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“I’m Better than You at Labeling!”: Preschoolers Use Past Reliability when Accepting Unexpected Labels

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Abstract

How do young children decide to trust testimony that contradicts their initial beliefs? The current study examined whether children rely on cues to informant credibility (i.e., history of accuracy) to determine if they would endorse an unexpected label from an informant. Three- and 4-year-olds ($N = 60$) saw a picture of a hybrid artifact that consisted of features of two typical familiar artifacts. Children made initial judgments about the name of the hybrid object and subsequently received a different name offered by an informant who had earlier either accurately or inaccurately named familiar objects. Children were more willing to revise their own judgment and accept the unexpected label if it was from a previously accurate informant than if it was from someone who had made obvious naming errors. This suggests that preschool-aged children selectively revise their own knowledge; they are more trusting toward sources proven accurate than inaccurate.

Keywords: selective trust; accuracy; reliability; unexpected testimony; preschoolers

Introduction

Children not only learn from their own perceptions and observations of the world around them but also learn from information provided by others. Research on young children has underlined the importance of others’ testimony in knowledge acquisition in the early stages of development (see Gelman, 2009; Harris, 2007; Mills, 2013, for reviews). In particular, extensive studies have demonstrated that children show selective trust in testimony depending on an informant’s previously established credibility (e.g., Koenig, Clément, & Harris, 2004; Sabbagh & Baldwin, 2001; for a review, see Koenig & Sabbagh, 2013).

Children show sensitivity to the prior accuracy of informants and make persistent use of such information to learn new words and new object functions (Birch, Vauthier, & Bloom, 2008), learn novel rules (Rakoczy, Warneken, & Tomasello, 2009), and solve problems (Palmquist & Jaswal, 2015). This effect of accuracy has been established in studies that present children with two unfamiliar informants who consistently provide accurate or inaccurate information in the context of familiar objects and examine whether these children subsequently prefer the accurate over the inaccurate informant when the two informants offer conflicting novel information (e.g., two different names for the same novel object). By applying such a two-informant paradigm, research has shown that children aged 4 years, and 3 years under certain conditions, selectively endorse new information from the accurate informant over the inaccurate one (e.g., Koenig et al., 2004; Nguyen, Gordon, Chevalier, & Girgis, 2016).

Although the two-informant paradigm has proven informative, children’s selective trust toward one of two informants leaves open questions of how children evaluate and learn from a single informant—a situation in which children are typically involved in everyday interactions (e.g., Lane & Harris, 2015). Furthermore, the mechanisms underlying children’s assessment of the testimony from a single source versus two contrasting sources may be different. For example, 3- and 4-year-olds would endorse new information from a previously inaccurate informant as long as there was no other informant who proposed an alternative (Vanderbilt, Heyman, & Liu, 2014). This suggests that in general children prefer to endorse testimony from an accurate versus an inaccurate informant, but yet they are willing to trust the testimony of a single inaccurate informant if that is the only testimony available.

The studies presented above are related to children learning something that they do not have any prior knowledge of. However, acquiring new knowledge is plausibly a simpler process than accepting something that conflicts with one’s own knowledge or violates one’s expectations (hereafter as *unexpected testimony*). It remains unknown to what extent children’s acceptance of unexpected testimony would be influenced by the informant’s past accuracy. Specifically, in the absence of another person’s testimony, would children still trust a previously inaccurate (or accurate) informant’s testimony when it is contrary to one that they have previously formed on their own? A related line of research has shown that 3- to 4-year-olds are indeed credulous and tend to give up their own beliefs to accept other’s statements that are counterintuitive or overtly misleading, particularly when the speaker’s communicative intent is salient (e.g., Heyman, Sritanyaratana, & Vanderbilt, 2013; Lane & Harris, 2015). Research examining preschoolers’ advice-taking (Rakoczy, Enrling, Harris, & Schultze, 2015) also demonstrated that 3- to 6-year-olds were more likely to adjust their own social judgments when receiving advice from an expert rather than an ignorant advisor, suggesting that children do keep track of informants’ credibility and use such cues in adjusting their own inferences. However, no studies have examined whether an informant’s history of accuracy would affect children’s willingness to revise their own testimony in face of testimony different from their own beliefs, and in the context where there was no other informant offering alternative testimony.

