Preschoolers' Evaluations of Ignorant Agents are Situation-Specific

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Abstract

Preschool children's preference for knowledgeable agents over ignorant and inaccurate agents (Sabbagh & Baldwin, 2001; Koenig & Harris, 2005; Rakoczy et al., 2015), is generally interpreted as epistemic vigilance. However, Kushnir and Koenig (2017) recently found that without a contrasting accurate agent, preschoolers will learn new information from an agent who professed ignorance, but not from one who was inaccurate. Employing a two-speaker design contrasting an agent who professed ignorance about familiar object labels with a speaker whose knowledge state was not revealed, we found that preschoolers (N = 41; 3.50-4.89 years, M = 4.08 years) avoided requesting and endorsing novel information from the ignorant agent in the same domain as her previous ignorance (i.e., labels). In different domains, however, (i.e. novel function learning, resource sharing, etc.) they were at chance in choosing the ignorant agent. This suggests that preschoolers' view of ignorance is situational, rather than uniformly negative.

Keywords: learning; testimony; social cognition; credibility; cognitive development; epistemic trust; accuracy; epistemic vigilance

Background

Numerous studies show an overwhelming preference in early childhood for a competent, confident, accurate, or knowledgeable agent over an agent who was inaccurate, ignorant, or uncertain (Birch, Vauthier, & Bloom, 2008; Brosseau-Liard & Birch, 2010, Brosseau-Liard, Cassels, & Birch, 2014; Fusaro, Corriveau, & Harris, 2011; Harris & Corriveau, 2011; Koenig & Harris, 2005; Koenig & Woodward, 2010; Pasquini et al., 2007; Rakoczy et al., 2015; Sabbagh & Shafman, 2009; Scofield et al., 2013; Tenney et al., 2011; Tummeltshammer et al., 2014; *For review, see* Harris et al., 2018). There may be many reasons for this preference--including assessments based on vigilance or trust—but in any case, there seems to be a general negative assessment of all uninformative agents by preschool age.

Recent findings suggest that children do not treat all uninformative agents as equally untrustworthy. Kushnir & Koenig (2017) measured preschoolers' evaluations of either an agent who professed ignorance about familiar object labels or one who was inaccurate. In one condition, 3- and 4-year-old children viewed an agent who professed ignorance about the names of familiar objects. In another, children viewed an agent who was inaccurate in naming the same objects. Kushnir & Koenig found that children were willing to learn new things from the previously ignorant agent, but not from the inaccurate one. This study suggests that children's evaluations of uninformative agents are not uniformly negative or vigilant. Specifically, that they don't see ignorance about some things as a sign to mistrust or avoid learning other things.

We can infer from Kushnir and Koenig (2017) that children respond more negatively to inaccurate agents than ignorant agents, but it remains unclear what these results imply about their evaluations of professed ignorance. It could be that by the presence of a preferred accurate agent overrode information from an ignorant agent in previous studies (e.g., Koenig & Harris, 2005), and that this single-speaker design revealed children's true ignorance evaluations. However, it could be that children were simply agnostic toward the previously ignorant agents, and were willing to learn from them when no alternatives were available.

What is the nature of children's stance on professed ignorance? We suggest that there are at least three possible answers. One is that children view ignorance as situation-specific. Broadly, this means children could discount past ignorance when learning new things (as in the above example) or they might treat an agent's claims of ignorance as specific to one domain of expertise and not another (e.g. Lutz & Keil, 2002; Kushnir, Vredenburgh & Schneider, 2013). The second possibility is that children look favorably on ignorant agents when they make new claims because they will admit what they don't know (i.e. they are "well calibrated" or even "virtuous" e.g. Kominsky, Langthorne, & Keil, 2016; Tenney et al., 2011). This suggests that children could show a preference for those who admit ignorance regardless of domain or situation because. A third possibility is that children only prefer previously ignorant agents when no other agents are available to provide information. This suggests that if any other reasonable (i.e. not inaccurate) source of information was present, children would avoid learning from an ignorant agent. Of course, these need not necessarily be mutually exclusive and could represent contributing factors in a nuanced assessment. We investigate the roles of these three possible interpretations in the current study.

