enhancement in children's memory is limited, though there is robust evidence that self-enhancement is present in domains other than memory and that self-concept is related to children's memory more generally.

Development of self-concept. Aspects of a concept of self can be seen early in development, but self-concept undergoes considerable elaboration in type of content and in organization. When asked to describe themselves, by at least 3 years of age, children do so somewhat consistently, but their descriptions are fairly limited: They are generally based on activities (e.g., "I can count, I go to school") and possessions (e.g., "I have a cat") (Keller, Ford, & Meacham, 1978). During early and middle childhood these descriptions become more varied, such that by at least 10 years, children describe themselves based on many dimensions including kinship roles (e.g., a sister), territoriality (e.g., from Charlottesville), and preferences (e.g., likes playing soccer) (Montemayor & Eisen, 1977). Furthermore, throughout early and middle childhood children have overall positive self-concepts (see Harter, 2012a), which would be needed to see self-enhancement in children's memory.

In addition to asking children to describe themselves in an open-ended manner, researchers have also investigated the development of self-concept by giving children the opportunity to endorse statements (e.g., "I can run fast"). Interestingly, preschoolers give different responses to different categories of behavior; for example, a child might rate him or herself highly on physical ability but not on peer relations, providing some evidence for a differentiated self-concept even at this early age (H. W. Marsh, Ellis, & Craven, 2002). That said, older children show both more coherence and more differentiation on self-concept measures. For example, closely related aspects of self-concept, such as views of peer competence and peer acceptance, are thought to become more integrated in middle childhood while distinct aspects of self-concept, such as views of peer competence and math competence, become more differentiated (H. W. Marsh & Ayotte, 2003; H. W. Marsh, Craven, & Debus, 1998).

A self-concept composed of primarily positive schemas is present from as early as 3 years, creating the possibility that self-concept could influence memory in a self-enhancing manner from an early age. But given the subsequent development in the variety of content and in organization of self-concept, self-enhancement effects in memory may not emerge until later or may strengthen with age. The following section reviews the existing research on self-enhancement in early and middle childhood.

Evidence for self-enhancement. Children show biases in several kinds of judgments that can be seen as part of self-enhancement (for a review, see Trzesniewski, Kinal, & Donnellan, 2010). Like adults, children tend to attribute positive outcomes to factors within themselves (e.g., ability) and negative outcomes to external factors (e.g., task difficulty). This "self-serving bias" is present as early as age 6 and remains throughout childhood and into adulthood (Mezulis, Abramson, Hyde, & Hankin, 2004; Snow, 1996; van Elk, Rutjens, & van der Pligt, 2015; Whitley & Frieze, 1985). For example, first and fourth grade children who were told they were competing with another child on an academic or athletic task, and then were subsequently told that they had won or lost (regardless of actual performance), said they felt more responsible for the outcomes of tasks where they won compared to lost (Snow, 1996). When asked about the other child, children also said that the other child was more responsible for wins than loses, but to a much lesser extent. Additionally, in a related task where 5-year-olds rated trait stability for themselves and others, participants said that positive traits were more stable for themselves than for others and that negative traits were less stable for themselves than for others (Diesendruck & Lindenbaum, 2009).

Children's judgments of how generous they say they will be also provide evidence for a self-enhancement bias. In Balcetis et al. (2008; Study 1), for example, 8- and 9-year-olds were told to imagine working hard on a task and receiving candy for their performance. Then they were told to imagine that another child who had not performed as well did not receive any candy. At this point, children were asked whether they would give any of their candy to the other child and were asked to estimate how many pieces they would give. They also made an estimate for how much candy they thought another child would give in the same situation. Five days later, when children were actually given the opportunity to give candy in a similar situation, they did not give as much as they had previously said they would. Their prediction for how much another child would give was closer to the average number of candies actually given by all the children. In other words, they saw themselves, but not others, as more generous than they really were. Interestingly, children who were from a collectivist culture (i.e., Spain), where having overly positive self-concept may not be valued, were more accurate in predicting how much they would give than children from individualistic cultures (e.g., England).

When it comes specifically to memory, there is evidence of bias in children's verbal narratives of past nice and mean behavior, which could be a result of self-enhancement. For example, Tasimi and Young (2016) asked 6- to 8-year-olds to talk about a time in the past when they had been mean to someone or a time when they had been nice to someone. Children were more likely to describe their mean actions than their nice actions as provoked by others. They were also less likely to identify a specific mean behavior in their narrative (e.g., "I took someone's stuff") compared to specific nice behaviors (e.g., "I helped a friend up when she fell") and instead describe more general situations when prompted to talk about times when they were mean (e.g., "when my brother was being annoying"). In this research, however, it is difficult to know the exact role that memory plays because children may initially experience these events differently (e.g., attend to provocation of mean behaviors to a greater extent) and they may remember more than what they tell in their narrative, withholding information due to self-presentational concerns.

To my knowledge there is only one experimental study that has investigated how self-enhancement may influence children's memory for their own actions. In Tasimi and Johnson (2015), 5- to 8-year-old children had the opportunity to give stickers to another child, or they heard about another child who had done so. After a day, participants accurately remembered how many stickers they and the other child had given. Interestingly, however, after a week, children remembered giving slightly more than they actually had given and they remembered the other child giving slightly fewer than s/he had.

These findings suggest that a self-enhancement bias may influence children's memory—that they remember themselves as more generous than they actually were but remember others as less generous. This provides evidence for a certain kind of self-enhancement where memory of past positive acts become exaggerated, but leaves open the question of whether children also experience other kinds of self-enhancement in memory, such as worse memory for their own past negative acts.

Self-concept and memory. Though research on self-enhancement in children's memory is limited, there is experimental evidence that children's memories of their own actions are remembered differently from memories of others' actions. For example, children as young as three years old recognize more actions that they performed a week earlier compared to actions they observed an experimenter perform (J. Ross, Anderson, & Campbell, 2011). Importantly, like adults, children show cross-cultural differences in self-concept that are related to differences in autobiographical memory. This at least provides evidence that variation in self-concept is related in some way to children's memories of their past, even if it is not specific to self-enhancement.

As discussed above, individuals in Western cultures usually have greater focus on themselves as independent entities whereas individuals in collectivist cultures focus on themselves as parts of a larger whole (Markus & Kitayama, 1991). These differences in self-concept influence the way that people in these cultures remember the events in their lives starting early in childhood. For example, Wang (2004) asked 3- to 8-year-old American and Chinese children to respond to prompts such as, "I'd like you to tell me just one thing you did recently that was really special and fun." Compared to Chinese children, American children told longer memory narratives about more specific events, and included more emotional references and autonomous orientation compared to Chinese children. Chinese children included more details about social interaction, group activity, and mentions of other people in their narratives. This shows that American children's representations of themselves as independent and unique entities may help them to remember information that is focused on their own specific experiences while Chinese children's representations of themselves as interdependent entities may help them to remember information that is instead focused on other people and groups.

Negativity in Memory of Others

While memories of one's own behaviors may be primarily positive because of the influence of self-concept, both children's and adults' memory is better for other people's negative behaviors. Rather than being influenced by self-concept, these memories are affected by different pressures, namely the adaptive utility of remembering that someone has done something negative so that they can be avoided in the future (e.g., Kinzler & Shutts, 2008). This is particularly interesting because it means that memory for the same actions may be very different depending on whether they are carried out by oneself or someone else. In this section, I review evidence that adults and children remember others' negative acts better than their positive ones.

Negativity in adults' memory. The adult literature on memory of other people's positive and negative behaviors has focused on memory for cheaters and trustworthy individuals. In Buchner, Bell, Mehl, & Musch (2009), for example, participants saw a series of images of faces along with behavioral descriptions that would lead a reader to conclude the individual was a cheater, trustworthy, or neutral. Participants were better able to remember which faces were cheaters than which were trustworthy or neutral. This suggests that, consistent with the negativity bias described earlier (Baumeister et al., 2001; Rozin & Royzman, 2001), other people's negative acts are more memorable than their positive ones. This effect is quite stable, as it is still present after a week delay (Buchner et al., 2009) and when names are used to represent people instead of faces (Bell, 2009).

Some initial explanations of these memory effects focused specifically on the adaptive benefits of having better memory for cheaters compared to trustworthy individuals (Cosmides, Tooby, Fiddick, & Bryant, 2005). But more recent research has extended these findings to other positively and negatively valenced domains, showing that adult memory for other people's disgusting behavior is better than for their pleasant behavior (Bell & Buchner, 2010), and memory for other people's aggressive behavior is better than for their prosocial behavior (Kroneisen, Woehe, & Rausch, 2015). For example, in Kroneisen et al. (2015), participants read descriptions of people who were aggressive (e.g., "Q.P. is a fanatical soccer fan. He often meets his friends to provoke a fight with other soccer fans"), prosocial (e.g., "S.H. is disabled because of an accident. Every noon, he and other helpers provide the homeless with a tasty meal"), or neutral. When asked to remember whether each person had done something aggressive, prosocial, or neutral, participants were better at remembering which individuals had been aggressive than which ones had been prosocial or neutral.

The source memory advantage for negatively valenced individuals is thought to result from the emotional reaction that participants experience at encoding when hearing about behavior that violates their expectations (Bell & Buchner, 2012; for alternative views, see Barclay & Lalumière, 2006; Cosmides et al., 2005). That is, when someone is said to behave in an unconventional manner, this leads to an emotional reaction that results in the participant paying greater attention at encoding. Support for this explanation comes from two sets of studies. The first manipulates expectancy and shows that participants have better source memory for prosocial behaviors when they are led to believe that antisocial behaviors are the ones to be expected (Kroneisen et al., 2015). For example, adults are better able to remember that someone who helped the homeless did something prosocial when they are asked to imagine being in a neighborhood with mainly aggressive people compared to when they receive no such instructions and presumably expect people to behave positively.

A second line of research suggesting that emotional reactions explain the negativity memory bias more directly manipulates participants' reactions. When cheating and trustworthy behaviors are equated in terms of valence and arousal ratings (e.g., a car salesman who conceals serious defects from customers compared to a cheese seller who removes old cheese immediately), the cheating behaviors tend to elicit a stronger emotional reaction and are remembered better (Buchner et al., 2009). However, when the valence and arousal ratings of the trustworthy behavior are higher than those of the cheating behavior, the trustworthy behavior elicits a stronger emotional reaction and the memory advantage for the cheating behavior disappears. In Bell and Buchner (2011), for example, participants were told that one individual saved a child from drowning at great risk to their own life while another individual downloaded movies illegally. In this case, adults remembered who had done something trustworthy just as well as they remembered who had cheated. It is interesting to note that increasing the valence and arousal of trustworthy actions did not lead adults to remember those positive acts to a greater extent than the cheating actions, providing continued support for the strength of negative information in memory for others' actions.

Negativity in children's memory. Like adults, young children generally expect others to behave in positive ways (Boseovski, 2010). For example, in Boseovski and Lee (2006), 3- to 6-year-olds heard information about a person who did mean or nice things (e.g., shared play-doh or took someone's chocolate). Interestingly, children were unlikely to say that someone was mean unless they had heard multiple examples of that person behaving in a mean way. In contrast, they tended to say that someone was nice even if they had been provided just one instance of that person behaving nicely. Thus, when an individual behaves in an antisocial manner, this would be unexpected. Based on the previously described research with adults, such behavior would likely be particularly memorable.

Indeed, Baltazar et al. (2012) presented 4-year-olds with a series of faces of children accompanied by trait/behavior descriptions. Half the child characters were described as mean (e.g., "Ashley is always mean. Today she stole everyone's cookies and no one got any."). The other half of the characters were described as nice (e.g., "Kimberly is always nice. Today she brought in cookies and everyone got some."). After hearing these descriptions, children were better at correctly identifying which characters had been mean than they were at identifying which characters had been nice. Children were also better at selecting which of two mean behaviors had been performed by a given mean child than which of two nice behaviors were performed by a nice child. Baltazar et al. argue that this shows that children are particularly sensitive to potentially threatening information and remember it better than positive information, but the results are also consistent with the mechanism proposed in the adult literature that unexpected acts are remembered better than expected ones.

Another example demonstrating how another person's unexpected or unconventional behavior may lead children to have enhanced memory comes from a study by Drell, Tsang, and Jaswal (2015) where 6- and 7-year-olds heard about children who committed an accidental transgression (e.g., broke a dish) and either apologized or simply said "oh well," as well as children who did not commit a transgression. Participants were better able to remember which characters had failed to apologize than which characters had apologized or had not committed a transgression. In other words, they remembered the unexpected/negative act of not apologizing more so than the expected/positive act of apologizing.

These examples suggest that children's memory for others' negative behaviors is often better than their memory for others' positive behaviors. It is important to point out, however, that their memory for others' negative behaviors is not always accurate. In a study by Tasimi and Johnson (2015), for example, 5- to 8-year-old children were told that one child took a number of stickers from another child. A day later, participants remembered the child taking, on average, one more sticker than s/he really had, and a week later this difference increased to almost two stickers. Interestingly, when children themselves took stickers from the other child, they did not later misremember the number they had taken. Thus, another child's, but not the child's own, negative behavior may be remembered to an exaggerated degree over time. This could actually be seen as a manifestation of self-enhancement bias in that remembering more of another person's negative behaviors could make someone feel good about themselves in comparison, functioning in a similar way as remembering fewer of their own negative behaviors (Crocker, 1993).

The self-enhancement and self-concept literatures indicate that children are likely to remember the positive things that they have done more than the negative ones, and they may exaggerate the extent to which they acted positively in the past. When it comes to memory for other people's actions, however, it seems clear that 4- to 7-year-olds are better at remembering who has done something mean (and/or unexpected) compared to who has done something nice (and/or expected), and children may even remember others' mean acts in an exaggerated way.

The Impact of Socialization through Parent-Child Reminiscing

Children growing up in Western cultures may have positive self-concepts and show self-enhancement in their memories in part because of the way that parents talk to them about their past prosocial behavior and transgressions. Similarly, although children's memory for others' transgressions may initially be encoded better because of automatic attentional mechanisms (Bell & Buchner, 2012), they may also be influenced over time by the way they are talked about with parents. In the following sections, I review evidence from socialization research examining parent-child discussions about the past.

Talking about their child's behavior. In the U.S. in particular and Western cultures more generally, feeling good about oneself is valued (Falk & Heine, 2015). As a result, parenting practices tend to focus on helping children maintain high self-esteem. For example, in reviewing parenting books in Western cultures, Harter (2012a) found that they recommend that parents acknowledge children's achievements, encourage children to have positive self-views, and offer limited negative feedback. In an interview study of childrearing values, Miller, Wang, Sandel, and Cho (2002) found that middle-class American parents of toddlers often spontaneously mentioned the importance of self-esteem. Either spontaneously or with prompting, they talked about self-esteem's importance for positive outcomes such as achievement and mental health, and also discussed how they helped their own children build self-esteem, emphasizing the importance of parent-child interactions for this.

In contrast, parents in East Asian cultures are more likely to emphasize self-improvement than to foster positive self-views (Wang, 2013). For example, in Miller et al.'s study, when asked about childrearing values, Taiwanese parents did not spontaneously mention self-esteem very often nor did they talk about it when prompted. In fact, if they did discuss self-esteem it was generally in a negative way—that high self-esteem could make a child react negatively to failure and feedback.

These parenting values regarding self-esteem have an important influence on how parents talk to their children about their past behavior. In a longitudinal home observation study of children from age 2;6 to 4;0 in urban, well-educated families in the U.S. and Taiwan, Miller, Fung, Lin, Chen, and Boldt (2012) found very few instances where American parents and children talked about transgressions such as telling lies, losing one's temper, or damaging other's property. In contrast, the Taiwanese parent-child dyads talked about children's transgressions much more often. Even when the American dyads did talk about transgressions, parents made them seem less serious, put a positive spin on the story, and/or introduced humor. Miller et al. propose that this difference could reflect a concern on the part of the American parents that talking too much about children's past transgressions will damage their self-esteem and that it is instead better to deal with a transgression when it occurs and not continue to dwell on it later—a concern that Taiwanese parents did not share. In another study, when American parents were specifically prompted to talk to their 3-year-old children about a past transgression, they generally selected events involving mischief or misadventure, rather than more serious transgressions, and tended to downplay the transgression (Reese, Taumoepeau, & Neha, 2014).[3]

Research with 7-year-olds and older children has shown that American parents do sometimes talk about the consequences of their children's past transgressions (e.g., asking about how the child's transgression made the victim feel), but that they simultaneously promote positive self-views: Rather than evaluating the child's harmful actions, they focus more on what the child did well in the situation—for example, that they attempted to repair the harm afterwards (Recchia, Wainryb, Bourne, & Pasupathi, 2014). They also continue to use narrative devices such as downplaying the transgressions and introducing humor, as they do with younger children (Wang & Song, 2014).

By not discussing or by downplaying children's past transgressions, parents may contribute to their children having poor memory for their transgressions because these are not rehearsed. Additionally, if children's views of what memory is for are shaped by reminiscing experiences with their parents, then American children are unlikely to see remembering their own past transgressions as an important function of memory, or at least that it is not as important as remembering their own good behavior.

Indeed, in Miller et al.'s (2012) study comparing American and Taiwanese families, parents in both cultures talked about their children's past positive behaviors, including showing the children as helpful, honest, and generous, but the American parents' positive stories sometimes cast their children in an exaggeratedly positive way. For example, they excessively

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[3]It is important to distinguish here between memories of children's negative acts and their negative experiences. Parents do focus more on discussing emotions in narratives of past negative events compared to positive ones, which helps children to understand their negative emotions (Fivush, Hazzard, Sales, Sarfati, & Brown, 2003). But that research focuses on negative events that have happened to children or that they have witnessed, and not on children's own negative acts.

praised their children for simple acts such as making a friend laugh or helping set the dinner table. Similarly, when given specific prompts in the lab, American parents talked with their children about the benefits that they gained from helping others (e.g., feeling proud) and used evaluations (e.g., "you are a good person"), which is thought to contribute to children's self-concept (Recchia et al., 2014).

In short, the narrative practices of American parents may contribute to their children having positive self-concept, and socialize children to see the functions of thinking and talking about the past as primarily for highlighting achievements and good deeds, rather than focusing on things that one has done wrong. It seems plausible that this kind of socialization practice would contribute to children being biased to remember more of their own positive acts than negative ones. One goal of the present research was to ask whether the goals parents have when talking to their children about the past are related to children's self-enhancement memory bias.

Talking about other children's behavior. In addition to influencing discussions of children's own misdeeds, parents' values also affect the way that they discuss others' transgressions against their children. In American culture, independence and unique personal experiences are highly valued (Markus & Kitayama, 1991). Because of this, when American parents talk with their children about past events, they focus on their children's unique perspectives and emotions and on affirming their child's individual experience, for example, by asking their children about their judgments and opinions (Wang, Leichtman, & Davies, 2000). In China, in contrast, interdependence and social harmony are more highly valued (Markus & Kitayama, 1991). When parents talk with their children about the past, they do not focus on affirming their child and on their child's emotions, but instead on the importance of social relationships and maintaining those relationships (Wang & Fivush, 2005).

This specifically plays out in parent-child discussions of peer interactions in these cultures. When the mothers of 9- to 10-year-olds were asked to talk with their child about a negative peer interaction, American mothers and children often talked about times when a peer had done something negative to the child, such as being aggressive or socially excluding them, rather than times when the child had transgressed against a peer (Wang & Song, 2014). During these conversations, parents focused on sympathizing with their child and talking about their child's emotions rather than discussing the peer's perspective. The Chinese dyads talked about others' transgressions less often and also in a different way: The Chinese mothers tried to minimize the harm done to their child, talked about why the peer might have transgressed, and were focused on repairing the relationship.

Through these experiences, American children may be more likely to talk about and rehearse memories of times when they were a victim rather than a transgressor, leading to better memory for others' negative acts. Moreover, if children's views of the functions of talking about the past are shaped by these interactions with parents, then American children may come to see thinking and talking about the past as an opportunity to consider others' transgressions against them and work through their own emotional reactions.

Individual Differences in Self-Concept

Another key factor that may contribute to self-enhancement bias is an individual's self-concept. At the moment there is no research on this in childhood, but research with adults shows that individual variability in aspects of self-concept, such as self-esteem, are related to variation in the strength of self-enhancement bias (Falk & Heine, 2015). In this section I further discuss the role of self-esteem and review another aspect of self-concept known as self-values.

Self-esteem. There is considerable evidence from domains other than memory that adults with higher self-esteem show greater self-enhancement (for a review, see Falk & Heine, 2015). For example, when asked to rate how well positive personality traits described them or an unfamiliar peer, adults were biased to give higher ratings for themselves than the peer and the degree of bias was related to self-esteem: Participants with higher global self-esteem showed a larger bias (Hamamura, Heine, & Takemoto, 2007). Importantly, there is emerging evidence that self-esteem is specifically related to self-enhancement in memory. Many of these studies have used actual autobiographical memories and measured self-enhancement based on subjective experiences of remembering. For example, when asked to recall a memory of being cooperative (Jones et al., 2016) or of feeling proud (D'Argembeau & Van der Linden, 2008), adults with higher self-esteem had greater subjective feelings of remembering on items such as the amount of visual detail in their memory. When they recalled a memory of being rude or feeling shame, those same adults had lower subjective feelings of remembering.

Another type of subjective experience, subjective temporal distance, also shows a relationship between self-enhancement and self-esteem: Adults with higher self-esteem felt subjectively closer in time to instances where they had attained a goal and further from instances where they had failed to attain a goal, regardless of the actual amount of time since the events (Demiray & Freund, 2017).

There is only one study that has examined self-esteem's relationship with memory accuracy for controlled lab stimuli. Jones and Brunell (2014) showed adults a list of positive (e.g., "kind") and negative (e.g., "mean") traits and for each one asked participants to think about whether the word described them (i.e., self item) or whether it described another person (i.e., other item). They found that people with higher self-esteem recalled more positive-self items and fewer negative-self items on a later memory test whereas self-esteem was not related to memory for “other” items.

It is important to note that not all studies have found evidence for a relationship between self-enhancement memory bias and self-esteem. Ritchie, Sedikides, and Skowronski (2016) asked participants to recall positive and negative behaviors that they had done in the past. They measured memory accuracy during a second visit a few weeks later by asking the participants to recall the behaviors they had generated during the first visit. Using one measure of self-esteem that asked participants to compare themselves to the average person, Ritchie and colleagues found that participants with higher self-esteem showed a greater recall advantage for positive over negative behaviors. However, in a subsequent study using a self-esteem measure that did not ask them to compare themselves to others, there was no relationship with memory recall.

In sum, there is considerable evidence for a relationship between self-esteem and self-enhancement memory bias where adults with higher self-esteem show greater bias. However, most of this evidence comes from studies of subjective memory ratings, and so the relationship with memory accuracy is less understood.

If high self-esteem is a contributor to self-enhancement memory bias in adulthood, then it is reasonable to explore whether it is also involved in such biases in childhood. Precursors to self-esteem are present as early as preschool age, when children have certain perceptions of themselves in specific domains such as physical competence (e.g., good at climbing) and peer acceptance (e.g., have a lot of friends) (Harter & Pike, 1984). At least as young as 8 years old, children can give reliable ratings of global self-esteem (Harter, 2012a). One goal of the present research is to examine the relationship between self-esteem and self-enhancement bias in both adults and children.

Self-values. Values are considered to be an important part of an individual's self-concept and therefore may have an important influence on memory (Conway & Pleydell-Pearce, 2000). Schwartz (2001, p. 521) defines values as, "desirable, transsituational goals, varying in importance, that serve as guiding principles in people's lives." In his theory of human values, he describes types of values that people have and how these different values relate to one another (Schwartz, 1992; Schwartz et al., 2001, 2012). By nature, the pursuit of some values is compatible with certain other values, but conflicts with yet others. Schwartz's theory includes ten different value constructs that are arranged along multiple dimensions to represent these compatibility-conflict relationships. Given my research focus on self-enhancement, the dimension of self-enhancement versus self-transcendence is of particular importance here. Values that are related to power (e.g., social status and dominance) and achievement (e.g., personal success) focus on promoting one's own interests and so are closer to the self-enhancement pole. Values related to benevolence (e.g., enhancing welfare of close others) and universalism (e.g., protecting welfare of all people and nature) instead promote other's wellbeing and are closer to the self-transcendence pole. In addition, hedonism values (e.g., personal gratification) are often closely related to power and achievement and fall close to the self-enhancement pole.

Notably, the way that someone prioritizes values is related to beliefs and behaviors (for a review, see Roccas & Sagiv, 2010). For example, people who rated universalism more highly felt more ready to engage in social contact with outgroup members (Sagiv & Schwartz, 1995). There is also some evidence for a causal effect of values on behavior: Sagiv, Sverdlik, and Schwarz (2011) had participants rate their values and then a few weeks later participate in a social dilemma game. Before the game, half of the participants rated their values again as a way to make them more cognitively accessible. Overall, participants who scored higher on benevolence cooperated more while participants who scored higher on power competed more; importantly, these effects were stronger when participants' values were more accessible because they had just thought about them.

Schwartz and Bardi (2001) found that in the United States, college students tend to rate their top three values as benevolence, achievement, and hedonism, while universalism is generally rated lower and power is often rated as the lowest priority value. They also found that it is common across many cultures to rate benevolence highly and power quite low, and so it is also informative to consider American students' values compared to students in other cultures: American students are a little above average on benevolence, considerably lower on universalism, and considerably higher on achievement, hedonism, and power. This is consistent with the strong focus in the U.S. on independence and high self-esteem (Heine & Hamamura, 2007; Markus & Kitayama, 1991; P. J. Miller et al., 2002), which have also been implicated in self-enhancement biases as discussed previously.

Turning to developmental research, an adult-like arrangement of value constructs is present in childhood from at least 7 years old (Döring et al., 2015; Döring, Blauensteiner, Aryus, Drögekamp, & Bilsky, 2010) and likely from 5 years of age (Collins, Lee, Sneddon, & Döring, 2017; Lee, Ye, Sneddon, Collins, & Daniel, 2017). There are developmental differences from age 5 to 12 years, with an increase in differentiation between the ten lower-level value constructs (Lee et al., 2017). The higher-level dimensions, however, are very similar to adults: For example, benevolence and universalism (self-transcendence) are highly related at one pole and power and achievement are highly related at the opposing pole (self-enhancement) and these findings hold across samples from multiple countries (Döring et al., 2015).

Like adults, children tend to rate self-transcendence values as most important and self-enhancement values as least important (Döring et al., 2015). Value priorities for 8- to 11-year-olds are moderately stable over two year periods (Cieciuch, Davidov, & Algesheimer, 2016). Value priorities do change over time, and in at least in one Polish sample, self-transcendence decreased in importance while self-enhancement increased in importance from age ten to twelve and then became more stable (Cieciuch et al., 2016). This increase in self-enhancement with age—though not the decrease in self-transcendence—was also found in a cross-sectional study of American children (Döring et al., 2015).

No research has examined the relationship between memory and self-values in either adults or children, and so one of the goals of the present research was to explore whether individuals with higher self-enhancement values or lower self-transcendence values show stronger self-enhancement memory bias. It is possible that the motivations underlying self-enhancement values are the same ones that contribute to this memory bias. Self-values provide insight into the self in a way that is unique from personality or self-esteem because values are about what someone thinks is important, not about how someone truly is or how they see themselves. For example, someone may highly value dominance, but not be dominant nor view themselves as dominant.

The Self-Reference Paradigm

The aim of the present research is to understand how children's memory for their own mean and nice behaviors differs from their memory of others' behaviors. One limitation of much of the previous work on the self-enhancement bias is that it does not control the encoding of the original event because real-life memories are used (e.g., Messick et al., 1985). This means that differences between memories cannot be controlled and memory accuracy cannot be assessed.

Using real-life memories also does not allow researchers to control how much a memory has been rehearsed, and so interpreting memory differences between one memory and another is complicated. Additionally, the use of memory recall and/or subjective ratings of memories in prior research does not show whether differences in memory for one's own prosocial acts and transgressions are a result of less information about one's transgressions being present in memory, or just about that information being somewhat less accessible to recall (i.e., does not come to mind easily) and less clear or vivid.