The current study seeks to use the single-informant paradigm to explore the extent to which 3- and 4-year-olds use informants’ past accuracy as a cue to evaluate testimony that contradicts their own beliefs about object labels. The

task was modeled after Vanderbilt et al. (2014) and Jaswal, Lima, and Small (2009). Children were presented with pictures of ambiguous hybrid artifacts each involving features of two typical and familiar objects (e.g., car-shoe), and were asked to provide a name for each hybrid artifact. We examined how children would react to a previously accurate or inaccurate informant who provided an unexpected label, which was not misinformation, but one that always contradicted the children’s own beliefs. This would test whether children are willing to give up their own (prior) beliefs to accept the informant’s testimony. Based on previous findings that preschoolers show robust sensitivity to informants’ past accuracy, we predicted that children would be trusting toward the previously accurate informant and accept this informant’s unexpected labels, and that they would be skeptical about the previously inaccurate informant and, therefore, rather not change their initial judgments about the object labels. Additionally, it has been found that children with larger vocabulary (Jaswal, 2007) and those with disadvantaged executive function (Jaswal et al., 2014) were more credulous toward others’ testimony than those with smaller vocabulary and advanced executive function skills, respectively. Hence, children’s vocabulary and executive function ability were also assessed to control for potential confounds in this study.

Method

Participants

A total of 60 3- and 4-year-olds ($M_{age} = 49.64$ months, $SD = 6.69$, range = 35–61 months; 26 girls) participated in this study. Half of them were randomly assigned to the accurate condition and the other half to the inaccurate condition. Children were recruited from private childcare centers in a middle-class neighborhood in Singapore. Only children whose parents had given their consent were included in the study. The majority of participants (96%) were Asian and the rest were Eurasian. All children spoke English and the experiment was conducted in English. One additional child did not want to provide answers in the test phase and, therefore, was excluded from the final sample. Another eight children participated but were excluded due to experimenter error ($n = 2$) or failure to name familiar objects (see Design and Procedure, $n = 6$).

Materials

Video clips of a single informant naming photographs of objects were prepared and shown to children on a 13-inch laptop computer. The informant was a college-age female actor and with neutral facial expressions. In each video clip, the informant was seated behind a table with a picture placed on it. Pictures of three familiar objects (i.e., apple, ball, and book) were used in the familiarization trials to establish the informant’s accuracy. Eight typical exemplars of familiar categories were selected and paired to form four stimulus sets to be used in the test trials (i.e., key-spoon, car-shoe, toothbrush-pen, and hat-cup). For each stimulus

set, features from the pair of typical exemplars were integrated to form a “hybrid” exemplar. These hybrid exemplars were designed such that each hybrid object looked mostly like one of the two typical exemplars of that set (i.e., dominant exemplar) but also shared some features of the other exemplar (i.e., non-dominant exemplar) such as a spoon-like key (see Figure 1).

A total of 14 video clips was made, corresponding to three familiarization clips with the informant naming each of the familiar objects correctly (accurate condition), three familiarization clips with the informant naming each of the familiar objects incorrectly (inaccurate condition), four testimony clips featuring the informant naming the hybrid objects with the labels for the dominant exemplars, and four testimony clips featuring the informant naming the same hybrid objects with the labels for the non-dominant exemplars (see Figure 2).

Design and Procedure

This study employed a between-participants design. The procedure for both the accurate and inaccurate conditions was the same, except that the history of the informant was established differently during the familiarization phase.

Children were tested individually in a quiet room at their childcare centers. Children were randomly assigned to one of the two conditions. All children were seated in front of a laptop computer and a female experimenter (a different

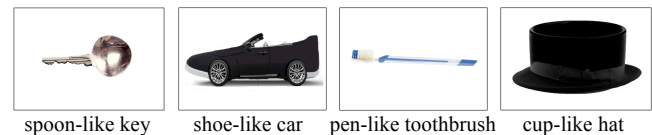


Figure 1. Hybrid objects used in the experiment.

