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Children's Attributions of Moral and Epistemic Virtue: Effects on Learning and Memory

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One developmental task faced by children is to identify, remember, and learn from epistemic and moral agents around them who are known to be good or virtuous. Here, in 2 studies, we examined U.S children's (N = 138; 55% female, 45% male; predominantly White, middle-class) memory processes for agents varying in moral and epistemic virtue. In Study 1, when presented with 16 faces of individuals who were said to vary in moral or epistemic virtue, children demonstrated enhanced trait memory for the characteristics of agents lacking in virtue relative to their more moral and competent counterparts. In Study 2, when presented with pairs of faces in the moral and epistemic domains, children showed enhanced content memory for information communicated by an epistemically competent individual with age. Together, these findings provide evidence that when categorizing single agents among many, children show better memory for their negative characteristics; and in a learning context, children show better retention of information communicated by more competent agents.

Keywords: selective trust, source memory, content memory, competence, morality

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How do children identify and learn from agents said to be epistemically and morally good or virtuous? Further, how are these evaluations supported by children's memory in different contexts? Recent research suggests that as early as preschool, if not before, young children actively monitor agent's epistemic abilities and their benevolence and use that information to inform their learning decisions (for reviews, see Harris, Koenig, Corriveau, & Jaswal, 2018; Koenig & Stephens, 2014). Although a large body of research has focused on children's selective decisions about whom to believe, very little is known about the agent information that children encode and remember. Do both epistemic and moral virtues affect children's face recognition memory and trait memory for individuals? How does young children's selective learning from individuals relate to their source memory of the speakers and content memory for their claims? Here, we investigated the way in which children distinguish between speakers with epistemic and moral virtues and how these characteristics influence children's source-related memory, selective learning decisions, and memory for the content of the speaker's claims.

Children's Source Memory

Children and adults often recall the source, or origin, of their memories, knowledge, and beliefs, an ability known as "source monitoring" (Johnson et al., 1993). Previous research on children's source monitoring has largely focused on "unmarked" source modalities such as seeing or touching, and this work has revealed that preschool-aged children often perform poorly when asked to report how they come to know information that they have just recently acquired (e.g., Ackil & Zaragoza, 1995; Drummey & Newcombe, 2002; Gopnik & Graf, 1988; O'Neill & Gopnik, 1991; O'Neill & Chong, 2001; Taylor et al., 1994; Wimmer et al., 1988). For example, after gaining knowledge about what was inside several drawers by seeing the object, making inferences about it, or being told about it, the majority of 3- to 4-year-old children were good at immediately reporting the content of their knowledge (i.e., what the object is), but they were relatively poor at reporting the source of knowledge (i.e., how they know what the object is) after a few minutes (Gopnik & Graf, 1988).

Children's source attributions are also less accurate when sources are highly similar to each other. For example, 4- and 6-year-olds were good at distinguishing two speakers that were different genders, but they made more source misattributions when two speakers were of the same gender (Lindsay, Johnson, & Kwon, 1991; see also, Kovacs & Newcombe, 2006; Roberts & Blades, 1999; Thierry et al., 2010). Young children's ability to distinguish between two sources of information further deteriorates following a delay period. For example, Drummey and Newcombe (2002) exposed 4-, 6-, and 8-year-olds to a series

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The data that support the findings of the studies are openly available in Open Science Framework at https://osf.io/n3gx2/. The studies reported in this article were not preregistered.

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of novel facts communicated by either a puppet or the experimenter. After a week's delay, four-year-old children's memory of the source of the facts was substantially worse than the 6- and 8-year-olds'.

External Monitoring of Trustworthy Sources

Although young children are prone to making source attribution errors in situations featuring neutral or similar sources, a recent line of work has shown that children are often good at monitoring human sources of information who vary not in their physical characteristics but in their epistemic and moral ones (for a review, see Koenig et al., 2019). In the traditional selective learning paradigm (e.g., Koenig et al., 2004), children are presented with two speakers who vary in a specific characteristic of interest (e.g., accuracy in labeling common objects). Findings typically reveal that preschool-aged children effectively monitor speakers' histories of reliability and prefer to learn from more reliable individuals both immediately and after delays of up to 1 week (e.g., Corriveau & Harris, 2009; see Harris et al., 2018; for a review).

Why do 3- to 4-year-old children, who are poor at reporting the sensory sources of their knowledge, show such sensitivity to the reliability of sources in selective learning contexts? In typical source monitoring paradigms, the sources of information are sense modalities (visual perception, inference, touch) and often valence-neutral (e.g., Gopnik & Graf, 1988; Lindsay et al., 1991), whereas in the selective learning literature, children are typically presented with testimony from human agents varying in competence or goodwill (e.g., Koenig & Doebel, 2013; Landrum et al., 2013). Thus, children may be particularly biased to monitor and remember human sources for certain epistemic and moral virtues related to trustworthiness, especially when engaged in learning tasks that make that information relevant.

Indeed, research with adults demonstrates enhanced source memory for encounters with untrustworthy individuals. For example, adults displayed equivalent recognition memory for faces verbally described as engaging in cheating behavior, trustworthy behavior, or unusual behavior irrelevant to social exchange, but they showed enhanced trait memory for faces associated with descriptions of cheaters when sorting faces into categories labeled "cheating" and "trustworthy" (Buchner et al., 2009; see also Bell et al., 2010; Hechler et al., 2016; Rule et al., 2012; Suzuki & Suga, 2010). This has led some to propose specialized cognitive architecture that evolved to facilitate the detection of social contract violations (i.e., social contract theory; Cosmides & Tooby, 1992; Tooby & Cosmides, 2005).

Preschool-aged children have also shown enhanced face recognition memory for "mean" over "nice" individuals (Kinzler & Shutts, 2008). They were also better at remembering the traits associated with "mean" individuals (i.e., recalling that a "mean" individual was, in fact, mean), and the specific actions committed by "mean" individuals compared to "nice" individuals (Baltazar et al., 2012; but see Chen et al., 2016; for a study in which children had equally good trait memory for nice and mean individuals). In Study 1, we attempt to replicate this effect for agents who are described as "mean," and investigate whether this enhanced memory for problematic agents in childhood extends to agents who are said to be "not smart." Since research has yet to explore whether children are exclusively sensitive to moral risks, our first primary question is to clarify whether children have a similar memory advantage for individuals who pose epistemic risks of misinformation. Exploring possible source-specific memory biases for both immoral and incompetent agents provide an important step in evaluating the early development of capacities related to identifying and learning from reliable agents. In this study, we presented children with 16 individuals described as competent, incompetent, moral, or immoral. Children's recognition memory of the individual's faces and their trait memory for each individual was then assessed. We predicted that children would display the same pattern of heightened memory for incompetent individuals as they do for immoral individuals (Kinzler & Shutts, 2008).

Children's Selective Learning From Epistemic and Moral Agents

Our second primary question concerns how an agent's epistemic and moral character influence children's learning decisions both in terms of their retention of the communicated information, as well as their source memory for the agents. In Study 2, we reduce the number of agents and presented children with a pair of speakers who were described in terms of moral virtue in the Morality condition, or in terms of epistemic virtue in the Competence condition. Since research suggests that morality and competence represent universal dimensions by which humans perceive individuals (Fiske et al., 2007) and social groups (Fiske et al., 2002), this study investigated whether children not only remember agents' good or bad intentions and ability to cooperate in situations of social exchange but also recall the information that moral and epistemic agents communicate to them.

Effective learning from others has been shown to be influenced by a range of behaviors that indicate an agent's morality and competence (Johnston et al., 2015; Landrum et al., 2013; for a review, see Koenig & Stephens, 2014). For example, young children effectively monitor speakers' accuracy, preferring to learn novel words from previously accurate over inaccurate speakers (Birch et al., 2008; Koenig et al., 2004; Scofield & Behrend, 2008). Children also demonstrate enhanced source-related monitoring of immorality. For example, 3- and 4-year-olds were more likely to accept information from a source described as "nice" than from one described as "mean" and one that was described as "honest" than "dishonest" (Lane et al., 2013; Mascaro & Sperber, 2009; Vanderbilt et al., 2011).

