

Turning Believers into Skeptics: 3-Year-Olds' Sensitivity to Cues to Speaker Credibility

Vikram K. Jaswal and Lauren S. Malone
University of Virginia

Under most circumstances, children (and adults) can safely assume that the testimony they hear is true. In two studies, we investigated whether 3-year-olds ($N = 100$) would continue to hold this assumption even if the person who provided the testimony behaved in an uncertain, ignorant, and/or distracted manner. In Study 1, children were less likely to trust that, for example, a key-like object was a spoon if the speaker indicated uncertainty about her testimony (e.g., "I think this is a spoon") than if she simply labeled the object ostensively (e.g., "This is a spoon"). In Study 2, 3-year-olds were also more skeptical about a speaker's testimony when she had earlier made an obvious naming error and seemed distracted, but not when she either made an error or seemed distracted. These results indicate that 3-year-olds can respond differently to the same testimony, depending on the speaker's behavior.

Successful communication is built on trust. If you tell me that you had eggs for breakfast this morning, I trust that you actually believe that you had eggs. Your belief may be wrong because, for example, you misremembered or you ate an artificial food that looked and tasted like eggs. Nevertheless, I expect that you believe what you say, and your saying it will likely cause me to believe it as well. As Grice (1975) pointed out, listeners expect that speakers will attempt to be truthful. In fact, a number of thinkers have suggested that children and adults may, by default, assume that testimony is true (e.g., Coady, 1992; Gilbert, 1991; Reid, 1764/1997; Spinoza, 1677/1982). Because most testimony is true, such a default assumption would be adaptive because it would mean listeners did not have to laboriously evaluate the veracity of everything they heard.

And yet, testimony is not always true. Due to error, ignorance, or deception, people sometimes say things that are false (Perner, 1988). Rather than blindly accepting anything someone says, a sophisticated listener should treat testimony with what Clément, Koenig, and Harris (2004) called “skeptical trust.” Particularly when a piece of testimony conflicts with one’s own expectations, a measure of skepticism could help a listener to avoid being led astray by false claims. The two studies in this paper explore 3-year-olds’ trust in unexpected testimony that comes from a potentially questionable source—in particular, a source whose behavior could suggest that she may not have the knowledge to support the surprising claims she makes.

Jaccard (1981) proposed that three variables interact to influence how receptive adults are to persuasive messages: the size of the discrepancy between the adult’s initial beliefs and the message; the confidence with which the adult holds the initial belief that conflicts with the message; and the adult’s evaluation of the credibility of the source of the message. These three variables also play an important role in how receptive children are to unexpected testimony.

For example, children are less likely to accept testimony that is widely discrepant from their expectations than testimony that is only moderately discrepant. Koenig and Echols (2003) found that 16-month-old infants who heard a speaker refer to a picture of a cat as a “shoe” objected by, for example, offering the correct label, waving their hands, shaking their heads, and/or pointing to their own shoes (see also Pea, 1982). And yet, Jaswal (2004) found that 3-year-olds were often willing to accept an adult experimenter’s assertion that a dog-like animal was a “cat.” On hearing the label, they inferred that it drank milk rather than ate bones, for example, even though when no label was provided, they inferred that it ate bones (see also Gelman & Markman, 1986). The most likely explanation for the difference between the two studies is that whereas the stimuli used in Koenig and Echols’s study were pictures of actual exemplars of familiar categories, those used in Jaswal’s study were computer-generated hybrids. These hybrids were specifically designed to look more like one category, but to be plausible (but unlikely) members of the other. Thus, just how discrepant a given piece of testimony is will influence how receptive children are to it.

A second variable influencing children’s receptiveness to unexpected testimony is how confident they are in their initial beliefs. For example, Naigles, Gleitman, & Gleitman (1993) found that young preschoolers tended to accept that a familiar intransitive verb could be used transitively (e.g., “the lion comes the giraffe” was interpreted as if meant “the lion brings the giraffe”). Older children, by contrast, tended to dismiss the anomalous frame as an error (e.g., “the lion comes the giraffe” was interpreted as if the speaker meant to say “the lion comes *to* the giraffe”). The explanation given by Naigles et al. was that younger children were less confident that they had encountered every possible frame in which a verb could appear (see also Golinkoff, Hirsh-Pasek, & Schweisguth, 2001). Similarly, Jaswal (2004) found that whereas 3-year-olds were generally deferential to testimony

about the hybrid stimuli described earlier (e.g., that a dog-like animal was a “cat”), 4-year-olds were largely skeptical. Jaswal suggested that one reason younger children may have been more receptive is because they were less confident that they had seen the full range of exemplars in the cat and dog categories.

Finally, a third variable that plays a role in how receptive children are to unexpected testimony—and the focus of the two studies presented here—is their evaluation of the credibility of the speaker. For example, Jaswal (2006) found that 3- and 4-year-olds were more likely to accept that a key-like object was a “spoon” when the label came from a speaker who claimed to have made the object than one who claimed merely to have found it. The children seemed to recognize that the person who creates an object has special authority to decide its name (e.g., Bloom & Markson, 1998). Similarly, in Jaswal’s (2004) study, when a speaker referred to a key-like object by saying, “You’re not going to believe this, but this is actually a spoon,” the otherwise skeptical 4-year-olds became significantly more credulous. Ironically, a simple acknowledgement that what she was about to say was going to seem incredible increased her credibility. Thus, a speaker’s behavior can turn young skeptics into believers.