We used a modified version the two-speaker design from Koenig & Harris (2005) which contrasts an ignorant with an accurate speaker to examine these three possibilities. The modification was to contrast an agent who admitted to not knowing the names of familiar objects with a neutral agent whose knowledge state has not been disclosed. To explore the specificity of children's ignorance evaluations, we measured children's willingness to learn from the ignorant agent about novel objects in two domains: labels and functions. To explore the depth of children's evaluations, we measured children's choices of the ignorant agent for requesting information and for endorsing new claims within both domains.

If children's evaluations of ignorance are situation-specific, we expect children to differ in their willingness to learn new information about object labels versus functions from a source who was ignorant about labels. If they instead view ignorance as a virtue or signal of calibration, we expect children to show willingness to learn from the ignorant agent in all cases. Finally, if children show overall vigilance, we expect them to avoid learning new information from the ignorant agent in all cases.

In addition to the learning tasks, we included three different measures of children's ignorant speaker evaluations in non-learning situations. To capture whether they had a preference or general positive regard for the ignorant agent, we measured how often children shared more stickers with her than with the neutral agent across three resource-sharing trials (*see* Chernyak & Sobel, 2015; Kanngiesser & Warneken, 2013; Moore, 2009). Toward testing for general dislike or mistrust, we controlled for agent knowledge state by measuring children's endorsements of claims about the location of a hidden object that both agents could see. Further, to determine whether evaluations permeated children's explicit understanding of agent knowledge, we asked children which of the two agents knows more. Together, these measures can provide evidence about the extent of overall positive or negative evaluations of the ignorant agent.

Method

Participants

We tested 41 preschool age children (16 girls) between 3.50 and 4.89 years old (M = 4.08 yrs., SD = 0.42 yrs.) from a large midwestern city. In addition, one child was excluded for experimenter error, and one child was excluded for ending the study early. Participants were predominately from white, upper-middle class families.

History Phase

Children were shown an image of the two agents and were told they were going to watch some videos of these two friends and then play a game. They then watched alternating videos of the ignorant (*I*) agent (3) and neutral (*N*) agent (3). For each video, the agent sat at a table with a confederate, who initiated a brief exchange with the agent. In order to control for features outside of demonstrated knowledge state, both agents responded to the confederate in a conventional way (e.g., returning a greeting or responding to a question) and were on screen for approximately equal periods of time. Agent who spoke first (*I* vs. *N*; speaker order was constant across all trials within subjects) and actor who was the ignorant agent (*blue shirt* vs. *red shirt*), were counterbalanced between subjects.

Ignorant Agent Videos The confederate handed a familiar object (ball, cup, shoe) to the ignorant agent, asking "Look what I have! Can you tell me what that is called?" (see Kushnir & Koenig, 2017). Each time, agent *I* held the item with both hands, shook her head, and responded "I don't know what that is called". All professions of ignorance concerned labels for familiar objects.

Neutral Agent Videos The confederate and the neutral agent both sat at the table using their cell phones with none of the familiar objects from the Ignorant condition present. The confederate briefly looked up and initiated a common, familiar interaction with agent *N*. ("Hi," "Good morning," and "How are you?") before looking back at her phone. The neutral agent then looked up briefly and responded with an appropriate but non-informative answer ("Hi," "Good morning," and "Fine").

Test Phase

The test phase consisted of 9 trials. The first 6 were two blocks of 3 trials: one novel label and one novel function trial (counterbalanced) followed by a resource sharing trial. The last three trials were (in this order): locations trial, final resource sharing trial, and knowledge attribution. Of the four novel objects, two were always used for label trials and two were always used for function trials. Each trial type is described below:

Novel Label Requests For each novel label trial, the experimenter (*E*) first displayed an image of the novel object on the screen and prompted the child by saying "Look at that thing! I've never seen one of those before! I wonder what it's called. I bet one of our friends can tell us!" *E* then showed the paused opening scene of the novel object video, in which the confederate is standing between the two agents and holding the object, and asked the child, "Who do you want to ask what that is called?" If the child did not reply, *E* prompted once more with "Which friend do you want to ask?" The child's first choice was recorded, and *E* responded with "Ok. Let's see!" regardless of the response.