When morality and competence are pitted against each other, there is evidence that children weigh both dimensions in their decision-making process, perhaps equally (Johnston et al., 2015; Landrum et al., 2013). For example, when asked to evaluate sources who varied in both morality and competence, Liu and colleagues (2013) found that 5- and 6-year-olds preferred to accept information from a source with a history of good intentions as opposed to one with a history of bad intentions, regardless of outcomes (i.e., an individual finding or failing to find a treat). But they also preferred to accept information from a source whose testimony consistently led to positive outcomes over one whose testimony consistently led to negative outcomes, regardless of their intentions. Taken together, this research shows that children monitor sources for both morality and competence information. In Study 2, we address the important question of whether epistemic and moral virtue are distinguished by young children in their learning and memory. Specifically, we explore whether young children weigh epistemic and moral

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virtue equally heavily in a learning context, and whether they better remember information from good moral and epistemic agents over agents lacking in such virtues.

The Relationship Between Memory and Selective Learning

As reviewed above, preschool-aged children have relatively poor memory when asked to report the source of their knowledge, but they sometimes show heightened memory for human information sources. Moreover, research on children's selective learning has found that children readily use information about the informants' competence and morality to make learning decisions. To our knowledge, very few studies have directly explored children's memory for informants and their learning decisions in the same research design. In particular, little work has investigated children's long-term retention for information from preferred or problematic informants or for the identity of the sources themselves. The little extant evidence suggests that children may demonstrate poorer retention of information that is communicated by incompetent sources. For example, 24-month-olds showed more fragile semantic memory for word-object pairings presented by an inaccurate relative to an accurate source (Koenig & Woodward, 2010). Similarly, preschoolers failed to recall a word-object association after a brief delay that had been presented by an admittedly ignorant speaker, but remembered new words presented by a knowledgeable speaker (Mangardich & Sabbagh, 2018; Sabbagh & Shafman, 2009). Specifically, ERP evidence revealed that children were able to encode the labeling event by the ignorant speaker, but then blocked the transfer of this information to their long-term semantic memory (Mangardich & Sabbagh, 2018).

In an important study, Corriveau and Harris (2009) found that 3- and 4-year-old children demonstrated good retention of two informants' histories of accuracy (i.e., as measured by their reports of who was "good" and "not good" at naming familiar objects) after 1 week's delay. Moreover, children maintained a selective preference to learn novel words from the more accurate speaker after the delay, and this sustained selectivity was especially evident among children who were able to explicitly identify the accurate informant during initial testing. Although this study demonstrates that children's memory for informants guides their sustained selective learning preferences, the kind of information that supports children's memory remains unclear. For example, because Corriveau & Harris (2009) focused on children's selective preference for more accurate speakers after delays, we do not know how well children remembered the novel words they accepted during the initial test phase. Second, because none of the existing studies (Corriveau & Harris, 2009; Mangardich & Sabbagh, 2018) explored children's memory for informants varying in levels of benevolence, we do not know if children remember speakers who vary in moral behavior as well as they remember speakers who vary in accuracy. Here we ask: How well do children remember the information they learn from accurate and moral sources compared to inaccurate and immoral ones? Moreover, do children's selective learning preferences relate to their ability to remember the information that was presented by the more accurate and more moral sources? In Study 2, we examine children's selective retention of information communicated by variably moral and competent speakers after a short delay, with an interest in better understanding the source memory and semantic memory that support children's selective learning decisions.

In sum, the primary aim of this article is to investigate young children's memory for individuals varying in dimensions of both competence and morality. We took two approaches to this question. In Study 1, we present children with 16 faces in a categorization task to determine the extent to which children demonstrate enhanced recognition and trait memory for incompetent and immoral individuals. In Study 2, we present children with pairs of speakers in a learning context and assess children's source memory for individuals varying in competence and morality as it related to children's memory for the information they communicated.

Study 1

Method

Participants

We recruited a total of 74 typically developing children, (M_{age} = 53.69 months; range = 40–71 months): 25 three-year-olds (15 female, 10 male, M_{age} = 43.12 months; range = 40–47 months), 25 four-year-olds (17 female, 8 male, M_{age} = 54 months; range = 48–58 months), and 24 five-year-olds (14 female, 10 male, M_{age} = 64.38 months; range = 60–71 months). We chose to recruit a group of preschool aged children to match the age groups assessed in Kinzler and Shutts (2008). Participants were recruited through a university-managed database of children who were predominantly European American and from households of middle- to upper-socioeconomic status (SES). An a priori G Power 3.1 analysis (Faul et al., 2007) was conducted based on a medium effect size of η_p^2 = .06 (f = .25) with a conservative alpha (.01) for two within-subjects factors (Dimension, Valence) and one between-subjects factor (Age[1]), which showed that a sample size of 74 was needed to achieve 97% power. The study was approved by the University of Minnesota Institutional Review Board ("How Children Learn From Others: Identifying Core Dimensions and Processes," IRB1403S49086).

Materials and Apparatus

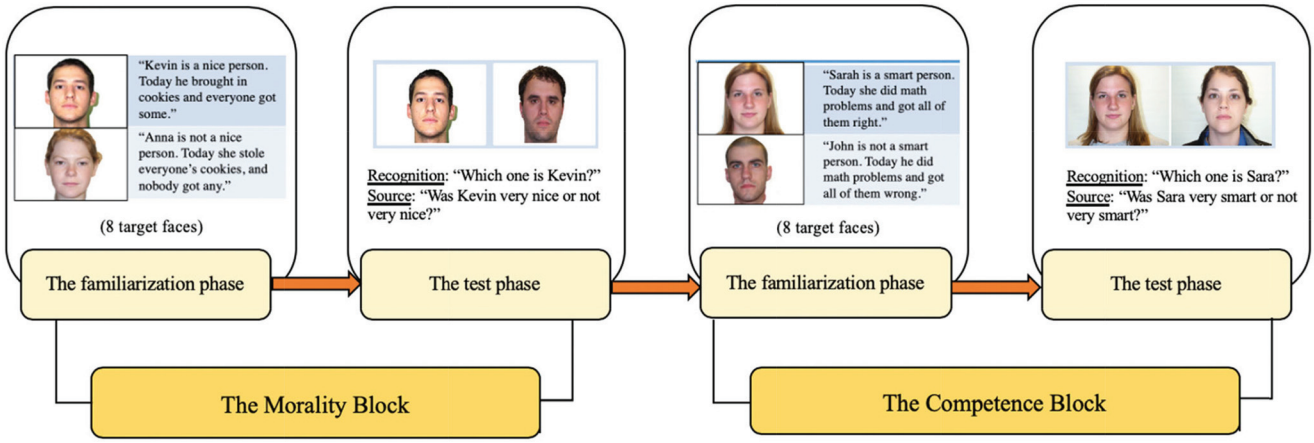
Each participant was presented with photographs of 32 adult faces (16 male and 16 female) with neutral expressions on a computer monitor. Faces were obtained from the Center for Vital Longevity Face Database (Minear & Park, 2004). All faces selected as stimuli appeared White and lacked distinctive characteristics, such as facial hair, jewelry, and heavy makeup. The background of each photographed face was edited to white (see Figure 1). Here, both male and female faces were used to follow the design of previous studies on face memory and trait memory (e.g., Baltazar et al., 2012; Chen et al., 2016).

In addition, to ensure that the faces did not differ a priori with respect to experimentally-relevant characteristics, 19 undergraduate students were presented with each face individually for 4 seconds and were asked to rate the face's attractiveness and trustworthiness on a 9-point Likert scale, with 1 representing *not at all attractive/*

[1] We initially treated age as a categorical variable in the power analysis, but treated age as a continuous variable in the reported analyses based on a reviewer's helpful comments and the increasing push in the developmental literature to analyze age as a continuous variable whenever possible.