The question addressed in the two studies reported here was the converse: Under what circumstances could a speaker’s behavior turn young believers into skeptics? To investigate this question, we provided 3-year-olds with testimony that was moderately discrepant from what we knew their expectations to be. We focused on 3-year-olds because previous work has shown that they tend to be generally receptive to the unexpected labels applied to the stimuli that will be used here (Jaswal, 2004). Like older children, 3-year-olds will spontaneously assume that a dog-like animal is a dog, for example, or a key-like object is a key. But unlike older children, they are also generally willing to accept testimony that the dog-like animal is a “cat” or the key-like object is a “spoon.”

Importantly, we do not wish to imply that 3-year-olds are deferential to all testimony. Indeed, we noted earlier that even younger children can respond skeptically when testimony is extremely discrepant from their expectations (e.g., Koenig & Echols, 2003), or when the testimony conflicts with a belief held with a high degree of certainty (e.g., Naigles et al., 1993). However, the goal of the current studies was to investigate specifically those aspects of a speaker’s behavior that could lead children to treat skeptically unexpected testimony they would otherwise be receptive to. Only by holding constant the other influences on children’s receptiveness to testimony, namely the size of the discrepancy between initial beliefs and the message and the confidence with which initial beliefs are held, was it possible to investigate the role of speaker credibility by itself.

In previous work involving moderately discrepant testimony about the names of objects (e.g., Gelman & Markman, 1986; Jaswal, 2004; Sloutsky & Fisher, 2004), the informant who provided the names (a) spoke with confidence; (b) deliberately attended to the object during the naming event; and (c) had a history only of veridical reference. In the two studies reported here, the speaker violated one or

more of these three hallmarks of ostensive naming. Study 1 addressed children's sensitivity to the speaker's confidence: The speaker used a linguistic hedge ("I think") and a set of non-verbal cues (e.g., hesitation, furrowed brow, etc.) to express uncertainty about the unexpected labels she used. Study 2 addressed whether the speaker's attentional focus and history of veridical naming would also influence children's receptiveness to unexpected labels.

STUDY 1

There is conflicting evidence about whether an explicit acknowledgement of uncertainty can influence 3-year-olds' trust in a given piece of testimony. On the one hand, Sabbagh and Baldwin (2001) showed that 3-year-olds who heard a speaker express uncertainty about the name for a novel object (e.g., "maybe this one's a *blicker*") were less likely to learn and remember a word-referent link than those who heard the speaker express confidence (e.g., "this one's a *blicker*"). On the other hand, Moore, Bryant, and Furrow (1989) found that 3-year-olds did not seem to understand that beliefs expressed through testimony could be held with different levels of certainty. Children this age were as likely to search in a location indicated by a puppet who expressed certainty (e.g., "I know the candy is in the red box") as one who expressed uncertainty (e.g., "I think the candy is in the blue box").

In Study 1, we investigated whether 3-year-olds would respond skeptically to unexpected testimony that came from a speaker who expressed uncertainty. We used a category induction procedure (e.g., Gelman & Markman, 1986; Jaswal, 2004), in which an adult experimenter introduced an object by using a label that did not match the object's appearance (e.g., a key-like object was referred to as a "spoon"). Children chose between making an inference about the object that was consistent with its appearance (thereby discounting the unexpected label the speaker had just used), or an inference that was consistent with its label (thereby deferring to the unexpected label the speaker had just used). In one condition, the speaker confidently asserted that the key-like object was a "spoon," for example. Here, we expected to replicate earlier work using the same stimuli that, as described earlier, showed that 3-year-olds tended to make inferences in line with the unexpected labels the speaker provided (Jaswal, 2004). In the second, critical condition, the speaker hedged when providing each unexpected label by saying, "I think this is an X." At the same time, she also provided non-verbal cues (e.g., furrowed brow, hesitant voice) consistent with uncertainty.

Method

Participants. Forty 3-year-old children (age range = 2;11 – 3;11) from middle-class backgrounds participated in a single 10 to 15 min session. Three

additional children were tested, but their data were not included due to experimenter error (2) or failure to cooperate (1).

Design. Children participated in a Standard or Think condition, resulting in 20 participants per condition. The Standard condition had 6 boys and 14 girls, and the Think condition had 10 boys and 10 girls. The average age in the Standard and Think conditions was 3;4 and 3;5, respectively. Children participated in four trial blocks.

Materials. Four sets of stimuli were created by pairing together similarly shaped familiar artifacts: Key-spoon, shoe-car, cup-hat, and button-ball. Color photographs of a prototypical exemplar of each artifact were obtained from a digital library of photo-objects (Hemera Technologies, Quebec, Canada). These are referred to as *demonstration exemplars*. In addition, three *test exemplars* were created for each stimulus set: Two were additional typical exemplars of the categories represented by that set, and the third was a hybrid of the two categories in that set. The hybrid had features of both categories, but was computer-generated to look more like a member of one category than the other. The result was a key-like exemplar (with some spoon-like features), a car-like exemplar (with some shoe-like features), a hat-like exemplar (with some cup-like features), and a button-like exemplar (with some ball-like features). These four hybrids are displayed in Figure 1. Importantly, previous research showed that 3-year-olds spontaneously treated these hybrids as members of the categories they most resembled (e.g., the key-like exemplar was spontaneously treated like a key; Jaswal, 2004). A set of warm-up stimuli was also used and consisted of pictures of typical dolls and shovels.