Novel Label Endorsements *E* then played a video in which the confederate said "Look what I have!" and turned to each agent (order counterbalanced between subjects) and asked "Can you tell me what this is called?" Each agent gave a different label (e.g., danu or koba, counterbalanced). After each video, the child was shown a still image of the two agents with the item between them. *E* pointed to each agent in the order in which they spoke, saying, "So she said it's a danu, and she said it's a koba. What do you think it's called?"

Children's first response was recorded. If the child said "I don't know," *E* followed up with "do you think they could both be right or both be wrong?" Otherwise, no feedback was given.

Novel Function Requests The procedure for novel function requests was identical to that of the novel label requests, except that *E* said "I wonder what it's used for!" and "Who do you want to ask what it's used for?" instead of "I wonder what it's called…Who do you want to ask what it's called?" The objects used for function trials each had features that made both functional claims feasible.

Novel Function Endorsements Endorsement measures for novel functions were also the same as the label endorsement trials, except the confederate asked the agents what the object was for, and they named and demonstrated different functions (e.g., in *Figure 1,* for looking or for stacking).

Resource Sharing At each sharing trial, the experimenter placed two cups, each with a picture of one of the two agents taped to it, in front of the child. The child was then given five identical stickers and was told that for each sticker, they could share with whichever friend they want by putting the sticker in that agent's cup.

Location Endorsement Children watched a video in which the agents had two boxes (equal in size, varying in color) between them. In the video, the confederate showed a small toy, held up a barrier blocking the boxes from the child's view, and then made a motion of placing the toy somewhere behind the barrier while both agents followed the motion with their gaze to indicate they were watching. The confederate then asked where the toy was, and each agent made a different claim about which box it was in (counterbalanced). Children were then asked to endorse one of the locations.

Knowledge Attribution After all the test videos, children were shown the still image of the two agents one more time and were asked, "Who do you think knows more?" First response was recorded, and children were asked "why do you think she knows more?" as a follow-up.

Figure 1: Examples of novel function *(left*) and novel label (*right)* stimuli.

Coding

We coded four categories of responses to our request and endorsement questions. The majority of responses (77.32%) were selections of a single agent (ignorant agent or the neutral agent). The second most frequent response (15.12%) was expressing uncertainty about the choice (e.g. "I don't know"). A small percentage of children (2.44%) picked both agents. On endorse trials, a small percentage of children (5.12%) made up their own label or function (see below).

Requests For each request question (2 label, 2 function), children were given 1 point for each time they asked the ignorant agent (singly or by responding "both") and 0 points for each time they did not (by picking the neutral agent or saying "I don't know").

Endorsements For each endorsement (2 label, 2 function, 1 location) Similar to coding for requests, we gave children 1 point for each time they endorsed the ignorant agent and 0 points for each time they did not. In cases where children used an alternative name or function, we coded their response as a 0. In cases where children responded with uncertainty, we followed up with "Do you think they could both be right or both be wrong?" and assigned 1 point if they selected "both right" and 0 points if they selected "both wrong". (See *Table 2* for responses before follow up question).

Resource Sharing For each of the three sticker sharing trials, we coded two measures. Children were given a score of 1 for each time they gave more stickers to the ignorant agent and a score of 0 each time they gave fewer stickers to the ignorant agent, and we added these scores across the three trials for a possible score of 0-3. We also recorded the number of stickers (0-5) shared with the ignorant agent on each trial and calculated each child's average number of stickers shared with Agent I across all three trials.

Knowledge Attribution Children were given a score of 1 if they indicated that the ignorant agent knew more and 0 if they did not.

Results

McNemar's tests indicated that there were no significant differences in the proportion of Ignorant agent choices in Trial 1 and Trial 2 for label requests (p = 1.00), label endorsements (p = 0.344), function requests (p = 0.146), or function endorsements (p = 0.238). Therefore, we summed across both trials of each of the four questions types, creating four variables with possible scores of 0-2. Pearson's correlations indicated that age in months was not significantly related to ignorant agent choice in any question type or domain (see *Table 1)*, so we did not include age as a covariate in further analyses.