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Figure 1
Flow Chart and Visual Depiction of the Procedure in Study 1



Note. The order of the Competence Block and the Morality Block was counterbalanced. The original face stimuli came from the Park Aging Mind Laboratory Face Database. Adapted from "A Lifespan Database of Adult Facial Stimuli," by M. Minear and D. C. Park, 2004, *Behavior Research Methods, Instruments, & Computers, 36*, 630–633. Copyright 2004 by Springer Publishing. See the online article for the color version of this figure.

trustworthy and 9 representing *extremely attractive/trustworthy*. Faces were rated as acceptably consistent across both attractiveness (Cronback's $\alpha = .92$) and trustworthiness (Cronback's $\alpha = .79$). The data that support the findings of this study are openly available in Open Science Framework at https://osf.io/n3gx2/. This study was not preregistered.

Procedure

Each child participated in a Competence Block and a Morality Block, the order of which was counterbalanced. Each block consisted of a *familiarization phase* and a *test phase* (see Figure 1 for a visual depiction of the procedure).

Familiarization Phase

Before the first *familiarization phase*, the experimenter introduced the task by saying to the child, "Today you're going to see pictures of some new people on this screen. They will either be nice, smart, not very nice, or not very smart, and I want you to pay really close attention to each new person!" In each block, the child then observed a series of 8 faces on the computer monitor, each presented for 4 s. Male and female faces were presented in alternating order.

Across both the Competence and Morality blocks, descriptions were presented in positive/negative pairs. In the Competence Block, the experimenter introduced and described each face as competent or incompetent (e.g., "John is not a smart person. Today he did math problems and got all of them wrong.") during its presentation. In the Morality Block, the experimenter introduced and described each face as nice or not nice (e.g., "Emma is not a nice person. Today she stole everyone's cookies and nobody got any." See online supplemental materials for the full set of descriptions). The faces were presented in constant order for all participants, but their appearance in the Morality or Competence blocks varied according to whether participants received the Morality Block first or the Competence Block first. The paired descriptions associated with each face were also counterbalanced.

Test Phase

After each *familiarization phase*, participants were presented with the 8 target faces presented during *familiarization* paired with 8 distractor faces. For each target-distractor face pair, participants answered (a) a *recognition memory* question and (b) a *trait memory* question. The *recognition memory* question asked participants to indicate which face they had seen previously during *familiarization* (e.g., "Which one is Sarah?"), while the *trait memory* question asked participants to recall the described characteristics of each individual (e.g., "Was Sarah very smart or not very smart"; "Was Eric very nice or not very nice?"). Target faces were presented in the same order in which they appeared during *familiarization*.

Results

Preliminary analyses revealed no effects of counterbalancing, block order, or gender. Given that responses were dichotomous and each participant provided data for several trials, separate mixed-effects binary logistic regression were conducted with Age in Months (mean-centered), Dimension (Competence vs. Morality) and Valence (positive vs. negative) as fixed effects, and subject as a random effect. Dependent measures included children's recognition judgments (correct = 1, incorrect = 0) and trait memory judgments (correct = 1, incorrect = 0) in each trial. We also tested for potential interactions between the fixed effects by running fuller models, but the interactions were not significant and did not improve model fit. Thus, only parsimonious models are discussed here. In addition, logistic regression models including only the intercept as a fixed effect and participant as a random effect were run on each of the Dimension and Valence to compare children's performance against chance.

Recognition Memory

Children's recognition memory of previously presented faces described as competent ($M = 72\%$, $SE = 2.6\%$), incompetent ($M =$

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76.4%, *SE* = 2.5%), moral (*M* = 77.7%, *SE* = 2.4%), and immoral (*M* = 73.6%, *SE* = 2.6%) were all significantly above chance, all $p < .001$. Children's recognition judgments did not vary according to Dimension (Competence vs. Morality), $p = .53$, or Valence (positive vs. negative), $p = .95$ (see Figure 2). In other words, children demonstrated equivalent recall of previously presented faces described as competent, incompetent, moral, and immoral. However, there was a main effect of Age on the likelihood of correct recognition judgments, *OR* = 1.05, 95% CI [1.03, 1.08], $p < .001$, indicating that older children had more correct recognition judgments than did younger children.

Trait Memory

Children's likelihood of correct trait memory was significantly above chance for the incompetent and immoral individuals (incompetent, *M* = 66.2%, *SE* = 2.8%; immoral, *M* = 70.3%, *SE* = 2.7%), both $p < .001$; but their trait memory of the positive individuals was at chance (competent, *M* = 46.6%, *SE* =2.9%; moral, *M* = 47%, *SE* = 2.9%, *ns*). As depicted in Figure 3, analyses revealed a main effect of Valence on the trait judgments, *OR* = 2.46, 95% CI [1.94, 3.12], $p < .001$. Children were more likely to recall their encounters with negative faces, or those described as incompetent and immoral, than they were to recall their encounters with positive faces, or those described as competent and moral. There was also a main effect of Age (*OR* = 1.02, 95% CI [1, 1.03], $p = .02$), indicating that children's trait memory performance improved with age. The accuracy of children's trait memory judgments did not vary according to Dimension (Competence vs. Morality), $p = .43$.

Discussion

Study 1 aimed to examine the extent to which preschoolers show enhanced trait memory for immoral and incompetent individuals relative to their more virtuous counterparts, extending previous research with preschoolers and adults in the moral domain (Baltazar et al., 2012; Buchner et al., 2009; Kinzler & Shutts, 2008). After viewing a series of photographs depicting faces described with positive and negative characteristics that were either moral or epistemic in nature, children demonstrated above-chance recognition for all previously presented individuals, and accuracy rates increased with age. Consistent with previous studies (Baltazar et al., 2012; Buchner et al., 2009), preschool-aged children also demonstrated more accurate reporting about whether a previously presented individual was immoral (i.e., "not nice" as opposed to moral (i.e., "nice").

Figure 2

Proportion of Correct Faces Recognized as a Function of Dimension and Valence in Study 1

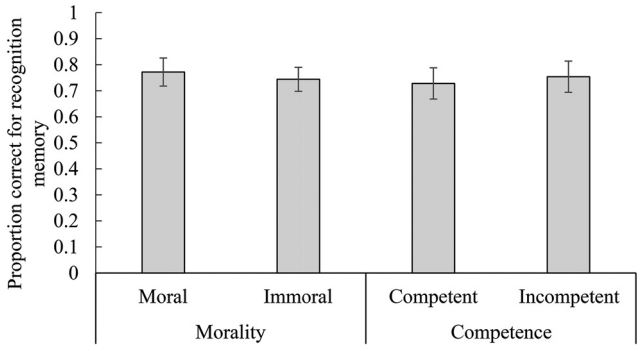
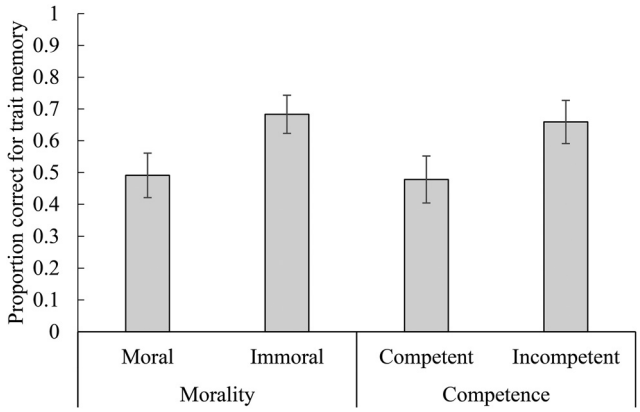


Figure 3

Proportion of Correct Traits of Sources Recalled as a Function of Dimension and Valence in Study 1



The primary new contribution of Study 1 was the demonstration of children's heightened memory for the traits of individuals with negative epistemic characteristics. Children's recognition and trait memory for individuals varying in epistemic competence closely paralleled their recognition and trait memory for individuals varying in moral character. Specifically, preschoolers demonstrated equivalent recognition memory for the faces of competent and incompetent epistemic agents but more accurately recalled negative epistemic traits about individuals (i.e., "not smart") than positive epistemic traits (i.e., "smart"). In light of social contract theory, such findings are consistent with the possibility that adaptive mechanisms in humans have evolved to detect both the epistemic and the moral risks that untrustworthy agents present. Specifically, our findings indicate that children may be equally biased to remember negative evidence regarding two "core" dimensions of person perception (Fiske et al., 2007) critical for cooperative exchange—morality and competence. Future efforts to replicate this finding should also investigate whether enhanced face-trait memory for incompetent agents exists in younger children and continue to explore the important theoretical question of whether children's memory biases are specified to moral and epistemic risks, or if they are part of a more general psychological phenomenon (Baltazar et al., 2012).