All images were sized to approximately 2 to 4 inches wide and 2 to 5 inches tall. Each image (and its left-right reverse) was printed in color, cut out, and mounted into a small stand so that it could stand on its own.

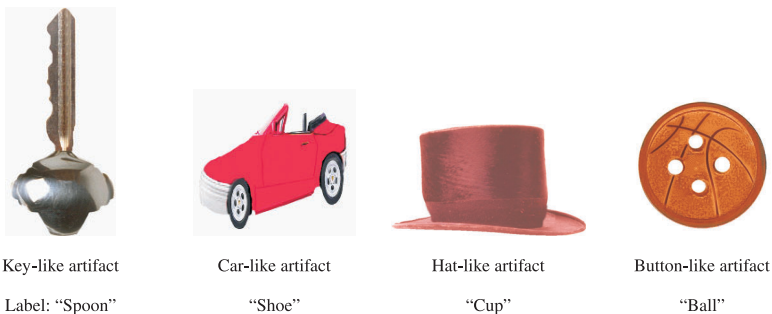


FIGURE 1 Hybrid artifacts. Children saw the stimuli in color.

TABLE 1
Stimulus Sets

<i>Stimulus Set</i>	<i>Function (background photo in bold)</i>
Key	Starts the car
Spoon	Used to eat cereal from the bowl
Shoe	Goes on the baby's foot
Car	Drives on the road
Cup	Sits on the table
Hat	The man wears it
Button	Goes on the coat
Ball	Drops through the hoop

Each of the eight categories was associated with a particular familiar function, as shown in Table 1. Color photographs of a prop associated with each function were obtained from the photo-object library. For example, the key was associated with starting a car, and the photo used to illustrate this function was of a minivan. These prop photos were mounted onto one of two 8.5 × 11-inch easels.

Procedure

Standard condition. We begin by describing the procedure used in the Standard condition, as the Think condition was a simple modification of it. Children were tested individually in a small room at their school or in the laboratory. They sat at a small table with the researcher across from them. The session began with a warm-up trial, designed to familiarize them with the basic procedure: On one easel, the experimenter displayed a photo of a bed and, using the doll stimulus, demonstrated and explained that the doll slept in the bed. She did this by holding the doll up to the bed, rotating her so it appeared that she was lying down, and making snoring sounds. Next, on the other easel, the experimenter showed a photo of a bucket and, using the shovel stimulus, demonstrated and explained that a shovel could be used to scoop sand into or out of the bucket. She did this by holding the shovel to the bucket and making scooping motions. Children were then shown additional doll and shovel exemplars in alternating order and were asked where each went, until they succeeded in placing a doll with the bed and a shovel with the bucket (or pointing to the bed and bucket photographs) consecutively. Correct selections were praised, and incorrect selections were corrected. Four children required correction.

Test trials were similar to the warm-up trial. For example, the experimenter displayed a photo of the minivan on one easel and showed that the demonstration key could be used to start the van. The experimenter then displayed a photo of the bowl on the other easel, and showed that the demonstration spoon could be used to eat cereal from the bowl. In order to reduce memory load, the demonstration key and

spoon were left standing in front of the photo of the minivan and bowl, respectively. Children were then shown the three test exemplars (another typical key, another typical spoon, and the key-like hybrid), one at a time and in a pseudo-random order (described below). Their task was to indicate, by acting out or pointing to the minivan or the bowl, whether each test exemplar was used to start the car or to eat cereal.

The researcher introduced each typical test exemplar by referring to it twice with the category label consistent with its appearance: “This is an X. Can you show me what this X does?” Each hybrid was also referred to twice with a category label, but the label used did not match what one would expect based on the hybrid’s appearance. For example, the key-like hybrid was referred to as “this spoon” (see Figure 1). Regardless of their response to the test items, children were given neutral feedback in a positive tone (“Okay!”), and the researcher then proceeded to the next test exemplar or the next set of stimuli. Importantly, the researcher provided cues normally associated with veridical ostensive naming: She spoke with confidence and deliberately attended to the object during naming. Further, she had a history only of veridical reference.

The order of the three test exemplars in each trial block was random with the constraint that across the four trial blocks, the hybrid was presented first, second, and third at least once each. The order of the four trial blocks was counter-balanced across children according to a Latin Square design. Finally, the left-right positions of the prop photographs were counter-balanced within children so that the function consistent with the label the speaker used for a hybrid could be demonstrated twice on the left and twice on the right, and across children so that each prop photograph appeared an equal number of times on the left and right.

Coding was conducted from videotape, and involved noting which of the two functions (e.g., starting the car vs. eating cereal) children selected for each test exemplar.

Think condition. The Think condition was nearly identical to the Standard condition. As in that condition, the speaker attended to the object when labeling it and had not committed any previous naming errors. However, when labeling each hybrid, the speaker prefaced each unexpected label with the hedge, “I think.” For example, on presenting the key-like object to the child, she said “I think this is a spoon. Can you show me what this spoon does?” The speaker was instructed to deliver the testimony naturally, as if she were uncertain, and so also provided paralinguistic cues typical of expressions of uncertainty (e.g., furrowed brow, hesitancy; Krahmer & Swerts, 2005).

Results

Preliminary analyses in this study and Study 2 showed no effects or interactions involving gender, so this factor will not be considered further. Inferences about the

typical items confirmed that children in both conditions understood the task: When the speaker presented a typical artifact exemplar and referred to it with a label that matched its appearance, children inferred that it had the function associated with its label at least 99% of the time. For example, when the speaker introduced the typical key as a “key,” children in both conditions readily inferred that it was used to start a car rather than to eat from a bowl.