To address these concerns, in the present studies I used a paradigm that has previously been used to research the self-reference effect in memory. In the traditional self-reference paradigm, participants see a list of words, often adjectives, and for each item they are instructed to either think about how it relates to themselves (e.g., “Does this describe you?”), think about how it relates to a familiar person (e.g., “Does this describe Barack Obama?”), or process the item in a semantic or perceptual way (e.g., “Is it a synonym of cold?”, “Is it written in capital letters?”). In general, adults better recognize and recall items that are self-referenced during encoding (for a review, see Symons & Johnson, 1997). This memory advantage is thought to result from two effects: 1) reference to the self creates an automatic increase in attention to related stimuli (Turk, Cunningham, & Macrae, 2008) and 2) processing with relation to self-concept results in greater elaboration and organization of the stimuli (Klein & Loftus, 1988).

The self-reference paradigm is limited in that it does not capture the kinesthetic and agentic properties of actual behavior. For example, when someone actually performs an action they have awareness of their intentions and they feel themselves physically move. Despite this drawback, the self-reference paradigm is still thought to rely on similar self-referential processes as everyday thoughts and actions involving the self and can provide a more controlled test of how behavior is remembered differently for oneself versus others than is possible when using real-life memories (see J. Ross et al., 2011). In particular, using this paradigm allows for greater control of encoding and rehearsal and also allows for a focus on memory availability without confounding it with accessibility.

Item memory and source memory in the self-reference paradigm. Before discussing the results of prior studies using the self-reference paradigm, it is important to understand some basic information about different processes that contribute to performance on memory tasks. Here I focus on two different ways of assessing memory: Recognition tests and source tests. Recognition tests assess item memory—whether someone is able to recognize that a specific item was seen before or not. Accurate item recognition does not require remembering the contextual details associated with an item during encoding—for example, whether a statement was made by a man or a woman, or in the study here, whether the material was encoded with regard to self or other. Source memory tests, on the other hand, go beyond recognition by asking the participant to remember the contextual details of an experience.

Notably, according to theoretical accounts of source monitoring, item memory and source memory performance may differ in some situations (Johnson, Hashtroudi, & Lindsay, 1993). This is supported by evidence from studies where experimental manipulations have different effects on recognition test performance and source memory test performance. This has been shown in a variety of cases, such as memory for trustworthy and untrustworthy behaviors (Buchner et al., 2009), the influence of retrieval cues (Dodson & Shimamura, 2000), and the effect of level of processing during encoding (Lindsay & Johnson, 1991). One example of a mechanism for differences between item memory and source memory is that paying more attention to an item during encoding may increase item memory, but not affect source memory if no effort is made to connect the item with its context. The importance of the distinction between item memory and source memory is made clear in the following section.

Self-enhancement in the self-reference paradigm. One goal of the current work is to confirm that adults do show a self-enhancement bias in memory of self-referenced actions compared to other-reference actions. This is important because previous research using the self-reference paradigm and positive and negative adjectives has yielded inconsistent findings. Consistent with a self-enhancement effect, Leshikar and colleagues (2015) found that participants had better source memory for positive adjectives when they had encoded them with regard to themselves (self-reference condition) than when they simply made a judgment about how common the adjectives were (semantic judgment condition). For example, when participants had decided during encoding whether or not a positive adjective was self-descriptive (responding yes or no), they were subsequently more likely to respond “self” rather than “common” or “don't know” when asked which judgment they had been asked to make for that adjective. Replicating this result, Durbin, Mitchell, and Johnson (2017) also found that source memory was better for positive self-referenced words compared to semantic judgment words. The studies, however, diverged in their results for negative words. In line with self-enhancement bias, Leshikar et al. found that negative adjectives were remembered worse when self-referenced while Durbin et al. found no difference in source memory for negative self-referenced and semantic judgment words. There are too many methodological differences between the studies to address why the results differed, but it does make it clear that more research is needed to clarify the conditions under which self-enhancement bias is present in adult memory.

Similar effects have also been shown using free recall tests (D’Argembeau, Comblain, & Van der Linden, 2005; Jones & Brunell, 2014). For example, using positive social/moral adjectives such as “generous,” “obedient,” and “cooperative,” Jones and Brunell (2014) found that adults were better able to recall those encoded with reference to self than those encoded with reference to someone else. In contrast, for negative adjectives, such as “rude,” “unfair,” and “dishonest,” there was no recall difference between self- and other-referenced items. This is similar to the source memory findings in Durbin and colleagues (2017) described above and is also consistent with a self-enhancement bias, though the influence of memory recollection and accessibility in this case cannot be separated because free recall was used to measure memory.

Two other studies that used a subjective rating of remembering did not find self-enhancement (Carson, Murphy, Moscovitch, & Rosenbaum, 2015; D’Argembeau et al., 2005). In this task, participants could respond that an item was new, that they remembered seeing it before (i.e., they remembered details of the context from the study phase), or that they just knew they saw it before (i.e., they recognized it but did not remember specific details from study). This type of subjective judgment is often correlated with performance on recognition and source memory tests (for a review, see Yonelinas, 2002). Thus, this inconsistency with the findings described above is surprising and points toward a need for further evidence of self-enhancement in adult memory.

Unlike source memory and free recall, item memory has not shown a self-enhancement effect in prior research. Studies have found that recognition is better for self-referenced items than other-referenced items or semantic judgment items (Carson et al., 2015; D’Argembeau et al., 2005; Durbin et al., 2017; Leshikar et al., 2015; Yang, Truong, Fuss, & Bislimovic, 2012). However, none of these studies found that memory for self-referenced adjectives varied based on their valence, and the effect of valence itself is inconsistent across these studies. Thus, memory measures that test item memory, rather than source memory, generally do not show self-enhancement.

The combined pattern of results from recognition memory and source memory tests is consistent with the idea that the advantage for self-referenced, positive information is that it is more easily connected to the self and/or the disadvantage for negative information is that it is less easily connected to the self. Self-referential processing may produce an advantage in item memory regardless of item valence because of greater attention to the item or deeper processing of the item, without necessarily connecting the item to the self (i.e., binding it to contextual details; see Durbin et al., 2017). In turn, valence differences may be present in source memory because judgments about the type of processing present at encoding would rely on remembering the connection to the self. This argument is situated more generally in the emotional memory literature where several explanations have been proposed for situations where item and source memory are influenced differently by arousal and valence (e.g., Cook, Hicks, & Marsh, 2007; Johnson, Nolde, & De Leonardis, 1996; Mather, 2007). These explanations are based on the idea that sometimes processing is focused more narrowly on an item while other times the item is processed more broadly within its context.

In the present studies, I used a test of both source memory and recognition in order to investigate these differences in the effects of self-referential processing.

Self-reference in childhood. There have been no prior studies with children using the self-reference paradigm with emotionally valenced stimuli. The general self-reference effect, however, has been demonstrated in young children. For example, Cunningham, Brebner, Quinn, and Turk (2014) had 4- to 6-year-olds watch a series of 48 images of familiar items, such as toys and household items. For half the items, an image of the participant's face was shown next to the item and the participant was asked whether he/she liked the item (self-reference). For the other half of the items, an image of an unfamiliar, opposite-gender child was shown next to it and the participant was asked whether that child would like the item (other-reference). When subsequently viewing the old items mixed with 24 new ones, children at all ages were better at recognizing items they had encoded with reference to the self. Additionally, children had better source memory for self-referenced items: When asked to indicate whether each object had been self- or other-referenced at encoding, children were better at identifying that an object was self-referenced.

The present research. I modified Cunningham and colleagues' (2014) procedure to use nice, mean, and neutral action verbs. The basic task in all four studies reported here was the following: During the study phase, participants processed half the verbs with reference to themselves and half with reference to another person. Then they completed a recognition and source memory test. The primary interest was whether children and adults remember more of the nice behaviors if they processed them with self-reference, and whether they remember more of the mean behaviors if they processed them with other-reference.

Action words (i.e., verbs) rather than trait adjectives were used because this is more in line with the goal of examining memory for nice and mean behaviors. Prior research on self-enhancement using the self-reference paradigm with adults has primarily examined adjectives, not verbs, and so in addition to addressing development, the present findings also extend the previous adult work.

Study 1 will show that the self-reference paradigm can be used to examine self-enhancement in children and adults and draws attention to important methodological changes that are then incorporated into a new procedure with adult participants in Study 1a. That procedure is then used with children in Study 2 to show evidence for self-enhancement bias in source memory. Finally, Study 3 returns to adult participants to explore potential mechanisms of the bias. All data have been made publicly available via Open Science Framework and can be accessed at osf.io/4b5kq.

Chapter 2: Study 1

Six-year-olds and 9-year-olds were included in the study for two reasons. Firstly, children of these ages fall in the middle of two different theorized periods of self-concept development (Harter, 2012a), and therefore their self-concepts may influence memory to a different extent. Secondly, Cunningham and colleagues (2014) found evidence that the 4- to 6-year-olds in their study may have experienced the self-reference effect primarily through an automatic, attentional mechanism rather than an elaborative mechanism involving self-concept: The memory advantage for self-referenced compared to other-referenced objects was equally strong when the manipulation was whether children saw a picture of their face or another child's face next to an object, without elaborating on the link by deciding whether they (or the other child) liked the object. When adults perform a similar task they do show a stronger advantage for self-referenced items in the more elaborative condition compared to the passive presentation condition (Turk et al., 2008). Self-enhancement may be more likely to occur with the elaborative mechanism because this involves processing that relies on the self-concept. Thus, if 6-year-olds' self-concepts are not sufficiently developed for this mechanism to be in place, in the current study they may not show self-enhancement to the same extent as the 9-year-olds, whose memory may be more influenced by self-concept.

As discussed earlier, the narrative practices of American parents may contribute to children being biased to remember more of their own positive acts than negative ones. In the present study, I included a measure of parental reminiscing goals to explore the possibility that parents with more goals related to having a positive sense of self would have children who remembered positive, self-referenced material better and parents with more goals related to learning from mistakes would have children who remembered negative, self-referenced material better.

Other potential moderators of self-enhancement bias are certain aspects of individuals' self-concepts because this is thought to be a key contributor to such bias. In the present study, I measured one aspect of self-concept—self-values. As discussed previously, values related to self-enhancement and self-transcendence are most relevant here. I expect one of two possible outcomes: One possibility is that participants who identify with power and achievement values will show a greater memory bias because they may be generally more likely to self-enhance. An alternative possibility is that participants who identify with benevolence and universalism values will show a greater memory bias because being nice to others is a stronger part of their self-concept and people are more likely to self-enhance when something is more central to their sense of self (Sedikides & Green, 2000).

Method

Participants. Participants were 30 6-year-olds (n_{female} = 15; M_{Age} = 78.1 mos; $Range_{Age}$ = 72-84 mos), 30 9-year-olds (n_{female} = 15; M_{Age} = 113 mos; $Range_{Age}$ = 108-120 mos), and 30 college students (n_{female} = 21; M_{Age} = 19 yrs; $Range_{Age}$ = 17-24 yrs). An additional two 6-year-olds did not complete the study; all 9-year-olds and adults completed the study. An additional seven 6-year-olds and two 9-year-olds were excluded from analyses for suspected inattention or misunderstanding of instructions. This was decided based on a few criteria: 1) Children picked responses randomly across item type (i.e., selected each response option about 33% of the time for each type of item); 2) Children either picked the same response many times in a row (e.g., one participant selected "other" 13 times in a row) or only used one of the response options a few times (e.g., one participant selected "other" only 4 times); 3) Children selected incorrect responses at an unusually high rate across item types (e.g., one participant had 87% false alarms to new items and for old items 60% of the time selected the opposite source from the correct one). No adults were excluded based on this criteria. Nine children did not have self-values data due to shorter appointment lengths or experimenter error.

Design. There were two within-participant manipulations: Valence type and reference type. Valence type was the manipulation of whether the words to be remembered were nice, mean, or neutral. Reference type was the manipulation of whether participants were asked to process the words in a self-referential or other-referential manner.

Materials. Ninety verbs (e.g., help) or verb-preposition combinations (e.g., work together) that represented nice/polite, mean/impolite, and neutral actions were used; there were 30 verbs of each valence type and the complete list can be found in Appendix A. Mean and nice items were generated in a variety of ways, including from studies of moral behavior and discussion with other researchers.[4] Neutral items were selected from a large corpus of words rated for valence (Warriner, Kuperman, & Brysbaert, 2013); only words that were given neutral or close to neutral valence ratings were used. For counterbalancing, thirty different combinations of the 90 verbs were created, one for each participant in each age group. To do this, I first made ten sets of 90 verbs where an equal number of each valence type (nice, mean, neutral) was pseudo-randomly assigned to be self-referenced, other-referenced, or distractor items. To control for any influence of specific items, I counterbalanced across participants so that each item was self-referenced, other-referenced, or a distractor the same number of times: Each of the original ten sets of 90 verbs were made into an additional two sets by rotating which items were self-referenced, other-referenced, and distractors. Additionally, because many of our analyses relied

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[4]Several additional items were generated, but later eliminated during pilot testing because children did not reliably understand their meaning.

on within-participant comparisons, when creating the original ten sets of verbs I assigned verbs within each valence type across self-reference, other-reference, and distractors in a way that balanced features known to influence memory: Concrete (e.g., hit) and abstract (e.g., lie) verbs were distributed evenly, the median word frequency in spoken English (The Corpus of Contemporary American English; Davies, 2008) was kept as similar as possible, and the average magnitude of how mean or nice the verbs were was matched (ratings were from a pilot study with a separate group of 14 college students).

For the encoding phase, the items in each of the 30 unique sets of verbs were arranged into a random order with the constraints that no more than two of the same valence type (nice, mean, neutral) or reference type (self, other) occurred in a row, and that half of each valence type by reference type pairing was presented in the first half of the list and the remainder in the second half of the list. Three additional neutral verbs were included at the beginning and end to eliminate primacy and recency effects for the actual items; these were not analyzed. At test, the same constraints were used to create random orders of all the old and new items.

Procedure. The memory task was completed on a computer using PsychoPy stimulus presentation software version 1.83.03 (Peirce, 2007). Participants were told that they were going to hear words and answer questions; they were not told that their memory would be tested because a meta-analysis of adult research found that the self-reference effect is stronger when the memory test is unexpected (Symons & Johnson, 1997). Before the actual encoding trials, participants completed two practice trials—one self-reference and one other-reference—to ensure that they understood the task. During the encoding phase, participants completed 60 trials split into two 30-trial blocks with a break for a few seconds in between. Half of the trials within each block were self-reference trials and half other-reference trials. For self-reference trials, participants first saw a picture of their own face on a computer and heard a recording of the question "Do you do this? X," where X was a nice, mean, or neutral verb (e.g., help). For other-reference trials, they first saw a picture of an opposite-gender, same-age individual and heard the question, "Does Fran/Fred do this?" followed by a nice, mean, or neutral verb. The picture remained on the screen and a green rectangle that said "Yes" and a red rectangle that said "No" appeared underneath. Participants pressed a matching green or red button on a button box to record their response. At the beginning, participants were instructed to keep their hands on the table with one finger on each of the buttons so that they could make a response as soon as they decided. Child participants were periodically reminded of this if they removed their fingers from the buttons during the procedure.

After the encoding phase, participants did a 5 minute filler task where they completed visual puzzles such as mazes; research with adults shows a stronger self-reference effect when a distractor task is completed between encoding and test (Symons & Johnson, 1997).

Then they started the test phase which used a three-alternative forced-choice procedure that includes both old-new recognition and source memory. Participants heard a series of words on the computer; 60 were from the study phase and an additional 30 were new. Of the new words, 10 were nice, 10 were mean, and 10 were neutral. For each word, participants decided whether they had seen it during study as a self-reference item, seen it during study as an other-reference item, or whether it was not seen at all during study. On each trial, the computer would play an audio clip of the verb, and then three rectangles appeared on the screen with the words "New," "Me," and "Fran" (or "Fred"). Children were instructed at the beginning of the test, "When you hear the words, I want you to tell me whether you think the word is new—one that you didn't hear at all before (for those you can say "New" or point to this), or whether you think you heard the word earlier and were asked if it was something that you do (for those you can say "Me" or point to this), or whether you think you heard the word earlier and were asked if it was something that Fran/Fred does (for those you can "Fran/Fred" or point to this). So each time you hear a word, I want you to pick either "New", "Me", or "Fran/Fred" depending on which you think it is." After hearing the instructions, the experimenter asked whether the children understood and repeated the instructions if necessary. Adults received similar written instructions and responded by pressing one of three labeled keys.

Moderators.

Adults. For adult participants, reminiscence goals were measured using the Thinking About Life Experiences questionnaire (TALE; Bluck & Alea, 2011). This has 15 items equally divided between three types of goals: Self-continuity, social bonding, and directing-behavior. Each item describes a possible reason to think or talk about the past such as, "when I want to feel that I am the same person that I was before." Participants rated these on a 5-point scale of how frequently they think/talk about the past for that reason, from "Almost never" to "Very frequently." The primary interest here was the directing-behavior goal, which contains items similar to the Directive goal on the parent measure described next. The questionnaire was completed immediately after participants completed the memory procedure.

After the TALE, adult participants completed a shortened form of the Portrait Values Survey (PVS; Schwartz et al., 2001) that has been used in the European Social Survey. Participants were instructed, "Please read the following brief descriptions of some people, then decide how much each person is or is not like you." Then they read 21 statements such as, "It is important to him to be rich. He wants to have a lot of money and expensive things," and rated each statement on a 6-point scale from "very much like me" to "not like me at all." The statements represent the 10 different values in Schwartz's theory of human values; of interest here were the values belonging to the higher-order constructs of Self-enhancement (power and achievement) and Self-transcendence (benevolence and universalism). Scores for Self-enhancement and Self-transcendence were computed by subtracting each participant's average rating of all items from their average rating for the items belonging to the construct, according to the guidelines provided by Schwartz and colleagues (2001).

Children. To measure reminiscing goals, one parent of each child completed the Caregiver-child Reminiscence Scale (CRS; Kulkofsky & Koh, 2009), which includes 40 items with the stem statement, ‘‘I engage in past talk with my child in order to . . .’’. The items are rated on a 7-point scale, from “never” to “very often” and then parents receive sub-scores on goals related to emotion regulation, directive, positive emotionality, individual self in relation to others, conversation, cognitive skills, and peer relationships. The Positive emotionality and Directive goals were of primary interest in the present study. Generally it was the child's mother who filled out the questionnaire.

To measure self-values, child participants completed the Picture-Based Value Survey for Children (PBVS-C; Döring et al., 2010), a child analog of the PVS. After completing the memory part of the study, participants were shown 20 pictures with short captions that represent ten different values, including benevolence, power, achievement, and security. Children were told, “This is about things that are important in life. It is about which goals you have for your life. And it is about how you would like to be in your future life.” And then they were asked to imagine they were the character in the pictures and imagine how they would like to be in the future.

After looking at all the pictures and listening to the captions, children were told that they could arrange the pictures in order of how important each item was in their lives. First they ranked two pictures as "very important" by placing them at the top of a chart. Next they rated two as "not at all important" by placing them at the bottom of the chart. Then four pictures were ranked as "important" by placing them just under the "very important" items, and an additional four as "unimportant" by placing them just above the "not at all important" items. The remaining eight items were not ranked by the children and for analysis are considered to be ranked in the middle of the "important" and "unimportant" items. Self-enhancement and Self-transcendence each had four pictures associated with them—two for each of their component values. Scores were calculated by taking the mean ranking of the four pictures for a given construct ("very important" = 5, "important" = 4, "of mean importance" = 3, "unimportant" = 2, "not at all important" = 1). This measure has been used with children as young as 8 years old and materials were originally generated through piloting with children as young as 6 years old (Döring et al., 2010), therefore it should be appropriate for use with the 6- and 9-year-olds in this study.

Results

Recognition memory. Table 2.1 shows the proportion of recognition hits and false alarms on the memory test. To correct for guessing, I calculated corrected recognition scores by subtracting the false alarm rate from the correct hit rate (Snodgrass & Corwin, 1988). As Figure 2.1 shows, the primary finding was that corrected recognition was consistently better for self items compared to other items across valence types and age groups.

Table 2.1. Means and standard deviations of recognition hits and false alarms

	Nice			Mean			Neutral		
	Self-hits	Other-hits	FA	Self-hits	Other-hits	FA	Self-hits	Other-hits	FA
6-yr-olds	.86 (.14)	.75 (.14)	.15 (.15)	.82 (.16)	.78 (.16)	.16 (.14)	.86 (.12)	.85 (.14)	.06 (.10)
9-yr-olds	.91 (.08)	.83 (.14)	.11 (.14)	.93 (.08)	.88 (.11)	.13 (.14)	.92 (.09)	.89 (.11)	.05 (.08)
Adults	.92 (.10)	.86 (.14)	.22 (.17)	.95 (.09)	.85 (.10)	.17 (.15)	.93 (.09)	.90 (.14)	.08 (.08)

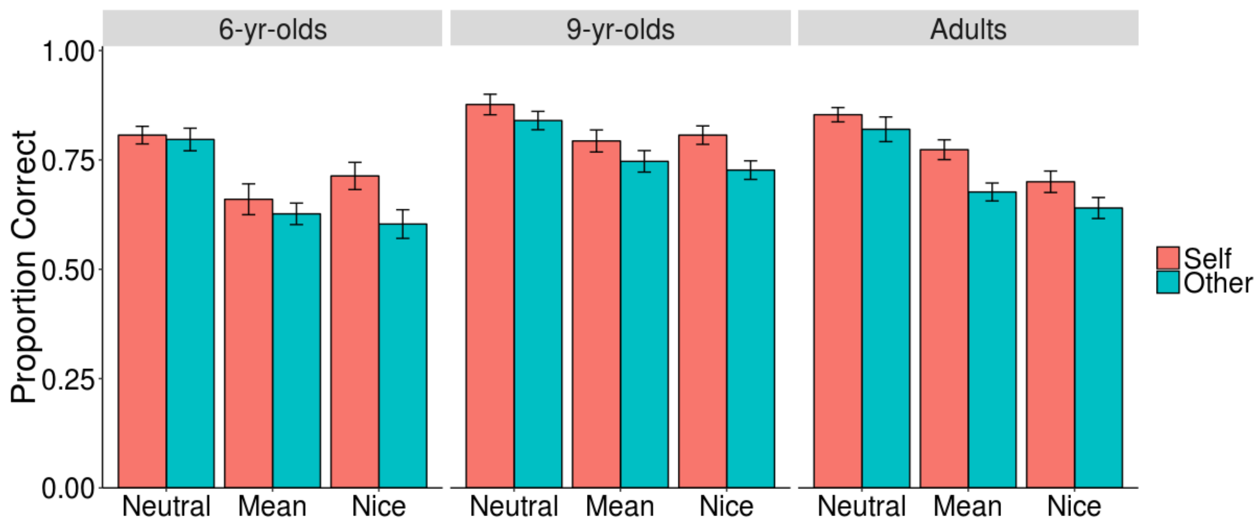

Figure 2.1. Mean corrected recognition scores by age group, reference type, and valence type. Error bars show standard errors.

I performed a 3 valence (neutral vs. mean vs. nice) x 2 reference (self vs. other) x 3 age group (6-year-olds vs. 9-year-olds vs. adults) mixed analysis of variance (ANOVA) on corrected recognition. There was a main effect of age group, $F(2, 87) = 5.21$, $p = .007$, $\eta^2_p = .107$. Follow-ups using the Bonferroni correction showed that 9-year-olds had better recognition performance ($M = .80$, $SD = .10$) than 6-year-olds ($M = .70$, $SD = .13$), $p = .005$, and that adults ($M = .74$, $SD = .12$) were not different from 6- or 9-year-olds, $p = .480$ and $p = .225$, respectively. The lack of difference in recognition memory between the adults and children may seem surprising, but it is important to keep in mind that the mean and nice items in this study were semantically related and this may have resulted in the higher false alarm rate observed for the adults (see Table 2.1), and in turn the lower corrected recognition scores. There were no significant interactions with age group (all *p*s < .18).

Consistent with prior research with adults and children (Cunningham et al., 2014; Symons & Johnson, 1997), participants were better at recognizing self items (*M* = .78, *SD* = .13) than other items (*M* = .72, *SD* = .13), $F(1, 87) = 34.84$, $p < .001$, $\eta^2_p = .286$. There was also a main effect of valence, $F(1, 87) = 30.28$, $p < .001$, $\eta^2_p = .258$; follow-up tests with a Bonferroni correction showed that the neutral items (*M* = .83, *SD* = .13) were remembered better than the mean and nice items, $p < .001$. Recognition did not differ between mean and nice items (mean: *M* = .71, *SD* = .18; nice: *M* = .70, *SD* = .16), $p = 1$. Better corrected recognition for neutral items reflects the lower false alarm rates for these items.

There was a significant valence x reference interaction, $F(2, 174) = 4.18$, $p = .017$, $\eta^2_p = .046$, suggesting that the recognition difference between self and other varied by the verb valence. Orthogonal contrasts showed that there was no difference in the magnitude of the reference effect in the mean vs. nice items, $F(1, 87) = 1.48$, $p = .228$. That is, there was no evidence of self-enhancement bias. This is consistent with prior research using the self-reference paradigm with adults (e.g., Leshikar et al., 2015). The effect driving the interaction was between the neutral and the valenced items (mean and nice combined), $F(1, 87) = 7.16$, $p = .009$—specifically, the magnitude of the difference between neutral items encoded with reference to the self and neutral items encoded with reference to another person (*M* = .85, *SD* = .14 vs. *M* = .82, *SD* = .16) was smaller than that difference for valenced items (*M* = .74, *SD* = .15 vs. *M* = .67, *SD* = .15). Despite this difference, paired samples t-tests showed that for all valence types, self items were still remembered better than other items (mean: t (89) = 3.93, $p < .001$, $d = .43$; nice: t (89) = 5.52, $p < .001$, $d = .22$; neutral: t (89) = 1.86, $p = .067$, $d = .57$).

Encoding response. Participants could choose during encoding to respond "yes" or "no" to each item. As Table 2.2 shows, the likelihood of responding "yes" or "no" varied somewhat across valence and reference types. To eliminate the possibility that any memory effects were only a result of differing levels of yes/no responses during encoding, I checked whether these responses influenced recognition memory. Because false alarms are for new items that were not present at encoding, I analyzed recognition hits rather than corrected recognition scores. I used a generalized linear mixed model (GLMM) to do logistic regression predicting recognition hits from valence x reference separately for items that received "yes" and "no" responses. This confirmed the primary finding from the main analyses: Self-referenced items were recognized more often than other-referenced items. The only exception to this was for neutral items that received a "no" response, where no self advantage was present, $z = .74$, $p = .460$. The only other difference from the primary analyses was that for items that received a "yes" response, there were more recognition hits for mean compared to nice items ($OR = 1.70$), $z = 2.44$, $p = .014$.

Table 2.2. Means and standard deviations of proportion of items receiving a "yes" response during encoding

	Nice		Mean		Neutral	
	Self	Other	Self	Other	Self	Other
6-yr-olds	.90 (.13)	.87 (.13)	.12 (.15)	.18 (.22)	.76 (.18)	.70 (.17)
9-yr-olds	.87 (.12)	.76 (.26)	.23 (.28)	.25 (.30)	.79 (.17)	.70 (.23)
Adults	.92 (.12)	.95 (.08)	.47 (.30)	.43 (.30)	.76 (.21)	.72 (.22)

Encoding response time. As with the encoding responses, participants' time spent processing each item was not experimentally controlled and therefore could vary by valence and/or reference (see Table 2.3). As described below, there were some effects of response time, but this did not alter the overall finding that recognition memory was better for self items than for other items.