Given that children were better able to remember the traits of less competent and less moral individuals relative to their more positive counterparts, in Study 2 we investigated whether such selective memory mechanisms might guide their learning decisions and their memory for the content of what is said. In Study 1, children were asked to categorize different faces, and they demonstrated biases in memory for the negative individuals. But it is unclear whether the negativity bias obtained in this categorization task would influence situations in which children are evaluating agents, including pairs of agents in a learning context. Since the context within which targets are encoded play an important role in the source memory performance of adults (e.g., adults had better

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face memory of cooperators & cheaters in the context of a trust game compared to when they saw faces of opponents when no social interaction took place, Bell et al., 2010), we investigated whether children make use of negative information in contexts that require children to make learning decisions rather than classification judgments and when the stakes of remembering source competence and morality are higher,

The primary aim of Study 2 was to compare how children's selective learning decisions might be supported by their biased source memory and content memory for informants who vary in competence and in morality. In two between-subjects conditions, children were exposed to two informants described in terms of their variably competent or moral actions. The two informants then presented a series of facts, and children indicated their preferences about whom to learn from and how much they believed each source. Following a 10-minute delay, children were asked to recall both the content and the source of each presented fact. Based on the available evidence of children's better retention of information communicated by knowledgeable sources compared to an admittedly ignorant ones (Mangardich & Sabbagh, 2018; Sabbagh & Shafman, 2009), we predicted that this pattern would extend to the dimension of morality, and children would show better content memory for information from more competent and moral sources relative to information from negative alternatives. Here, we focused on a slightly older group of children (four-year-olds and six-year-olds) because attentional, learning, and memory demands of the tasks were greater. We predicted that children's content memory and source monitoring performance would improve with age.

In addition, our secondary aim of Study 2 was to assess whether the relative importance of speaker competence versus morality depends upon situational demands. Specifically, there might be situations in which children are more sensitive to risks associated with immorality than incompetence, and vice versa. For instance, when making decisions about who to affiliate with, or who to share with, children may choose moral agents over immoral ones more systematically than they choose competent over incompetent ones, since a lack of knowledge does not necessarily pose as much social threat as an individual who is harmful or has conflicts of interest. By contrast, when it comes to learning decisions, perhaps children would show stronger selectivity for the competent source over the incompetent one but are more equivocal when learning from the moral and immoral informant. In Study 2, we distinguished between the above-mentioned sociomoral decisions and epistemic decisions that children were making: Aside from including a learning task, we also added an affiliation task and a resource allocation task to investigate whether children's sociomoral evaluations of the speaker differ by dimension (i.e., competence and morality). By asking a larger variety of questions, we were interested in exploring children's use of trait-specific information and whether they make flexible use of speaker characteristics based on the type of decisions they were required to make.

Study 2

Method

Participants

We recruited a total of 64 children (30 female, M_{age} = 66.33 months; range = 50–83 months) from the same university-managed database as Study 1, consisting of children who were primarily European American, native English speakers from middle to high SES homes in Twin Cities, Minnesota, in the United States: 32 four-year-olds (14 female, M_{age} = 53.81 months; range = 50–59 months), 32 six-year-olds (16 female, M_{age} = 78.84 months; range = 72–83 months). Sample size was determined based on the effect size of η_p^2 = .21 in Sabbagh and Shafman (2009), which also used a between-subjects design. An a priori power analysis indicated that a sample size of 64 was necessary to attain good statistical power (.96) for the main analysis with one within-subjects variable (Valence) and two between-subjects variables (Age, Dimension) at α = .01. Children were randomly assigned to one of the two experimental conditions: The Competence condition or the Morality condition. The study was approved by the University of Minnesota Institutional Review Board ("Children's Source Monitoring and Selective Learning From Problematic Speakers," IRB1503P66782).

Materials

Each participant was presented with photographs of two female faces with neutral expressions representing the two informants. Since we only presented children with two informants, the gender of the faces was kept consistent across all participants to follow the convention of previous selective learning studies (e.g., Corriveau, & Harris, 2009; Johnston et al., 2015). The two faces were obtained from the Center for Vital Longevity Face Database (Minear & Park, 2004). In the learning phase, all participants were presented with photographs of 12 rare animals and associated unfamiliar names (see Figure 4 for an example). Pilot testing confirmed that children were not familiar with the animals or their real names. The data that support the findings of this study are openly available in Open Science Framework at https://osf.io/n3gx2/. This study was not preregistered.

Procedure

Participants first went through a familiarization phase, in which they were introduced to two agents varying in competence (in the Competence condition) or niceness (in the Morality condition). Then, all children received the *trait memory, affiliation, and resource allocation* tasks and participated in the *learning* and *test phases* (see Figure 4 for an overview of the procedure).

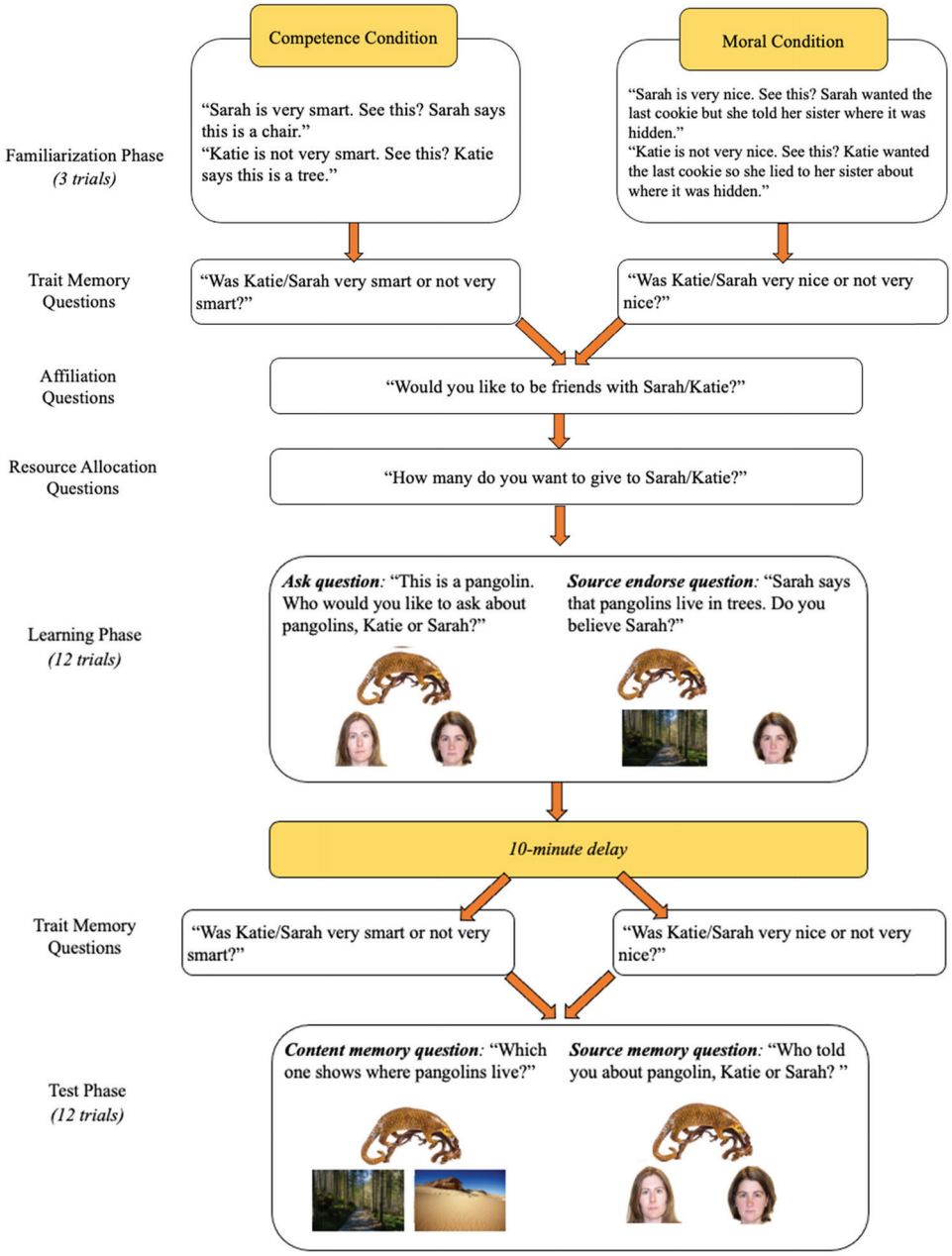
Familiarization Phase. The experimenter introduced the task by saying, "Today you're going to see two new people. One of them is very smart [very nice] and one of them is not very smart [not very nice]. I want you to pay really close attention to these new people because I'm going to ask you some questions about them!" Participants were then shown photographs of the two informants and introduced to them (i.e., "This is Katie."; "This is Sarah.").