Table 1: Mean choices of ignorant agent and age correlations by task.

Task	*M*	SD	*r* with Age
Novel Labels			
Requests	0.63	0.799	0.23
Endorsements	0.634	0.799	-0.14
Novel Functions			
Requests	0.927	0.848	-0.14
Endorsements	1.024	0.758	0.24

Note. For all tasks, $N = 41$. Range (0-2). For all correlations, $p > .05$

Main Effect of Domain and Question Type

A 2 x 2 repeated-measure ANOVA of domain (label vs. function) by question type (request vs. endorse) revealed a main effect of the domain of the novel information on children's choices of the ignorant agent. Specifically, children were significantly less willing to choose to learn from the ignorant agent in the label domain than in the function domain; F(1) = 7.895, p <.01, 95% CI[-.587, -.096] (see *Table 1* for *M* and *SD*). There was no main effect of question type (F = 0.196) and no domain by question type interaction (F = 0.170).

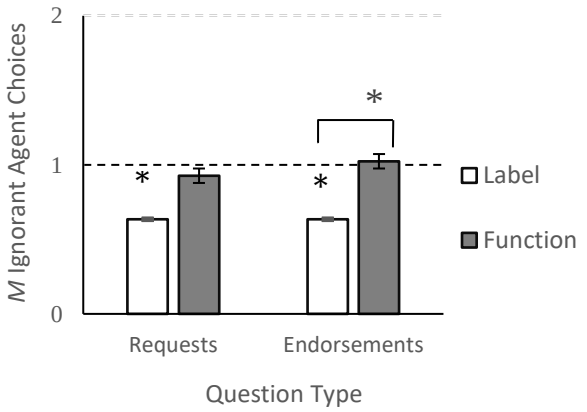

Figure 2: Mean selections of the ignorant agent across domains & question types. Dashed line refers to chance responding.

Domain & Question Type Differences

To further explain this domain effect, we tested choice of ignorant agent against chance for each task and the difference in ignorant agent choices between domains for each question type (e.g. label requests vs. function requests). See *Figure 2* for a visualization of these results.

Children's selections of the ignorant agent were significantly below chance for both requests and endorsement questions in the label domain; $t(40) = -2.933$, $p < .01$, 95% CI [-0.62, -0.11]. In the function domain, children were at chance for choices of the ignorant agent for both function requests (t(40) = -.552, p = .58, 95% CI [-0.34, 0.19]) and function endorsements; t(40) = .206, p = .84, 95% CI [-0.21, 0.26].

Follow up paired-samples t-tests revealed that the domain effect was stronger for endorsements than requests: there was no significant difference between domains on children's requests alone ($t(40) = -1.524$; $p = .153$), but children were significantly less likely to endorse the ignorant agent for novel labels than for novel functions ($t(40) = -2.72$, p = .01, 95% CI[-0.68, -0.10].

To further examine which alternative responses children made when they did not endorse the ignorant agent, we looked descriptively at the counts and percentages of all response categories for each task (see *Figure 3)*. While the percentage of Ignorant Agent choices were noticeably higher in the novel function domain than in the novel label domain, the percentage of choices of the Neutral agent remained similar across all tasks except the novel label requests. The distribution of responses shows that when children were not endorsing the Ignorant agent's label, they were expressing uncertainty or making up their own alternative label as often as they were endorsing the neutral agent's label.