Table 2.3. Means and standard deviations of encoding response times

	Nice		Mean		Neutral	
	Self	Other	Self	Other	Self	Other
6-yr-olds	1.38 (.54)	1.58 (.58)	1.63 (.61)	1.76 (.94)	1.84 (.89)	1.99 (.90)
9-yr-olds	1.27 (.47)	1.29 (.45)	1.36 (.39)	1.53 (.51)	1.40 (.56)	1.55 (.54)
Adults	.91 (.16)	1.02 (.24)	1.06 (.32)	1.16 (.30)	1.03 (.26)	1.14 (.36)

Response time was measured starting from 1 s after the end of stimulus presentation, when participants were able to make a response. The median time for each participant for each type of item was calculated and then these were transformed by log 10 before analysis due to extreme skew in the data. Using GLMM logistic regression to predict recognition hits, there was only an interaction of response time and reference type, $z = 2.04$, $p = .042$. For other-referenced items, participants had better recognition memory if they took longer to provide a response during encoding (*OR* = 1.99, 95% CI: [1.26, 3.15]). For self-referenced items, response time did not influence recognition memory, (*OR* = .75, 95% CI: [.46, 1.23]). This means that as response time increased, the difference in recognition memory between self and other items decreased. Importantly, however, memory for self was still better than other for most values of response time, as shown in Table 2.4.

Table 2.4. Predicted recognition hit rate by response time and reference type

	Self	Other
1^{st} quartile: .89s	.92	.84
Median: 1.20s	.91	.86
3^{rd} quartile: 1.86s	.91	.87

Valence ratings. In pretesting of the stimuli with adults, some nice verbs were rated as nicer than others while some mean verbs were rated as meaner. It is possible that this variation in valence was related to how well the items were remembered. Logistic regression predicting recognition hits showed that items that were rated as more strongly nice or mean were recognized at lower rates than less extreme items (nice: OR = 1.50, 95% CI[1.06, 2.13]; mean: OR = .66, 95% CI[.50, .89]) and there were no interactions with reference type, *z*s < 1.26, *p*s > .207. Therefore, this did not alter the primary finding of better memory for self-referenced items than other-referenced items across valence types.

Summary. Overall, the recognition memory results showed no self-enhancement bias: Children and adults did not have significantly better recognition memory for self-referenced nice verbs than other-referenced nice verbs or self-referenced mean verbs. These results did, however, confirm that the manipulation of self-reference versus other-reference had an influence on memory performance across age groups: Participants had better memory for self items than other items across the different valence types, encoding responses, and response times.

Source memory. Source memory was defined as the ability to remember whether a verb was encoded with reference to self or other and was measured with the single-source Conditional Source Identification Measure (Murnane & Bayen, 1996). This shows the proportion of correct source hits out of the number of items correctly recognized as old, because that helps to avoid confounding source memory and recognition memory. This measure does not, however, take into consideration biases that participants have to guess one source over another (Riefer, Hu, & Batchelder, 1994), a limitation that will be discussed further after the source memory results are presented.

Source accuracy. Table 2.5 shows response frequencies and Figure 2.2 shows source accuracy as a function of age, valence, and reference type. A 3 valence (neutral vs. mean vs. nice) x 2 reference (self vs. other) x 3 age group (6-year-olds vs. 9-year-olds vs. adults) mixed ANOVA on these data revealed a marginally significant 3-way interaction, $F(4, 174) = 2.15$, $p =$

.077. Even though this interaction was only marginal, this was the effect of primary interest in the study and thus it seemed important to pursue any potential age group differences, thus I followed up with separate ANOVAs in each age group.

Table 2.5. Response frequencies aggregated across participants by age group

	Response								
	6-year-olds			9-year-olds			Adults		
Item	**New**	**Other**	**Self**	**New**	**Other**	**Self**	**New**	**Other**	**Self**
Nice verbs									
New	**256**	15	29	**268**	20	12	**235**	42	23
Other	75	**171**	54	50	**213**	37	43	**216**	41
Self	42	43	**215**	26	42	**232**	25	35	**240**
Mean verbs									
New	**253**	29	18	**260**	28	12	**248**	26	26
Other	65	**190**	45	36	**239**	25	45	**225**	30
Self	55	82	**163**	22	46	**232**	16	37	**247**
Neutral verbs									
New	**283**	6	11	**286**	6	8	**277**	15	8
Other	44	**223**	33	34	**253**	13	31	**243**	26
Self	41	26	**233**	23	20	**257**	21	36	**243**

Note. Correct responses are in bold.

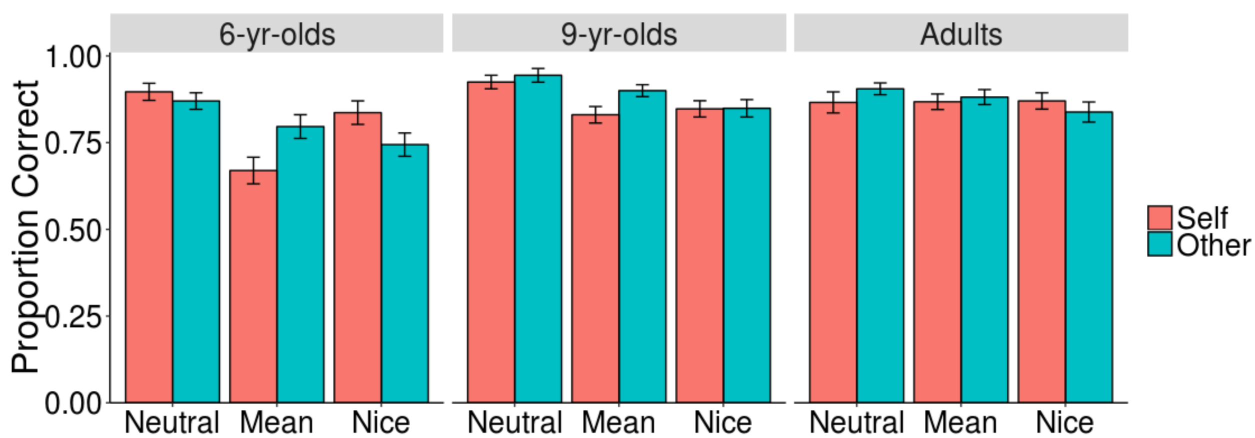

Figure 2.2. Mean source accuracy by age group, reference type, and valence type. Error bars show standard errors.

Of all the age groups, the pattern of results for the 6-year-olds seemed most consistent with self-enhancement. There was a main effect of valence, $F(2, 58) = 20.63$, $p < .001$, $\eta^2_p = .416$. Pairwise comparisons with a Bonferroni correction showed no difference between mean and nice items (mean: $M = .73$, $SD = .16$; nice: $M = .79$, $SD = .12$), $p = .09$. Neutral items were remembered better than both mean and nice items (neutral: $M = .88$, $SD = .11$), $p < .001$, which is consistent with the recognition memory results and may reflect the greater distinctiveness of these items. There was also a significant valence x reference interaction, $F(2, 58) = 7.28$, $p = .002$, $\eta^2_p = .201$, that was driven by the mean items showing a different effect of reference than the nice or neutral items, $F(1, 29) = 12.81$, $p = .001$ and $F(1,29) = 7.54$, $p = .010$. As Figure 2.2 shows, 6-year-olds remembered more other-referenced than self-referenced mean items, $t(29) = 2.19$, $p = .036$, $d = .41$, and the pattern was for better source memory for self- than other-referenced nice and neutral items, though not significantly, $t(29) = 1.61$, $p = .119$, $d = .42$ and $t(29) = .74$, $p = .460$, $d = .15$, respectively. These results are consistent with a self-enhancement memory bias, though as will be shown when examining false alarm patterns, there is reason to be hesitant of drawing this conclusion.

For 9-year-olds, the pattern of results is not consistent with self-enhancement bias. There was an effect of valence, $F(2, 58) = 18.35$, $p < .001$, $\eta^2_p = .387$: Neutral items were remembered better than both nice and mean items, $t(29) = 5.36$, $p <.001$, $d = .85$ and $t(29) = 4.15$, $p <.001$, $d = 1.17$, which did not differ from each other, $t(29) = 1.40$, $p = .17$, $d = .70$ (neutral: $M = .88$, $SD = .11$; nice: $M = .79$, $SD = .12$; mean: $M = .73$, $SD = .16$). There was no effect of reference, $F(1, 29) = 1.82$, $p = .188$, $\eta^2_p = .059$ and no valence x reference interaction, $F(2, 58) = 1.09$, $p = .342$, $\eta^2_p = .036$. The 9-year-olds showed neither an overall advantage in source memory for self-referenced items nor evidence of a self-enhancement bias.

For adults, there was no significant effect of valence, $F(2, 58) = 1.13$, $p = .329$, $\eta^2_p = .038$, reference, $F(1, 29) = .09$, $p = .769$, $\eta^2_p = .003$, nor was there an interaction, $F(2, 58) = 1.01$, $p = .370$, $\eta^2_p = .034$. Adults did not show a self-enhancement bias, nor even the typical self-reference effect where source memory for self-referenced items is better than for other-referenced items.

The presence of self-enhancement bias in the 6-year-olds, but not in either of the older two groups is surprising. As mentioned above, just measuring source accuracy does not correct for participants' guessing biases. In source memory tests, participants use various heuristics to guess when they do not remember the source of an item, and if this is not taken into account it can obscure results (Riefer et al., 1994). For example, a participant could have more Other source hits because they truly remember these items better, or because they have a tendency to guess Other when they cannot remember the source of an item. This is particularly problematic in the present study because guessing biases could obscure the self-enhancement bias or create the appearance of a non-existent self-enhancement bias.

While not an ideal measure of response bias, false alarms where participants identify new items as old ones can provide some information regarding whether participants were biased to provide one type of source response over another. It is important to note that this is only a rough estimate of bias. There is no guarantee that a bias to guess a particular source for an item incorrectly identified as old would be the same as the bias to guess that source when an item is correctly identified as old. Additionally, someone with no false alarms could still be biased to choose a particular source, but measuring bias with false alarms would not identify their bias. A related issue is that someone with more false alarms has the opportunity to have a higher bias score than someone with fewer false alarms. Despite these drawbacks, false alarms do provide some information about bias and are the only way to approximate this in the current data.

False alarms. For the self-enhancement effect, only the mean and nice items were of interest, so the neutral items were not included in this analysis.

I performed a 2 valence (mean vs. nice) x 2 response (self response vs. other response) x 3 age group (6-year-olds vs. 9-year-olds vs. adults) mixed ANOVA on the false alarm rates, shown in Table 2.6. There was a significant 3-way interaction, $F(2, 87) = 5.19$, $p = .007$, and this was followed up with separate ANOVAs in each age group.

Table 2.6. Means and standard deviations of source responses to false alarms in Study 1

	Nice		Mean		Neutral	
	Self	Other	Self	Other	Self	Other
6-yr-olds	.10 (.14)	.05 (.10)	.06 (.08)	.10 (.12)	.04 (.09)	.02 (.05)
9-yr-olds	.04 (.07)	.07 (.11)	.04 (.06)	.09 (.12)	.03 (.06)	.02 (.06)
Adults	.08 (.10)	.14 (.12)	.09 (.10)	.09 (.09)	.03 (.04)	.05 (.07)

For 6-year-olds, there was only a significant interaction of valence and response, $F(1, 29) = 5.11$, $p = .031$. They had more “other” than “self” responses to false alarms for mean items ($M = .10$, $SD = .12$ vs. $M = .06$, $SD = .08$), but more “self” than “other” responses to false alarms for nice items ($M = .10$, $SD = .14$ vs. $M = .05$, $SD = .10$). To the extent that this indicates a response bias to respond “other” to mean items and “self” to nice items, it would artificially inflate source accuracy for other-mean and self-nice items. Thus, the self-enhancement bias seen for source accuracy in this age group may not be a true memory effect, but instead reflect response bias.

Nine-year-olds were more likely to incorrectly respond “other” than “self” to new items ($M = .08$, $SD = .09$ vs. $M = .04$, $SD = .04$), $F(1, 29) = 6.89$, $p = .014$. There was no effect of valence, $F(1, 29) = 1.00$, $p = .326$, and no interaction, $F(2, 87) = .80$, $p = .380$. This shows that 9-year-olds may have had a bias to respond “other” regardless of item valence. It is difficult to say whether this bias could be covering up a self-enhancement bias. Given that self-nice and other-nice source memory was the same for this age group, it is possible that after accounting for bias, self-nice memory would better than other-nice memory. However, quite a few of the 9-year-olds did not have any false alarms with which to assess possible bias.

For adults, as with the 6-year-olds, there was a significant interaction between valence and response, *F*(1, 29) = 4.42, *p* = .044, but this interaction was driven by different effects than with the 6-year-olds. For new, mean items incorrectly identified as old, adults were equally likely to say "other" or "self" (*M* = .09, *SD* = .09 vs. *M* = .09, *SD* = .10), but for new, nice items incorrectly identified as old, adults were more likely to respond "other" (*M* = .14, *SD* = .12) than "self" (*M* = .08, *SD* = .10). Therefore, adults may have been particularly biased to respond "other" to nice items, which could have obscured self-enhancement by artificially inflating nice-other source memory hits.

In sum, the false alarm analyses show that response bias may be influencing the source memory results in different ways across age groups. Response bias could be obscuring an existing self-enhancement bias in the adults, and creating the appearance of a non-existent bias in the 6-year-olds. One analytical approach to deal with this issue is to use multinomial processing tree (MPT) models (Batchelder & Riefer, 1990). These allow for estimation of source memory separate from guessing bias. However, MPT models of the present data could not be fully estimated because there were an insufficient number of degrees of freedom. This is a common issue with MPT models from procedures comparing source memory from two sources and can be dealt with by including an additional source (Riefer et al., 1994). For this reason, I conducted Study 1a, which had three sources. The goal of Study 1a was to demonstrate a self-enhancement bias in the adult age group when guessing bias was separated from source memory. Then in Study 2, the new procedure was used to study children's memory.

Encoding response. I checked whether yes/no responses during encoding influenced source memory using a GLMM to do logistic regression predicting source accuracy from valence x reference separately for items that received “yes” and “no” responses. Given that the source memory results were different for each age group, this analysis was separated by age.

When separating “yes” and “no” items, for the 6-year-olds there was no longer the reference x valence interaction that was found in the primary analyses. For items they responded “no” to during encoding, there was no effect of reference, valence, or the interaction all *z*s < 1.06, all *p*s > .290. For the items they responded “yes” to, source memory was better for self-referenced than other-referenced items, $z = 2.40$, $p = .017$, and for neutral compared to nice items, $z = 3.09$, $p = .002$. It is possible that the effects detected in the primary analyses resulted from confounding with encoding response: For mean items, 6-year-olds were more likely to say “yes” for self than other items, and for nice items they were more likely to say “yes” for other than self items, $z = 2.26$, $p = .024$.

The results for 9-year-olds were the same here as they were in the primary analysis: Regardless of whether they responded “yes” or “no” during encoding, the only effect was that neutral items were remembered better than nice or mean ones, $z = 2.83$, $p = .005$, and $z = 2.21$, $p = .027$, respectively.

As a reminder, adults had no significant effects in the primary analysis. Here there was an interaction such that for neutral items with a “yes” response, source memory was better for other-referenced items than self-referenced items, $z = 2.04$, $p = .042$. No other differences were found for “yes” items. There were not enough nice items with “no” responses to complete the same analysis, but an analysis with reference as the only predictor found no effect, $z = .46$, $p = .648$. These results do not change the conclusions of the primary analysis regarding the lack of self-enhancement in source memory.

Encoding response time. Next I checked whether the amount of time taken to respond to an item during encoding influenced source memory. As in the previous analyses, response time was transformed by log 10 because of skew.

Using GLMM logistic regression to predict source accuracy, 6-year-olds showed a 3-way interaction of valence, reference, and response time, $z = 2.91$, $p = .004$. For mean items, 6-year-olds had better source memory for self-referenced items that they took longer to respond to, $z = 2.48$, $p = .013$, while for nice items they had better source memory for other-referenced items that they took longer to respond to, $z = 1.89$, $p = .058$. Predicted values from this model showed that across much of the range of response times, the results remained consistent with the primary analyses: Nice, self-referenced items were remembered better than nice, other-referenced items and vice versa for mean items. For neutral items, there was no interaction of response time and reference, $z = .20$, $p = .839$.

Nine-year-olds did not show any effect of response time or interactions with it, all zs < 1.47, all ps > .141.

Adults showed a 3-way interaction of valence, reference, and response time, $z = 2.14$, $p = .033$. For neutral and mean items there was no interaction of response time and reference, $z = .61$, $p = .544$ and $z = .99$, $p = .325$, respectively. For nice items, there was a marginal interaction where participants had somewhat better source memory for self-referenced items and worse memory for other-referenced items when they took longer to respond. Thus, while the primary analyses showed no significant effects, examining predicted values from this model showed that source memory for nice items may have been higher for self-reference than other-reference when these were processed for a longer time.

Valence ratings. Lastly, I examined whether ratings of niceness and meanness were related to how well items were remembered. Logistic regression predicting source accuracy showed no effect of the ratings and no interactions with reference type in any age group, *z*s < 1.77, *p*s < .078.

Summary. Overall, the source memory results showed no self-enhancement bias: 9-year-olds and adults did not have better source memory for self-referenced nice verbs than other-referenced nice verbs or self-referenced mean verbs. As discussed, biased guessing strategies may have confounded these results. While 6-year-olds did show the expected pattern for self-enhancement bias, they may have instead been due to biased guessing strategies and to the influence of the "yes"/"no" responses they gave during encoding rather than true self-enhancement.

Reminiscence goals. The narrative memory practices of parents may contribute to children being more or less biased to remember their own positive acts over their negative ones. I asked whether parents who more highly valued positive emotionality (e.g., building a positive sense of self) when talking with their children about the past had children with a stronger self-enhancement memory bias. I also examined whether parents who more highly valued directive functions (e.g., learning from past mistakes) showed the opposite effect—had children with a weaker self-enhancement memory bias. Similar to the goals that parents have for talking about the past with their children, adults in general vary in the reasons that they think and talk about their own past (Bluck, 2003). Thus, I also analyzed adults' reminiscence goals, examining whether adults who place more value on directive functions show less self-enhancement.

I used mixed-effects linear regression for all analyses, with valence type, reference type, and the moderators as predictors of source accuracy. Conclusions were drawn using likelihood ratio tests to compare models with and without the interactions with the moderators. Only mean and nice items were included in the analyses. The primary source accuracy results were different for 6- and 9-year-olds and so the two age groups were analyzed separately here. Adult data was also analyzed separately from the parent/child data because the measures were different. I used a more lenient criterion for hypothesis testing as these analyses were meant to identify potential relationships for future study.

Directive reminiscing goals were measured for both parents and adults, but positive emotionality was only included in the parent measure. For both parents and adults, I calculated centered scores by taking the average rating for the goal of interest (e.g., directive) and subtracting that individual's average rating for all goals on the questionnaire. This was done so that the measure would reflect how much that goal was valued compared to the other goals and to lessen the influence of overall frequency of reminiscing.

Descriptives. As shown in Table 2.7, on average, parents rated both Directive and Positive Emotionality reminiscing goals slightly above the midpoint between “very rarely” and “very often,” though there was considerable individual variability in these ratings. Adult participants said that they reminisced for Directive reasons on average between “occasionally” and “often.” Parents who rated Directive reminiscing goals more highly also tended to rate Positive Emotionality goals highly, but when considering the centered scores there was no relationship between the two types of goals (see Table 2.8). This indicates that some parents were overall more likely to talk with their children about the past, and emphasizes the need to use the centered scores in further analyses. Interestingly, parents who rated Positive Emotionality goals more highly had children who rated Self-Enhancement values more highly as well.

Table 2.7. Means and standard deviations of self-values and reminiscing goals

Children		
	M	*SD*
Self-enhancement	2.30	0.53
Self-transcendence	3.44	0.41
Directive	4.51	1.31
Directive (centered)	0.27	0.76
Positive emotionality	4.63	1.23
Positive emotionality (centered)	0.39	0.50
Adults		
	M	*SD*
Self-enhancement	-0.21	0.74
Self-transcendence	0.65	0.6
Directive	3.72	0.83
Directive (centered)	0.45	0.55

Note: Children's self-values scores range from 1 = "not at all important" to 5 = "very important." Parents reminiscing goal ratings range from 1 = "never" to 7 = "very often." Adults' self-values ratings were centered using their mean rating for all values. Adult reminiscing goal ratings range from 1 = "almost never" to 5 = "very frequently."

Table 2.8. Correlations of children's self-values and parents' reminiscing goals

	1	2	3	4	5	6
1. Self-enhancement	-					
2. Self-transcendence	-0.32*	-				
3. Directive	-0.08	-0.09	-			
4. Directive (centered)	-0.25	-0.13	0.60*	-		
5. Positive emotionality	0.19	-0.05	0.71*	-	-	
6. Positive emotionality (centered)	0.32*	-0.06	-	-0.15	0.55*	-

* $p < .05$

Note: Correlations not reported between centered and raw scores for different parent reminiscing goals.

Children. The general prediction was that having more directive reminiscing goals would be related to better memory for self-referenced, mean items while having more positive emotionality goals would be related to better memory for self-referenced, nice items.

For 6-year-olds there was a valence x reference x directive interaction, χ^2 (1) = 3.58, p = .058. As Figure 2.3 shows, 6-year-olds whose parents rated directive goals more highly showed less of an advantage for self-referenced, nice items compared to other-referenced, nice items.

This is generally in line with expectations, though why the effect came out so strongly on the other-referenced, nice items is not clear. For 9-year-olds, there was no interaction of directive goals with reference in predicting source memory, χ^2 (1) = .51, p = .474 and no interaction of directive goals with valence, χ^2 (1) = .13, p = .719.

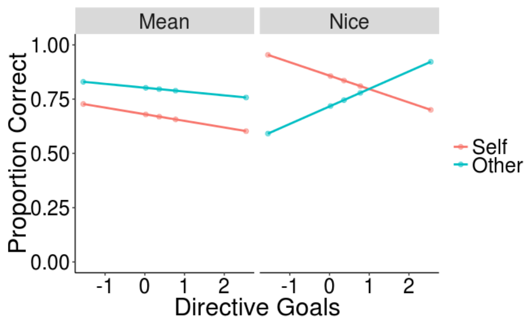

Figure 2.3. Six-year-olds' source memory by valence and reference type by levels of parents' directive goals. Points represent the minimum, 1st quartile, median, 3rd quartile, and maximum of directive goals.

Next, turning to the relationship of positive emotionality goals to source memory, both age groups showed marginally significant 3-way interactions with valence and reference, 6s: χ^2 (1) = 3.21, p = .073 and 9s: χ^2 (1) = 2.82, p = .093. As Figure 2.4 shows, in comparison to memory for self-nice items, memory for all other types of items decreased as positive emotionality increased. This finding is consistent with the prediction that parents who more highly value talking about the past to increase positive emotions in their child would have children who are better at remembering self-nice items.

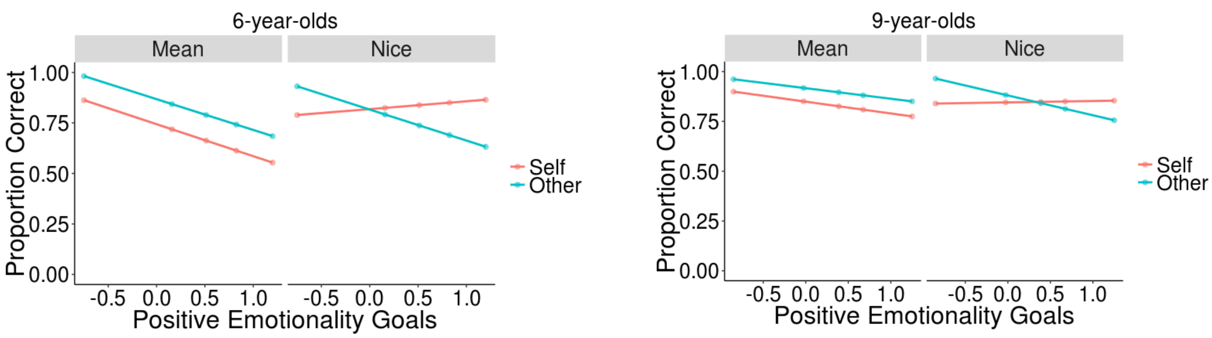

Figure 2.4. Children's source memory by valence, reference, and levels of parents' positive emotionality goals. Points show the minimum, 1st quartile, median, 3rd quartile, and max of positive emotionality goals.

Adults. Adults' directive reminiscing goals did not interact with valence or reference in predicting source memory, valence: χ^2 (1) = 2.53, p = .111 and reference: χ^2 (1) = .497, p = .481. Overall for the adult participants and contrary to predictions, there was no evidence that reminiscing goals were related to self-enhancement memory bias. This could be because of the aforementioned problems with the source memory measure and/or because the items included in the adult measure were less indicative of self-enhancement than the parent measure (see Appendices B and D). In Study 3, I added items to the adult measure to more closely address goals related to self-enhancement.

Summary. In sum, adults did not show a relationship between reminiscing goals and memory performance. For children, there was evidence that parents with stronger positive emotionality goals had children with better memory for self-referenced, nice items. Thus, there was preliminary evidence to support a link between parents' socialization practices and children's memory bias.

Self-values. The second type of moderator that I examined was self-values. I predicted one of two possible outcomes for the relationship of self-values and self-enhancement memory bias. One possibility was that participants who more highly value self-enhancement (power and achievement) would show a greater memory bias because they may be generally more likely to self-enhance. A contrasting possibility was that participants who more highly value self-transcendence (benevolence and universalism) would show a greater memory bias because being nice to others is a stronger part of their self-concept and people are more likely to self-enhance when something is more central to their sense of self (e.g., Sedikides & Green, 2000).

As with the reminiscing goals, mixed-effects linear regression was used, neutral items were not included, and all age groups were analyzed separately. As is customary with the adult

PVS (Schwartz et al., 2001), scores for each type of value were centered by subtracting each participants' average rating for all values. The child PBVS produces an average ranking for each value, which was not altered for analysis because this ranking already reflects how much a participant identifies with that value compared to the other possible values.

Descriptives. As shown in Table 2.7, both children and adults rated self-transcendence values higher than self-enhancement values. Self-enhancement and self-transcendence were negatively correlated in both the child and adult participants (see Table 2.8 and 2.9), which is consistent with Schwartz and colleagues' (2001) theory of human values that places these at opposite poles.

Table 2.9. Correlations of adults' self-values and reminiscing goals

	1	2	3	4
1. Self-enhancement	-			
2. Self-transcendence	-0.53*	-		
3. Directive	-0.17	-0.11	-	
4. Directive (centered)	0.12	0.03	0.50*	-

Children. Six-year-olds showed no significant effects of self-enhancement on source memory, all *p*s > .132. In contrast, as shown in Figure 2.5, 9-year-olds who ranked self-enhancement values more highly had better source memory for self-referenced items than other-referenced items, regardless of valence, χ^2 (1) = 6.54, *p* = .011. They were more accurate at identifying self-referenced items as such, or alternatively were more biased to respond “self” on the memory test. This is different from the predictions, which was that valence and reference type would interact.

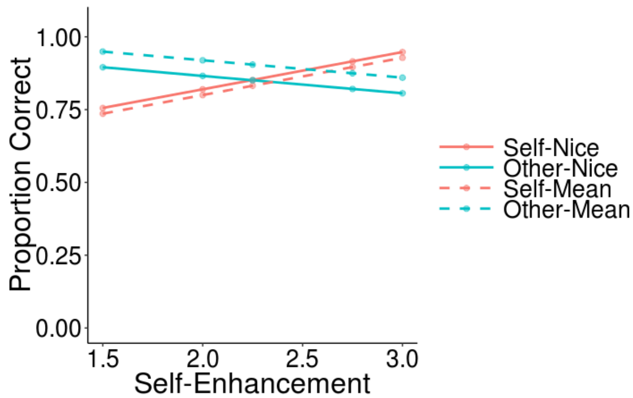

Figure 2.5. Nine-year-olds' source memory by valence and reference type across self-enhancement. Points represent the minimum, 1st quartile, median, 3rd quartile, and maximum of self-enhancement ratings.