Then, participants in both conditions received three familiarization trials. For each trial in the Competence condition, participants were presented with a photograph of an informant along with a photograph of a familiar object. One of the informants was described as being smart and as labeling the familiar object correctly (e.g., "Sarah is very smart. See this? Sarah says this is a chair."), and the other was described as being not smart and as labeling the familiar object incorrectly (e.g., "Katie is not very smart. See this? Katie says this is a tree."). For each trial in the Morality condition, one of the informants was described as being nice and as telling the truth (e.g., "Sarah is very nice. See this?

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Figure 4

Procedural Overview For Study 2 With Examples of Questions and Visual Depiction in Each Phase



Note. The original face stimuli came from the Park Aging Mind Laboratory Face Database. Adapted from "A Lifespan Database of Adult Facial Stimuli," by M. Minear and D. C. Park, 2004, *Behavior Research Methods, Instruments, & Computers, 36*, 630–633. Copyright 2004 by Springer Publishing. Additional image sources were (1) Red Rocket Photography for The Children's Museum of Indianapolis. (2013, August 8). Ground pangolin (photograph licensed under CC BY-SA 3.0). Wikimedia Commons. https://commons.wikimedia.org/wiki/File:The_Children%27s_Museum_of_Indianapolis_-_ground_pangolin.jpg; (2) Alfie Ianni. (2008, July 18). Great Sand Sea-Desert (photograph licensed under CC BY 2.0). Flickr. https://www.flickr.com/photos/ainet/2760282525; (3) Barnyz. (2017, October 1). Forest (photograph licensed under CC BY-NC-ND 2.0). Flickr. https://www.flickr.com/photos/75487768@N04/38004374914/. See the online article for the color version of this figure.

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Sarah wanted the last cookie but she told her sister where it was hidden."), and the other was described as being not nice and as lying (e.g., "Katie is not very nice. See this? Katie wanted the last cookie so she lied to her sister about where it was hidden."). Here, we included examples of moral behavior that focus on truthful or deceptive communication, and epistemic behavior that focus on word-naming abilities to make the trait-consistent behavior more compatible with the learning phase (see Lane et al., 2013; Mascaro & Sperber, 2009: Vanderbilt et al., 2011). In both conditions, the positive (i.e., smart, nice.) informant remained positive and the negative (i.e., not smart, not nice) informant remained negative across all three trials. The identity of the positive and negative informants was counterbalanced across participants.

Trait Memory. After the *familiarization phase*, participants' memory for the smartness and niceness of the informants was assessed with *trait memory* questions. The purpose of these questions was to determine the extent to which children monitored information regarding sources' competence or morality. Participants were presented with photographs of each of the two informants individually and asked to indicate whether that informant was very smart/nice or not very smart/nice (e.g., "Was Katie very smart or not very smart?").

Affiliation. Next, participants' willingness to affiliate with each informant was assessed. Participants were presented with the photograph of each informant individually and asked to indicate whether or not they would be friends with the depicted informant (i.e., "Would you like to be friends with Sarah?").

Resource Allocation. After the *affiliation* judgments, two plastic cups bearing the faces of the two informants were placed in front of the participants. Children were then given five paper coins and asked, "How many do you want to give to Sarah?" and "How many do you want to give to Katie?" Participants were encouraged to distribute all five of the coins between the two informants.

Learning Phase. Children then received 12 learning trials in the *learning phase*. In each learning trial, children received an *ask question* and a *source endorse question*. Participants were first presented with a photograph of a novel animal along with photographs of the two informants. The experimenter labeled the animal and administered an *ask question*, requesting that the participant indicate which of the two informants they wanted to ask about the animal (e.g., "This is a pangolin. Do you know about pangolins? Who would you like to ask about pangolins, Katie or Sarah?"). Then, children heard a fact of an animal from one of the two informants. Specifically, the experimenter showed the children a photograph of the animal, a photograph of its food or habitat, and a photo of one informant, then communicated the animal fact to the participant (e.g., "Katie says that pangolins live in trees."). In an effort to ensure that participants paid attention to the communicated facts, the experimenter requested that the child repeat the fact immediately after hearing it (e.g., "Where did Katie say that pangolins live?). All participants were able to repeat the fact communicated in each trial.

Next, the experimenter asked a source endorse question, requesting that the participant indicate whether they believed the informant (e.g., "Do you believe Katie?"). Across the 12 learning trials, each informant was described as communicating six facts about animals' habitat or diet. The facts associated with each informant were counterbalanced. As such, the informant for each fact was predetermined by counterbalancing conditions and did not necessarily match the child's choice of informant based on their responses to ask questions. In cases of a mismatch, the experimenter stated, "It looks like we're going to hear from Katie (Sarah) this time" and continued with the trial. This was done so that children were asked to learn an equal amount of facts from both sources.

Delay and Test Phase. A 10-min delay followed the learning phase. The duration of the delay period was established through pilot testing and informed by prior research on external source monitoring (Kovacs, & Newcombe, 2006). During the delay period, children completed a few executive functioning tasks as distractors. When the 10-min delay ended, children completed a second set of trait memory questions identical to the first set, which assessed their memory for the smartness and niceness of the informants Then, children were presented with 12 test trials, assessing their memory for the facts and their associated sources that had comprised the previously presented 12 learning trials. In each test trial, participants first saw a photograph of a previously presented animal along with a photograph of its habitat/diet and a foil photograph of a habitat/diet associated with a different animal they learned about. Participants were asked a content memory question to identify the photograph depicting the correct habitat/diet of the target animal (e.g., "Which one shows where pangolins live?"). Next, participants saw photographs of both informants and were asked a source memory question to indicate who communicated the fact about the target animal (e.g., "Who told you about pangolins, Katie or Sarah?").

Results

Preliminary analyses revealed no effects of counterbalancing or gender. Thus, reported analyses collapse across these factors. All binary dependent measures were analyzed with logistic regression models including the variables of interest (i.e., Age in months, Dimension and Valence, when applicable). We also ran models with interaction terms, and the best models were selected based on comparisons between nested models.