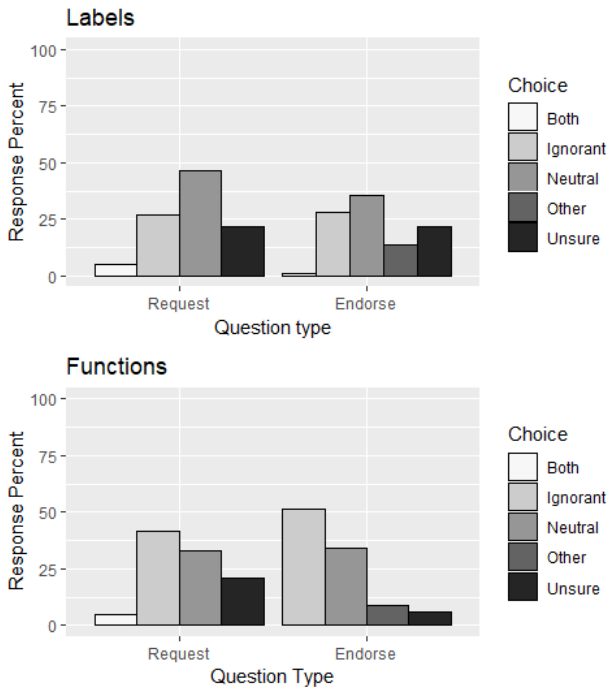

Figure 3: Percentage of raw response types by domain & question type.

Location, Knowledge Attribution, & Sharing

Binomial tests revealed that children were at chance for endorsement of the ignorant agent's hidden object location claim (54% ignorant agent endorsement, p = 0.76) and for attribution of knowledge to the ignorant agent (56%, p = 0.53).

Table 2: Pearson correlations for Ignorant Agent choices in tasks without novel object

	Attribute Knowledge	Share Freq.	Share Avg.	Label Total	Function Total
Endorse Location	.262	.378*	.162	.127	-.236
Attribute Knowledge	1	.564**	.364*	.117	.165
Share Freq.	-	1	.755**	.145	.211
Share Avg.	-	-	1	-.006	.106

Note. "Share Freq." is frequency of sharing more with agent *I* (0-3). "Share Avg" is the avg. amount shared with agent *I* (0-5). "Label total" and "Function Total" are the sum of *agent I* choices across all novel label trials and all novel function trials, respectively*; *p < .05, **p < .01*

Children were also at chance (M = 1.49, SD = .952) for the number of times (0- 3) they shared more stickers with the ignorant agent; t (40) = -.082, p = .935, 95% CI[-0.31, 0.39], and for the average number of stickers (0-5) they shared with the ignorant agent across trials (M = 2.54, SD = 0.774); t (40) = 0.303, p = .764, 95% CI[-0.21, 0.28].

We conducted 2-tailed Pearson correlations to explore the relation of these measures to all the other outcome variables. Agent choices on location endorsement, knowledge attribution, and resource sharing were not related to agent choices on any of the novel label or function questions.

However, ignorant agent choices were strongly correlated between several of these three non-novel object tasks (*Table 2).* Notably, the number of trials in which children shared more stickers with the ignorant agent than with the neutral agent and the average number of stickers they shared with the ignorant agent were positively related to their attribution of more knowledge to the ignorant agent.

Discussion

When preschool children monitor agents' informativeness as evidence about their reliability, they often show an overwhelming social and learning preference for an agent who demonstrates knowledge, certainty, and accuracy over one who is lacking in any of these criteria. By contrasting an ignorant agent with a neutral agent, we tested three possible stances from which children could be considering professed ignorance. We found that children's responses to a previously ignorant agent are more nuanced than a uniform negative or positive judgment.

If children view professed ignorance as specific to the situation or domain in which they have seen evidence of her ignorance—in this case, object labels, we would expect them to respond to her further claims about object labels differently than her claims in another domain. In support of this explanation, we found that children avoided both requesting and endorsing novel labels from the ignorant agent but did not demonstrate this vigilance against her when learning novel object functions. This result suggests that there is a situational constraint of preschooler's pessimism about ignorant agents.

If children look favorably on agents who profess ignorance, perhaps seeing it as evidence of virtue, we would expect them to show a preference for the ignorant agent in their overall learning, perhaps in their resource sharing, and possibly even in their explicit judgments of agent knowledge. Our novel label and novel function data suggest that they avoided learning labels from, or were agnostic toward learning functions from the ignorant agent rather than preferring her over the neutral agent. On sticker sharing trials, which are often used to measure judgment of virtue or general liking of an agent (Chernyak & Sobel, 2015; Kanngiesser & Warneken, 2013; Moore, 2009), our results show no relation between children's learning from and willingness to share with an agent. Therefore, we did not find that children had a general positive regard toward the ignorant agent based on the sharing data, and having positive regard for the ignorant agent did not predict learning from her. However, children who explicitly stated that the ignorant agent knows more also shared more with her. Together, these results suggest that preschoolers do not think of professed ignorance as virtuous, but they may think of knowledge as a virtue.