As Figure 2 shows, when 3-year-olds in the Standard condition heard the speaker refer to a hybrid object with a label that did not match its appearance (e.g., the key-like object referred to as a *spoon*), they made an inference consistent with that label 65% ($SD = 37%$) of the time (and an inference consistent with the hybrid’s appearance the remaining 35% of the time). This level of label-based inferences is very similar to that obtained with 3-year-olds in Jaswal (2004), which used a larger set of the same kind of stimuli (67%), and also with 3-year-olds in Gelman and Markman (1987), which used a different category induction procedure and an entirely different set of stimuli and moderately discrepant labels (67%). Thus, on hearing the key-like object referred to as a “spoon,” most 3-year-olds in the Standard condition indicated that it was used to eat cereal.

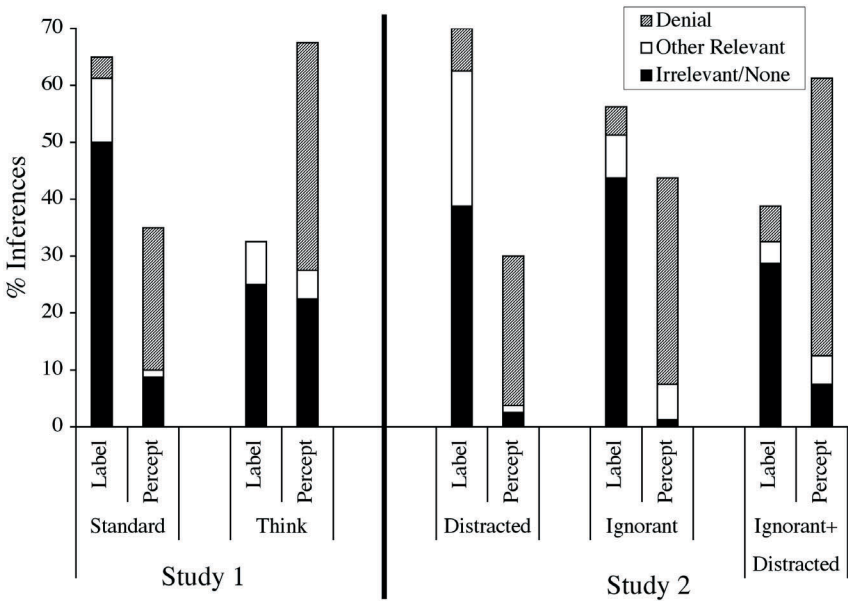


FIGURE 2 Percentage of label-based and perceptually based inferences about hybrid artifacts, and distribution of spontaneous comments made after hearing them labeled. See Table 2 for examples of comments.

Of interest in the present study was whether children in the Think condition, who saw and heard the speaker behave uncertainly when providing the unexpected labels, would treat these same labels skeptically. Indeed, as shown in Figure 2, children in this condition made label-based inferences about the hybrid objects just 33% ($SD = 29\%$) of the time, significantly less often than those in the Standard condition, $t(38) = 3.10, p < .01$. For example, when the speaker referred to the key-like object by saying, "I think this is a spoon," most children in this condition ignored the label and inferred that it was used to start the car.

An analysis by individual revealed the same pattern of results. Whereas 10 of the 20 children in the Standard condition made label-based inferences at least 75% of the time, only 3 of the 20 children in the Think condition did so, distributions that are significantly different from each other, $\chi^2(1, N = 40) = 5.58, p < .05$.

Finally, an examination of the comments children made after hearing the unexpected label showed that the difference between the two conditions was not because children in the Think condition failed to hear or process the unexpected labels. Working from transcripts, two coders independently coded the spontaneous comments children made after hearing the experimenter use an unexpected label. Comments were assigned to one of three categories: Denials, comments on the appearance of the object and/or the label the speaker provided, and irrelevant/none. Table 2 shows examples of each. The two coders agreed 97% of the time; the few disagreements were resolved through discussion.

The shading in Figure 2 shows the distribution of comments in each condition as a function of whether children went on to make a label-based or perceptually based inference. As the figure shows, when children who made label-based inferences, they typically did so without saying anything that was relevant to the ap-

TABLE 2
Categories of Spontaneous Comments Made about Hybrid Stimuli

<i>Category</i>	<i>Examples</i>
Denials, rejections, corrections	On hearing a button-like object called a <i>ball</i> : "Not a ball. It's a button. Balls look like that (pointing to demonstration ball); buttons look like this (pointing to hybrid)." On hearing a car-like object called a <i>shoe</i> : "No, it's a car. It has wheels, silly. See, it's a car because it has wheels. See, I need to show you this. It has wheels. It's a car."
Other comments relevant to the appearance and/or label	On hearing a key-like object called a <i>spoon</i> : "It looks like a key. It looks like a key, doesn't it? I think it's a key. I think it goes with the car because it has (pointing to ridges on hybrid)." On hearing a hat-like object called a <i>cup</i> : "Cup? I thought it was a hat."
Irrelevant	Comments including "Right here."

pearance of the object or the label. However, when children made a perceptually based inference, they overwhelmingly denied the label the speaker provided or pointed out the discrepancy between the appearance of the object and its label. For example, on hearing a speaker refer to a hat-like object by saying, "I think this is a cup," one child (aged 3;11) responded by insisting, "This is not a cup!" Clearly, these children heard the speaker's unexpected labels, but were skeptical that they applied.