Trait Memory

We found that children's memory of the characteristics of the positive and negative informants was at ceiling for the two conditions, both immediately and after the 10-minute delay. When presented with photographs of each informant, 100% of children in the Competence condition and 97% of children in the Morality condition said that the previously positive informant was very smart or very nice; and 100% of children in the Competence condition and 100% of children in the Morality condition said that the negative informant was not very smart or nice. Following the delay period, the majority of children in both conditions were still able to recall that the previously positive informant was very smart or very nice (97% of children in the Competence condition and 97% of children in the Morality Condition) and that the previously negative informant was not very smart or nice (99.7% of children in the Competence condition and the Morality Condition). Children's initial trait memory did not differ significantly from their delayed memory in either condition or in response to any question posed, and there were no differences between the two conditions (all $ps > .38$).

Affiliation

When asked whether or not they wanted to be friends with the previously positive informant, 87% of children in the Competence

condition and 87% of children in the Morality condition responded affirmatively. When asked the same question in reference to the negative informant, only 28% of children in the Competence condition and 6% of children in the Morality condition responded affirmatively. A binary logistic regression model examining the effects of Dimension and Age in Months (mean-centered) on whether children wanted to befriend the negative informant revealed a main effect of Dimension (Competence, Morality), OR = 6.03, 95% CI [1.38, 42.43], p = .03, indicating that children were more likely to befriend the incompetent informant compared to the immoral informant. There was not a main effect of Age, p = .49.

Resource Allocation

Children allocated a greater number of coins to the positive informant than the negative informant, and this pattern was significantly above chance across both conditions (2.5 out of 5): Competence condition, M = 3.59, SD = .875, $t(31)$ = 7.073, $p < .001$; Morality condition, M = 3.66, SD = .865, $t(31)$ = 7.558, $p < .001$. A linear regression model conducted with Dimension (Competence, Morality) and Age in Months as predictors revealed no main effect of Dimension, p = .76 or Age, p = .51, indicating that children gave equally to the two positive agents.

Learning Phase: Selective Ask and Source Endorse

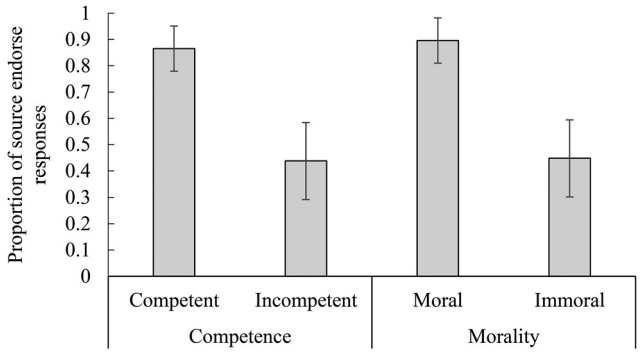
Ask Trials. Children in both the Competence and Morality conditions performed above chance in the proportion of trials they asked the positive speaker: Competence condition, 83.6% choices of the competent speaker, $p < .001$; Morality condition, 72.9% choices of the prosocial speaker, $p < .001$. A binary logistic mixed-effects model with Dimension and Age in Months (centered) as between-subjects factors revealed a main effect of Dimension, p = .0297, indicating that children in the Competence condition demonstrated stronger preferences to ask the previously positive informant compared to children in the Morality condition. There was no main effect of Age on children's ask question performance, p = .11.

Source Endorse Trials. Children's answers to the source endorse questions for the positive informant (e.g., "Sarah says that pangolins live in trees. Do you believe Sarah?") and the negative informants (e.g., "Katie says that colugos live underground. Do you believe Katie?") were coded as binomial responses based on whether children endorsed the source of the communicated fact in each trial. Children in both conditions were significantly above chance in believing the positive speaker (Competence condition, M = 86.5%, SE = 2.5%, $p < .001$; Morality condition, M = 89.6%, SE = 2.2%, p = .001), and they were at chance in believing the negative speaker (Competence condition, M = 43.8%, SE = 3.6%, ns; Morality condition, M = 44.8%, SE = 3.6%, ns).

A mixed-effects logistic regression including Age in Months (centered), Informant Valence (positive, negative), and Dimension (Competence vs. Morality) as fixed effects, and subject as a random effect, revealed a significant main effect of Informant Valence on children's willingness to endorse the source of communicated facts, OR = 27.65, 95% CI [16.54, 48.31]; $p < .001$. Thus, children more often expressed their belief in positive informants than in negative informants, regardless of Dimension (see Figure 5). There were no other main effects.

Figure 5

Proportion of Trials in Which Children Endorsed Sources of the Communicated Facts as a Function of Dimension and Valence in Study 2



Test Phase: Content Memory

In both conditions, children received 6 trials for each informant, assessing their memory for the facts that were presented in the learning trials A mixed-effects logistic model which included an Age × Dimension × Informant Valence interaction as a fixed effect yielded the best fit for the data. The model revealed a significant effect of Informant Valence (OR = 1.96, 95% CI [1.26, 3.19], p = .003), which was subsumed by a significant three-way interaction between Age, Dimension, and Informant Valence, OR = .93, 95% CI [.89, .98], p = .007. To better understand the three-way interaction, we computed separate mixed-effects logistic models for each Dimension that included Age, Informant Valence, and their interaction. For children in the Morality condition, there was a significant effect of Age (OR = 1.04, 95% CI [1.01, 1.07], p = .02), but no effect of Valence and no interaction between the two. This indicated that although older children had better content memory than younger children, their content memory for facts was not influenced by whether the informant was moral or immoral. By contrast, for children in the Competence condition, there was a significant interaction between Age and Valence (OR = 1.05, 95% CI [1.01, 1.09], p = .006), indicating that compared to younger children, the difference between children's semantic memory for content communicated by an incompetent informant and an competent informant was larger for the older children(see Figure 6). In other words, with age, children's selective forgetting of information communicated by negative sources became especially evident for incompetent sources.

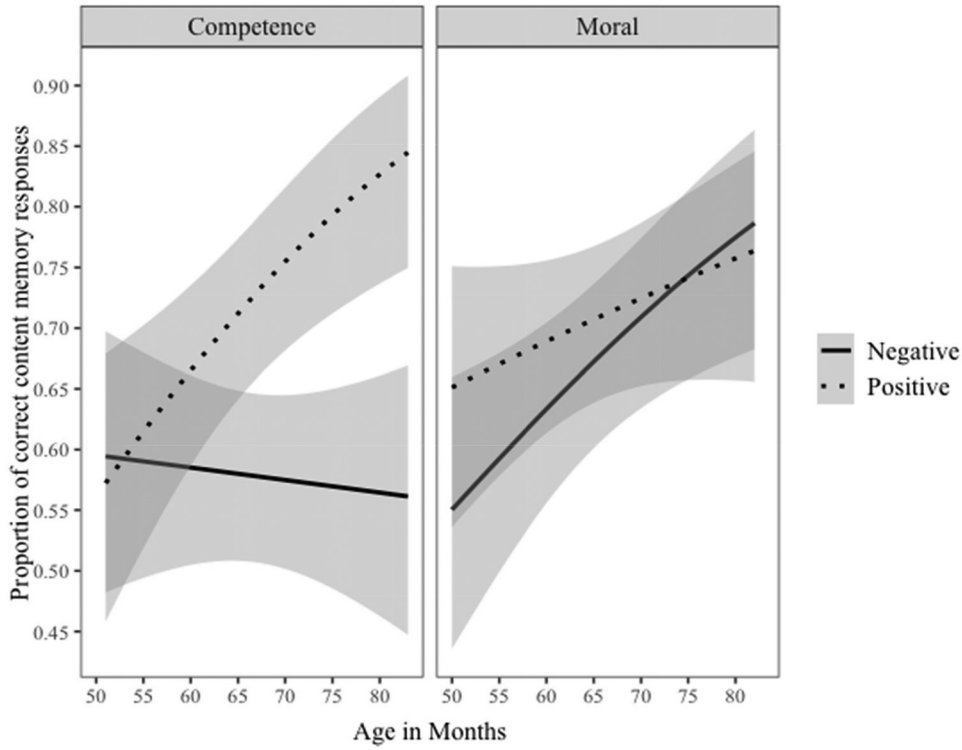
Test Phase: Source Memory

In both conditions, children's source memory for the facts (e.g., "Who told you about pangolins, Katie or Sarah?") were also assessed for each informant (6 trials each). Children's source memory responses were analyzed using mixed-model binary logistic regressions. The best model found an effect of Informant Valence (OR = 2.31; 95% CI [1.48, 3.65]; $p < .001$) and an effect of Age (OR = 1.05; 95% CI [1.02, 1.08]; p = .001), both subsumed by a moderate three-way interaction between Age in Months, Informant Valence, and Dimension (OR = 1.05, 95% CI [1, 1.1], p = .04). To further examine the interaction, separate mixed-effects logistic