If children avoid learning from ignorant agents unless no reasonable alternative is available, we would expect preschoolers not to request or endorse new information from the ignorant agent on any novel label or function trials. If children's avoidance of the ignorant agent expanded beyond epistemic vigilance and into mistrust, we would also expect children to share fewer resources with the ignorant agent and reject her claim about the location of a hidden object. Because children were at chance in responding to the ignorant agent across all trials outside of the label domain, we did not find evidence that children are generally pessimistic toward people profess ignorance.

Overall, we propose an explanation that combines elements of two of our three possibilities. Children's stance on professed ignorance is situation-specific—they show epistemic vigilance against new information from an agent only in situations similar to those in which she was ignorant before (e.g., the label domain). However, the extent of their vigilance is influenced by whether there is another reasonable option from whom to learn. When children saw only an familiar-label-ignorant agent in Kushnir & Koenig (2017), they were above chance in endorsing her later novel label and function claims, but when we presented a neutral agent as a contrast, children's domain-specific vigilance emerged, and their willingness to learn from the ignorant in a new domain was reduced to chance. This situational specificity is not apparent in studies contrasting an ignorant and accurate agent (e.g., Koenig & Harris, 2005), which suggests that preschool children are agnostic in their evaluations of ignorant agents outside of the specific situation in which they professed ignorance, treating them similarly to an agent whose knowledge state is unknown. Future studies should include professed ignorance in other, non-linguistic domains in order

to determine whether these situation-specific evaluations are actually specific to ignorance about labels.

The situational nuances in preschoolers' evaluations of agents who profess ignorance aligns with the extant literature on the development of children's understanding of knowledge and expertise. Our findings highlight preschoolers' stance on professed ignorance as part of a greater developmental trajectory for epistemic trust and social learning (as in Kushnir & Koenig, 2017). By 4 years old, children have begun to distinguish ignorant agents from both accurate and inaccurate agents, distinguish agents by their demonstrated domains of expertise (e.g., labels or causal functions), and use these distinctions to inform learning from those agents (Kushnir et al., 2013, see also Brosseau-Liard & Birch, 2011 and Sobel & Corriveau, 2010). This corresponds with our finding that children also evaluate an agent's ignorance—which could be considered the opposite of expertise—based on the domain in which it is demonstrated. However, in alignment with other studies showing that children do not successfully use an agent's calibration of certainty as a sign of epistemic virtue until the end of middle childhood (Tenney et al., 2011; Kominsky et al., 2016; Brosseau-Liard et al., 2014), we found that preschoolers did not show a significant preference of or deference to the ignorant agent on any trials.

Because we only considered one, specific kind of ignorance—familiar object labels—it would be useful to test children's responses to an ignorant versus neutral agent when the ignorance is professed in different domains, such as familiar object functions and causal knowledge (e.g., Bridgers et al., 2016) or with information that is unfamiliar to the child. Further, we are limited in our knowledge of how children evaluate the neutral agent and what exactly makes an agent "neutral" as a source of information, so future studies should explore different presentations of an agents whose knowledge states are not revealed.

In order to draw more detailed, concrete conclusions about children's understanding of knowledge and the development of their epistemic trust, future work should continue to unpack the different ways children respond after evidence of ignorance. We focused on children's willingness to choose the ignorant agent in different situations, but the variety of responses from children who did not choose her suggest that professing ignorance may be influencing children's behavior outside of signaling someone's reliability as a source of information. Because our study showed the ignorant agent later assigning names to unfamiliar objects, the combination of these factors could have given children license to find an answer on their own. In that case, the number of responses where children made up their own answer rather than endorsing either agent could be related to children's increased exploration in the absence of pedagogical cues (Bonawitz et al., 2011). Future studies should consider individual differences in children's responses and in other sensitive developmental areas for preschool-aged children, such as social cognition (e.g., Sabbagh & Baldwin, 2003).

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