The final analysis for the children examined self-transcendence values. Six-year-olds had no relationship between self-transcendence and source memory, all *p*s > .399. Nine-year-olds who ranked self-transcendence values more highly had worse source memory for self items than other items, regardless of valence, χ^2 (1) = 3.23, *p* = .072. However, self-enhancement and self-transcendence were strongly negatively related in this age group (*r* = -.62), *t* (21) = 3.65, *p* = .001, and so I tested both predictors together. When both self-enhancement and self-transcendence were included, the interaction of reference and self-enhancement was the stronger predictor (*b* = .17) and the interaction with self-transcendence did not add additional value (*b* = -.04), χ^2 (2) = .15, *p* = .929.

Adults. Neither self-enhancement nor self-transcendence values were related to source memory in adults, *p*s > .199. There was, however, an interaction between reference type, valence type, and self-transcendence, χ^2 (2) = 6.42, *p* = .040. As Figure 2.6 shows, self-transcendence was not related to memory for self-referenced items as had been predicted, χ^2 (1) = .29, *p* = .590. Instead, participants who rated self-transcendence more highly compared to other types of values had better memory for other-referenced, mean items and worse memory for other-referenced, nice items, χ^2 (1) = 7.26, *p* = .007. There are a few possible explanations for this. One is that people with these values have a stronger expectation that others will act positively, and so when they do not this violates their expectations to a greater extent, and results in better memory for those acts (e.g., Kroneisen et al., 2015). Another possibility is that people who value being benevolent remember more of other's negative acts in order to feel good about themselves in comparison (for similar arguments regarding self-esteem, see Ritchie et al., 2016).

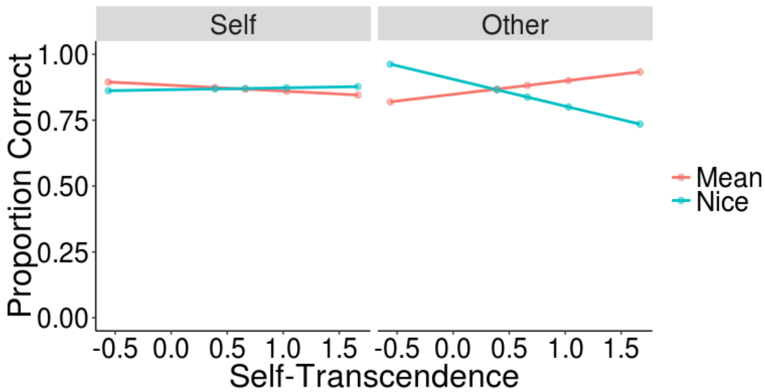

Figure 2.6. Adults' source memory by valence and reference type across self-transcendence. Points represent the minimum, 1st quartile, median, 3rd quartile, and maximum of self-transcendence ratings.

Summary. Overall, the findings for children were consistent with the prediction that greater self-enhancement values, rather than greater self-transcendence values, would be related to memory bias in self-referenced items. Conversely, the only relationship detected for adults was between self-transcendence and other-referenced items. It will be important to further explore these preliminary findings in Study 2 and Study 3.

Discussion

The main predictions for this study were 1) the typical self-reference effect, but not self-enhancement, would be observed in recognition memory, 2) self-enhancement would be found in adults' and possibly children's source memory, 3) self-enhancement may be seen to a lesser extent in the 6-year-olds compared to the 9-year-olds.

The first prediction was confirmed: Consistent with prior adult research (Leshikar et al., 2015), self-referenced items were remembered better than other-referenced items and this was not influenced by item valence. The amount of time spent processing an item was related to later memory for that item, but the self-reference effect was still present when accounting for this.

The results were not consistent with the second or third predictions. Nine-year-olds and adults did not have better source memory for self-referenced nice verbs than other-referenced nice verbs or self-referenced mean verbs. Six-year-olds did show a pattern of results consistent with self-enhancement bias, but their results were also consistent with the use of biased guessing strategies (Riefer et al., 1994). Based on analysis of the false alarm data, it seemed possible that biased guessing could have not only created the illusion of an effect for the 6-year-olds, but also obscured an existing bias in the other groups.

The findings for the moderators were mixed. For example, as predicted, parents with stronger positive emotionality goals had children with better memory for self-referenced, nice items. Directive goals, however, were only related to memory for 9-year-olds and had an unexpected relationship with memory for other-referenced items. The self-values measures showed different effects in the children and adults: Children with greater self-enhancement values had more biased memory for self-referenced items while adults with greater self-transcendence values had more biased memory for other-referenced items.

In sum, the present study did not find consistent evidence of self-enhancement across age groups, but did indicate that this procedure could be used effectively to influence children's memory. In Study 1a, I address methodological issues of this study and provide evidence that the improved procedure can detect self-enhancement bias in adult memory.

Chapter 3: Study 1a

The results of Study 1 showed that the self-reference manipulation was successful in affecting both the children's and the adult's memory performance. However, there was not good evidence for self-enhancement bias, most likely due to several aspects of the procedure. The purpose of Study 1a was to address these issues in the adult participants so that in Study 2 the new procedure could be used with children. The most important change was that three types of processing were used during encoding in Study 1a instead of only two: Self-reference, other-reference, and semantic processing. This allowed for analysis with multinomial processing tree (MPT) modeling, which provides a way to account for guessing biases in source memory (Batchelder & Riefer, 1990). Based on the Study 1 false alarm analysis, it seemed possible that guessing biases prevented the detection of self-enhancement bias; because the new analyses account for guessing biases, I expect to find evidence for self-enhancement in source memory. I also added confidence ratings to the memory test as another way to examine response bias. If participants are guessing more on certain types of items, then they should also rate themselves as less confident on these items.

Another key change was that verb phrases were used instead of solitary verbs in order to make the meaning of the items less ambiguous. For example, rather than “kick,” the item was “kick someone's leg.” In addition to switching to verb phrases, a different set of neutral items were used in this study. In Study 1, neutral items were selected using valence norms to choose only verbs that were rated as neither positive nor negative (Warriner et al., 2013), but this led to selection of verbs that were unusual because many typical activities (e.g., walking) were rated as somewhat positive. In Study 1a, I redefined neutral items as ones that are neither mean nor nice, rather than being based on typical valence ratings, with the expectation that in the context of the mean and nice items these would be seen by participants as fairly neutral. Additionally, in Study 1 verbs within the mean and nice valence types were semantically related and had social content while the neutral verbs were neither. For Study 1a three different types of neutral items were included to better match these to the mean and nice items: semantically related items (all related to the theme of getting ready in the morning), social items (all involving interaction with another person), and general items (neither semantically related nor social).

The predicted results were the same as in Study 1: I expected to find self-enhancement bias such that participants would remember self-referenced, nice verbs better than self-referenced, mean verbs, but that the opposite pattern would be found for other-referenced verbs.

Method

Participants. The final sample included 48 college students (n_{female} = 26; M_{Age} = 19.19; SD_{Age} = 1.08; $Range_{Age}$ = 18-22). An additional 12 participants were excluded because of an error in the computer program (11), and exceptionally poor memory performance (1; this participant provided the same response 27 times in a row with only one trial interrupting that pattern).

Design. As in Study 1, there were two within-participant manipulations: Valence type and reference type. Valence type was the manipulation of whether the words to be remembered were nice, mean, or neutral. Reference type was the manipulation of whether participants were asked to process the words in a self-referential, other-referential, or semantic manner.

Materials. 108 short verb phrases (e.g., cheat on a test) that represented nice, mean, and neutral actions were used. There were 36 verb phrases of each valence type; the complete list is shown in Appendix B. Many of the same mean and nice verbs from Study 1 were included here along with new ones needed because of the additional semantic reference type. Most of the neutral verbs were different from those used in Study 1 in order to provide a better match with the mean and nice items in terms of semantic relatedness and how social they were. For counterbalancing, four different combinations of the 108 verbs were created. To do this, I first made one set of 108 verb phrases where an equal number of each valence type (nice, mean, neutral) was pseudo-randomly assigned to be self-referenced, other-referenced, semantic, or a distractor item. To control for any influence of specific items, I created the remaining three sets by rotating the phrases from the first set through each of the reference types so that each phrase was self-referenced, other-referenced, semantic, and a distractor one time across all four set. Additionally, because many of our analyses relied on within-participant comparisons, when creating the original set of phrases, I assigned phrases within each valence type across self-reference, other-reference, semantic, and distractors in a way that balanced features that could influence memory: Sub-types of the verbs (e.g., for mean verbs one sub-type was physical harm, see Appendix B), word frequency (Kučera & Francis, 1967), and ratings of the magnitude of how mean or nice the verb phrases were. These ratings were generated from a pilot study with a separate group of 15 college students who rated the phrases on a 7-point scale from very nice to very mean.

For the encoding phase, the 81 verbs that were not distractors in each of the four sets of verb phrases were arranged into a different random order with the constraints that no more than two of the same valence type (nice, mean, neutral) or reference type (self, other, semantic) occurred in a row, and that half of each valence type by reference type pairing was presented in the first half of the list and the remainder in the second half of the list. Then an additional four lists were created by swapping the first and second half of each of these lists. This created a total of eight encoding lists; each participant was randomly assigned to one of these. Three additional neutral verbs were included at the beginning and end of the encoding phase to eliminate primacy and recency effects for the actual items; these were not analyzed.

At test, items were presented to a participant in one of two possible orders. The first order was generated by randomly ordering all 108 items using the same constraints as in the encoding lists. Then the second order was created by swapping the first and second halves of the original order. Each participant saw one of these lists at test. The lists were not fully crossed with the encoding lists, the original four encoding lists were paired with the first test list and the additional four encoding lists were paired with the second test list.

Procedure. Participants were instructed that they would see action phrases on the computer and for each one they would be asked a question about whether they do the action, whether the average man/woman does the action, or whether the phrase was something people say often. As in Study 1, they were not told that their memory would be tested. Before the actual encoding trials, participants completed three practice trials—one self-reference, one other-reference, and one semantic—to ensure that they understood the task. During the encoding phase, participants completed 81 trials split into two blocks with a break for a few seconds in between (the break was self-paced by the participant). Twenty-seven of the trials were self-reference, 27 other-reference, and 27 semantic. For self-reference trials, participants first saw a picture of their own face on a computer and saw the text "Do you do this?" followed 1 s later by the appearance of a nice, mean, or neutral verb phrase on the screen. For other-reference trials, they first saw a picture of an opposite-gender adult and saw the text, "Does Fran/Fred do this?" followed by a nice, mean, or neutral verb phrase. For semantic trials, they saw a plus sign on the screen and saw the text "Is it common?" followed by a nice, mean, or neutral verb phrase. Then 2 s later the phrase disappeared and a green rectangle that said "Yes" and a red rectangle that said "No" appeared on the screen underneath the picture. Participants pressed the corresponding green or red button on a button box to record their response.

After the encoding phase, participants did a 2.5 minute filler task where they listed as many names of states in the U. S. as they could think of.

Then they started the recognition test phase which included a combined old-new recognition and source memory test, as in Study 1, with the addition of a confidence rating. Participants saw a series of phrases on the computer; 81 were from the study phase and an additional 27 were new. Of the new phrases, 9 were nice, 9 were mean, and 9 were neutral. For each phrase, participants decided whether they had seen it during study as a self-reference item, an other-reference item, or a semantic item, or whether it was not seen at all during study. On each trial, the computer displayed the verb phrase, and then four rectangles appeared on the screen with the words “New,” “Me,” “Fran” or “Fred,” and “Common.” The instructions stated, “For the next part of the study, you will hear about actions again. This time, some of the actions are going to be the same as the ones you heard earlier, and some of them are going to be new ones. For each action, you will decide whether the action is: New - one that you did not hear earlier; Me - one that you heard earlier and were asked 'Do you do this?'; Fran/Fred - one that you heard earlier and were asked 'Does Fran/Fred do this?'; Common - one that you head earlier and were asked 'Is it common?'” Participants responded by pressing one of four labeled keys. After selecting a response, participants rated their confidence on a 6-point scale: 1 = completely confident, 2 = quite confident, 3 = somewhat confident, 4 = somewhat unconfident, 5 = quite unconfident, 6 = not at all confident.

Results

Analytic plan. I used two separate approaches to analyze data from the memory task. The first was the typical linear modeling approach using ANOVA, as in Study 1. This was used to examine hypotheses regarding both recognition and source memory. The advantage of this approach is that it maintains the within-participant nature of the data and allows for examining individual differences in memory performance. However, it cannot separate the effects of actual source memory from guessing bias.

The second approach was multinomial processing tree (MPT) models (Batchelder & Riefer, 1990). These were primarily used as a tool to examine source memory, though recognition memory is also included in the models. This approach provides estimates of memory retrieval processes that are separate from guessing bias (Bayen, Murnane, & Erdfelder, 1996; Bröder & Meiser, 2007). These models are not without their limitations: They make the assumption that the underlying retrieval process is a threshold process—meaning that someone either remembers something or does not remember, or remembers that something comes from one source or another (Batchelder & Riefer, 1990). Research shows that this may not be a valid assumption and that memory retrieval may be a continuous process, whereby something can be remembered by degree rather than in an all-or-none fashion (Slotnick & Dodson, 2005). Additionally, MPT analyses aggregate data across participants, eliminating the structure of the data and not allowing analyses of individual differences. In principle, it is possible to use separate models for each participant or to use hierarchical models to address these drawbacks (Smith & Batchelder, 2010), but given the particular design used here, this was not possible. Given the strengths and weakness of each approach, it will be important to include both in the following analyses.

Recognition memory. Table 3.1 shows the proportion of recognition hits and false alarms on the memory test, which were used to calculate corrected recognition. As Figure 3.1 shows and consistent with research showing an advantage for information encoded relative to the self (e.g., Symons & Johnson, 1997), corrected recognition was consistently better for self items compared to other items across valence types.

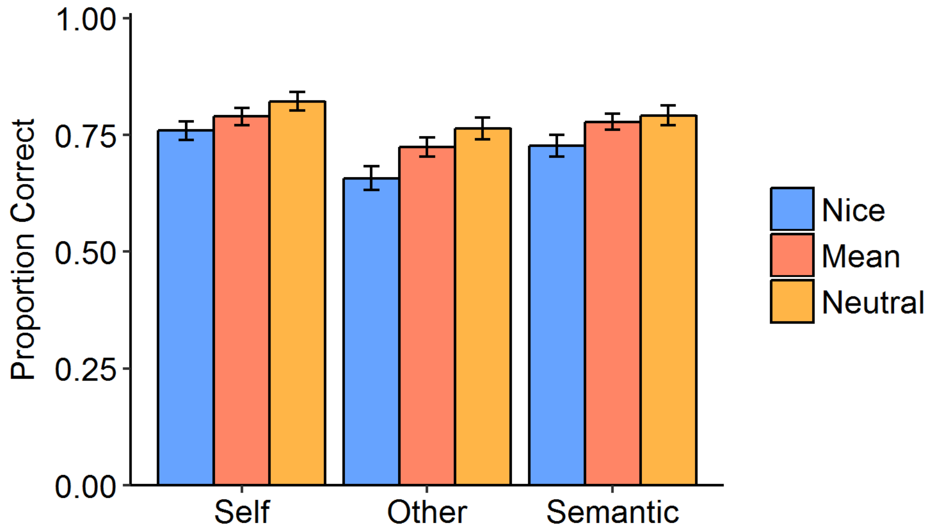

Figure 3.1. Corrected recognition by valence type and reference type. Error bars represent standard errors.

I performed a 3 valence (neutral vs. mean vs. nice) x 3 reference (self vs. other vs. semantic) repeated measures analysis of variance (ANOVA) on corrected recognition. There was no interaction, $F(4, 188) = .83$, $p = .506$, $\eta^2_p = .017$. That is, there was no evidence of self-enhancement bias because the effect of reference was not dependent on the valence of the items. This is consistent with prior research using the self-reference paradigm with adults (e.g., Durbin et al., 2017).

There was a main effect of reference, $F(2, 94) = 17.79$, $p < .001$, $\eta^2_p = .275$. Follow-up paired t-tests were consistent with Study 1: Participants were better at recognizing self items ($M = .79$, $SD = .15$) than other items ($M = .72$, $SD = .16$), $t(47) = 5.71$, $p < .001$, $d = .82$. They also remembered self items better than semantic items ($M = .77$, $SD = .16$), $t(47) = 2.21$, $p = .032$, $d = .32$, and semantic items better than other items, $t(47) = 3.60$, $p < .001$, $d = .52$.

Table 3.1. Means and standard deviations of recognition hits and false alarms

	Nice	Mean	Neutral
Self hits	.93 (.11)	.93 (.10)	.93 (.08)
Other hits	.83 (.16)	.87 (.14)	.88 (.11)
Semantic hits	.90 (.13)	.92 (.09)	.90 (.11)
False alarms	.17 (.19)	.14 (.18)	.11 (.11)

There was a main effect of valence, $F(2, 94) = 4.28$, p .017, $\eta^2_p = .084$; follow-up tests showed that the neutral and mean items were remembered better than the nice items, $t(47) = 2.64$, $p = .011$, $d = .38$, and $t(47) = 1.96$, $p = .056$, $d = .28$, respectively, and there was no difference between mean and neutral items, $t(47) = 1.10$, $p = .278$, $d = .16$ (mean: $M = .76$, $SD = .20$; nice: $M = .71$, $SD = .21$; neutral: $M = .79$, $SD = .13$). Better corrected recognition for neutral items may reflect the lower false alarm rates for these items.

Encoding response. Participants could choose during encoding to respond "yes" or "no" to each item. As Table 3.2 shows, the likelihood of responding "yes" or "no" varied somewhat across valence and reference types. To eliminate the possibility that any memory effects were only a result of differing levels of yes/no responses during encoding, I checked whether these responses influenced recognition memory. I used a GLMM to do logistic regression predicting recognition hits from valence and reference separately for items that received "yes" and "no" responses. This showed the same primary finding as the main analysis: For both "yes" and "no" responses, self-referenced items were recognized more often than other-referenced items, $z = 5.43$, $p < .001$ and $z = 2.19$, $p = .028$, respectively. Semantic items were also recognized more than other-referenced items regardless of encoding response. In the main analysis, self-referenced items were remembered marginally better than semantic items, and here they were remembered better, but only when they received a "yes" response, $z = 2.60$, $p = .010$. The effect of valence was also similar to the main analysis: Neutral items were recognized more than mean or nice, but only for items that received a “no” response, $z = 2.35$, $p = .019$ and $z = 2.08$, $p = .038$.

Table 3.2. Means and standard deviations of proportion of items receiving a “yes” response during encoding

	Nice	Mean	Neutral
Self	.87 (.12)	.31 (.16)	.79 (.16)
Other	.88 (.09)	.36 (.15)	.84 (.11)
Semantic	.88 (.10)	.40 (.19)	.87 (.12)

Encoding response time. As with the encoding responses, participants' time spent processing each item was not experimentally controlled. However, on average it did not vary much by valence or reference (see Table 3.3) and unlike Study 1, did not have any significant effects on recognition hits. A GLMM logistic regression predicting recognition hits found no main effect of response time and no interactions with valence or reference, all *z*s < 1.6, all *p*s > .10.

Table 3.3. Means and standard deviations of encoding response times

	Nice	Mean	Neutral
Self	1.05 (.20)	1.11 (.30)	1.01 (.10)
Other	1.04 (.13)	1.04 (.18)	.99 (.12)
Semantic	.98 (.13)	1.04 (.14)	.96 (.13)

Note: Response time was measured starting from 1 s after the end of stimulus presentation, when participants were able to make a response. The median time for each participant for each type of item was calculated and then these were averaged across participants.

Valence ratings. In pretesting of the stimuli, some nice phrases were rated as nicer than others while some mean phrases were rated as meaner than others. Logistic regression predicting recognition hits showed that mean items that were rated as more mean were recognized at lower rates than less extreme items (OR = .51, 95% CI[.32, .79]). Nice items, however, showed the opposite effect: Nicer items were recognized at higher rates than less extreme items (OR = .62, 95% CI[.41., .95]). There were no interactions with reference type, *z*s < .51, *p*s > .606. Therefore, this did not alter the primary findings reported above.

Summary. Overall, the recognition memory results showed no self-enhancement bias: Participants did not have significantly better recognition memory for self-referenced nice items than self-referenced mean items. These results did show the typical self-reference effect, with self-referenced items having an advantage over other-referenced items regardless of item valence, encoding response, or encoding response time.

Source memory. Table 3.4 shows response frequencies and Figure 3.2 shows source accuracy as a function of valence and reference type. A 3 valence (neutral vs. mean vs. nice) x 3 reference (self vs. other vs. semantic) repeated measures ANOVA on these data revealed a significant interaction, $F(4, 188) = 6.09$, $p < .001$, which was followed up with paired t-tests as shown in Table 3.5. The key finding regarding self-enhancement bias was that memory for self-referenced mean items was worse than memory for other-referenced mean items, self-referenced nice items, and self-referenced neutral items. Self-referenced nice items were not remembered better than self-referenced neutral items, but they were remembered better than other-referenced nice items. Thus, the self-enhancement bias was found both in poorer memory for mean items and enhanced memory for nice items.

Table 3.4. Response frequencies aggregated across participants

	Response			
Item	**New**	**Other**	**Self**	**Semantic**
Nice verbs				
New	**359**	25	16	32
Other	75	**278**	29	50
Self	31	17	**351**	33
Semantic	45	37	52	**298**
Mean verbs				
New	**370**	32	10	20
Other	57	**321**	22	32
Self	29	45	**303**	55
Semantic	34	60	66	**272**
Neutral verbs				
New	**384**	17	8	23
Other	54	**307**	14	57
Self	29	20	**346**	37
Semantic	42	28	55	**307**

Note. Correct responses are in bold.

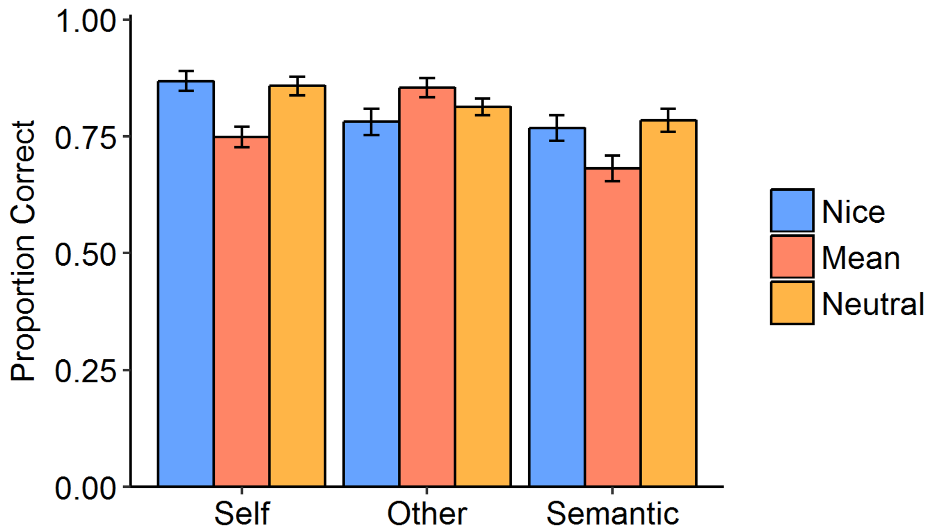

Figure 3.2. Source accuracy by valence type and reference type. Error bars represent standard errors.

Figure 3.2 shows a pattern that is consistent with source accuracy being higher for other-referenced mean items compared to other-neutral and other-nice ones, though only the comparison to nice items was significant (see Table 3.5). This is consistent with prior research showing a negativity bias in memory for others' behaviors (e.g., Buchner et al., 2009).

Table 3.5. Cohen's d for source memory comparisons

	Self-Nice	Self-Mean	Self-Neutral	Other-Nice	Other-Mean
Self-Nice					
Self-Mean	.56*				
Self-Neutral	.06	.58*			
Other-Nice	.35*	X	X		
Other-Mean	X	.51*	X	.36*	
Other-Neutral	X	X	X	.14	.23

Note: Semantic reference items are omitted from the table. Only comparisons among self-referenced and other-referenced items that were relevant to the hypotheses were tested. The "X" symbol denotes comparisons that were not tested.
* p < .05

Confidence. I recoded the confidence ratings so that higher numbers indicated greater confidence. Overall, participants were more confident when they were correct than when they were incorrect (correct: $M = 5.28$, $SD = .41$; incorrect: $M = 4.39$, $SD = .75$), $t(47) = 10.0$, $p < .001$. There was no evidence that participants were knowingly guessing more on specific combinations of valence type and reference type. Examining the items where participants gave the correct source response, mixed-effects linear regression showed no interaction of valence and reference in predicting confidence ratings, *t*s < .89, *p*s > .38. This provides some evidence that the source accuracy differences reported above were not simply an artifact of guessing biases; further evidence for this will be explored in the MPT analyses. Participants were more confident on neutral items than on mean and nice items, *t*s > 3.28, *p*s < .002 (neutral: *M* = 5.42, *SD* = .36; mean: *M* = 5.15, *SD* = .38; nice: *M* = 5.26, *SD* = .44). There was also a main effect of reference: Participants were most confident on self-referenced items (*M* = 5.53, *SD* = .44), then other-referenced items (*M* = 5.30, *SD* = .44), and then semantic items (*M* = 4.98, *SD* = .32), *t*s > 4.20, *p*s < .001. This may indicate that source accuracy for other-referenced items was inflated in the main analyses. However, taking this into account would not eliminate the self-enhancement bias: Memory for other-referenced mean items may be lower and closer to memory for self-reference mean items, but that would also mean that other-referenced nice items would be lower and further from self-referenced, nice items.

Encoding response. There were not enough "no" responses to nice items and "yes" responses to mean items to reliably examine the interaction of valence type and reference type by encoding response (see Table 3.2). However, based on the pattern of responses, it seems unlikely that differences in encoding responses would explain the source memory results. For example, participants responded "yes" slightly less often for self-referenced items than for other-referenced items across valence types, but in some cases self-referenced items were remembered better than other-referenced items and in other cases the reverse was true.

Encoding response time. Next I checked whether the amount of time taken to respond to an item during encoding influenced source memory. As with encoding response, only mean vs.

nice and the self-reference vs. other-reference were included. Response time was transformed by log 10 because of skew. A GLMM logistic regression predicting recognition hits found no main effect of response time and no interactions with valence or reference, all zs < 1.46, all ps > .14. Therefore, variation in response time could not account for the significant valence by reference interaction in the main analysis.

Valence ratings. Lastly, I examined whether the extremity of valence ratings was related to source accuracy. Logistic regression predicting source accuracy showed no effect for nice items and no interaction with reference type, zs < .18, ps > .857. There was an effect of valence ratings for mean items where ones that were rated as more mean had lower source accuracy than less extreme items (OR = .53, 95% CI[.38, .72]). There was no interaction with reference type, $z = 1.63$, $p = .102$. Thus, the meanness and niceness of items did not influence the valence by reference interaction found in the main analysis.

Summary. The source memory results showed evidence of self-enhancement bias: Participants had worse source memory for self-referenced mean items than other-referenced mean items, self-referenced nice items, and self-referenced neutral items. This effect held when encoding response time was statistically controlled. Additionally, the pattern of encoding responses indicated that these were unlikely to explain the observed effects. Moreover, based on the confidence rating analysis, the effects did not seem to be a result of guessing biases. However, that does not directly address guessing bias and so in the next section, I describe results from MPT models that separate the effects of source memory and guessing.

Multinomial model. When using MPT models, the exact model specification depends on the hypothesized cognitive processes underlying participants' responses. Here I use a model that has previously been used in similar research examining source memory for individuals' faces paired with trustworthy, untrustworthy, and neutral behavioral descriptions (Bell & Buchner, 2010, 2011). This model is based on widely accepted models of source memory (Batchelder & Riefer, 1990; Bayen et al., 1996; Riefer et al., 1994).

The model shown in Figure 3.3 consists of four multinomial processing trees, one for each type of item on the memory test (Self-referenced, Other-referenced, Semantic, and New) for a single valence type.