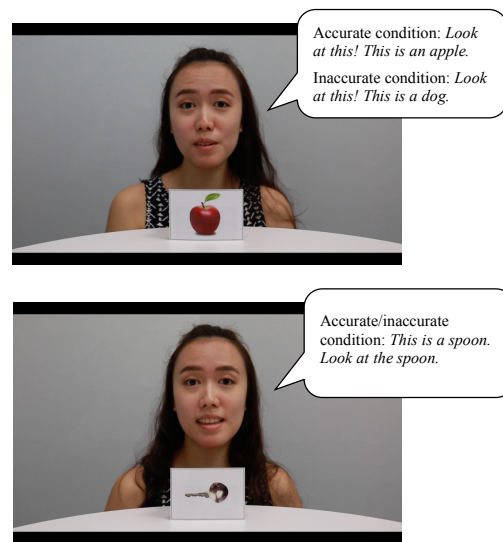


Figure 2. Screenshots from familiarization video clips in the familiarization phase (top) and testimony video clips in the test phase (bottom).

person from the informant in the video clips) was seated beside the child. The whole procedure was videotaped and children's responses were coded from the videos. Each child received three familiarization trials (Familiarization Phase), followed by four test trials (Test Phase), and two explicit judgment trials. The experiment was designed and written using PsychoPy (Peirce, 2007).

Familiarization Phase In the familiarization phase, the experimenter introduced the children to a single informant, a still image of whom was shown on the screen. In the accurate condition, children were then presented with three familiarization video clips, each showing the informant accurately naming a familiar object (i.e., labeling an apple, a ball, and a book correctly). In the inaccurate condition, children were familiarized with the same informant providing inaccurate information (i.e., saying that the above three objects were a dog, a tree, and a chair, respectively). After each familiarization video clip, children saw a picture of the same familiar object presented in the previous video (without the informant) and were asked by the experimenter, "Can you tell me what this is called?" This question was to make sure that each child knew the correct labels of the familiar objects, implying that the child was able to tell whether the informant had made errors or not. Children did not receive any feedback about whether they or the informant was correct. The order of the presentation of the three familiar objects was the same for all participants.

Test Phase The experimenter proceeded to the test phase where children had to respond to a testimony that conflicted with their initial judgments (i.e., an unexpected but possible label for a hybrid object). Each test trial began with a picture of a typical object (e.g., a key) appeared on the computer screen and the experimenter asked the children for the name of the object. The purpose of the question was to ensure that the children knew the names of the typical objects. Six children were excluded because they failed to name one or more typical objects (two in accurate and four in inaccurate condition). The experimenter then showed a picture of the other typical object from the same stimulus set (e.g., a spoon) on the screen, and children were again asked what that object was called. Children were then presented with a picture of the hybrid object that included features of the two previously shown typical objects (e.g., a key-spoon), and were asked if they knew what that object was called (*pre-testimony test*). Children's answers to this pre-testimony test were recorded as their initial judgments about the name of the hybrid object. The experimenter then told the children, "Okay. Now, let's hear what the girl will say about this." and played a testimony video clip, where the informant and the picture of the same hybrid object appeared in the clip, and the informant always provided a label that was different from what the children had indicated earlier. Subsequently, children were shown the picture of the hybrid object on the computer screen for a second time (without the informant) and were asked by the experimenter

what the hybrid object was called (*post-testimony test*). During the test phase, children received neutral feedback following a response, regardless of what their answers were (e.g., "Thank you!"). All children completed four test trials. The order of the two typical exemplars of each stimulus set was fixed, such that, for two sets of stimuli (key-spoon and hat-cup), the dominant exemplars were shown first, and for the other two sets (car-shoe and toothbrush-pen), the non-dominant exemplars were shown first. The order of the four test sets was randomized for each participant.

Explicit Judgment Trials After children completed all four test trials, the experimenter asked two questions assessing children's evaluation about the informant. With the picture of the informant presented on the screen, children were asked, "Was this girl good or not good at telling the names of the pictures?" Finally, the experimenter showed a picture of a novel object and asked children whether they would seek the informant's help for the name of the object, "If you wanted to know what this new thing was called, would this girl be a good person to ask?" This question was included to replicate Vanderbilt et al.'s (2014) results on children's overwhelming judgment of the accurate/inaccurate speaker as being a good person to ask for the label of a novel object.