Discussion

Like the 3-year-olds in Jaswal's (2004) study, children in the Standard condition of the present study were often willing to accept a speaker's rather surprising testimony about the category to which an object belonged. Their credulity in this condition is understandable: As noted in the introduction, most testimony is true, and even adults may, by default, be inclined to trust that what they hear is true (e.g., Gilbert, 1991; Spinoza, 1677/1982). Furthermore, the speaker in the Standard condition spoke with confidence, deliberately attended to the objects during the naming events, and provided no past evidence of ignorance or inaccuracy.

Unlike children in the Standard condition, those in the Think condition, who heard the speaker introduce each unexpected label with "I think," responded much more skeptically. Even though she had attended to the objects and had provided only accurate testimony in the past, her lack of confidence led children to doubt the veridicality of the unexpected names she provided. These results are consistent with those of Sabbagh and Baldwin (2001), who, as described earlier, found that 3-year-olds were less likely to learn and remember the name of a novel object when that name had been provided by a speaker who expressed uncertainty than one who expressed confidence. At the same time, our results seem to conflict with those of Moore and colleagues, who have argued that children younger than four years may not understand that beliefs upon which testimony is based can be held with differing degrees of certainty (Moore & Davidge, 1989; Moore et al., 1989; Moore, Pure, & Furrow, 1990). For example, as noted earlier, 3-year-olds in Moore et al.'s (1989) study did not discriminate between a puppet who claimed to "know" an object's location and one who merely "thought" he knew its location.

One explanation for these apparently conflicting results may have to do with the domains investigated. Three-year-olds may be better able to track information about a speaker's certainty when it involves the names of things, as in the present study (and Sabbagh & Baldwin, 2001), than when it involves locations, as in Moore et al.'s (1989) study. Indeed, Happé and Loth (2002) found that the same preschoolers who failed the classic location false belief task (Wimmer & Perner, 1983) succeeded when the task was re-framed in terms of a mistaken belief about the name of an object in a box.

Another factor influencing 3-year-olds' responses in the Think condition of the present study may be that the uncertain speaker made assertions that were moderately discrepant from expectations held by the child. For example, the key-like object looked like a key and children this age spontaneously assume that it is a key (Jaswal, 2004). In contrast, in Moore et al.'s (1989) study, children had no expectations: They had not seen the object's location, and so both puppets in that study offered information to which the child was not privy. As a result, the level of certainty with which the puppets offered this information may not have been as salient as the mere fact that the puppets claimed to have some knowledge that the child did not.

Finally, the uncertain speaker in the Think condition of the present study was, of course, a human rather than a puppet. In addition to saying that she was uncertain (i.e., "I think this is an X"), the speaker in the present study also acted as though she were uncertain. For example, she furrowed her brow in a puzzled expression, emphasized the word "think," and spoke in a hesitating manner. Moore et al. (1989) do not provide details about what cues, if any, their uncertain puppet provided other than the mental state verb "think." We cannot know from the present study which particular cues (or combination of cues) to uncertainty children were responding to (but see Sabbagh and Baldwin (2001) for evidence that hesitancy alone may be sufficient). However, it is worth pointing out that we instructed the speaker to act normally. In natural situations involving uncertainty, these cues are likely to co-occur as they did here.

As described in the introduction, in previous research investigating children's receptiveness to moderately surprising testimony about the name of an object (e.g., Gelman & Markman, 1986; Jaswal, 2004; Sloutsky & Fisher, 2004), the speaker has (a) spoken with confidence; (b) deliberately attended to the object during the naming event; and (c) had a history only of veridical reference. Study 1 demonstrated that if an informant speaks with uncertainty rather than confidence, 3-year-olds will respond skeptically. The goal of Study 2 was to investigate whether a speaker's attentional focus and history of veridical naming would also influence their receptiveness to unexpected testimony.

STUDY 2

From a very early age, children recognize that where someone is looking is an extremely reliable cue to their referential intent. In a classic study, for example, Baldwin (1991, 1993) showed that when children as young as 18 months heard a new label, they assumed that the speaker was labeling the novel object she was looking at rather than the novel object that had been the focus of their own attention. This suggests that children may find it easier to discount testimony about the name of an object—even if it is delivered with confidence and if the speaker has a

history of only veridical reference—if the speaker does not seem to be looking at it when providing the label.

In order to put this behavior in a plausible context, in one condition of Study 2, the speaker acted in a distracted manner as she provided the unexpected labels: As she held up one of the hybrid objects, she directed her gaze toward a box on the floor as though she were looking for something. As she continued to look inside the box and began to rummage through it, she provided the unexpected label. One way to reconcile the speaker's unexpected label with the appearance of the object under these circumstances could be to assume that the speaker was momentarily distracted and so provided the wrong label (e.g., perhaps she provided the label for one of the objects in the box by mistake).

A speaker's past reliability in naming situations may also influence how credible children judge her to be. A number of recent studies have shown that even 3-year-olds prefer to learn novel words from a speaker who has accurately labeled familiar objects in the past rather than one who has inaccurately done so (Harris, Pasquini, Corriveau, Koenig, & Clément, in press; Jaswal & Neely, 2006; Koenig, Clément, & Harris, 2004). In a second condition of Study 2, the speaker began the session by making an obvious naming error and acknowledging that she sometimes did not look at things as carefully as she should. She then went on to provide the unexpected labels as in the Standard condition of Study 1.