For analysis, there were three sets of these together in the model—for Mean, Nice, and Neutral items. See Appendix C for a brief summary of the following explanation of the model parameters. The first processing tree represents cognitive processes for an old, Self-referenced item. Within this, parameter D_{Self} refers to the probability of recognizing the item as old. This is distinct from just a response that the item is old, it is the parameter for when someone actually recognizes the item without guessing; items that are guessed as old are covered separately. For a recognized old item, parameter d_{Self} is the conditional probability that the source of the item was correctly remembered as *Self*, whereas $1\text{-}d_{Self}$ is the conditional probability that the source of the item was not remembered. If the source is not remembered, then the participant will guess. Parameter a_{Person} represents the conditional probability that they guess the source was any person (either *Self* or *Other)*, while $1\text{-}a_{Person}$ is the parameter for guessing that the source was *Semantic*. If they guess that the source was a person, then the further conditional probability that they guess it was a *Self* item is a_{Self}, and the conditional probability that they guess *Other* is $1\text{-}a_{Self}$.

The rest of the model of Self-referenced items shows the probabilities when the item is not recognized as old, which is represented by $1\text{-}D_{self}$. In this case, the item can be incorrectly identified as a new item with probability 1-*b* or guessed to be old with probability *b*. If the item is guessed to be old, then there are additional parameters representing how the participant

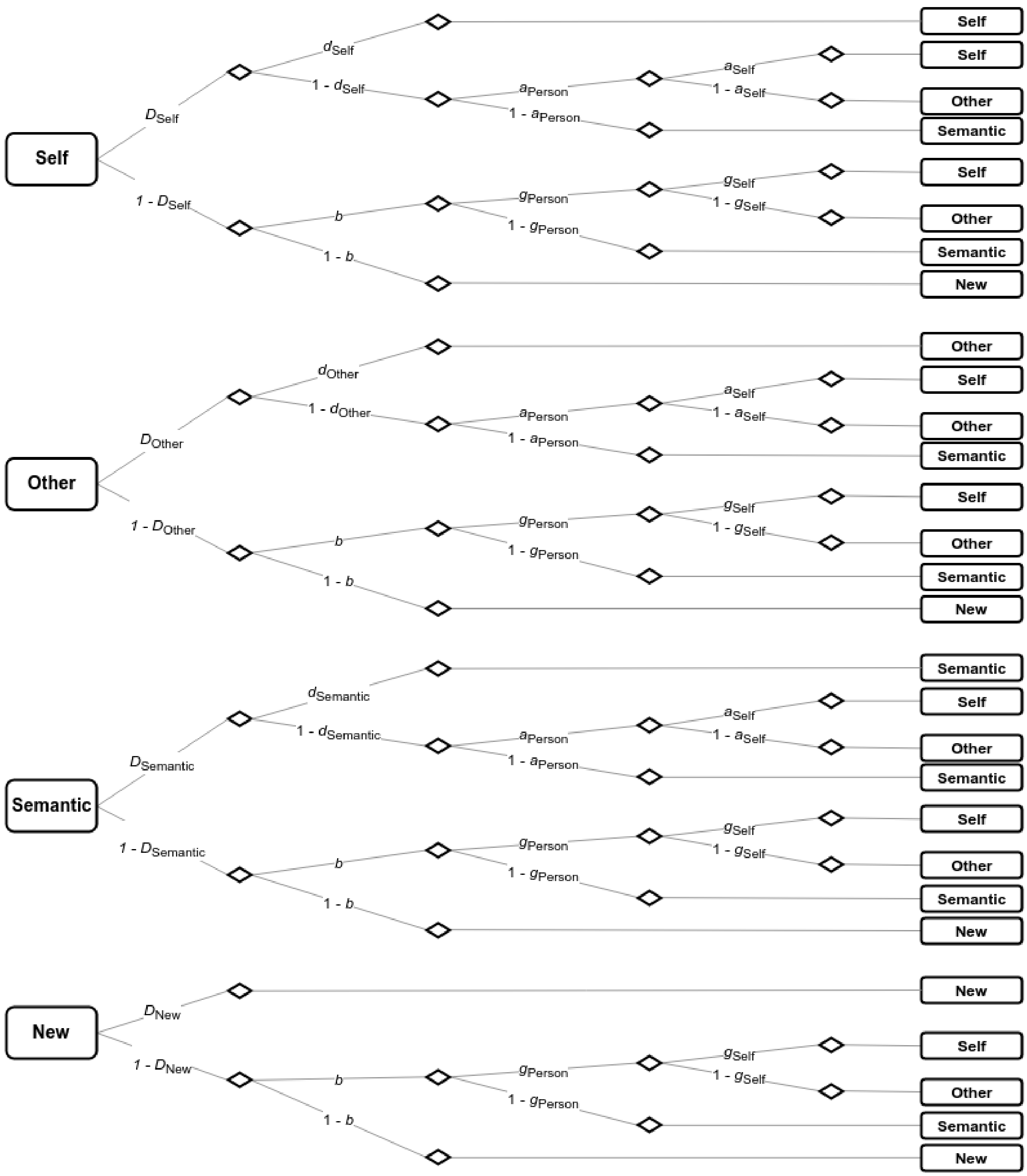

Figure 3.3. Multinomial processing tree model. Boxes on the left represent the type of item. Boxes on the right represent participants' responses. Paths between the item type and the response represent different cognitive processes that participants could use to produce a particular response to a particular type of item. Three sets of trees identical to this one were used, one for each valence type.

subsequently guesses the source of the item, which are similar to those for when the item was recognized as old. Parameter g_{Person} represents the conditional probability that they guess the source was any person (either *Self* or *Other)*, while 1-g_{Person} is the parameter for guessing that the source was *Semantic*. If they guess that the source was a person, then the further conditional probability that they guess it was a *Self* item is g_{Self}, and the conditional probability that they guess it was an *Other* item is 1-g_{Self}.

The trees for Other-referenced and Semantic items are arranged in the same manner with their own set of parameters, as shown in Figure 3.3. The tree for New items is somewhat different. The parameter D_{New} represents knowing that the item was not seen before, while 1-D_{Self} refers to not knowing whether a *New* item was seen before or not. In this latter case, the item could still be correctly guessed as new with parameter 1-*b*, or incorrectly guessed as old with parameter *b*. If the item is guessed as old, then it has a similar set of parameters for guessing the source of the item as in the previously described trees.

Each tree illustrates the possible cognitive processes that could result in each of the four possible responses on the memory test (Self, Other, Semantic, New). For example, a participant who correctly responded "Self" to a *Self* item might have 1) recognized the item as old and remembered that it was a *Self* item, 2) recognized the item as old and guessed that it was a *Self* item, or 3) guessed the item was old and guessed that it was a *Self* item, with respective probabilities of $D_{Self} * d_{Self}$, $D_{Self} * (1 - d_{Self}) * a_{Person} * (1 - a_{Self})$, and $(1 - D_{Self}) * g_{Person} * (1 - g_{Self})$. The probability that a "Self" response is given to a *Self* item is the sum of these three sets of probabilities and the multinomial model allows these to be separated from each other so that source memory without guessing (the first type of response) can be calculated.

Models were fit using the *mpt* package for R (R Core Team, 2016, version 3.3.2;

Wickelmaier, 2011, version 0.5.4). To perform hypothesis testing within this framework, I compared sets of nested models to determine whether applying certain constraints affected model fit. For example, a constrained model that sets the recognition memory parameter *D* for *Self* items equal to the parameter *D* for *Other* items could be compared to an unconstrained model where these two parameters are freely estimated. If the unconstrained model fits better, then this is evidence for a difference in recognition memory between *Self* and *Other* items because forcing them to be the same worsens the model's fit of the data. Alternatively, if there is no difference in fit between the two models, then this indicates that there is not a difference in recognition memory between *Self* and *Other* items because forcing them to be the same has no effect on the model's fit of the data. I assess goodness of fit for each model with G^2, the likelihood ratio of the fitted versus the saturated model; significant G^2 values indicate poor model fit. For model comparison, G^2 values for pairs of nested models were compared.

Base model. Before examining the source memory parameters, I compared several models to select a base model (see Table 3.6). Some parameters need to be constrained from the start to have enough degrees of freedom to estimate the model and it is best to select the most constrained model that has good fit before performing model comparisons (Bayen et al., 1996). I constrained the recognition memory parameters, but left the source memory parameters to be freely estimated. In Model 1, within each reference type the parameters were constrained across valence type so that there were single D_{Self}, D_{Other}, and $D_{Semantic}$ parameters in the model. This was done because the original ANOVA analysis revealed few differences in recognition memory across valence types, but did show consistent differences across reference type. The model had good fit and so these constraints were included in all the following models. Model 2 constrained D_{New} for neutral items to be equal to the $D_{Semantic}$ parameters. This constraint did not reduce fit compared to Model 1 and so remained in the model. Next, in Model 3 the *b* guessing parameters were constrained across valence type, but compared to Model 2 this led to marginally worse model fit. Subsequently in Model 4, only the negative and neutral *b* parameters were constrained, and this did not significantly reduce fit compared to Model 2 and so was kept in the model. Finally, in Model 5 the a_{Person} parameters for neutral and positive items were constrained to be equal and this did not reduce fit compared to Model 4.[5] Model 5 had good fit and was used as the base model for the remainder of the analysis.

Table 3.6. Model comparisons for MPT base model

Model	Parameter restrictions		AIC	G^2	*df*	*p*
1	$D1_{Self} = D2_{Self} = D3_{Self}$ $D1_{Other} = D2_{Other} = D3_{Other}$ $D1_{Semantic} = D2_{Semantic} = D3_{Semantic}$		250.1	2.92	6	.819
2	$D1_{Self} = D2_{Self} = D3_{Self}$ $D1_{Other} = D2_{Other} = D3_{Other}$ $D1_{Semantic} = D2_{Semantic} = D3_{Semantic} = D3_{New}$		248.9	3.66	7	.818
		Δ Model 1	-1.2	.74	1	.390
3	$D1_{Self} = D2_{Self} = D3_{Self}$ $D1_{Other} = D2_{Other} = D3_{Other}$ $D1_{Semantic} = D2_{Semantic} = D3_{Semantic} = D3_{New}$ $b1 = b2 = b3$		249.7	8.50	9	.485
		Δ Model 2	.8	4.84	2	.089
4	$D1_{Self} = D2_{Self} = D3_{Self}$ $D1_{Other} = D2_{Other} = D3_{Other}$ $D1_{Semantic} = D2_{Semantic} = D3_{Semantic} = D3_{New}$ $b2 = b3$		247	3.75	8	.879
		Δ Model 2	-1.9	.08	1	.760
5	$D1_{Self} = D2_{Self} = D3_{Self}$ $D1_{Other} = D2_{Other} = D3_{Other}$ $D1_{Semantic} = D2_{Semantic} = D3_{Semantic} = D3_{New}$ $b2 = b3$ $a1_{Person} = a3_{Person}$		246.1	4.87	9	.846
		Δ Model 4	-.9	1.20	2	.55

Note: The number following each parameter indicates valence type: 1 = Nice, 2 = Mean, 3 = Neutral.

[5] This last constraint was added because without it the model had difficulty estimating some of the other source memory parameters and because including it did not significantly affect overall model fit.

Recognition memory. Recognition memory was not the focus of these analyses and so no model comparisons are reported. Recall that for this model, each *D* represents the estimate across valence type. As shown in Figure 3.4, the recognition results mirrored those found in the ANOVA results reported above where self-referenced items were recognized better than semantic items, which were recognized better than other-referenced items.

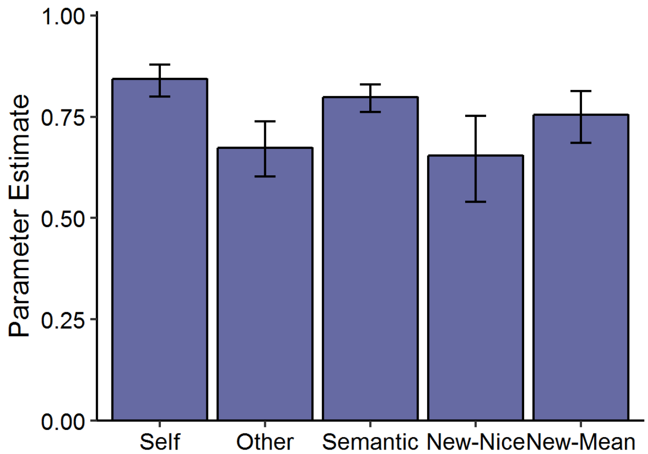

Figure 3.4. Recognition memory *D* parameter estimates with 95% confidence intervals.

Source memory. As in the ANOVA results reported previously, I expected to find self-enhancement bias in source memory: Memory for nice, self-referenced items would be better than mean, self-referenced items and the reverse would be true of other-referenced items. To examine this, I compared each valence type within each reference type. Because I was also interested in directly comparing memory for self- and other-referenced items, I compared each reference type within each valence type. This second set of comparisons is particularly important because it is more controlled in that the same exact items are present in each reference type, whereas with the comparisons of valence type the items are necessarily different.

Differences by valence type. As shown in Figure 3.5, the probability of remembering the source of a self-referenced item was not different between nice and neutral items, but was lower for mean items. The model comparisons in Table 3.7 show that constraining the d_{Self} parameter to be equal between nice and neutral items did not significantly change model fit. On the other hand, constraining it to be equal between nice or neutral and mean items did lead to worse model fit. This is consistent with a self-enhancement bias: Mean, self-referenced items were not remembered as well as nice, self-referenced items. It is interesting to note that there was no difference between the nice and neutral self-referenced items. It may be the case, as others have argued (e.g., Sedikides & Green, 2000), that difficulty remembering our own negative actions is the primary force behind self-enhancement, rather than stronger memory for our own positive actions.

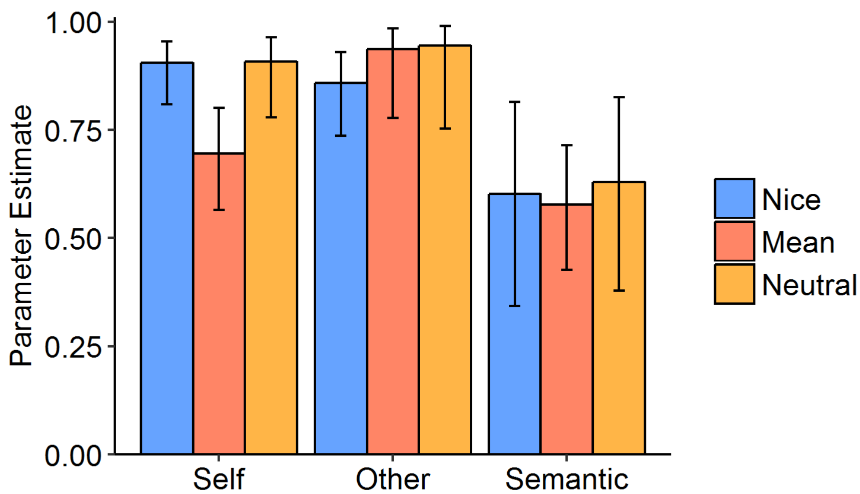

Figure 3.5. Source memory *d* parameter estimates with 95% confidence intervals.

The results for other-referenced items were less clear. Similar to the ANOVA results, Figure 3.5 shows that the difference between nice and mean items is in the expected direction: Mean items were remembered better than nice items. However, this difference was smaller than that observed for self-referenced items and model comparisons constraining the d_{Other} parameter indicated that it was not significant (see Table 3.7). It is possible that this was partly due to ceiling effects because memory for other-referenced mean items was quite high.

Table 3.7. Model comparisons by valence type

Model	Parameter restrictions		AIC	G^2	*df*	*P*
6.1	$d1_{Self} = d2_{Self}$		254.8	15.6	10	.113
		Δ		10.70	1	.001
6.2	$d1_{Self} = d3_{Self}$		244.1	4.87	10	.900
		Δ		.00	1	.940
6.3	$d2_{Self} = d3_{Self}$		250.6	11.4	10	.327
		Δ		6.53	1	.011
7.1	$d1_{Other} = d2_{Other}$		246.2	6.97	10	.729
		Δ		2.10	1	.150
7.2	$d1_{Other} = d3_{Other}$		246.6	7.38	10	.689
		Δ		2.52	1	.110
7.3	$d2_{Other} = d3_{Other}$		244.1	4.9	10	.898
		Δ		.03	1	.850

Note: The number following each parameter indicates valence type: 1 = Nice, 2 = Mean, 3 = Neutral. Model 5 was selected from the previous set of model comparisons as the base model and Δ indicates comparison to that model.

*Differences by reference type***.** Figure 3.5 shows that the probability of remembering the source of an item was not different between self- and other-referenced nice items. The model comparisons in Table 3.8 show that constraining the d_{Self} and d_{Other} parameters to be equal did not significantly change model fit. The results for neutral items mirrored this, with source memory for self- and other-referenced items not significantly different. In stark contrast to the nice and neutral items, and consistent with self-enhancement bias, Figure 3.5 shows that for mean items the probability of remembering the source of an item was better for other-referenced items than self-referenced items. This was confirmed by a significant decrease in model fit when the d_{Other} parameter was constrained to be equal to the d_{Self} parameter (see Table 3.8).

Table 3.8. Model comparisons by reference type

Model	Parameter restrictions		AIC	G^2	*Df*	*p*
8	$d1_{Self} = d1_{Other}$		244.8	5.58	10	.849
		Δ		.71	1	.400
9	$d2_{Self} = d2_{Other}$		260.2	21.0	10	.021
		Δ		16.1	1	<.001
10	$d3_{Self} = d3_{Other}$		244.5	5.28	10	.872
		Δ		.41	1	.52

Note: The number following each parameter indicates valence type: 1 = Nice, 2 = Mean, 3 = Neutral. Model 5 was selected from the previous set of model comparisons as the base model and Δ indicates comparison to that model.

Guessing biases. The final step in the MPT analysis was to examine the guessing bias parameters. Regarding recognition memory, the *b* parameters in Table 3.9 show that across valence types, when participants did not recognize an item, they were more likely than chance (25%) to guess that it was new (i.e., 1 – *b*).

Table 3.9. Guessing parameters estimated from Model 5 with 95% CIs

Parameter	Nice	Mean	Neutral
a_{Person}	.47 [.21, .75]	.62 [.44, .77]	.47 [.21, .75]
a_{Self}	.66 [.49, .79]	.64 [.49, .76]	.81 [.55, .93]
g_{Person}	.57 [.45, .68]	.69 [.58, .78]	.48 [.37, .60]
g_{Self}	.40 [.27, .54]	.25 [.14, .39]	.26 [.14, .43]
B	.48 [.38,.60]	.59 [.51,.66]	.59 [.51,.66]

Note: a_{Person} parameters for nice and neutral items were constrained equal and *b* parameters for mean and neutral items were constrained equal.

Turning to source memory, as the g_{Person} parameters in Table 3.9 show, when participants did not recognize that a nice or neutral item was old, they were more likely to guess that the item was semantic (i.e., 1 – g_{Person}) than they should have been if they were solely guessing based on the frequency of presented items. In other words, 33% of old items on the memory test were semantic, but participants tended to guess that an item was semantic about 50% of the time. The semantic category was likely the lowest-strength source, and so this finding is consistent with research showing that participants tend to use a heuristic where they select the lower-strength source more often when uncertain (Riefer et al., 1994). On mean items, however, the likelihood of guessing an item was semantic was no different from what would be expected by chance. Therefore, participants were more likely than usual to guess that a mean item was either a self or an other item rather than semantic. This general pattern was also true when participants did recognize that items were old (Table 3.9, a_{Person} parameters), though there is greater uncertainty in those estimates as demonstrated by the confidence intervals. This bias could influence typical source memory accuracy measures such that performance on self-referenced and other-referenced mean items would appear higher than it should when compared to nice and neutral items. Given the ANOVA results, this could mean that self-enhancement was in reality stronger than it appeared and that the negativity bias in memory for the other-referenced items was weaker than it appeared, which is reflected in the parameter estimates in Figure 3.5.

Next, Table 3.9 shows that when participants recognized that an item had been seen before, they were biased to guess that it was self-referenced rather than other-referenced. However, when they did not recognize the item, they were biased to guess that it was other-referenced. This is consistent with Batchelder and colleagues' (1993) prediction regarding source guessing biases in situations where recognition memory varies between sources. If someone is better at recognizing self-referenced items, then whether or not they recognize an item provides information that they can use to guess its source: They can optimize performance if they guess "self" more when they recognize an item and if they guess "self" less when they do not recognize the item. Given that participants were particularly likely to guess "other" for mean items that they did not recognize (see Table 3.9), and that they recognized other-referenced items at lower rates than self-referenced items, this could have inflated the source accuracy for other-referenced, mean items in the ANOVA results. However, as described above, the MPT results still show a difference in source memory between self-referenced and other-referenced mean items when guessing biases are accounted for.

Discussion

The results of this study show strong evidence for self-enhancement bias in adults' source memory: Self-referenced, mean verb phrases were remembered worse than both other-referenced, mean verbs and self-referenced, nice verbs. This is consistent with previous research using a variety of methods (e.g., Kouchaki & Gino, 2016; Leshikar et al., 2015; Sedikides & Green, 2000). It is possible that self-enhancement bias was detected here and not in Study 1 because the stimuli were changed from individual verbs to verb phrases, which may have clarified the meaning of the verbs, allowing for a clearer demonstration of the desired effects.

The self-enhancement effect was more apparent in the self-referenced, mean verbs rather than the self-referenced, nice verbs. There was no difference in source memory between self-referenced, nice verbs and self-referenced neutral verbs in either the ANOVA or the MPT analysis. This is in line with theoretical arguments that avoidance of negative self-relevant information is stronger than approach to positive self-relevant information (e.g., Baumeister et al., 2001; Sedikides & Gregg, 2008). However, the ANOVA results were consistent with other research showing that source memory was better for self-referenced nice verbs compared to other-referenced nice verbs (Jones & Brunell, 2014; Leshikar et al., 2015), which in some ways is a better comparison than self-referenced neutral items because it avoids the confounds present in cross-valence comparisons. It is difficult to draw a strong conclusion for this though, because the MPT results did not detect this difference. This discrepancy could either indicate that guessing biases influenced the ANOVA results, or that aggregating data across participants masked an effect in the MPT results.

In favor of the first explanation, some studies using measures of memory recall instead of source memory find no difference between self- and other-referenced positive items. For example, when participants were presented with a set of behaviors that were supposedly things they were likely to do or things someone else was likely to do, they subsequently recalled positive behaviors (e.g., “would keep secrets when asked to”) just as often for themselves as for someone else (Green, Sedikides, & Gregg, 2008). While guessing can still play a role in recall memory, it may not be as strong a factor as in source memory, which could explain why these studies are more similar to the MPT results reported here.

Regarding the second explanation, traditional MPT models make the assumption that effects are the same across individuals (Batchelder & Riefer, 1990). This may not be a valid assumption for the present study because self-enhancement is thought to vary among individuals (e.g., Jones & Brunell, 2014). It may be that worse memory for self-referenced, mean behaviors was found because it is more consistent across individuals, but better memory for self-referenced, nice behaviors may have been more variable across individuals. Future research could use hierarchical MPT modeling that accounts for both guessing biases and individual variability.

As predicted, self-enhancement was only present in the source memory test, and not in the recognition test. This is consistent with prior research (e.g., Durbin et al., 2017; Leshikar et al., 2015) and with arguments that self-referenced, negative information is remembered worse because it is less easily connected to the self and therefore effects are primarily evident in source memory (see Durbin et al., 2017).

In conclusion, the present study demonstrated an effective paradigm for studying self-enhancement bias in memory and found poorer memory for negative information related to oneself even when accounting for guessing biases. In Study 2, I extend this to show that self-enhancement is present in children's memory as well.

Chapter 4: Study 2

Study 1 showed that the self-reference manipulation was successful in affecting children's memory performance, but procedural issues obscured the expected self-enhancement effect. Study 1a was designed to eliminate some of these procedural issues, and results demonstrated the self-enhancement effect in adults' memory. The purpose of Study 2 was to examine self-enhancement in children between 8 and 10 years of age using the improved method of Study 1a.

I did not include a younger age group in the present study because I found that the 6-year-olds in Study 1 had difficulty completing the task (almost 25% were excluded for either non-completion or chance performance) and given that the task here will be longer and more difficult it seems unlikely that this procedure will be effective with the younger children. Moreover, the primary goal of this research is to demonstrate the existence of self-enhancement bias in children's memory. Exploration of the developmental progression of this bias can be addressed in future research. The 8- to 10-year-old range was chosen to represent individuals who are expected to be in the same stage of self-concept development (Harter, 2012a), and so should show self-enhancement to a similar degree.

An additional goal of this research was to explore whether there is a link between self-concept or parent-child socialization practices and children's memory bias. There were two measures of self-concept included in this study: Children's self-values (as in Study 1) and children's self-esteem. I included a measure of self-esteem as an additional aspect of self-concept because there is evidence that adults with higher self-esteem show greater self-enhancement across several domains including memory (Falk & Heine, 2015; Jones & Brunell, 2014; Jones et al., 2016; Ritchie et al., 2016). Similar to Study 1, parents completed a questionnaire about their reasons for talking about the past with their children as an indicator of their socialization practices.

Method

Participants. Participants were 39 8- to 10-year-olds (n_{female} = 21; M_{Age} = 9;9; $Range_{Age}$ = 8;4 – 11;0). Five additional children were excluded from analyses due to poor task performance, which was defined in the same way as Study 1.

Design. As in Study 1a, there were two within-participant manipulations: Valence type and reference type. Valence type was the manipulation of whether the words to be remembered were nice, mean, or neutral. Reference type was the manipulation of whether participants were asked to process the words in a self-referential, other-referential, or semantic manner.

Materials. 108 short verb phrases of nice, mean, and neutral actions were used (see Appendix D). Some of these were identical to those used with adults in Study 1a, but several of the Study 1a phrases were either not applicable to children or not easily understood by children. These items were replaced whenever possible with phrases that had a similar meaning (e.g., "whine about a job" was changed to "whine about homework"). In total, four mean phrases, seven nice phrases, and seven neutral phrases were changed from those in Study 1a.

Children saw the phrases presented on a computer screen and also heard an audio clip of the phrases at the same time. Counterbalanced phrase sets and encoding orders were generated using the same method as in Study 1a. This controlled for any influence of specific items or item order. The order of the list of items during the memory test was generated somewhat differently from in Study 1a: The criteria for generating the pseudo-random order was changed to allow three items of the same type in a row instead of only two. This was done out of concern that participants might notice the two-in-a-row rule. One memory test order was created using this pseudo-random method and a second order was made by reversing the order of the first one. Then for each of the four encoding orders, half of the participants had the first memory test order and half had the second test order.

Procedure.

Self-reference memory task.[6] Children completed a task similar to the one completed by the adults in Study 1a, but with a few adjustments. The largest difference was that children did not provide confidence ratings during the memory test because of concerns about fatigue. Additionally, the verb phrases were presented both via audio and written text; participants named fruits and vegetables during the filler task instead of U.S. states; and the response options involved pushing colored keys (e.g., to respond "Me," children pressed a yellow button with the letter "M").

Moderators: Reminiscing, self-values, and self-esteem. Parents completed the CRS (Kulkofsky & Koh, 2009), as in Study 1, but with a few additional items to address more positive and negative reminiscing situations. After the self-reference memory task, children completed the same self-values measure from Study 1 (PBVS; Döring et al., 2010) and then the Self-Perception Profile for Children (Harter, 2012b). This is a questionnaire designed for children from 2nd through 8th grade that includes subscales for global self-esteem, scholastic competence, social competence, athletic competence, and physical appearance. Children were presented with pairs of opposing statements and they selected the statement from each pair that best represents

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[6] Before the self-reference memory task, children completed a few tasks that are not relevant to the present study. These were meant as baseline data for future studies that may use priming procedures prior to the self-reference memory task. Children talked with the experimenter about their trip to arrive at the lab and were asked to focus on neutral aspects of the trip (e.g., buildings they saw, cars they heard). Then they were asked to rate how well they remembered the trip. Finally, they completed a shortened version of the PANAS for Children (Ebesutani et al., 2012) using a five-point scale of increasingly large dots to show the intensity of each emotion. They rated five negative emotions (mad, afraid, scared, miserable, sad) and five positive emotions (joyful, happy, energetic, proud, cheerful).

themselves, for example, “Some kids often forget what they learn BUT Other kids can remember things easily.” Children were given the option of reading through the questionnaire on their own or reading through it with the experimenter and most children chose to complete it alone.

