



## PAPER

# Dealing with conflicting information: young children's reliance on what they see versus what they are told

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## Abstract

Children often learn about the world through direct observation. However, much of children's knowledge is acquired through the testimony of others. This research investigates how preschoolers weigh these two sources of information when they are in conflict. Children watched as an adult hid a toy in one location. Then the adult told children that the toy was in a different location (i.e. false testimony). When retrieving the toy, 4- and 5-year-olds relied on what they had seen and disregarded the adult's false testimony. However, most 3-year-olds deferred to the false testimony, despite what they had directly observed. Importantly, with a positive searching experience based on what they saw, or with a single prior experience with an adult as unreliable, 3-year-olds subsequently relied on their first-hand observation and disregarded the adult's false testimony. Thus, young children may initially be credulous toward others' false testimony that contradicts their direct observation, but skepticism can develop quickly through experience.

## Introduction

First-hand observation and information provided by others are two primary sources of knowledge about the world. Children often learn from what they directly perceive. For example, they can learn that cats have four legs from observing different cats or what chairs are for from seeing how people use them. However, there are many situations in which children cannot learn through first-hand observation. For instance, a great part of scientific phenomena are not visible to the naked eye, and children cannot directly witness remote events in history or observe distant entities in space (Harris, 2007; Harris & Koenig, 2006; Harris, Pasquini, Duke, Asscher & Pons, 2006; Siegal, Butterworth & Newcombe, 2004). When learning about these domains, children must rely on the testimony of others for relevant information.

An intriguing question is whether children place greater weight on one source of information than on another when they have access to both. There are situations in which children can acquire knowledge through both first-hand observation and other people's testimony. For example, they can both see and be told that snow is white. Often, the testimony of others corresponds with reality or what children can directly observe. However, verbal reports come by way of the mind and thus are subject to error, given that our mind may sometimes misrepresent reality (Perner, 1988, 1991).

For instance, due to a mistake, misremembering, ignorance, or purposeful deceit, a speaker may sometimes make false claims that contradict the listener's first-hand observation (e.g. Perner, 1991; Dawkins, 1995; Robinson, Champion & Mitchell, 1999). When faced with such contradictions, would young children rely on what they see or would they accede to what they are told?

One might predict that children would rely on what they see. Humans and other individuals have evolved with perception as a reliable source of information, and introspectively human adults know that visual perception most often provides accurate representations of reality (Bargh, 1989; Gilbert, 1991; Perner, 1991). Presumably this is also the case for young children, although some studies suggest that children younger than 4 years lack the *explicit* understanding of the link between perception and knowledge (e.g. Gopnik & Graf, 1988; Perner & Ogden, 1988; Wimmer, Hogrefe & Perner, 1988). For example, when asked *why* a person knows what is inside a box, 3-year-olds did not understand that seeing (or being told about) what is inside the box is necessary for having the knowledge of its content (Wimmer *et al.*, 1988).

Nevertheless, other studies suggest that children as young as 3 years can treat visual experience as a reliable source of knowledge when it is made explicit to them that individuals may have different access to information (O'Neill, Astington & Flavell, 1992; Pillow, 1989; Robinson *et al.*, 1999). For example, young

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preschoolers can infer that a puppet knows the content of a box only if he has looked inside the box (Pillow, 1989), and they understand that only seeing (not other senses like feeling) can provide accurate information about certain properties of an object (O'Neill *et al.*, 1992). Also, preschoolers update their initial belief about the identity of an object based on another person's verbal reports if the person has seen the object. If the person has no visual access to the object, children persist in their initial judgments (Robinson *et al.*, 1999).

Despite children's early understanding of visual perception as a reliable source of information, there are reasons to believe that they might accede to another person's false testimony that contradicts their first-hand observation. Children depend largely on the testimony of others to learn about the world, and what they are told most often conveys truthful information and corresponds with reality. Thus, children may have a default assumption that what they are told is generally true (Coady, 1992; Dawkins, 1993, 1995; Gilbert, 1991). In a related vein, listeners often expect that speakers will attempt to make truthful statements during conversations (Grice, 1975), and this may be the case for young children as well.

Previous research has shown that young children tend to accept ambiguous or false statements of another person at face value (e.g. Mills & Keil, 2005; Lee, Cameron, Doucette & Talwar, 2002). For example, Lee and colleagues (2002) found that 3- and 4-year-olds believed in obviously false claims about implausible events: Following a protagonist's implausible statement that a ghost jumped out of a book and broke a glass, children referred to the ghost rather than the protagonist when asked who had committed the misdeed. Studies on eyewitness testimony and suggestibility have also shown that young children are susceptible to misinformation provided by others, and false memories about a past event can be easily induced in children through repeated questioning or misleading probes (e.g. Ceci, Ross & Toglia, 1987; Ceci & Bruck, 1993; Leichtman & Ceci, 1995).

Thus, it is an open question whether young children would rely on their own observation of an event upon receiving conflicting testimony from another person. Some studies have provided findings relevant to this question, by placing one's visual experience in conflict with other people's false claims. The classic Asch experiments investigated the influence of social pressure on people's judgments, suggesting that individual adults would conform to the inaccurate reports of a group when indicating the length of lines, despite their own visual perception (Asch, 1955). In a recent study, Clément, Koenig and Harris (2004) found evidence that preschoolers can weigh their prior observation over the false claims of a 'puppet'. In one of their tasks, 3- to 5-year-olds first saw a pompon on top of a box. Then children observed as the experimenter hid the pompon in the box. Each of two 'puppets', one reliable and one unreliable in

the past, looked into the box and claimed that the pompon was in a color different from its actual color. When asked about the color of the pompon in the box, most children correctly stated the color that they had seen, ignoring the false claims of both 'puppets'. However, it is unclear whether young children would persist in their own observation upon receiving false testimony in an ecologically more valid situation, such as when the false testimony is provided by *an adult* in a real-life setting rather than by a pretending 'puppet'.