In a third and final condition of Study 2, the speaker violated two characteristics of a veridical labeler: First, she made an error at the beginning of the session and acknowledged that it was due to inattention. And later, when offering the unexpected labels, she also seemed distracted.

Method

Participants. Sixty 3-year-old children (age range = 3;0 – 4;0) from middle-class backgrounds participated in a single 10 to 15 min session. Ten additional children were tested, but their data were not included due to experimenter error (9) or failure to cooperate (1). None of the children had participated in Study 1.

Design. Children participated in an Ignorant, Distracted, or Ignorant + Distracted condition, resulting in 20 participants per condition, with 10 boys and 10 girls in each. The average age in the Ignorant and Ignorant + Distracted conditions was 3;5, and in the Distracted condition, 3;7.

Materials. The materials were the same as those used in Study 1. Additionally, a color picture of a typical horse was used in the Ignorant and Ignorant + Distracted conditions. The horse was 3.5 inches wide and 3 inches tall, and was mounted into a stand like the other stimuli.

Procedure

Ignorant condition. The procedure in the Ignorant condition was the same as in the Standard condition of Study 1, with one exception. Before the warm-up trial, the experimenter held up a picture of a horse and said, “Look at this fish!” Thirteen of the 20 children spontaneously corrected the experimenter (e.g., “That’s a horse!”). Regardless of whether a child offered a correction, the experimenter paused as if recognizing that she had made a mistake and then corrected herself, explaining, “(You’re right!) Oh my goodness, did I say that was a fish? Oops! That’s not a fish, is it? That’s a horse! Sometimes I don’t look at things as carefully as I should.” Following this error and acknowledgement that it was due to inattention, the procedure was exactly the same as that used in the Standard condition of Study 1: The speaker spoke confidently when labeling and directed her visual attention toward the objects she was labeling.

Distracted condition. In this condition, the experimenter began the session as in the Standard condition of Study 1. However, rather than looking at each hybrid as she labeled it, the experimenter used her right hand to hold it up for the child to see, but directed her visual attention downward and toward her left, at a box near her feet where all the stimuli were kept. When giving the label (“Look at this! This is an X. Can you show me what this X does?”), she continued to hold the stimulus up in front of the child with her right hand and to look into the box, rummaging around in it with her left hand as though she were looking for something. After providing the label confidently twice, she set the stimulus on the table but continued to look into and rummage around in the box until the child made a selection (which she could see from her peripheral vision). This box was just behind the legs of the table, against a wall, and so its contents were out of view of the child. The lack of visual attention to the hybrid objects while naming violated normal practice in ostensive labeling situations, and could lead children to infer that the unexpected labels she provided were errors due to inattention.

Ignorant + Distracted condition. In this condition, the speaker made an error at the beginning of the session by calling a horse a “fish,” and explained that inattention was the cause of the mistake. Subsequently, she behaved in a distracted manner when offering each unexpected label, directing her gaze toward a box at her feet. Fifteen of the 20 children in this condition spontaneously corrected the experimenter when she made the initial error (e.g., “That’s a horse!”).

Results

As in Study 1, children in all three conditions clearly understood the task, making the appropriate inferences about the typical items at least 98% of the time. When

making inferences about the hybrid objects, however, performance depended on condition. As shown in Figure 2, children in the Distracted condition were generally credulous: They were willing to accept the speaker's unexpected labels and used them as the basis for inference 70% ($SD = 29\%$) of the time. Those in the Ignorant condition were somewhat more skeptical: They made label-based inferences 56% ($SD = 36\%$) of the time. Only in the Ignorant + Distracted condition were children more skeptical than credulous: They made label-based inferences just 39% ($SD = 34\%$) of the time.

Because Studies 1 and 2 shared the same stimuli and basic procedure, we next compared the percentage of label-based inferences in each of the five conditions: Standard (65%), Think (33%), Distracted (70%), Ignorant (56%), and Ignorant + Distracted (39%). A one-way ANOVA on these data showed significant differences between the conditions, $F(3, 95) = 4.85, p < .05$. Post-hoc Tukey HSD tests showed that only the Think and Ignorant + Distracted conditions differed from the Standard one ($ps < .05$). That is, only when the speaker was uncertain (Think condition), or when she made an error, explained that inattention was the cause, and did not attend to the objects while naming them (Ignorant + Distracted condition) did 3-year-olds treat her unexpected testimony skeptically.

The only other differences shown by the Tukey HSD tests were that children in the Think and Ignorant + Distracted conditions were more skeptical than those in the Distracted condition ($ps < .05$). The performance of children in the Ignorant condition did not differ from the performance of children in any of the other conditions: Their behavior fell between the credulity shown by children in the Standard and Distracted conditions and the skepticism shown by those in the Think and Ignorant + Distracted conditions.

An analysis by individual revealed the same pattern of results. Whereas 10 of the 20 children in the Standard and Ignorant conditions and 11 of the 20 in the Distracted condition made label-based inferences at least 75% of the time, only 3 of the 20 children in the Think condition and 4 of 20 in the Ignorant + Distracted condition did so. An omnibus chi-square analysis showed that these distributions differed from each other, $\chi^2(4, N = 100) = 12.14, p < .05$. Individual chi-square analyses confirmed that fewer children in the Think and Ignorant + Distracted conditions made primarily label-based inferences relative to the number of children who did so in each of the other three conditions, $\chi^2s(1, N = 40) > 3.96, ps < .05$.