Results

Recognition memory. Table 4.1 shows the proportion of recognition hits and false alarms on the memory test, which were used to calculate corrected recognition.[7] As Figure 4.1 shows, corrected recognition was consistently better for self items compared to other items across valence types.

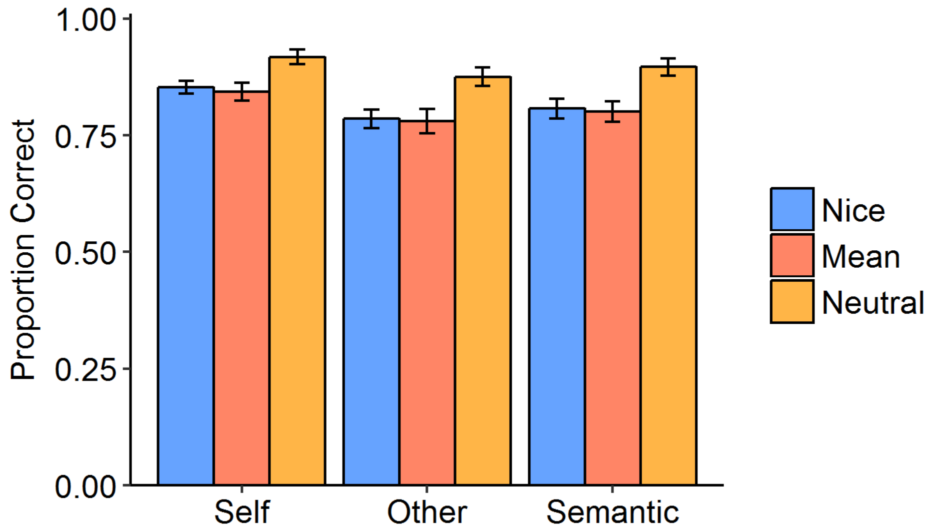

Figure 4.1. Corrected recognition by valence type and reference type. Error bars represent standard errors.

I performed a 3 valence (neutral vs. mean vs. nice) x 3 reference (self vs. other vs. semantic) repeated measures analysis of variance (ANOVA) on corrected recognition. There was no interaction, $F(4, 152) = .24$, $p = .917$, $\eta^2_p = .006$. That is, there was no evidence of self-

[7] Due to a programming error in one out of the four phrase sets, about one quarter of participants were presented with an unequal number of each type of trial. Participants were meant to see nine of each item type, but during encoding these participants saw only eight neutral-other and mean-semantic items, and they saw ten nice-other and neutral-semantic items. Then during test they saw eight nice-new items and ten mean-new items. Additionally, two other participants only saw eight nice-other items. These differences were taken into account when calculating proportions for memory performance.

enhancement bias because the effect of reference was not dependent on the valence of the items. This is consistent with the adult findings in Study 1a and is in line with predictions that self-enhancement would only bias source memory and not item memory.

There was a main effect of reference, $F(2, 76) = 10.24$, $p < .001$, $\eta^2_p = .212$. Follow-up paired t-tests were consistent with Study 1: Participants were better at recognizing self-referenced items than other-referenced and semantic items, $t(38) = 4.38$, $p < .001$, $d = .72$, and $t(38) = 2.97$, $p = .005$, $d = .48$, respectively (self: $M = .87$, $SD = .06$; other: $M = .81$, $SD = .06$; semantic: $M = .84$, $SD = .06$). Recognition of semantic and other-referenced items was not significantly different, $t(38) = 1.61$, $p = .116$, $d = .28$.

Table 4.1. Means and standard deviations of recognition hits and false alarms

	Nice	Mean	Neutral
Self hits	.93 (.08)	.93 (.10)	.97 (.06)
Other hits	.87 (.12)	.86 (.15)	.92 (.12)
Semantic hits	.89 (.15)	.88 (.12)	.95 (.07)
False alarms	.08 (.10)	.08 (.14)	.05 (.12)

There was a main effect of valence, $F(2, 76) = 8.57$, $p < .001$, $\eta^2_p = .184$; follow-up tests showed that the neutral items were remembered better than the nice items and mean items, $t(38) = 4.16$, $p < .001$, $d = .70$, and $t(38) = 3.41$, $p = .002$, $d = .57$, respectively (mean: $M = .81$, $SD = .12$; nice: $M = .82$, $SD = .09$; neutral: $M = .90$, $SD = .10$). Recognition did not differ between mean and nice items, $t(38) = .26$, $p = .797$, $d = .02$. This is similar to the results observed in Study 1a with adults and may reflect that the neutral items were less related to each other and to the rest of the items.

Encoding response. Participants could choose during encoding to respond “yes” or “no” to each item and, as Table 4.2 shows, the likelihood of responding “yes” or “no” varied across valence and reference types. To eliminate the possibility that any memory effects were only a result of differing levels of yes/no responses during encoding, I checked whether these responses influenced recognition memory. I used a GLMM to do logistic regression predicting recognition hits from valence and reference separately for items that received “yes” and “no” responses. This showed the same primary finding as the main analysis: For both “yes” and “no” responses, self-referenced items were recognized more often than other-referenced and semantic items, *z*s > 2.24, *p*s < .025. For the effect of valence, neutral items were recognized more than nice ones when the encoding response had been “yes,” $z = 3.94$, $p < .001$, and they were recognized more neutral items than mean ones when the encoding response had been “no,” $z = 3.87$, $p < .001$. This likely occurred because of the larger number of “yes” responses to nice items and “no” responses to mean items, and so does not change the interpretation of the main analysis—mean and nice items were recognized equally well and not as accurately as neutral items.

Table 4.2. Means and standard deviations of proportion of items receiving a “yes” response during encoding

	Nice	Mean	Neutral
Self	.83 (.13)	.13 (.17)	.74 (.18)
Other	.80 (.21)	.12 (.17)	.76 (.19)
Semantic	.80 (.13)	.27 (.22)	.82 (.14)

Encoding response time. As with the encoding responses, participants' time spent processing each item was not experimentally controlled. On average, it did not vary much by valence or reference (see Table 4.3), but unlike the adults in Study 1a, response time was related to children’s recognition memory. A GLMM logistic regression predicting recognition hits from the log 10 of response time found an interaction with reference type: At longer response times, semantic items were recognized at a higher rate and so were closer to self-referenced items than they were at slower response times, $z = 1.94$, $p = .052$. Importantly, however, memory for self-reference items was still better than semantic items for most values of response time. There was also an interaction with valence type: There was a smaller difference in recognition of neutral and nice items at slower response times, $z = 2.12$, $p = .034$. As with reference type, this did not alter the primary findings because neutral item recognition was still higher than nice item recognition across much of the range of response times.

Table 4.3. Means and standard deviations of encoding response times

	Nice	Mean	Neutral
Self	1.18 (.26)	1.25 (.38)	1.18 (.16)
Other	1.23 (.27)	1.29 (.23)	1.30 (.32)
Semantic	1.24 (.26)	1.38 (.60)	1.32 (.373)

Note: Response time was measured starting from 1 s after the end of stimulus presentation, when participants were able to make a response. The median time for each participant for each type of item was calculated and then these were averaged across participants.

Valence ratings. In pretesting of the stimuli, some nice phrases were rated by an adult sample as nicer than others while some mean phrases were rated as meaner than others.[8] Logistic regression predicting recognition hits showed that mean items that were rated as more mean were recognized at lower rates than less extreme items (OR = .66, 95% CI[.39, .97]). Nice items, however, showed no effect of valence ratings on recognition, $p = .33$, $p = .745$. Furthermore, there were no interactions with reference type for mean or nice items, *z*s < .75, *p*s > .451, showing that the degree of niceness or meanness did not alter the primary recognition findings.

Summary. Similar to the adults in Study 1a, children showed no self-enhancement bias in recognition memory. They did show the typical self-reference effect here as the children in Study 1 had, with self-referenced items having an advantage over other-referenced and semantic items regardless of item valence, encoding response, or encoding response time.

Source memory. Figure 4.2 shows source accuracy and Table 4.4 shows response frequencies as a function of valence and reference type. A 3 valence (neutral vs. mean vs. nice) x

[8] Valence ratings were only available for items that were the same as those used in Study 1a; the new items added in this study were not rated.

3 reference (self vs. other vs. semantic) repeated measures ANOVA on these data revealed a significant interaction, $F(4, 152) = 2.97$, $p = .021$, which was followed up with paired t-tests (see Table 4.5).

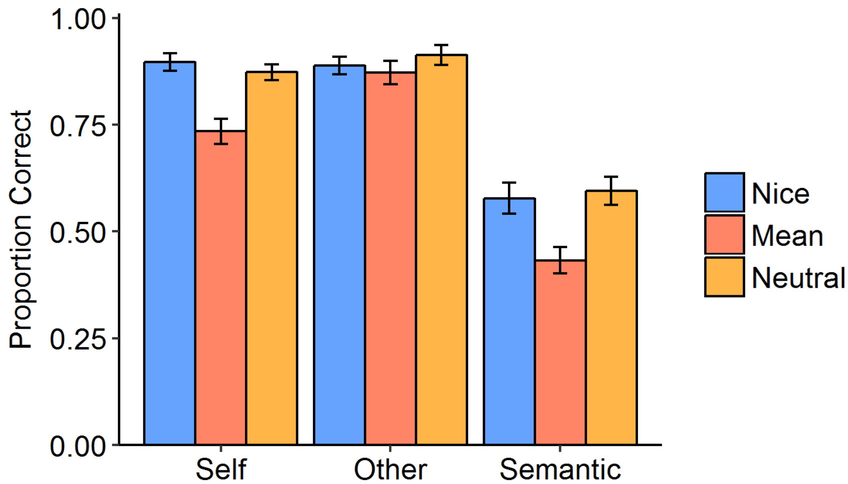

Figure 4.2. Source accuracy by valence type and reference type. Error bars represent standard errors.

Children showed evidence of self-enhancement bias: Memory for self-referenced mean items was worse than memory for other-referenced mean items, self-referenced nice items, and self-referenced neutral items. Self-referenced nice items were not remembered better than self-referenced neutral items or other-referenced nice items. Thus, the self-enhancement bias was found only in poorer memory for mean items and not in enhanced memory for nice items. Figure 4.2 shows no evidence of a negativity bias in memory for others' behaviors and the paired t-tests found no differences among the other-referenced items.

Table 4.4. Response frequencies aggregated across participants

	Response				
Item	**New**	**Other**	**Self**	**Semantic**	**Total**
Nice verbs					
New	**319**	9	14	9	351
Other	48	**284**	21	14	367
Self	23	16	**301**	20	360
Semantic	41	38	97	**184**	360
Mean verbs					
New	**337**	13	11	8	369
Other	50	**273**	16	21	360
Self	28	55	**244**	33	360
Semantic	42	71	106	**132**	351
Neutral verbs					
New	**339**	5	8	6	358
Other	28	**294**	20	9	351
Self	12	27	**301**	20	360
Semantic	19	40	101	**209**	369

Note. Correct responses are in bold. The total number of each type of item varied somewhat due to a technical error and is displayed in the rightmost column.

Table 4.5. Cohen's d for source memory comparisons

	Self-Nice	Self-Mean	Self-Neutral	Other-Nice	Other-Mean
Self-Nice					
Self-Mean	.79*				
Self-Neutral	.16	.63*			
Other-Nice	.06	X	X		
Other-Mean	X	.51*	X	.08	
Other-Neutral	X	X	X	.14	.23

Note: Semantic reference items are omitted from the table. Only comparisons among self-referenced and other-referenced items that were relevant to the hypotheses were tested. The "X" symbol denotes comparisons that were not tested.
* $p < .05$

Encoding response. There was a large difference in "yes" and "no" response rates among valence types (see Table 4.2). For this reason, there was insufficient data to examine the interaction of valence type and reference type separately for "yes" and "no" items. Thus, I cannot eliminate the possibility that these responses played some role in the observed effects. However, on average the difference in "yes" responses between self-referenced and other-referenced items within each valence type was minimal and so it seems unlikely that this would explain the source memory findings.

Encoding response time. Next I checked whether the amount of time taken to respond to an item during encoding influenced the valence type by reference type interaction. Given that the primary interest was in the mean vs. nice and the self-reference vs. other-reference comparisons, the neutral and semantic items were not included. A GLMM logistic regression predicting recognition hits from log 10 of response time found no 3-way interaction with valence and reference, $z = 1.18$, $p = .239$. Therefore, variation in response time could not account for the significant valence by reference interaction in the main analysis.

Valence ratings. Lastly, I examined whether the extremity of valence ratings was related to source accuracy. Logistic regression predicting source accuracy showed no effect for mean items and no interaction with reference type, zs < 1.26, ps > .209. Thus, the difference in source memory for self-referenced and other-referenced mean items observed in the primary analysis was present regardless of how mean the items were. There was an interaction with reference type for nice items, $z = 2.48$, $p = .013$: Self-referenced items that were rated as nicer had higher source accuracy than less extreme items while other-referenced items that were rated as nicer had lower source accuracy than less extreme items.

Summary. The source memory results showed evidence of self-enhancement bias: Participants had worse source memory for self-referenced mean items than other-referenced mean items, self-referenced nice items, and self-referenced neutral items. This effect held when encoding response time was controlled and the pattern of encoding responses indicated that these were also unlikely to explain the observed effects.

Moderators. I used GLMM to predict source accuracy from the 3-way interaction of valence type, reference type, and each moderator. Only mean and nice items that were self-referenced or other-referenced were included in the analyses.

Parent reminiscing goals. I examined whether self-enhancement bias in source memory was stronger for children whose parents highly valued positive emotionality reminiscing goals and whether it was weaker for children whose parents highly valued directive goals. As in Study 1, I calculated centered scores of the parent reminiscing goals by taking the average rating for the goal of interest (e.g., directive) and subtracting that individual's average rating for all goals on the questionnaire. The centered scores reflect how much each goal was valued compared to the other goals and they lessen the influence of overall frequency of reminiscing. Four parents completed the questionnaire incorrectly and were excluded from the following analyses.

As shown in Table 4.6, on average, parents rated positive emotionality goals higher than directive goals, $t(34) = 3.80$, $p < .001$. The centered scores showed that on average parents rated directive goals close to the average for all goals (i.e., close to zero) and they rated positive emotionality goals above the average. This is consistent with observational research showing that American parents tend to focus more on their children's positive behaviors compared to their negative ones in conversations about the past (e.g., P. J. Miller et al., 2012). As in Study 1, there was a strong positive correlation between the raw scores for positive emotionality and directive goals (see Table 4.7), but not between the centered scores.

Table 4.6. Means and standard deviations of reminiscing goals, self-values, and self-esteem

	M	*SD*
Directive	4.68	.93
Directive (centered)	.03	.48
Positive emotionality	5.14	.97
Positive emotionality (centered)	.48	.37
Self-enhancement	1.99	.48
Self-transcendence	3.44	.39
Global self-esteem	3.32	.65

Note: Parents' reminiscing goal ratings range from 1 = "never" to 7 = "very often." Children's self-values scores range from 1 = "not at all important" to 5 = "very important." Children's self-esteem scores range from 1 to 4, with higher scores indicating higher self-esteem.

Table 4.7. Correlations of reminiscing goals, self-values, and self-esteem

	1	2	3	4	5	6	7
1. Directive	-						
2. Directive (centered)	.26	-					
3. Positive emotionality	.72*	-	-				
4. Positive emotionality (centered)	-	-.40*	.29	-			
5. Self-enhancement	-.29	.41*	-.48*	-.01	-		
6. Self-transcendence	-.08	-.26	.04	-.03	-.40*	-	
7. Global self-esteem	.00	-.12	.14	.21	-.07	-.24	-

* $p < .05$
Note: Correlations are not reported between centered and raw scores for different parent reminiscing goals.

There were no significant 3-way interactions with positive emotionality or directive goals, *z*s <.70, *p*s > .48. Thus, I was unable to find evidence that parents' reminiscing goals moderated children's self-enhancement bias.

Self-values. I predicted that children who more highly valued self-enhancement would show a greater memory bias because they may be generally more likely to self-enhance. On average, children rated self-transcendence goals as more important than self-enhancement goals, $t(38) = 12.42$, $p < .001$ and self-transcendence was negatively related to self-enhancement (see Table 4.6 and 4.7), which is consistent with prior research (e.g., Döring et al., 2015). There was no evidence that children's self-values moderated their self-enhancement memory bias: There were no significant 3-way interactions with self-enhancement or self-transcendence in predicting source accuracy, *z*s < .97, *p*s > .33.

Self-esteem. I expected that children with higher self-esteem would have more self-enhancement bias than children with lower self-esteem. On average, children in this sample had high self-esteem (see Table 4.6) and were similar to children in other studies that have used this measure (Harter, 2012b). In contrast to the predictions, there was no 3-way interaction with self-esteem and therefore this study was unable to find evidence that self-esteem moderated the self-enhancement bias, $z = .45$, $p = .65$.

Discussion

Mirroring the results with adults in Study 1a, this study showed evidence for self-enhancement bias in children's source memory: Self-referenced, mean verbs were remembered worse than other-referenced, mean verbs and self-referenced, nice verbs. This occurred even though children responded "yes" and "no" to self-referenced and other-referenced mean verb phrases at about the same rates and on average spent around the same amount of time processing those items during encoding.

Multinomial processing tree analyses were not performed on the data from this study because the model structure used in Study 1a was unable to fit the data. Therefore, it is possible that guessing biases contributed to the source memory differences reported here. It will be important in future research to show that self-enhancement bias is present in children's memory even when accounting for guessing biases.

The self-enhancement effect was only present in the self-referenced, mean verbs; there was no difference in source memory between self-referenced, nice verbs and self-referenced neutral verbs or the other-referenced, nice verbs. This differs somewhat from the results from adults in Study 1a, who did show a memory advantage for self-referenced, nice verbs compared to other-referenced, nice verbs in the ANOVA results. This could have happened for a number of reasons. For example, it might reflect an actual difference between the age groups, with children being particularly affected by the mean items. Alternatively, in the adult data the difference in the nice items might have been an artifact of guessing biases, as the MPT analyses did not detect a difference.

Additionally, as with the adults in Study 1a and in prior research (e.g., Durbin et al., 2017), self-enhancement was only present in source memory, not in recognition memory. Children's recognition was better for self-referenced compared to other-referenced verbs, but this effect was not influenced by whether the verbs were mean or nice. This fits with the argument that self-enhancement in memory results from differences in the ease of making connections to the self, which primarily affects source memory rather than item memory.

To address potential mechanisms of self-enhancement memory bias, I examined aspects of children's self-concept and parents' reminiscing goals, but no evidence was found for moderation by any of these. Parent reminiscing goals and self-values had both shown some relationships to memory performance in Study 1, but these effects were not replicated here. Based on prior research with adults (e.g., Jones et al., 2016), self-esteem was another possible moderator, but I found no evidence to support this in the present study. There are several possible explanations for the inability of the present research to find evidence of moderation including low power or aspects of the memory task. For example, source memory performance was quite high on some types of items, such as self-referenced nice items, and these ceiling effects may have prevented moderator effects from emerging. Alternatively, it is possible that the moderators studied here are not, in fact, related to self-enhancement bias in childhood; future research that addresses the aforementioned methodological concerns is needed.

In conclusion, this study and Study 1a showed that both children and adults have self-enhancement bias in memory. The next important step is to explore potential mechanisms of these effects, which are addressed in Study 3.

Chapter 5: Study 3

Study 1a showed self-enhancement in adults' memory. The purpose of Study 3 was to replicate the results of Study 1a with another sample of adults, and to begin investigating questions about the psychological mechanism behind self-enhancement by adding an experimental manipulation of self-concept. There are two types of mechanisms proposed to explain self-enhancement bias: 1) A cognitive mechanism whereby positive self-concept facilitates remembering and 2) a motivational mechanism in which self-threatening information is minimized. Up until this point I have primarily explained the phenomenon using only the cognitive mechanism.

From the cognitive perspective, self-enhancement biases result from inaccuracies in information processing or influences of prior beliefs and expectancies (Kelley & Jacoby, 2012; D. T. Miller & Ross, 1975; for a review, see Schriber & Robins, 2012). Specifically with regard to memory, self-enhancement arises from the well-elaborated, and mostly positive, structure of self-concept facilitating encoding and retrieval of consistent (i.e., positive) information about oneself and also making it more difficult to encode and retrieve inconsistent (i.e., negative) information. This process is malleable in that at any given moment, certain aspects of self-concept are more active than others (Conway & Pleydell-Pearce, 2000). Thus, even if someone's self-concept is primarily positive, it is possible to activate their more negative self-views, which then influences memory.

From the motivational perspective, negative information about oneself is threatening to positive self-views, and people are unconsciously motivated to minimize this information in order to reduce its impact. Minimization occurs by disconnecting the negative information from the rest of self-concept, which makes it more difficult to encode and retrieve (Green et al., 2008).

This is similar to the cognitive mechanism, but rather than existing knowledge about the self passively facilitating memory, this is a more active compensatory mechanism.

Importantly, the two mechanisms make different predictions about when self-enhancement will occur. Following from the cognitive mechanism, self-enhancement will be present when positive self-views are active. If, however, someone's negative self-views are activated—for example, by thinking about a time in the past when they did something wrong—then this would instead facilitate memory for negative information about the self or at least result in lesser facilitation of positive information than would typically be seen. On the other hand, the motivational mechanism would predict the opposite result: When negative self-views are activated, this should create a state of self-threat and activate compensation, which would be expected to manifest as either worse memory for subsequent negative information, thus protecting the self from further damage, or better memory for positive information to recover from the threat.

The cognitive and motivational mechanisms likely both contribute to self-enhancement bias, but one may be more predominant in certain circumstances than the other (Schriber & Robins, 2012). The proposed manipulation in the present study is meant to demonstrate the causal role of self-concept and provide evidence for the cognitive or motivational mechanism.

In the present study, I primed participants by asking them to recall one of their own memories prior to completing the memory task that was used in Study 1a. Prior research shows that recalling a memory makes self-concept more accessible. In Charlesworth, Allen, Have and Moulin (2015), for example, after recalling a positive memory, adults were able to generate more statements about themselves to complete the prompt "I am ___." While this does not show whether recalling the memory activated specific, related aspects of self-concept, it is reasonable to expect that this would occur based on other findings that both positive and negative memories are organized around related self-views (Rathbone & Moulin, 2014; Rathbone & Steel, 2015).

I chose this priming manipulation because it fits with a larger theoretical framework of autobiographical memory known as the self-memory system (SMS; Conway & Jobson, 2012; Conway & Pleydell-Pearce, 2000). In the SMS, self-concept (including motivations) influences encoding, organization, and retrieval of autobiographical memories, and memories in turn contribute to self-concept. Therefore, in thinking about self-enhancement's role in this system, the proposed study will use the recall of a positive or negative memory to influence self-concept, which should then affect memory for new information related to the self.

In the present study, participants recalled a memory of doing something bad (e.g., cheating) or something good (e.g., helping someone). My prediction was that afterwards, when they completed the self-reference memory task from Study 1a, their performance would be different from participants who did not recall one of these memory (see summary in Table 5.1). According to the cognitive mechanism, recalling a memory of doing something bad should increase accessibility of negative self-views and lead to better memory for the self-referenced, mean verbs and/or worse memory for the self-referenced, nice verbs. Alternatively, according to the motivational mechanism, recalling a memory of doing something bad should lead to better memory for the self-referenced, nice verbs and/or worse memory for self-referenced, mean verbs as compensation for the self-threat. According to the cognitive mechanism, recalling a memory of doing something good would increase memory for self-referenced, nice verbs, while according to the motivational mechanism, it might increase memory for self-referenced, mean verbs because it would serve as a protective factor against the self-threat that would normally lead to poorer memory for those items.

Table 5.1. Predictions for memory performance as compared to the Neutral condition

Cognitive Mechanism

Manipulation	Theoretical mediator	Memory for self-referenced verbs
Recall good deed	Increased accessibility of positive self-views Decreased accessibility of negative self-views	Better memory for nice verbs Worse memory for mean verbs
Recall bad deed	Decreased accessibility of positive self-views Increased accessibility of negative self-views	Worse memory for nice verbs Better memory for mean verbs

Motivational Mechanism

Manipulation	Theoretical mediator	Memory for self-referenced verbs
Recall good deed	Decreased self-threat	No effect on memory for nice verbs Better memory for mean verbs
Recall bad deed	Increased self-threat	Better memory for nice verbs Worse memory for mean verbs

I included one additional condition to control for the potential confounding effect of negative affect in the bad deed memory condition. In this negative memory condition, participants recalled a time when something happened to them that made them feel negative emotions—a time when they were the recipient of a bad action, rather than when they were the one performing the action. The rationale for this was that it would generate negative emotional responses, but would not activate self-concept in the same way that recalling one's own bad deed would.

The negative memory condition is important given the influence of affect on information processing (for a summary, see Clore, Gasper, Garvin, & Forgas, 2001). In particular, research by Bless and colleagues (1996) showed that after participants recalled a sad memory, they had better recognition of schema-inconsistent information from a story compared to when they had recalled a happy memory. This was explained by more systematic processing and less reliance on schemas in the sad memory condition. In the present study, better memory for schema-inconsistent information would translate into better memory for self-referenced, mean verbs, which is the same prediction made for the cognitive mechanism of self-enhancement after recall of one's own bad deed. Thus, it would be uncertain whether the results reflect activation of negative self-concepts or a general change in processing strategy resulting from negative mood induction. Comparison to the additional negative memory condition may clarify this if the results differ between the two conditions.

Method

Participants and Design. Participants were 224 college students. Each participant was randomly assigned to one of four possible conditions where they wrote about a particular type of memory prior to completing the self-reference memory task: *Neutral Prime* (n_{female} = 32; M_{Age} = 19.1), *Mean Prime* (n_{female} = 33; M_{Age} = 19.0), *Nice Prime* (n_{female} = 36; M_{Age} = 19.2), and *Negative Prime* (n_{female} = 32; M_{Age} = 18.9). In the self-reference memory task, there were two within-participant manipulations: Valence type and reference type. Valence type was the manipulation of whether the words to be remembered were nice, mean, or neutral. Reference type was the manipulation of whether participants were asked to process the words in a self-referential, other-referential, or semantic manner.

Materials. Participants saw the same 108 short verb phrases of nice, mean, and neutral actions from Study 1a (see Appendix B). They also heard an audio clip of the phrase at the same time that the text was displayed on the computer screen. This was to make the procedure more similar to the one used with children in Study 2. The same counterbalanced phrase sets as in Study 1a were used to control for any influence of specific items and the same encoding orders were used. The only difference from Study 1a was that the order of the list of items during the memory test was generated differently. As in Study 2, the criteria for generating the pseudo-random orders was loosened to allow three items of the same type in a row instead of only two. This was done out of concern that participants might notice the two-in-a-row rule. One memory test order was created using this pseudo-random method and a second order was made by reversing the order of the first one. Then for each of the four encoding orders, half of the participants had the first memory test order and half had the second test order.

Procedure.

Memory priming and ratings. In the first phase of the study, participants in all conditions were asked to write about a memory. Table 5.2 shows the exact instructions given to participants in each condition.

Table 5.2. Memory prime instructions

Condition	Instructions
Neutral Prime	Think about the last time that you walked across campus, **use a detached and unemotional attitude** while you do this. For example, for this prompt people often write about where they were coming from and where they were going, which buildings they passed, what the weather was like, what pace they walked at, and what they were carrying. Please describe your walk in as much detail as possible so that a person reading this would understand exactly where you walked, but remember to **remain neutral and unemotional**.
Mean Prime	Think of a time in the recent past, in the last several months, when **you did something bad** that made you feel **guilt, regret, or shame**. For example, for this prompt people often write about times when they **acted selfishly at the expense of someone else, took advantage of a situation and were dishonest, or were untruthful or disloyal**. Please describe the situation and any thoughts and feelings you remember from the experience in as much detail as possible so that a person reading this would understand the situation, what happened, and how you felt.
Nice Prime	Think of a time in the recent past, in the last several months, when **you did something good** that made you feel **happy, proud, or pure**. For example, for this prompt people often write about times when they **acted selflessly to help someone else, did the right thing and were honest, or were truthful or loyal**. Please describe the situation and any thoughts and feelings you remember from the experience in as much detail as possible so that a person reading this would understand the situation, what happened, and how you felt.
Negative Prime	Think of a time in the recent past, in the last several months, when **something negative happened to you** that made you feel **disappointed, sad, or anxious**. For example, for this prompt people often write about times when **something unfair happened to them, they were left out of an activity, or someone made fun of them**. Please describe the situation and any thoughts and feelings you remember from the experience in as much detail as possible so that a person reading this would understand the situation, what happened, and how you felt.