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Figure 6

Proportion of Correct Content Memory Responses as a Function of Age and Dimension in Study 2



Note. Separate line types indicate children's content memory responses toward the positive (competent, moral) and negative (incompetent, immoral) speaker. Gray shading indicates standard errors.

models that included Age, Informant Valence, and their interaction were run separately for each of the two conditions. For children in the Morality condition, there were only marginal main effects of Age (*OR* = 1.03; 95% CI [1, 1.06]; *p* = .08) and Valence (*OR* = 1.52; 95% CI [.99, 2.33]; *p* = .06), indicating that children of all ages were similarly likely to recall the correct moral and immoral sources. For children in the Competence condition, there was a significant Age × Informant Valence interaction (*OR* = .94; 95% CI [.91, .98]; *p* = .002). As shown in Figure 7, compared to older children who recalled both competent and incompetent sources, younger children were more likely to recall who told them a fact when the source was competent as opposed to incompetent.

Relation Between Selective Learning and Memory

To further examine whether children's selective learning patterns were related to their content and source memory, we also ran a series of mixed-effects logistic models in which the target dependent variables were children's content memory and source memory responses, and children's responses in the ask trials and source endorse trials were added as fixed-effects predictors. Children's selective learning measures did not significantly predict children's source memory (i.e., whether children could correctly recall that which informant communicated the facts). However, we found that children's source endorse response (whether they expressed belief of an informant) predicted children's content memory for the facts above and beyond the other reported predictors, *OR* = 1.76, 95% CI [1.18, 2.64], *p* = .006. This indicated that if children expressed belief in an informant, they were also more likely to recall facts communicated by that informant.

Discussion

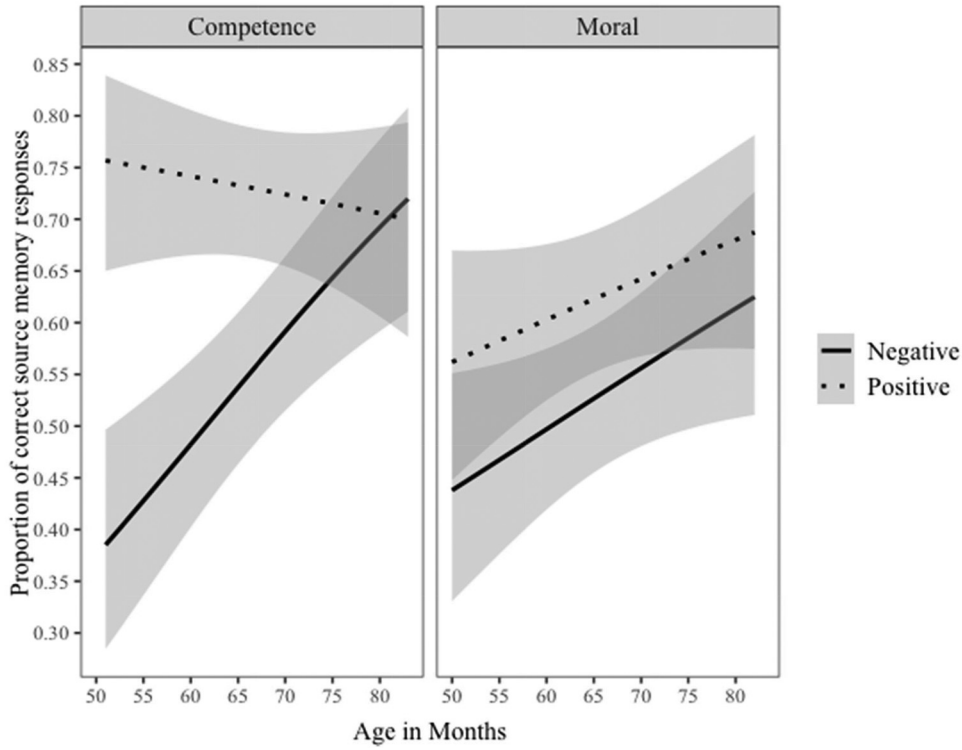
Study 2 assessed children's selective learning and memory of novel facts communicated by competent, incompetent, moral, and immoral agents and their memory for the source of each fact. Consistent with prior research on selective learning, children demonstrated a strong preference to ask the previously competent and benevolent sources for new information (e.g., Harris et al., 2018; Koenig et al., 2019), and this preference to learn from the positive informant was especially pronounced in the Competence condition compared to the Morality condition. In addition, children were more likely to express their belief in competent and moral sources themselves than in the incompetent or immoral sources. Importantly, children exhibited selective retention of communicated information in the Competence condition: With age, children recalled more facts when they were communicated by the competent source relative to when they were communicated by the incompetent source. For children in the Morality condition, however, their content memory for the facts stated by the moral and immoral sources did not differ.

Age-related differences were also evident in children's memory in the test phase. Children demonstrated better content memory and source memory with age, indicating that they were more likely

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Figure 7

Proportion of Correct Sources Memory Responses As a Function of Age and Dimension in Study 2



Note. Separate line types indicate children's source memory responses toward the positive (competent, moral) and negative (incompetent, immoral) speaker. Gray shading indicates standard errors

to recall the facts about novel animals and the sources of information at an older age. Older children also appeared to be more sensitive to the specific risks associated with incompetent sources over immoral sources: They only showed worse recall for facts communicated by the incompetent informant compared to those by the immoral informant. By implication, older children may appreciate that antisocial or harmful sources can nevertheless be knowledgeable. This possibility is consistent with previous research that children are sometimes willing to learn novel information from antisocial speakers (Hetherington et al., 2014; Johnston et al., 2015; Pesch, & Koenig, 2018).

Study 2 also examined relations between children's memory and selective learning, finding that children who were more likely to believe facts communicated by an informant also tended to be more likely to recall the content of facts communicated by this informant. It is possible that children actively recruit source information during learning situations and subsequently recall source-related information to guide their reporting of communicated information.

In study 2, we also investigated children's decisions to affiliate and share with the speakers. Consistent with the results on children's memory and selective learning decisions, the valence of the informants influenced children's practical and prosocial decisions. Specifically, children shared more with the competent or moral informant than the incompetent or immoral informant, and they were also more likely to state that they wanted to befriend the positive informant. Moreover, we found a condition difference in children's affiliation decisions toward negative informants: Children were less likely to state that they would want to be friends with an immoral agent relative to an incompetent agent, suggesting that children's decisions against affiliating with an individual may be especially influenced by an agent's history of immoral behavior. The reasons why children showed more trait-specific preferences in the affiliation measure but not in the resource allocation measure warrant further exploration, but it is possible that our resource allocation task was not sensitive enough to pick up dimension differences because children were forced to distribute a finite resource between the positive and negative agents. Future studies will be needed to more broadly assess children's judgments and actions toward incompetent versus immoral individuals across a variety of sociomoral measures.