As in Study 1, two coders independently assigned each spontaneous comment children made after hearing an unexpected label to one of three categories: denials, comments on the appearance of the hybrid or its label, and irrelevant/none. Agreement was 95%; the few disagreements were resolved through discussion. Figure 2 shows the distribution of comments in each condition as a function of whether children went on to make a label-based or perceptually based inference. We conducted a 2×5 mixed-model ANOVA (type of inference \times condition) on the propor-

tion of denials children in Studies 1 and 2 expressed following an inference. As suggested by Figure 2, the only significant effect was of type of inference, $F(1, 54) = 181.29, p < .0001$: Children were much more likely to object verbally to the label the speaker used when they subsequently made a perceptually based inference than when they made a label-based one. There was no effect of condition and no interaction, $F_s < 1$, indicating that this pattern was true across all conditions.

Discussion

Like the Think condition of Study 1, the three conditions in Study 2 were designed to investigate how 3-year-olds would respond to unexpected testimony from a speaker whose behavior was not consistent with the behavior of a typical veridical labeler. In the Ignorant condition, the speaker made an error and explained that she was sometimes inattentive; in the Distracted condition, she did not look at the objects when calling them by unexpected names; and in the Ignorant + Distracted condition, she made an error, explained that inattention was the cause, and subsequently did not look at the objects as she was labeling them. Only children in the Ignorant + Distracted condition were significantly more skeptical about the speaker's unexpected labels than those in the Standard condition of Study 1.

Given the speaker's unusual behavior in the Distracted and Ignorant conditions, one might be surprised that children in these conditions remained largely credulous. After all, previous work has shown that even infants are sensitive to a speaker's visual attention (e.g., Baldwin, 1991, 1993) and that preschoolers are sensitive to a speaker's history of accuracy in naming (e.g., Koenig et al., 2004). Furthermore, the speaker's behavior in the Distracted and Ignorant conditions was not subtle. In the Distracted condition, her visual attention was clearly directed to the box at her feet rather than to the objects she was labeling. In the Ignorant condition, she made (and acknowledged having made) a highly salient error. Indeed, 13 out of 20 participants spontaneously objected when she referred to a horse as a "fish."

That said, there are a number of procedural differences between the current study and the earlier work on which these two conditions were based. For example, children in the Distracted condition of the present study never saw the object that the speaker seemed to be looking at. In contrast, the infants in Baldwin's (1991, 1993) gaze-direction studies could see the object during the labeling episode (or they had been exposed to it just before). Children in the Ignorant condition of the present study heard the speaker make just a single error and then actually go on to provide several veridical labels (i.e., she labeled all the typical items correctly). In contrast, children in most previous studies investigating preschoolers' sensitivity to reliability heard the unreliable speaker make a number of errors, and she never labeled objects correctly (e.g., Jaswal & Neely, 2006; Koenig et al., 2004).

Interestingly, children did respond skeptically in the Ignorant + Distracted condition. At first glance, this might suggest an additive explanation: Perhaps two cues undermining a speaker's credibility are more likely to lead to skepticism about her testimony than just one. It is important to point out, however, that combining the cues that were available separately in the Ignorant and Distracted conditions actually provided children not just with more cues to the speaker's credibility, but also with a causal explanation for her behavior. That is, the speaker began the session by making an error and explaining the reason for it ("Sometimes I don't look at things as carefully as I should"). Later, when she offered potentially false testimony (e.g., referred to a key-like object as a "spoon"), she seemed distracted. Given the explicit explanation for the earlier error, children could attribute these apparent misnamings to her distraction.

Children in the Ignorant condition heard the remark about being distractible, but the speaker subsequently never acted in a distracted manner. When offering the unexpected labels, she behaved in a manner consistent with how veridical labels are normally offered: She spoke with confidence and she looked directly at the objects as she was labeling them. Moreover, most of the labels she offered were for typical items (there were twice as many typical items as hybrid ones), and so her testimony matched children's expectations more often than not. Indeed, children in the Ignorant condition may have been confused by these conflicting signals, which could explain why their receptiveness to the unexpected labels fell midway between the credulity of children in the Standard condition and the skepticism of those in the Ignorant + Distracted condition. Children in the Distracted condition watched as the speaker's attention was clearly focused on something other than the object she was putatively labeling. But they apparently did not spontaneously make any inferences about the implications of her distracted behavior on the likelihood that she was offering veridical labels.

GENERAL DISCUSSION

Under most circumstances, trust in testimony is warranted: Adults usually provide children (and each other) with accurate information. Being receptive to testimony even when it is counter-intuitive or surprising enables children to learn about things that are not obvious or that are beyond their personal experience (Gelman, 2003; Markman & Jaswal, 2003). For example, although personal observation would lead them to conclude that the earth is flat or that the moon is larger at the horizon than when it is overhead, testimony can correct these misconceptions. In order for testimony to have this effect, however, children sometimes must be willing to accept "on faith" what they are told (Jaswal & Markman, 2007).

The two studies reported here investigated the circumstances under which a speaker's behavior could lead otherwise credulous 3-year-olds to respond skepti-

cally to unexpected labels. In previous work showing that children this age were generally receptive to this kind of testimony (e.g., Gelman & Markman, 1987; Jaswal, 2004), the speaker (a) spoke with confidence; (b) deliberately attended to the object during the naming event; and (c) had a history only of veridical reference. Study 1 showed that children were less receptive to unexpected labels when the speaker expressed uncertainty. Study 2 showed that they were also less receptive when the speaker cited inattention as the cause of a labeling error at the beginning of the session and later behaved in an inattentive manner when offering labels.