Note: Bold text is to highlight condition differences, it was not present in the instructions given to participants.

Participants were given ten minutes to think and write about the memory and were told to spend the entire time on that. Pilot testing showed that this amount of time was sufficient for most participants to write about a complete event. Afterwards, participants were asked approximately how long ago the event had occurred. Then they rated their memory of the event on items from the Memory Characteristics Questionnaire (Johnson, Foley, Suengas, & Raye, 1988), which assesses the subjective experience of remembering. Participants rated four items from the Clarity dimension (e.g., "The overall vividness of the event is…") and two items from the Thoughts and Feelings dimension (e.g., "I remember how I felt at the time of the event"). The full list of items is in Appendix E. Participants also gave a 1-item rating of how they felt while writing about the memory on a 7-point scale from "good" to "bad."

Mood rating. Next, participants completed the 20-item version of the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). This was included primarily to examine mood differences between the *Mean Prime* and *Negative Prime* conditions in order to build a stronger case for the role of self-concept if memory differences emerged between the conditions.

Self-reference memory task. The self-reference task was similar to the one used in Study 1a except for a few minor changes to make it more consistent with the child procedure in Study 2. As noted above, stimuli were presented as both text on the computer screen and through audio. Additionally, instead of naming U.S. states during the filler task, participants named fruits and vegetables.

Moderators: Reminiscing, self-values, and self-esteem. As in Study 1, participants rated their goals for thinking and talking about the past using the TALE questionnaire (Bluck & Alea, 2011). The questionnaire was completed immediately after participants completed the memory part of the study. After the TALE, participants completed the same form of the PVS as in Study 1 to measure self-values. After the PVS, participants also completed ratings of self-esteem in several domains on the Self Perception Profile for College Students (Neemann & Harter, 2012). These included global self-esteem, scholastic competence, social acceptance, appearance, and morality. On the questionnaire participants read pairs of opposing statements, for example, “Some students like the kind of person they are BUT Other students wish that they were different,” and select the statement from each pair that best represents themselves. Then they rate whether that statement is “really true of me” or “sort of true of me.” Responses are scored numerically 1-4 where a 1 represents low self-judgments (e.g., saying “really true of me” to the statement “Other students wish that they were different”) and a 4 represents high self-judgments (e.g., saying “really true of me” to the statement “Some students like the kind of person they are”). Scores of 2 or 3 are given for rating the corresponding statements as “sort of true of me.”

Results

Neutral condition. First, I report analyses of the Neutral condition alone in order to show that the general pattern of results from Study 1a were replicated.

Recognition memory. As Figure 5.1 shows, corrected recognition was higher for self items compared to other items across valence types. I performed a 3 valence (neutral vs. mean vs. nice) x 3 reference (self vs. other vs. semantic) repeated measures ANOVA on corrected recognition. There was no interaction, $F(4, 220) = 1.36$, $p = .248$, $\eta^2_p = .024$. Consistent with Study 1a, there was no evidence of self-enhancement bias because the effect of reference was not dependent on the valence of the items.

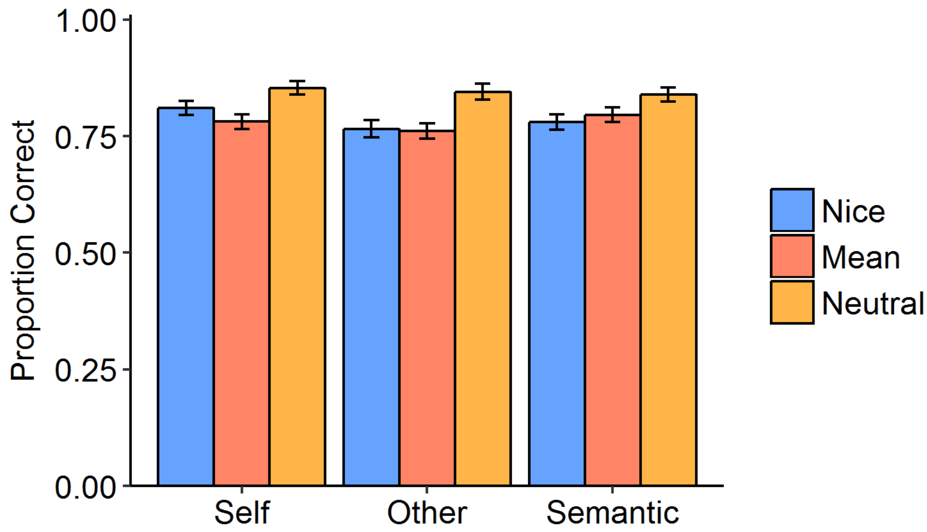

Figure 5.1. Corrected recognition by valence type and reference type in the Neutral condition. Error bars represent standard errors.

There was a marginally significant main effect of reference, $F(2, 110) = 2.48$, $p = .089$, $\eta^2_p = .043$. Consistent with Study 1a, participants were better at recognizing self items ($M = .82$, $SD = .06$) than other items ($M = .79$, $SD = .06$), $t(55) = 2.05$, $p = .046$, $d = .27$. In contrast to Study 1a, semantic items were not remembered significantly differently from either self or other items, $t(55) = .92$, $p = .363$, $d = .12$, and $t(55) = 1.41$, $p = .165$, $d = .19$.

There was a main effect of valence, $F(2, 110) = 7.62$, $p < .001$, $\eta^2_p = .112$; follow-up tests showed that the neutral items were remembered better than the nice and mean items, $t(55) = 3.43$, $p = .001$, $d = .46$, and $t(55) = 3.51$, $p = .001$, $d = .47$, respectively, and there was no difference between nice and mean items, $t(55) = .30$, $p = .762$, $d = .04$ (mean: $M = .78$, $SD = .11$; nice: $M = .79$, $SD = .10$; neutral: $M = .85$, $SD = .09$).

Encoding response. As Table 5.3 shows, the likelihood of responding “yes” or “no” varied somewhat across valence and reference types. To eliminate the possibility that any memory effects were only a result of differing levels of yes/no responses during encoding, I checked whether these responses influenced recognition memory. I used a GLMM to do logistic regression predicting recognition hits from valence and reference separately for items that received "yes" and "no" responses. This showed the same primary finding as the main analysis: For both "yes" and "no" responses, self-referenced items were recognized more often than other-referenced items, $z = 5.62$, $p < .001$ and $z = 2.60$, $p = .009$, respectively. In the main analysis, self-referenced items and semantic items were not significantly different, but here they were remembered better when they received a "yes" response, $z = 2.12$, $p = .034$. The effect of valence was similar to the main analysis: Neutral items were recognized better than mean and nice ones when they received a "yes" response, $z = 1.72$, $p = .086$ and $z = 2.64$, $p = .008$, and neutral items were recognized better than mean ones when they received a "no" response, $z = 3.30$, $p < .001$.

Table 5.3. Means and standard deviations of proportion of items receiving a "yes" response during encoding

	Nice	Mean	Neutral
Self	.84 (.13)	.32 (.17)	.76 (.18)
Other	.90 (.12)	.35 (.20)	.82 (.16)
Semantic	.91 (.11)	.43 (.19)	.88 (.14)

Encoding response time. On average encoding response time was similar across valence and reference type (see Table 5.4). Similar to Study 1, there was no main effect of response time and no interaction with reference, *z*s < .50, all *p*s > .630. Therefore, the better recognition observed for self-referenced compared to other-referenced items was not a result of response time. There was an interaction with valence, $z = 2.2$, $p = .027$: At slower response times, there was a smaller recognition advantage for neutral items.

Table 5.4. Means and standard deviations of encoding response times

	Nice	Mean	Neutral
Self	.93 (.20)	1.01 (.15)	.92 (.12)
Other	.93 (.14)	.99 (.23)	.97 (.17)
Semantic	.94 (.13)	1.01 (.28)	.91 (.15)

Note: Response time was measured starting from 1 s after the end of stimulus presentation, when participants were able to make a response. The median time for each participant for each type of item was calculated and then these were averaged across participants.

Valence ratings. Given that some nice phrases were rated as nicer than others and some mean phrases were rated as meaner than others, I tested whether these valence ratings were related to recognition. Logistic regression predicting recognition hits showed that mean items that were rated as more mean were recognized at lower rates than less extreme items (OR = .46, 95% CI[.30, .71]) and there was no interaction with reference type, $z = .02$, $p = .986$. For nice items, there was an interaction with reference type, $z = 1.94$, $p = .053$: Self-referenced and semantic items that were rated as nicer had higher source accuracy than less extreme items (self: OR = .40, 95% CI[.17, .93]; semantic: OR = .49, 95% CI[.25, .97]) while memory for other-referenced items was not related to the valence ratings (OR = 1.09, 95% CI[.62, 1.90]).

Summary. Overall, the recognition memory results were similar to Study 1a, replicating the primary finding that adults remembered self-referenced items better than other-referenced items regardless of valence type. The effect was smaller here, though, and only marginally significant.

Source memory. Table 5.5 shows response frequencies and Figure 5.2 shows source accuracy as a function of valence and reference type in the Neutral condition. A 3 valence (neutral vs. mean vs. nice) x 3 reference (self vs. other vs. semantic) repeated measures ANOVA on these data revealed a marginally significant interaction, $F(4, 220) = 2.01$, $p = .095$, which was followed up with paired t-tests. As shown in Table 5.6, source memory for self-referenced mean items was worse than for self-referenced nice items and self-referenced neutral items, but was only marginally worse than other-referenced mean items. Self-referenced nice items were not remembered better than self-referenced neutral items, but they were remembered marginally better than other-referenced nice items. This general pattern replicates the results of Study 1a with self-enhancement bias demonstrated through poorer memory for self-referenced mean items and enhanced memory for self-referenced nice items, though not all the effects were statistically significant.

Table 5.5. Response frequencies aggregated across participants for the Neutral priming condition

	Response				
Item	**New**	**Other**	**Self**	**Semantic**	**Total**
Nice verbs					
New	**422**	17	18	33	490
Other	97	**339**	25	57	518
Self	36	22	**401**	45	504
Semantic	57	43	89	**315**	504
Mean verbs					
New	**442**	25	19	32	518
Other	63	**372**	12	57	504
Self	33	44	**375**	52	504
Semantic	33	72	70	**315**	490
Neutral verbs					
New	**462**	9	12	21	504
Other	51	**368**	19	52	490
Self	37	18	**405**	44	504
Semantic	45	54	67	**352**	518

Note. Correct responses are in bold. The total number of each type of item varied somewhat due to a technical error and is displayed in the rightmost column.

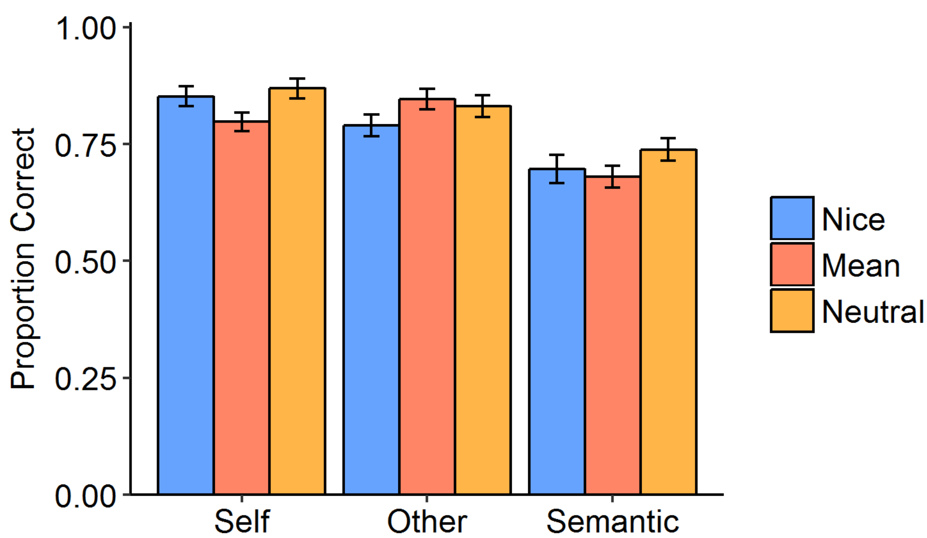

Figure 5.2. Source memory by valence type and reference type in the Neutral condition. Error bars represent standard errors.

Figure 5.2 shows a pattern of higher source accuracy for other-referenced mean items compared to other-neutral and other-nice ones, though only the comparison to nice items was significant (see Table 5.6). This is consistent with Study 1a and prior research demonstrating a negativity bias in memory for others' behaviors (e.g., Buchner et al., 2009).

Table 5.6. Cohen's d for source memory comparisons

	Self-Nice	Self-Mean	Self-Neutral	Other-Nice	Other-Mean
Self-Nice					
Self-Mean	.36*				
Self-Neutral	.08	.40*			
Other-Nice	.25†	X	X		
Other-Mean	X	.22†	X	.27*	
Other-Neutral	X	X	X	.17	.07

Note: Only comparisons among self-referenced and other-referenced items that were relevant to the hypotheses were tested. The "X" symbol denotes comparisons that were not tested.
* $p < .05$
† $p < .10$

Confidence. I recoded the confidence ratings so that higher numbers indicated greater confidence. Overall, participants were more confident when they were correct than when they were incorrect (correct: *M* = 5.00, *SD* = .68; incorrect: *M* = 4.07, *SD* = .88), *t* (55) = 10.7, *p* < .001. Examining the correct self-referenced and other-referenced nice and mean items only, there was no evidence that participants were knowingly guessing more on specific combinations of valence type and reference type. Mixed-effects linear regression showed no interaction of valence and reference in predicting confidence ratings, *t* = .70, *p* = .487. This provides some evidence that the source accuracy differences reported above were not simply an artifact of guessing biases. There was no effect of valence, thus participants were equally confident on mean and nice items, *t* = .70, *p* = .475.There was a main effect of reference: As in Study 1a, participants were more confident on self-referenced items than other-referenced items, *t* = 2.70, *p* = .008.

Encoding response. There was not enough "no" responses to nice items and "yes" responses to mean items to reliably examine the interaction of valence type and reference type by encoding response (see Table 5.3). However, based on the pattern of responses, it seems unlikely that differences in encoding responses would explain the source memory results. For example, participants responded “yes” slightly less often for self-referenced items than for other-referenced items across valence types, but in some cases self-referenced items were remembered better than other-referenced items and in other cases the reverse was true.

Encoding response time. Next, I checked whether the amount of time taken to respond to an item during encoding influenced source memory. As with encoding response, only mean vs. nice and the self-reference vs. other-reference were included. Response time was transformed by log 10 because of skew. A GLMM logistic regression predicting recognition hits found no main effect of response time and no interactions with valence or reference, all *z*s < 1.00, all *p*s > .315. Therefore, variation in response time could not account for the valence by reference interaction in the main analysis.

Valence ratings. Lastly, I examined whether valence ratings were related to source accuracy. Logistic regression predicting source accuracy showed that mean items that were rated as more mean had lower source accuracy than less extreme items (OR = .41, 95% CI[.30, .55]) and there was no interaction with reference type, $z = .16$, $p = .875$. For nice items, there was no effect of valence ratings and no interaction with reference type, *z*s = .53, *p*s = .595. Thus, the extremity of the valenced items did not impact the valence by reference interaction found in the main analysis.

Summary. The source memory results from the Neutral condition showed evidence of self-enhancement bias: Participants had worse source memory for self-referenced mean items than other-referenced mean items, self-referenced nice items, and self-referenced neutral items. Encoding response patterns could not explain the findings and the effect was still present when encoding response time was statistically controlled. Importantly, the confidence rating analysis provided evidence that the self-enhancement effect was not merely a result of guessing biases.

Moderators. I used GLMM to predict source accuracy from the 3-way interaction of valence type, reference type, and each moderator. Only mean and nice items that were self-referenced or other-referenced were included in the analyses. Table 5.7 and 5.8 show the means and intercorrelations for the moderators.

Table 5.7. Means and standard deviations of reminiscing goals, self-values, and self-esteem

	M	*SD*
Directive	3.64	.73
Directive (centered)	.18	.44
Self-enhancement	-.10	.58
Self-transcendence	.47	.46
Global self-esteem	2.80	.74

Note: Reminiscing goal ratings range from 1 = "almost never" to 5 = "very frequently." Self-values scores were centered using each participants' mean rating for all value items. Self-esteem scores range from 1 to 4, with higher scores indicating higher self-esteem.

Table 5.8. Correlations of reminiscing goals, self-values, and self-esteem

	1	2	3	4	5
1. Directive	-				
2. Directive (centered)	.48*	-			
3. Self-enhancement	-.05	.11	-		
4. Self-transcendence	.08	.16	-.45*	-	
5. Global self-esteem	.29*	.20	-.06	-.05	-

* p < .05

Reminiscing goals. On average, participants said they thought or talked about the past for Directive reasons between "occasionally" and "often." I expected that self-enhancement bias in source memory would be weaker for participants who said they reminisced more for Directive reasons compared to other kinds of reasons. There was a 3-way interaction of valence type, reference type, and directive reminiscing, $z = 1.98$, $p = .048$, but it was not in the predicted direction: Participants who rated Directive goals more highly had better memory for other-referenced, mean items compared to people who rated those goals lower. This resulted in a larger difference in memory between other-referenced and self-referenced, mean items, and thus a stronger self-enhancement bias.

Self-values. I predicted that adults who more highly valued self-enhancement would show a greater memory bias because they may be generally more likely to self-enhance. On average, participants rated self-transcendence goals as more important than self-enhancement goals, $t(56) = 4.81$, $p < .001$ and self-transcendence was negatively related to self-enhancement (see Table 5.8), which is consistent with prior research (e.g., Schwartz & Bardi, 2001). There was no evidence that self-values moderated self-enhancement memory bias: There were no significant 3-way interactions with self-enhancement or self-transcendence in predicting source accuracy, *z*s < .36, *p*s > .719.

Self-esteem. Based on prior research (e.g., Jones & Brunell, 2014), I expected that adults with higher self-esteem would have more self-enhancement bias than adults with lower self-esteem. On average, participants in this sample had moderate self-esteem (see Table 5.7), scoring somewhat lower than college students in the original studies validating this measure (Neemann & Harter, 2012). In contrast to the predictions, there was no 3-way interaction with self-esteem and therefore no evidence that self-esteem moderated the self-enhancement bias, $z = .44$, $p = .658$.

Condition comparisons. Next, I analyzed recognition memory and source memory in all of the priming conditions. The following analyses focus on the mean and nice items that were self-referenced or other-referenced. Neutral items and semantic items are not included because they do not provide information about the proposed causal mechanisms of self-enhancement.

Mood. First I analyzed the PANAS scores that were completed after the memory prime. This was used as a manipulation check to see whether the different kinds of narratives evoked different responses from participants (see Table 5.9). Pairwise comparisons between the Neutral condition and each of the other conditions showed that positive affect was higher in the Nice condition, $p = .015$, lower in the Mean condition, $p = .036$, and not different in the Negative condition, $p = .557$. Negative affect was higher in the Mean condition, $p < .001$, and the Negative condition, $p = .01$, and marginally lower in the Nice condition, $p = .07$.

Table 5.9. Means and standard deviations of positive and negative affect

	Positive affect	Negative affect
Neutral Condition	23.2 (8.25)	14.9 (5.57)
Nice Condition	26.7 (8.01)	13.1 (3.01)
Mean Condition	20.1 (6.54)	19.3 (6.05)
Negative Condition	22.3 (7.61)	17.5 (6.48)

Recognition memory. Table 5.10 shows the proportion of recognition hits and false alarms on the memory test for all conditions.[9]

Table 5.10. Means and standard deviations of recognition hits and false alarms

	Nice	Mean	Neutral
Neutral Condition			
Self hits	.93 (.11)	.93 (.10)	.93 (.10)
Other hits	.81 (.19)	.88 (.14)	.89 (.12)
Semantic hits	.89 (.13)	.93 (.10)	.91 (.11)
False alarms	.14 (.17)	.15 (.16)	.08 (.12)
Nice Condition			
Self hits	.93 (.09)	.95 (.08)	.95 (.08)
Other hits	.87 (.13)	.90 (.12)	.92 (.11)
Semantic hits	.90 (.09)	.95 (.09)	.93 (.10)
False alarms	.11 (.13)	.15 (.17)	.06 (.12)
Mean Condition			
Self hits	.94 (.09)	.96 (.08)	.96 (.07)
Other hits	.86 (.12)	.89 (.13)	.92 (.13)
Semantic hits	.89 (.12)	.93 (.08)	.92 (.13)
False alarms	.11 (.11)	.14 (.16)	.08 (.11)
Negative Condition			
Self hits	.95 (.08)	.96 (.07)	.95 (.08)
Other hits	.87 (.14)	.87 (.13)	.91 (.12)
Semantic hits	.90 (.13)	.95 (.06)	.92 (.12)
False alarms	.13 (.13)	.17 (.15)	.07 (.10)

[9] Due to a programming error in one out of the four phrase sets, about one quarter of participants were presented with an unequal number of each type of trial. Participants were meant to see nine of each item type, but during encoding these participants saw only eight neutral-other and mean-semantic items, and they saw ten nice-other and neutral-semantic items. Then during test they saw eight nice-new items and ten mean-new items. These differences were taken into account when calculating proportions for memory performance.

I performed 2 valence (mean vs. nice) x 2 reference (self vs. other) repeated measures ANOVAs separately for each condition. I did not expect condition differences for recognition memory because self-enhancement had only been observed in source memory in Study 1a. Consistent with this, Figure 5.3 shows that corrected recognition was better for self-referenced items compared to other-referenced items across all conditions. The size of this effect did vary somewhat across conditions with the Neutral condition showing a weaker effect than all the other conditions (see Table 5.11). There were no significant main effects of valence and no interactions in any of the conditions.

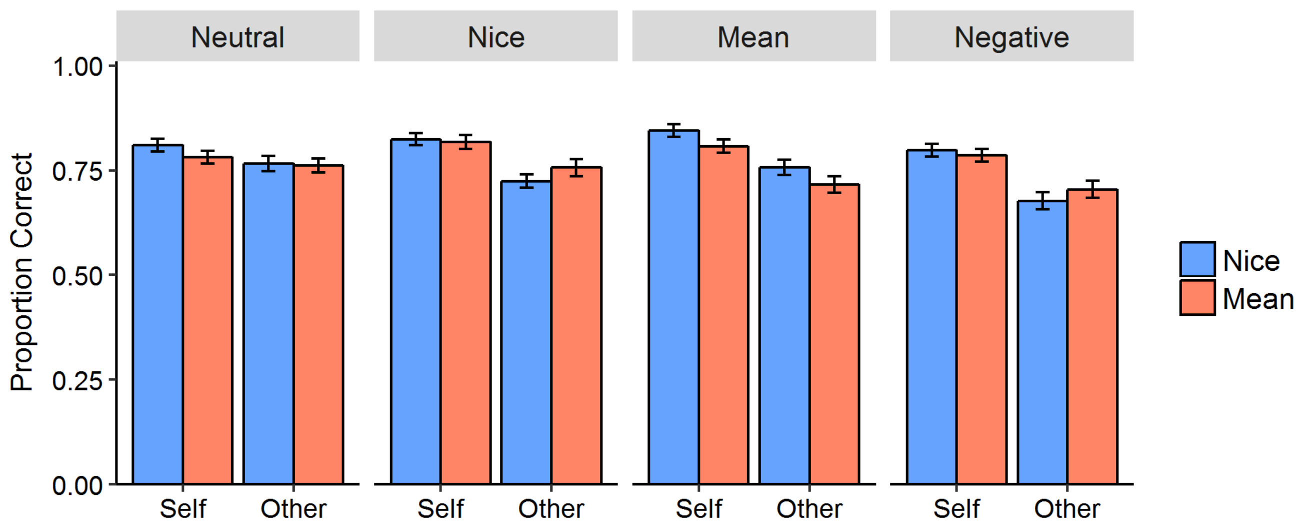

Figure 5.3. Corrected recognition of nice and mean items by reference type. Error bars represent standard errors.

Table 5.11. Corrected recognition ANOVA results

	F	*df*	*p*	η^2_p
Neutral Condition				
Valence	.68	1, 55	.414	.012
Reference	5.14	1, 55	.027	.086
Valence*Reference	.94	1, 55	.337	.017
Nice Condition				
Valence	.36	1, 55	.551	.007
Reference	42.35	1, 55	< .001	.435
Valence*Reference	1.96	1, 55	.167	.034
Mean Condition				
Valence	2.87	1, 55	.100	.050
Reference	33.6	1, 55	<.001	.379
Valence*Reference	.06	1, 55	.812	.001
Negative Condition				
Valence	.09	1, 55	.765	.002
Reference	55.0	1, 55	< .001	.500
Valence*Reference	3.08	1, 55	.084	.053

Source memory. Figure 5.4 shows source accuracy and Table 5.12 shows response frequencies as a function of valence and reference type in the all the priming conditions. I performed 2 valence (mean vs. nice) x 2 reference (self vs. other) repeated measures ANOVAs separately for each condition.

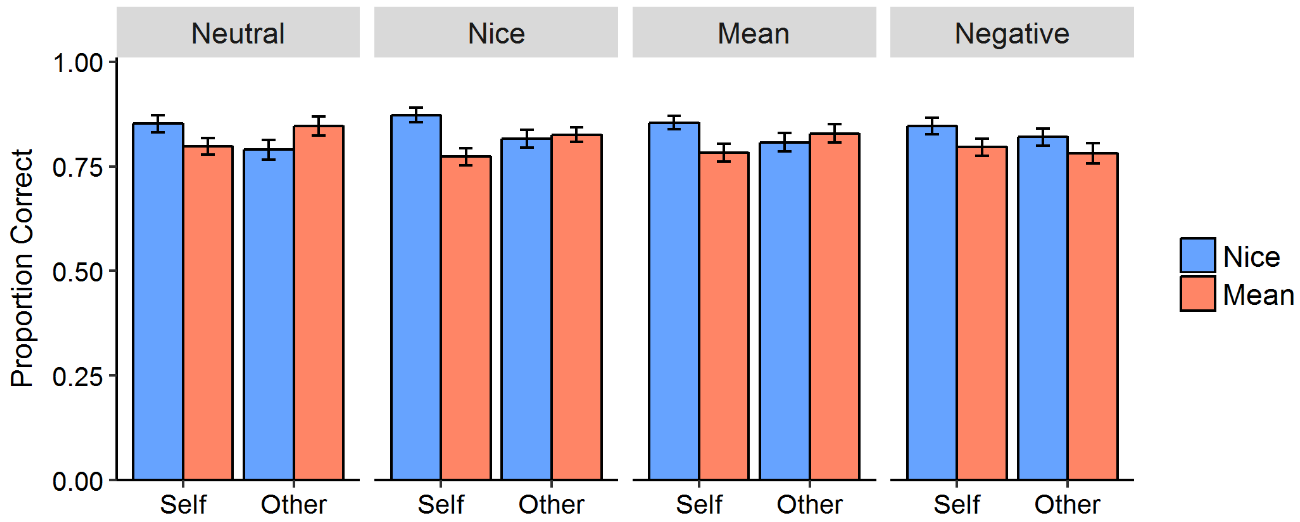

Figure 5.4. Source accuracy for nice and mean items by reference type and priming condition. Error bars represent standard errors.