In addition to performing the above experiment investigating selective trust in unexpected testimony, all children completed the Peabody Picture Vocabulary Test (PPVT-4; Dunn & Dunn, 2007), which measures receptive English vocabulary, and the Dimensional Change Card Sort task (DCCS-standard version; Zelazo, 2006), which assesses executive function. Both PPVT and DCCS tasks were administered and scored following standard procedures. For the PPVT, each child obtained a standardized score with a mean of 100. For the DCCS, children were classified as passing or failing the task based on performance on the post-switch phase of the DCCS.

Results

The number of times (out of 4 trials) when children adopted the different labels provided by the informant rather than persisting with their initial answers about the names of the hybrid objects on post-testimony test was calculated for each participant as the dependent variable. Thus, the scores indicate how children are willing to trust the informant and accept the informant's testimony that is contrary to their own. Preliminary analyses confirmed no effects or interactions involving children's age, gender, stimulus set, or test order; therefore, further analyses collapsed across these factors. We report 95% confidence intervals and effect sizes for our statistical tests. In the case of comparisons of group means these confidence intervals refer to the observed mean difference.

We first evaluated whether children in the two conditions had comparable language and executive function abilities. Vocabulary scores on PPVT-4 were not significantly different between the conditions (accurate: $M = 95.07$; inaccurate: $M = 96.17$), $t(58) = -0.35$, $p = .73$, Cohen's $d = -$

0.092, 95% CI of the difference [-7.45, 5.25]. Regarding performance on the DCCS task, children in the two conditions were comparable in terms of the proportion of children who passed the task (accurate: 20/30 passing, 67%; inaccurate: 20/30, 67%), $\chi^2(1, N = 60) = 0.00, p = 1.00$, Cramer's $V = .00$. Correlational analyses revealed that neither the PPVT scores nor the DCCS scores were related to children's likelihood of endorsing the informant's testimony across the two conditions, $r_s < .042, p_s > .74$.

In addition, all children, regardless of the experimental condition, correctly named the familiar objects and the typical exemplars during the familiarization and test phase respectively. Analyses of children's responses in the pre-testimony test trials, where children were to name the hybrid objects for the first time, indicated that children provided labels matching the dominant exemplars on 92% of the trials and labels matching the non-dominant exemplars 8% of the trials. There were equivalent number of pre-testimony trials where children chose the non-dominant label in accurate and inaccurate conditions (7 vs. 13 trials, respectively). Nevertheless, the informant always provided the label that was different from the children's label for the hybrid object in the testimony video clips (thus unexpected).

Crucially, we were interested in whether 3- and 4-year-olds would respond less credulously to the unexpected testimony from an informant who demonstrated inaccuracy at naming familiar objects compared to an informant with a history of accuracy, that is, whether children would discard their own labels and accept the unexpected labels from the informant in the post-testimony test.

As seen in Figure 3A, children were more willing to revise their answers and accept the unexpected testimony in the accurate condition ($M = 3.60, 95\% \text{ CI } [3.15, 4.06]$) than in the inaccurate condition ($M = 1.33, 95\% \text{ CI } [0.88, 1.79]$), $U = 123.50, z = -5.12, p < .001, r = -.66$. Examining patterns of individual behavior revealed similar differences between accurate and inaccurate conditions. We calculated the number of children in each condition who endorsed the unexpected testimony on 0, 1, 2, 3, or 4 out of four trials. Chi-square tests showed that the distribution of children across various patterns of responses was different between the accurate and inaccurate conditions, $\chi^2(4, N = 60) = 30.64, p < .001$, Cramer's $V = .72$. There were more children who accepted the informant's testimony on 3 or 4 trials in the accurate condition ($n = 28$) than the inaccurate condition ($n = 7$). None of the significance levels were affected by removing data from test trials where the child chose the non-dominant label in the pre-testimony test before the informant providing different testimony.