Given that the speaker's testimony conflicted with what we knew children's expectations about the hybrid artifacts to be, one might have expected them to be sensitive to the slightest variation from the typical ostensive naming routine. In fact, however, some manipulations of the speaker's behavior failed to lead children to respond skeptically. Children in Study 2 remained largely credulous even when the speaker seemed distracted when labeling, or when she had earlier made an error and identified herself as someone who did not look at things carefully. In both these cases (Distracted and Ignorant conditions), children had to infer for themselves what the implication of the speaker's behavior was—namely, that unexpected labels she offered could be erroneous. In contrast, in the two situations where children did respond skeptically, this inference was spelled out for them. In the Think condition, when the speaker acted in an uncertain manner, she also stated explicitly that she was uncertain as she labeled each object (“I think this is an X”). Similarly, in the Ignorant + Distracted condition, she acted in a distracted manner, but she also explicitly acknowledged that an earlier mistake was due to inattention (“Sometimes I don't look at things as carefully as I should”).

These results are consistent with previous research that also suggests that 3-year-olds need a good deal of support to understand the relationship between an informant's behavior and her likely knowledge (e.g., Esbensen, Taylor, & Stoess, 1997; Povinelli & deBlois, 1992; Pratt & Bryant, 1990; Sabbagh & Baldwin, 2001; Wimmer, Hogrefe, & Perner, 1988). For example, Povinelli and deBlois (1992) found that 3-year-olds performed quite poorly on a task in which they had to determine which of two individuals knew the location of a hidden toy. In this task, one experimenter hid a small toy beneath one of several opaque cups, in such a way so that the child could not see. A second experimenter then entered the room, both the first and second experimenters pointed to different cups, and children were invited to find the toy. Three-year-olds correctly selected the cup pointed to by the first experimenter just 39% of the time. (Four-year-olds did so 68% of the time.)

Povinelli and deBlois (1992) argue that these results suggest 3-year-olds do not have a firm understanding of the relationship between perception and knowledge (but see Pratt & Bryant, 1990). Importantly for our purposes, Povinelli and deBlois speculate that one way to improve 3-year-olds' performance would be to actually spell out how the informant's behavior was related to her likely knowledge (p.

235), just as this link was made clear in the Think and Ignorant + Distracted conditions of the present study. As Sabbagh and Baldwin argued, 3-year-olds may be able to make an inference about another's knowledge state, but only when the knowledge state is "made manifest through the provision of explicit statements and observable behavior" (pp. 1066–1067).

Previous research has shown that, provided a reliable cue, children younger than 3 years of age can distinguish between accidental and intentional behaviors (Carpenter, Akhtar, & Tomasello, 1998; Clark & Grossman, 1998; Tomasello & Barton, 1994). For example in Clark and Grossman (1998), 2- and 3-year-olds watched as an experimenter referred repeatedly to a series of five shuttlecocks as "ruks." At a certain point, the experimenter corrected himself, saying, "Oops. I made a mistake. These are dobs, not ruks," and then proceeded to repeatedly refer to the shuttlecocks as "dobs." On a later comprehension test, children correctly indicated that the shuttlecocks were the referents of "dobs," and either refused to respond or selected items from a distracter set when asked to find the referents for "ruks."

In these studies on intentional vs. accidental behaviors, whenever the speaker (or model) erred, she or he explicitly acknowledged this error, by saying, for example, "Oops!" or "Uh-oh"—expressions whose meaning is very familiar to young children, and which always signal that something unintentional has occurred and can therefore be ignored. In the present studies, in contrast, children were not provided such a reliable cue to error. That is, some statements that follow "I think" are correct, some veridical labels can be provided even when a speaker is not looking, and even the most ignorant or questionable speaker is often correct (e.g., Reid, 1764/1997). Thus, we would argue that children in the present studies faced a much more challenging task, in which they had to use cues from a speaker's behavior to evaluate her credibility.

As noted in the introduction, there are at least two variables other than a speaker's credibility that play a role in how children (and adults; Jaccard, 1981) respond to unexpected testimony: the discrepancy between the testimony and their initial beliefs and the confidence with which they hold those initial beliefs. In the two studies reported here, we held these two variables constant so that we could investigate whether 3-year-olds would treat the same unexpected testimony differently, depending on how that testimony was delivered. But these three variables undoubtedly interact in complex ways. For example, we expect that 3-year-olds (like infants; Koenig & Echols, 2003) would respond skeptically to testimony from a confident speaker if that testimony were highly discrepant from their initial beliefs. We also expect that 4-year-old novices about a particular domain would be more credulous about the same unexpected testimony than 3-year-old experts. A challenge for future work will be to explore these complex interactions in detail.

To return to the topic with which we began, communication is built on trust. We have neither the time nor opportunity to learn to trust testimony by checking it against our own observations (Price, 1969). Children seem to expect that speakers will convey truthful information. Indeed, Reid (1764/1997) suggested that children begin with a principle of credulity and then learn from experience that people can occasionally be unreliable (see also Csibra & Gergely, 2006). The two studies reported here have shown that 3-year-olds are often credulous about testimony that conflicts mildly with their own expectations. However, if the speaker provides evidence to indicate that she is uncertain about that testimony or possibly mistaken and the relationship between her behavior and likely knowledge is made explicit, 3-year-olds can respond skeptically.

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