Table 5.12. Response frequencies aggregated across participants for the Nice, Mean, and Negative priming conditions

Nice Condition					
	Response				
Item	**New**	**Other**	**Self**	**Semantic**	**Total**
Nice verbs					
New	**434**	20	12	24	490
Other	69	**369**	26	54	518
Self	33	20	**410**	41	504
Semantic	49	55	62	**338**	504
Mean verbs					
New	**440**	35	11	32	518
Other	48	**377**	27	52	504
Self	26	56	**370**	52	504
Semantic	25	70	93	**302**	490
Neutral verbs					
New	**474**	7	8	15	504
Other	40	**400**	8	42	490
Self	26	25	**416**	37	504
Semantic	37	48	54	**379**	518

Mean Condition					
	Response				
Item	**New**	**Other**	**Self**	**Semantic**	**Total**
Nice verbs					
New	**438**	17	9	26	490
Other	74	**358**	32	54	518
Self	28	24	**409**	43	504
Semantic	54	71	64	**315**	504
Mean verbs					
New	**444**	33	9	32	518
Other	53	**378**	18	55	504
Self	22	54	**376**	52	504
Semantic	33	63	77	**317**	490
Neutral verbs					
New	**464**	18	11	11	504
Other	39	**394**	9	48	490
Self	19	25	**414**	46	504
Semantic	42	43	56	**377**	518

Negative Condition					
	Response				
Item	**New**	**Other**	**Self**	**Semantic**	**Total**
Nice verbs					
New	**427**	19	16	28	490
Other	66	**375**	25	52	518
Self	24	28	**407**	45	504
Semantic	50	68	57	**329**	504
Mean verbs					
New	**432**	31	16	39	518
Other	66	**343**	24	71	504
Self	21	42	**384**	57	504
Semantic	26	94	61	**309**	490
Neutral verbs					
New	**470**	7	6	21	504
Other	44	**375**	11	60	490
Self	24	17	**398**	65	504
Semantic	40	47	57	**374**	518

Note. Correct responses are in bold. The total number of each type of item varied somewhat due to a technical error and is displayed in the rightmost column.

I expected that source memory performance on self-reference items would be different between the neutral condition and the nice and mean conditions. As Figure 5.4 and Table 5.13 show, however, the pattern of results was very similar across these three conditions: There was an interaction of valence and reference in all conditions except the Negative condition. In the Negative condition, there was only a main effect of valence.

Table 5.13. Source memory ANOVA results

	F	*Df*	*p*	η^2_p
Neutral Condition				
Valence	.003	1, 55	.958	<.001
Reference	.070	1, 55	.792	.001
Valence*Reference	8.50	1, 55	.005	.134
Nice Condition				
Valence	6.20	1, 55	.016	.101
Reference	.008	1, 55	.928	<.001
Valence*Reference	14.1	1, 55	<.001	.204
Mean Condition				
Valence	1.84	1, 55	.181	.032
Reference	<.001	1, 55	.981	<.001
Valence*Reference	7.37	1, 55	.009	.118
Negative Condition				
Valence	4.87	1, 55	.032	.081
Reference	.98	1, 55	.326	.018
Valence*Reference	.073	1, 55	.788	.001

According to both the cognitive and the motivational mechanisms of self-enhancement, the prediction was that the pattern of results for self-referenced items would differ across conditions, but this did not occur. In the Neutral, Nice, and Mean conditions, self-referenced, nice items were remembered significantly better than self-referenced, mean items, *t*s > 2.67, *p*s < .010, and this effect was marginally significant in the Negative condition, $t\ (55) = 1.72$, $p = .090$. Furthermore, there were no significant differences in source memory for self-referenced nice or mean items between the Neural condition and the Nice, Mean, and Negative conditions, *t*s < .77, *p*s > .441. Source accuracy for other-referenced items was not expected to differ across conditions, but Figure 5.4 shows that in the Mean and Nice conditions there was no difference between mean and nice items, *t*s < .80, *p*s > .425. Additionally, the Negative condition showed the opposite pattern of results for other-referenced items compared to the Neutral condition. The Negative condition was intended as a control for the Mean condition, thus it was surprising that this condition was the one that differed most from the Neutral condition. In the discussion, I consider some potential reasons for this unexpected finding. Overall, it seems that the memory primes did not have the intended effects on later memory performance and therefore these results were unable to provide evidence regarding the cognitive and motivational accounts of self-enhancement bias.

After the memory prime, participants rated one item about how they had felt while recalling the memory from 1 = "bad" to 7 = "good." Most participants gave ratings consistent with their conditions (i.e., Negative and Mean < 4; Nice > 4) and the pattern of source memory results remained the same when only participants who gave a rating consistent with their conditions were included (N_{Mean} = 45, $N_{Negative}$ = 39, N_{Nice} = 49).

Confidence. It is possible that the expected condition differences were not present because the memory prime also influenced participants' guessing biases in a way that obscured the results. To test this, I examined confidence ratings for correct items to examine whether guessing might have contributed to source accuracy differently across conditions. Mixed-effects linear regression showed no interaction of valence and reference in predicting confidence ratings in any of the conditions, *t*s < 1.60, *p*s > .111. Thus, there was no evidence that participants were correctly guessing more on specific combinations of valence type and reference type. In all conditions, there was a main effect of reference: Participants were more confident on self-referenced items than other-referenced items, *t*s > 2.6, *p*s < .010. In the Mean and Negative conditions, there was also a main effect of valence, *t*s > 2.0, *p*s <.052, where participants were more confident on nice items than mean items. This pattern was also present in the Nice and Neutral conditions, though the effect was not significant, *t*s < 1.9, *p*s > .068. Given that the same general patterns for confidence ratings were observed in all conditions, it seems unlikely that the different memory primes had a strong influence on participants' guessing biases.

Summary. In sum, the experimental manipulation using memory primes did not influence memory performance on the self-reference task. This was true even though participants' mood was affected by the priming and the results also held when considering guessing bias by examining confidence ratings.

Subjective memory ratings. During the memory priming procedure, participants provided subjective ratings of the overall clarity of their memory and how well they remembered their thoughts and feelings from the event. Consistent with prior research (Kouchaki & Gino, 2016) and as shown in Table 5.14, memories of good deeds were rated as clearer than memories of bad deeds.

Table 5.14. Means and standard deviations of subjective memory ratings

	Clarity	Thoughts and Feelings
Nice Condition	6.08 (.84)	6.15 (.90)
Mean Condition	5.40 (.83)	6.23 (.80)
Negative Condition	5.66 (.64)	6.53 (.61)

I performed a one-way ANOVA (Condition: Nice, Mean, Negative) on Clarity ratings. There was a significant effect of condition, $F(2, 165) = 10.8$, $p < .001$, $\eta^2_p = .116$. Follow-up t-tests showed that Nice memories were remembered more clearly than either Mean or Negative ones, $p < .001$ and $p = .005$, respectively. Additionally, Negative memories were remembered marginally more clearly than Mean ones, $p = .081$. In another ANOVA on Thought/Feeling ratings, there was also a significant effect of condition, $F(2, 165) = 3.60$, $p = .030$, $\eta^2_p = .042$. Follow-up tests showed that participated felt that they remembered their thoughts and feelings more clearly for Negative memories compared to Nice ones, p = .01. Thoughts and feelings were also marginally clearer for Negative memories compared to Mean ones, p = .05, and there was no difference between Nice and Mean memories, p = .59.

The differences in subjective ratings could not be explained by how old the memories were because the amount of time since the original events was similar across conditions (see Table 5.15), χ^2 (6) = 3.97, p = .681.

Table 5.15. Time since event in memory narratives

	Less than 1 week	1 week to 1 month	2 months to 6 months	7 months or more
Nice Condition	.11	.36	.43	.09
Mean Condition	.12	.41	.34	.12
Negative Condition	.11	.52	.30	.07

The subjective ratings demonstrate another facet of self-enhancement bias, where memories of our own mean behaviors are not remembered as clearly as our nice behaviors or negative things that have happened to us. These findings do not help to distinguish between the cognitive and motivational accounts of self-enhancement bias. They do, however, help to shed light on a possible reason that the Mean memory prime did not influence subsequent memory performance in the expected way. People's past transgressions tend to be minimized during memory recall: They are remembered less clearly than other kinds of memories (e.g., Kouchaki & Gino, 2016) and narratives tend to include elements such as blaming the behavior on external circumstances and focusing on how reparations were made (e.g., Song & Wang, 2014). An informal analysis of the content of the narratives in the present study showed that participants did, in fact, tend to minimize the harm they had caused by using these elements in their Mean memory narratives. Therefore, this memory prime that was intended to elicit negative self-related thoughts (cognitive account) and/or self-threat (motivational account) may not have done so.

Discussion

The present study replicated the primary findings of Study 1a: Source memory for self-referenced, mean verbs was worse than for self-referenced, nice verbs and other-referenced, mean verbs. It also showed another aspect of self-enhancement in participants' narratives—specifically, that adults' memories of their nice behaviors were subjectively clearer than memories for negative events, which in turn were clearer than memories for their mean behaviors.

Surprisingly, self-esteem did not moderate the self-enhancement effect on the source memory task. This differs from prior research using a similar experimental paradigm (Jones & Brunell, 2014), though in that study memory recall was measured rather than source memory. It is possible that self-esteem exerts its influence primarily by providing memory cues, which is important in recall memory and not in source memory. Although it is important to note that some prior research measuring memory recall of actual autobiographical memories did not find a relationship between self-enhancement and self-esteem (Ritchie et al., 2016). Another possibility is that the way self-enhancement bias was measured in the present study may have made it difficult to detect the influence of self-esteem. Future research could modify the current procedure to include more items; this would help to eliminate ceiling effects and to decrease measurement error.

Participants continued to show self-enhancement bias to a similar extent after recalling a neutral memory, a memory of having done something nice, or a memory of having done something mean. It is possible that guessing biases contributed to this null finding; if the memory primes differentially influenced guessing then this could have obscured condition differences. Multinomial processing tree analyses—like those in Study 1a—could address this issue, but they were not performed because the model structure was unable to fit the data. The analysis of confidence responses, which can provide some information regarding guessing, found no evidence that guessing biases were obscuring actual memory differences between the conditions. As mentioned, it is possible that biases in the way that participants recalled and wrote about the mean memories may have prevented the manipulation from affecting subsequent memory performance. Thus, further research is needed that includes analyses that separate source memory from guessing and possibly that uses a different priming procedure. This may include a similar type of memory prime, but with more specific instructions to focus on self-threatening information, or it may be better to use a simpler manipulation that would have less variability between participants.

The only condition that did not show evidence of self-enhancement was when participants recalled a memory of something bad happening to them prior to completing the primary memory task. The main difference in source memory performance between this condition and the others was that other-referenced, mean items were not remembered as well. Many participants' negative memories involved someone else transgressing against them. It could be that after recalling someone else acting in a mean way, participants felt this behavior was less unexpected and so did not remember it as well. This would be in line with arguments about the role of expectancy in memory for others' negative behaviors (e.g., Bell & Buchner, 2012). In support of this, participants tended to respond "yes" during encoding to other-referenced, mean items somewhat more often than in the other conditions (Negative = .45, Neutral = .35, Nice = .36, Mean = .37).

In sum, although the present study was not able to address the mechanism of self-enhancement, it did replicate the results of Study 1a and provided additional evidence of self-enhancement through the subjective memory ratings. It also generated a set of memory narratives that can be analyzed in the future to address other aspects of self-enhancement, such as harm minimization in transgression narratives.

Chapter 6: General Discussion and Future Directions

Understanding the development of self-concept and prosocial behavior requires an understanding of how past actions are remembered. However, little research has studied the role of memory in social development. In the studies reported here, I address this gap by examining whether the same nice and mean actions are remembered differently depending on whether they were related to oneself or to someone else—showing evidence for a self-enhancement bias in memory.

Study 1 presented a paradigm to address this question in a controlled, experimental setting. While this study did not find evidence of self-enhancement in children or adults, it did show that the experimental procedure influenced memory performance such that mean and nice verbs related to oneself during encoding were recognized more accurately than verbs related to someone else. This extends previous research of adults' memory for trait adjectives (Symons & Johnson, 1997) as well as research of children's memory for pictures of common objects (Cunningham et al., 2014).

In Study 1a, a modified version of the procedure found self-enhancement in adults' source accuracy: Self-referenced, mean verbs were remembered worse than both other-referenced, mean verbs and self-referenced, nice verbs. A key difference between this version and the original task in Study 1 was that verb phrases were used instead of single verbs, which clarified the verbs' meanings. This study makes three important contributions to the literature.

First, this study used multinomial processing tree models (Batchelder & Riefer, 1990) to show that the differences in source accuracy could not be explained by participants' tendencies to guess certain responses and therefore that these differences were indeed a result of biased memory. This is particularly important given that it is plausible that participants would have response biases in line with self-enhancement—for example, guessing that more mean verbs were related to someone else than to oneself. In fact, the guessing parameters in the modeling results showed evidence that raw source accuracy for mean items related to someone else may have been inflated by guessing, highlighting the value of the modeling results.

Second, prior studies of self-enhancement bias in source memory have compared self-referenced items to semantically processed items, but not to other-referenced items (e.g., Durbin et al., 2017; Leshikar et al., 2015). The present study shows that relating information to another person does not result in a positivity bias in memory—this bias was only present for self-referenced verbs. In fact, the effect was reversed for other-referenced verbs such that there was a negativity bias, which is consistent with a large body of prior research in memory and other domains (e.g., Baumeister et al., 2001; Buchner et al., 2009).

Third, Study 1a found no evidence of self-enhancement on the recognition part of the memory test. The fact that self-enhancement was present in the source memory results, but not in recognition fits with the proposal made by Durbin and colleagues (2017): The primary memory advantage for self-referenced, positive information is that it is easier to connect it to the self and/or the disadvantage for self-referenced, negative information is that it is harder to connect it to the self. Better recognition of self-referenced items regardless of valence could be explained by greater attention to the item or deeper processing of the item, without necessarily connecting the item to the self.

Development of Self-Enhancement

Study 2 found that 8- to 10-year-olds were very similar to the adults in Study 1a: They had worse source memory for self-referenced, mean verbs compared to other-referenced, mean verbs and self-referenced, nice verbs. This builds on previous evidence of self-enhancement in children's memory narratives (e.g., Tasimi & Young, 2016; Wainryb, Brehl, Matwin, Sokol, & Hammond, 2005) by demonstrating bias in a situation where extraneous factors, such as self-presentation concerns, are unlikely to have influenced the memory measure. Based on the two primary accounts of self-enhancement in adulthood, the present results may indicate that either self-concept is sufficiently organized and elaborated by middle childhood to facilitate memory for positive information over negative information, or that the motivations driving self-enhancement are present from at least this early in childhood.

Surprisingly, Study 2 did not find better source memory for other-referenced, mean verbs compared to other-referenced, nice verbs. This differs from Baltazar and colleagues' (2012) finding that 4-year-olds remembered which characters did mean actions in vignettes better than which characters did nice actions. There are many procedural differences between that study and the present one that may explain the difference in findings. For example, in the present study a single "other" child was used on all trials, which may have diluted negativity effects because participants were evaluating that same child on both nice and mean behaviors. In contrast, children in Baltazar and colleagues' study were presented with a single behavior that was either mean or nice for a series of different children.

One other question raised in Study 2 was whether parents' reminiscing goals are related to children's memory bias. Based on cross-cultural research of parent-child conversations about past good and bad deeds (e.g., Miller et al., 2012; Reese et al., 2014), I proposed that children would have a stronger self-enhancement bias if their parents' main goal during reminiscing was to help their child maintain positive self-views rather than help their child learn from past mistakes. However, I found no relationships between parents' self-rated reminiscing goals and children's memory bias. These null findings could have occurred because of methodological issues, such as low power or insufficient variability in either the memory measure or the parent measure. Alternatively, if there truly is no relationship in the age group tested here, that does not mean that a relationship would not be found in younger children. It is possible that parents' socialization practices influence self-enhancement in memory more at younger ages because parents may play a more active role in directing conversations with younger children.

The Role of Self-Concept

Study 3 was intended to investigate how self-concept influences memory to produce self-enhancement bias in adults. From the cognitive perspective (Kelley & Jacoby, 2012; D. T. Miller & Ross, 1975; for a review, see Schriber & Robins, 2012), self-enhancement arises from the well-elaborated, and mostly positive, self-concept facilitating memory for positive information about oneself and making it difficult to remember negative information. From the motivational perspective, negative information about oneself is threatening to positive self-concept, and so people are unconsciously motivated to disconnect negative information from the rest of self-concept, making it more difficult to remember (Green et al., 2008). In the present research, I asked adults to write about their own past mean behavior prior to completing the self-reference task—a manipulation that was intended to differentiate between motivational and cognitive accounts of self-enhancement. However, recalling this memory did not influence subsequent memory performance. As mentioned previously, allowing participants considerable freedom in the content of their narratives may have weakened the effect. Future work could use more controlled priming manipulations, such as providing false negative feedback (e.g., Green et al., 2008) or sorting negative traits and self-related words together (e.g., me, mine).

Study 2 and Study 3 also examined the role of self-concept by testing whether individual variation in self-esteem and self-values was related to self-enhancement bias. I predicted that individuals with higher self-esteem and greater self-enhancement values would show a stronger memory bias, but found no evidence of moderation by these factors for children or adults. The null findings could have occurred because of low power, particularly given that a 3-way interaction would have been necessary to show moderation effects. Additionally, because memory performance was high for both children and adults, there may have been ceiling effects that prevented detection of moderation.

If there really is no relationship with self-values, one explanation could be that examining self-enhancement in a domain that is related to self-transcendence pits these two values against each other. In other words, individuals who value self-enhancement may tend to self-enhance more than individuals who value self-transcendence, but not in the domain of mean and nice behavior because they do not value helping others as highly. One way to test this would be to use a memory task with content that is in line with self-enhancement values, such as behaviors related to success and failure or power and weakness.

While prior research has linked higher self-esteem to greater self-enhancement in the subjective qualities of memories (e.g., Jones et al., 2016; Demiray & Freund, 2017), research does not consistently find a relationship with self-enhancement in objective memory performance (e.g., Jones & Brunell, 2014; Ritchie et al., 2016). It is possible that most people experience some basic level of self-enhancement regardless of whether they have low or high self-esteem (for a similar argument, see Sedikides & Green, 2004). However, further research is needed that addresses the aforementioned methodological issues that may have contributed to the null findings in the present research.

Future Directions

The present research showed evidence of self-enhancement in memory from at least middle childhood, and so an important question for future research is whether this bias is also present in younger children. Children as young as three years of age can describe themselves in a consistent manner (Keller et al., 1978) and show a memory advantage for stimuli related to themselves and actions that they have performed (J. Ross et al., 2011). Thus, children at this age may have a sufficiently developed self-concept to experience self-enhancement in memory. However, self-concept becomes more organized as children get older (Harter, 2012a; H. W. Marsh & Ayotte, 2003; H. W. Marsh et al., 1998), and so it may be that self-enhancement does not emerge until middle childhood.

The procedure used in the present research was difficult for children younger than eight years of age to complete, but future research could incorporate positively and negatively valenced items into self-referential memory procedures that have been successful with younger children. For example, based on prior research on self-performed actions (e.g., J. Ross et al., 2011), children could be asked to perform or to watch someone else perform actions such as hugging a doll or throwing a doll. Another possibility, based on previous research on self-referenced objects (Cunningham, Vergunst, Macrae, & Turk, 2013; J. Ross et al., 2011), would be to assign participants to "own" some images representing positive and negative adjectives or behaviors and for someone else to "own" other images by sorting these into separate bins.

In addition to the question of when self-enhancement is first present in children's memory, it will also be important to consider its developmental trajectory. Until around 8 years of age, children are thought to experience all-or-none thinking where they tend to think something is all good or all bad (Harter, 2012a). Given that they also tend to have positive views of themselves, this could mean that if self-enhancement is present in younger children, it may actually be stronger than in middle childhood. Additionally, there is some evidence that global self-esteem is higher in middle childhood than in adolescence and young adulthood (Robins & Trzesniewski, 2005), presenting the possibility that the strength of self-enhancement bias would continue to decrease into adolescence. This possibility is supported by evidence of a decrease from middle childhood to adulthood in self-serving attributions, such as explaining successes by referring to internal abilities and failures by referring to external circumstances (Mezulis et al., 2004).

One additional question for future research is whether self-enhancement extends beyond the self to include close others. Close others such as parents or spouses may be partly included in the self, such that there is overlap between schemas of self and other (Aron, Aron, Tudor, & Nelson, 1991). In fact, prior research with adults has shown that the self-reference effect is smaller when comparing memory for self and a close other versus comparisons of self and a familiar, but not a close other (for a review, see Symons & Johnson, 1997). Children too, show a memory advantage when they are asked to think about whether a word describes a family member compared to when they are asked about the definition of a word (Bennett & Sani, 2008). The procedure used in the present research could readily be adapted to examine whether the observed bias in memory of mean and nice verbs related to the self is also present when these are related to a close other.

A final thought regarding avenues of future research is to investigate the influence that remembering our past behaviors has on our future behaviors. For example, there is emerging evidence that recalling memories of our own past good deeds leads adults and children to behave more generously immediately afterwards (Tasimi & Young, 2016; Young et al., 2012). However, remembering bad deeds may also be important if it motivates us to become better people. This raises many questions: When and why does remembering good deeds lead to further good behavior? What role does self-concept play in this relationship? Under what circumstances do we remember our bad deeds? Identifying the links between memory and behavior should be a priority because it will provide a more complete picture of social development.

Conclusion

In sum, the studies reported here show that children and adults are biased to remember nice behaviors when they are related to themselves, but not when they are related to others. Understanding this phenomenon is crucial because our memories not only show us who we were in the past, they also contribute to who we are in the present and they influence who we will be in the future.

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Appendix A: Verbs from Study 1

Mean	Nice	Neutral
annoy	agree with	act
argue	be kind	blink
blame	care for	brush
boss around	cheer for	carry
brag	clean up	catch
break	cuddle	climb
cheat	forgive	dig
crush	get along	erase
disobey	give	guess
fight with	greet	hide
hate	help	line up
hit	high five	march
ignore	hold hands	measure
interrupt	hug	move
kick	invite	nod
knock down	kiss	pedal
lie	love	peel
pinch	make friends	print
rip	pay attention	race
shove	play with	search
slap	protect	sell
smash	rescue	shrug
spill	share	spin around
spit	smile	stand up
steal	take turns	stir
stomp on	teach	stretch
tattle on	thank	sweep
trick	trust	tiptoe
whine	wave	toss

yell at	work together	twist

Appendix B: Verb phrases from Study 1a and Study 3

Mean	Nice	Neutral
Dishonesty	*Affectionate/caring behavior*	*General*
Cheat on a test	Hold hands with someone	Catch a ball
Lie to someone	Hug someone	Close a jar
Convention violation	Kiss someone	Dig a hole
Annoy a friend	Love someone	Find an umbrella
Boss people around	Nurse a sick person	Hang a picture
Brag about a grade	Protect a friend	Hide behind a chair
Disobey the rules	Take care of a pet	Mix a salad
Interrupt someone	Tutor someone	Park a car
Ruin someone's day	*Emotional support*	Shop for groceries
Trick someone	Cheer for someone	Turn on a light
Whine about a job	Comfort a baby	Use a computer
Physical harm	Compliment someone	Wash a cup
Hit someone	Congratulate someone	*Semantically related*
Kick someone's leg	Encourage someone	Bike to school
Pinch someone's arm	High-five someone	Brush one's teeth
Shove someone away	Praise someone	Drink juice
Slap someone's face	Support a friend	Dry one's hair
Stomp on someone's foot	*Instrumental helping*	Eat breakfast
Trip someone	Carry someone's backpack	Make the bed
Property damage	Clean up the house	Pack lunch
Crumple someone's letter	Help someone get up	Put on socks
Crush someone's glasses	Open a door for someone	Read the news
Knock down someone's bike	Rescue a dog	Take a shower
Rip someone's drawing	*Charity*	Turn off the alarm
Smash someone's plate	Donate to charity	Wake up
Spill someone's drink	Give a present	*Social*
Steal a book	Lend money to someone	Ask for directions
Relational/emotional harm	Share a cookie with someone	Drive with someone
Break a promise	Volunteer at a soup kitchen	Listen to someone
Curse at someone	*Sociable/friendly behavior*	Look at someone
Exclude someone from a game	Agree with a friend	Run around someone
Fight with a friend	Forgive a friend	Shake someone's hand
Gossip about a friend	Get along with others	Sit nearby someone
Hate someone	Greet a new student	Stand next to someone
Hurt someone's feelings	Invite someone to a party	Talk on the phone
Ignore someone	Keep someone's secret	Tell someone the time
Insult someone	Say thank you	Wait for someone
Make fun of someone	Smile at a friend	Walk past someone
Tattle on a friend	Wave to someone	
Yell at someone	Work together on a project	

Appendix C: Glossary of Model Parameters

Parameter	Cognitive process
D	Probability of recognizing item as old (or knowing it is not, for New items)
d	Probability that source of item is remembered, given that recognized item as old
a_{Person}	Probability that guess source is a person, given that recognized item as old
a_{Self}	Probability that guess source is self, given that recognized item as old and that guessed source is a person
b	Probability of guessing item is old (or that it is not, for New items), given that do not recognize item as old
g_{Person}	Probability that guess source is a person, given that guessed item is old
g_{Self}	Probability that guess source is self, given that guessed item is old and that guessed source is a person

Appendix D: Verb phrases from Study 2

Mean	Nice	Neutral
Dishonesty	*Affectionate/caring behavior*	*General*
Cheat on a test	Hold hands with someone	Catch a ball
Lie to someone	Hug someone	Close a jar
Convention violation	Kiss someone	Dig a hole
Annoy a friend	Love someone	Find an umbrella
Boss people around	Cuddle with a doll	Hang up a coat
Brag about a grade	Protect a friend	Hide behind a chair
Disobey the rules	Take care of a pet	Mix a salad
Interrupt someone	Teach a friend	Draw a circle
Ruin someone's day	*Emotional support*	Shop for groceries
Trick someone	Cheer for someone	Turn on a light
Whine about homework	Comfort a baby	Use a computer
Physical harm	Tell someone they're pretty	Wash a cup
Hit someone	Be kind to someone	*Semantically related*
Kick someone's leg	High-five someone	Bike to school
Pinch someone's arm	Support a friend	Brush one's teeth
Shove someone away	*Instrumental helping*	Drink juice
Slap someone's face	Carry someone's backpack	Dry one's hair
Stomp on someone's foot	Clean up the house	Eat breakfast
Trip someone	Help someone get up	Make the bed
Property damage	Open a door for someone	Pack lunch
Crumple someone's letter	Rescue a dog	Put on socks
Crush someone's glasses	*Charity*	Read a book
Knock down someone's bike	Donate to charity	Take a shower
Rip someone's drawing	Give a present	Turn off the alarm
Smash someone's plate	Let someone borrow a toy	Wake up
Spill someone's drink	Share a cookie with someone	*Social*
Steal a book	Volunteer at a soup kitchen	Ask for a snack
Relational/emotional harm	*Sociable/friendly behavior*	Drive with someone
Break a promise	Agree with a friend	Listen to someone
Call someone bad names	Forgive a friend	Look at someone's shirt
Exclude someone from a game	Get along with others	Run around someone
Fight with a friend	Greet a new student	Hear someone's footsteps
Laugh at someone	Invite someone to a party	Sit nearby someone
Hate someone	Keep someone's secret	Stand next to someone
Hurt someone's feelings	Say thank you	Talk on the phone
Ignore someone	Smile at a friend	See someone at school
Tease someone	Wave to someone	Wait for someone
Make fun of someone	Work together on a project	Walk past someone
Tattle on a friend	Play with someone	
Yell at someone	Make a new friend	

Appendix E: Memory ratings in Study 3

Approximately how long ago did this event happen? ________

Overall, I remember this event

1	2	3	4	5	6	7
hardly						very well

My memory of this event is

1	2	3	4	5	6	7
dim						sharp/ clear

I remember how I felt at the time of the event

1	2	3	4	5	6	7
not at all						clearly

The overall vividness of the event is

1	2	3	4	5	6	7
vague						very vivid

I remember what I thought at the time of the event

1	2	3	4	5	6	7
not at all						clearly

My memory of the event is

1	2	3	4	5	6	7
sketchy						highly detailed

While describing the event, I felt

1	2	3	4	5	6	7
bad						good