General Discussion

In this paper, we were interested in whether children differentially remember and learn from variably virtuous agents in the moral and epistemic domains. Across two experiments, we addressed two main questions: First, do children demonstrate enhanced trait memory for agents lacking in virtue when presented with many individuals during a categorization task? Second, when considering only two agents, how does an agent's competence and morality influence children's retention of communicated information, as well as their source memory for the facts they communicate? Study 1 extended previous research on children's enhanced trait memory for morally

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threatening individuals (e.g., Baltazar et al., 2012) by presenting preschoolers with a series of individuals described as "smart" or "not smart" and "nice" or "not nice." We found that children displayed equally good recognition memory for faces for all individuals, but they were better at remembering the traits associated with immoral and incompetent individuals relative to their moral and competent counterparts. Study 2 addressed the second question by presenting children with two individuals varying in competence or morality and assessed children's content memory of the novel facts they presented, as well as children's memory for the source of each communicated fact (i.e., who told them). Here, we found that children preferred to solicit novel information from more competent and moral individuals, and better remembered information communicated by competent individuals.

In Study 1, children showed equal recognition memory for positive and negative faces but enhanced trait memory for negative epistemic and moral sources. As stated earlier, Study 1 extended previous work on children's enhanced trait memory for antisocial agents (Baltazar et al., 2012; Buchner et al., 2009), and revealed that children more accurately reported an individual as incompetent (i.e., "not smart") than competent (i.e., "smart"). In line with evolutionary psychology's proposal that the mind evolved to detect threatening individuals (Cosmides & Tooby, 1992; Tooby & Cosmides, 2005), the finding that young children's trait-memory privileged the incompetent over competent sources suggests that negativity biases in memory may support the identification of epistemic threats as well as physical threats. Children's enhanced memory for characteristics of incompetent sources suggests that this early-developing system helps them avoid being misinformed by such agents. Future work should examine whether adults show a similar pattern and whether these memory advantages extend specifically to other forms of threat or more generally to other negatively valenced individuals.

Study 2 revealed that children selectively retain communicated content and source information from more positive informants, which is an important addition to prior research on children's selective learning (e.g., Corriveau & Harris, 2009; Landrum et al.,2013; Johnston et al., 2015). Specifically, this study is the first to show that children's preferences to seek and learn new information from competent and benevolent individuals is likely supported by better memory for the messages. Previous research has found evidence for more fragile word-object associations in young children when such information was presented by informants who were admittedly ignorant (Mangardich & Sabbagh, 2018; Sabbagh & Shafman, 2009). Our study extends these findings by showing that children's memory for claims made by an incompetent source is weak relative to their memory for claims made by a competent source. An important question concerns why children exhibit poorer retention of information from an incompetent agent. Based on prior evidence, children likely attend to learning events featuring negative informants and encode these learning events but fail to form semantic memories for the communicated information (Mangardich & Sabbagh, 2018). This possibility is also supported by findings from older children in Study 2, who were able to recall both competent and incompetent sources but were more likely to selectively retain information from the competent informant. This indicated that older children encoded the learning event with the incompetent individual, but long-term storage in their semantic memory was likely blocked.

Does immoral and incompetent behavior pose the same type of influence on children's memory and learning decisions? Interestingly, children's tendency to recall the traits of and express belief in information communicated by competent individuals did not differ from that by moral individuals, which might indicate that children's judgments of an agent's good moral and epistemic behavior carry some general implications for their memory and learning decisions. This interpretation is consistent with evidence of "halo effects" for moral and competent individuals, and general inclinations to favor "nicer" and "smarter" informants (e.g., Brosseau-Liard & Birch, 2010; Fusaro et al., 2011; Landrum et al., 2013). However, we also found that children's learning decisions to ask an individual for new information was especially influenced by the individual's competence, whereas their social decisions to affiliate with an individual was especially influenced by her moral behavior. Moreover, with age, children were also less likely to recall facts communicated by the incompetent individual compared to the competent individual in the Competence condition, but this pattern was not obtained in the Morality condition.

Taken together, these findings indicate that children indeed make distinct and adaptive use of specific characteristics (e.g., Hetherington et al., 2014; Johnston et al., 2015), and it may be that children's learning and memory are first guided by a more general attribution of an informant, and with age, they selectively appreciate the specific benefits and risks associated with the epistemic versus moral virtues of individuals. Since speaker competence is often introduced via behavioral history instead of by explicit trait labels (Corriveau, & Harris, 2009), future studies are needed to replicate these results by presenting children with behavioral descriptions instead of trait information to see if similar patterns emerge. To explore whether these patterns of results generalize to traits that are not specific to social and communicative exchanges, future studies are also needed to include other traits or characteristics that are less directly related to social or epistemic threats (e.g., cleanness, Rottman et al., 2020) and explore whether children show equivalent levels of selectivity in their learning, memory and social preferences for any positive versus negative distinctions.

Interestingly, children showed enhanced trait memory for negative sources in Study 1 when they were asked to classify individuals (when asked, e.g., "Was Katie very smart/nice or not very smart/nice?"), but they demonstrated poorer source memory for information communicated by the incompetent source in study 2 (when asked, e.g., "Who told you about pangolins?"). These results suggest that children's memory allows them to remember the identities and traits of potentially harmful epistemic and moral agents, but also to adjust their learning when such individuals provide information. Specifically, in Study 1, when source-specific memory demands were high and learning demands were low (i.e., children encountered 16 individuals with different genders in a categorization task, and were not asked to make learning decisions), children may have enhanced memory for the sources' negative traits to protect themselves against such agents in future interactions (Baltazar et al., 2012; Kinzler & Shutts, 2008). But in Study 2, when source-specific memory demands were reduced and learning demands were high (i.e., children were only exposed to two female individuals and were presented with various facts from these individuals), children may have preferentially sought out informants likely to provide them with accurate information,

resulting in better retention of the information communicated by the more trustworthy informants.

Thus, one interesting possibility is that children's memory is biased toward the negative characteristics of sources to avoid social and epistemic threats in future interactions, and this negativity bias might be associated with children's retention of what to believe, resulting in compromised semantic learning from negative sources and better content and source memory for information from positive sources in situations of social exchange (consistent with compromised memory for information from ignorant and inaccurate sources; Sabbagh & Shafman, 2009; Koenig & Woodward, 2010). It will be interesting for future studies to explore whether children's trait memory for the negative sources after longer delays might inversely predict content memory for the facts stated by negative sources in learning contexts.

It is also worth noting that there were nuanced differences in the agent behaviors that were presented across Study 1 and 2. Specifically, although both studies presented the traits of individuals as "nice," "mean," "smart," and "not smart," the trait-consistent behavior in Study 1 covered a wider range of behavior (e.g., pushing, stealing as examples of immoral behavior; not being good at math problems and reading as examples of incompetent behavior) than in Study 2 where we intentionally focused on epistemic and moral behaviors that were relevant to informing others (e.g., lying as an example of immoral behavior; misnaming a familiar object as an example of incompetent behavior). It will be important for future work to expand upon the kinds of moral and epistemic agents that children are presented with in order to examine whether children, especially older children, can distinguish between different types of immoral and incompetent behavior in their memory and learning choices.

In summary, the current study examined the influences of speaker competence and morality on children's source-related memory and selective learning. It is the first to yield insights into the role of both competence and morality in influencing children's memory of the sources and the information they share. By reporting children's enhanced memory of negative traits, we hope that the current studies can expand the scope of evolutionary accounts prioritizing concerns related to physical harm and survival, and include work on cognitive processes that serve to identify epistemic risks. To our knowledge, our study is also the first to move beyond the examination of children's selective learning preferences for competent and moral speakers to demonstrating that both semantic and source memory supports children's selective preferences. Our findings support the idea that children show an adaptive ability to remember the traits of agents who pose both epistemic and moral threats while retaining the testimony provided by more epistemically and morally virtuous counterparts.

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