Lastly, children's responses to the two explicit judgment questions were analyzed¹. In line with the patterns of information endorsement, significantly more children in the accurate condition agreed that the informant was good at

naming the pictures compared with those in the inaccurate condition (90.0% vs. 51.9%), $\chi^2(1, N = 57) = 10.24, p = .003$, Cramer's $V = .42$ (see Figure 3B). However, there was no significant effect of condition on the question assessing children's willingness to seek help from the informant for the label of a novel object, $\chi^2(1, N = 59) = 2.59, p = .18$, Cramer's $V = .21$ (see Figure 3C). Children overwhelmingly judged that the informant, regardless of whether she showed a history of accuracy or inaccuracy, would be a good person to ask about the label of a novel object—89.7% of children did so in the accurate condition, and it was the case for 73.3% of children in the inaccurate condition. These rates were in a similar range as those reported by Vanderbilt et al. (2014) where children were asked to judge whether an accurate or inaccurate source, either alone or paired with each other, would be a good person to ask for labels of novel objects (76%–90%).

Discussion

The current study examined the extent to which an informant's history of accuracy influenced children's endorsement of claims that conflicted with their independent beliefs about ambiguous hybrid artifacts. Using a single-informant paradigm, we found that 3- and 4-year-olds' trust toward unexpected testimony differed depending on the informant's past accuracy. Specifically, while children consistently revised their own initial judgments and endorsed unexpected testimony from an informant who appeared to be accurate and knowledgeable about common objects, they were less likely to do so in response to someone who made naming errors with these common objects. This study provided novel findings that children consider an informant's previous epistemic history when determining whether or not to revise their own prior beliefs in light of unexpected testimony.

The present results challenge the notion that in the absence of conflicting testimony from another informant, young children generally trust a single informant who has a record of inaccuracy. This notion of trust toward a single inaccurate informant may be true only if children themselves do not hold any conflicting information at all. Vanderbilt et al. (2014) found that 3- and 4-year-olds were willing to trust the testimony of an inaccurate informant when there was no other informant offering an alternative. In contrast, children in the current study were less willing to accept the testimony provided by a single inaccurate informant in the absence of competing testimony from another informant. An important difference between this study and Vanderbilt et al.'s (2014) work, however, is that children in this study held a different interpretation of an object than the informant, whereas children in the previous study did not. Thus, the present results suggest that children's own prior knowledge play an important role in selective trust, and that children would evaluate *all available sources* of information, including themselves, when determining whom to trust. In situations where children are mostly ignorant, such as labeling unfamiliar

¹Three children in the inaccurate condition did not provide answers to the "good or not good" question and one child in the accurate condition did not provide answers to the "ask for help" question.

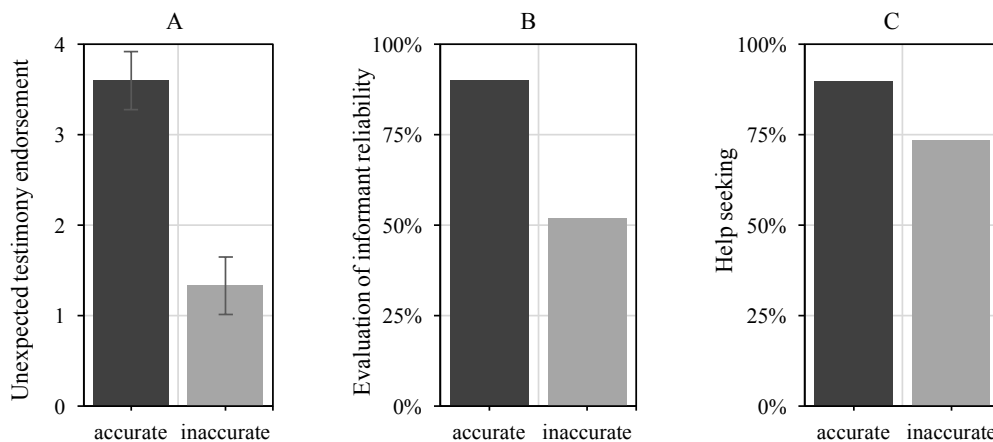


Figure 3. Evaluation of the informant by condition: (A) number of trials (out of 4) children adopting unexpected testimony from the informant, (B) percentage of children agreeing the informant being good at naming pictures, and (C) percentage of children being willing to seek novel information from the informant. Error bars represent 95% confidence intervals.

objects, children are likely to perceive an informant who confidently provides testimony as more knowledgeable than them, even if the informant has made errors previously. Whereas in situations where children possess some prior knowledge, albeit loosely formed ones, such as labeling ambiguous hybrid objects in this study, children would evaluate the relative trustworthiness of the source of information against themselves.

How do children determine the trustworthiness of an informant in relation to themselves? Past accuracy is one important factor. In the current study, children were more willing to discard their own beliefs in favor of an adult informant's testimony when this adult had been proven accurate compared to an inaccurate informant. However, it remains an open question that whether the current results were due to a negative bias toward the inaccurate source of information, or due to both a preference for the accurate source and an avoidance of the inaccurate one. Future studies could further investigate this question by examining children's responses in a control condition where no history of accuracy/inaccuracy would be provided. Age is another factor. Children in the accurate condition might perceive the accurate adult as a more credible source of information about what artifacts are called than them. In fact, 3- and 4-year-olds were more willing to learn novel labels from an adult than from a child when both were equally reliable (Jaswal & Neely, 2006). However, children appeared to weigh accuracy over age in selective trust; they were found to trust a previously accurate child more than a previously inaccurate adult when learning new words. This is also true in the inaccurate condition reported here, such that children's distrust toward inaccuracy was so robust that they assumed that an inaccurate adult was less reliable than them (a child). These results suggest that children consider multiple factors when evaluating the trustworthiness of another source of information compared with them, but weigh certain factors more than others (i.e., accuracy over age).

Even though the present results showed that children demonstrated a reduced tendency to accept the testimony against their own judgments in the inaccurate condition, it remains debatable whether it was because the children believed that the inaccurate informant was not trustworthy, or that they simply had alternative information available (i.e., their own), or both. Our results showed that children gave up their own beliefs and accepted the testimony from an *accurate* informant on an average of 90% of trials (near-ceiling), yet they were still willing to give up their own beliefs and accept the *inaccurate* informant's testimony on an average of 33% of trials (a 0% would indicate absolute rejection). This implies that children may be more ready to accept an adult informant's testimony than to reject it, even when the adult informant had been inaccurate previously, and even when the testimony conflicted with their own, at least possibly until they are provided with stronger evidence of the negative credibility of the adult informant (Ronfard & Lane, in press).

Children's degree of selective trust may thus be affected by various factors that reflect the extent of an informant's credibility. For instance, children were found to be more forgiving with errors in the episodic domain (e.g., locations of objects) than in the semantic domain (e.g., names of objects); they used semantic errors but not episodic errors when evaluating informants' trustworthiness in labeling objects (Palmquist & Jaswal, 2015). It is unknown whether children would remain skeptical toward unexpected testimony from an inaccurate informant who made episodic errors. Furthermore, hybrid artifacts were used in this study and the unexpected labels provided by the informant were always possibly "correct" and not entirely wrong, as the labels did contain some features of the hybrid, although they were contrary to children's inferences. It is unknown whether children would still be willing to accept the accurate informant's unexpected labels if the labels were not possibly correct (e.g., calling a spoon-like key a cat). Further research is needed to investigate how children's

selective trust may change depending on the types of errors made by the informants and when the unexpected labels are not actually possible.

Last but not least, children's openness to alternative information may be dependent on the strength of their initial beliefs. Indeed, Chan and Tardif (2013) found that 6-year-olds were more accepting an alternative when they felt less certain about their own prior knowledge. In the current study, children who chose the non-dominant label in the pre-testimony trials might be less certain about their answer and more prone to revise. Therefore it was important to control for children's initial choice (there were only limited number of trials with the non-dominant label thus they were excluded).

To conclude, the current study showed that when confronted with different testimony from others, young preschoolers selectively revised their own inferences depending on the informant's past accuracy. Young children are savvy in that they can use such credibility cues to evaluate another individual who holds different opinions from them and decide whether to adjust their own beliefs or not accordingly. The ability to appropriately evaluate the reliability of various sources of information and update their own knowledge correspondingly is important, since reliable sources allow children to learn efficiently while unreliable sources increase the risk of being misinformed. Our findings suggest that this ability is emerging in 3- and 4-year-old children.

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