Given the perceived status of adults as a credible source of information in general, would young children place greater weight on the false testimony of an adult than on their own observation of an event? The present research aimed to address this question, by examining how young children *behave in a problem-solving situation* where they have to deal with conflicting sources of information – their own visual experience versus the testimony of an adult. In Study 1, children ages 3 to 5 years watched through a small window as an adult hid a toy in one of three distinct containers. Immediately afterwards, the adult told the child that she had put the toy in a container different from the one in which the toy was actually hidden (i.e. false testimony). Then the child was asked to retrieve the toy. Children's actual choice of a container – the correct one versus the misleading one – would indicate whether they relied on what they themselves had seen or whether they were swayed by the false testimony of the adult.

Another goal of this research was to explore the circumstances under which children would skeptically assess the false testimony of an adult against their own observation. Specifically, we examined the role of prior experience. Both children's own prior perceptual experience and their prior experience with the adult informant might influence their decisions on which source of information to rely on. Study 2 investigated the role of a successful searching experience based solely on children's direct observation of a hiding event. We predicted that this positive experience would lead children to persist in their own observation and disregard another person's false testimony in a subsequent situation.

Study 3 investigated the effect of a prior experience with the adult informant as unreliable. Researchers have suggested that young children can track the past reliability of others and use it to guide their subsequent behavior or learning. For example, 14-month-olds follow the eye gaze of a looker who has been reliable during previous interactions, but they are less likely to follow the gaze of a previously unreliable looker (Chow, Poulin-Dubois & Lewis, 2008). In addition, by age 4 children prefer to learn novel information from a person who has been reliable in the past rather than from a previously unreliable one (Jaswal & Neely, 2006; Koenig, Clément & Harris, 2004; Koenig & Harris, 2005; Pasquini, Corriveau, Koenig & Harris, 2007). Thus, a negative experience with an adult as unreliable might also lead

children to rely on what they see in preference to the adult's false testimony.

## Study 1

### Method

#### Participants

The final sample included 60 children, 20 in each of three age groups: 3-year-olds ( $M = 41.5$  mos, range = 36.2–47.0 mos), 4-year-olds ( $M = 53.9$  mos, range = 49.0–58.9 mos), and 5-year-olds ( $M = 64.1$  mos, range = 60.0–69.8 mos), with equal numbers of girls and boys at each age. Two additional children were excluded due to experimenter error or shyness. Children were recruited from a participant database at a public university. Most children came from White, middle-class families.

#### Materials and setting

The materials consisted of three distinct containers with covers (blue bucket, red bowl, and purple box), three small chairs to put the containers on, and a toy. One container served as the correct hiding location (C), one as the misleading location indicated by the false testimony (M), and one as the neutral location (N).

The experiment took place in a room divided into two spaces by a black, opaque curtain: an 'outer space' that opened to the door, and an 'inner space' behind the curtain. The three chairs were aligned in the middle of the outer space, each with a container on it. A transparent plastic window (16 × 20 in) was inserted in the lower half of the curtain.

During the test phase, an adult hid a toy in the outer space as the child observed from the inner space through the window. Then, the adult moved to the inner space and provided false testimony about the hiding location. In order to make the situation appear more realistic, the child observed the hiding event through the window, as opposed to observing the event directly in the outer space: It is simply more rational for an adult to make false claims about what has just happened after a temporal-spatial change.

#### Procedure

Upon arrival, the child played with two female experimenters (E1 and E2) in the waiting room. Then the experimenters invited the child to play a game in the testing room. On the way to the testing room, E2 left with an excuse. E1 directed the child into the room and the test procedure with three phases followed. A video camera recorded the child's responses throughout the procedure.

During the *orientation phase*, E1 asked the child to label the containers and check what was inside each one.

The containers were covered after the child confirmed that they were all empty. Next, E1 directed the child to the inner space and asked the child whether he or she could see the three containers on the other side of the curtain (i.e. the outer space) through the window. All children confirmed that they could see the containers. Then, E1 informed the child that E2 was going to hide a present inside one container and asked the child to watch carefully through the window.

During the *test phase*, E2 entered the outer space of the room with a toy. She hid the toy inside one container (C) and covered it, without touching any of the other containers. As the hiding event took place, E1 asked the child in which container E2 put the toy. Most children (95%, 57/60) indicated the correct container. The remaining three children did not respond. Immediately after hiding the toy, E2 came to the inner space and provided false testimony with excitement, 'Here you are! Guess what? I have a prize for you! I just put your prize in the (M)! Can you go find it?' The misleading container was referred to by both its color and its identity (e.g. 'I just put your prize in the *purple box!*'). Then the child was allowed to go to the outer space to retrieve the toy by him/herself. The experimenters stayed in the inner space.

After the child found the toy, an *interview* followed, in which E2 left the room and E1 asked the child why E2 provided the false information, 'She said the toy was in the (M), but you found it in the (C). Why did she say it's in the (M)?' If the child did not answer spontaneously, he or she was asked to choose from two potential explanations, 'You can take a guess. Do you think she was lying to us or she just made a mistake (counterbalanced)?'

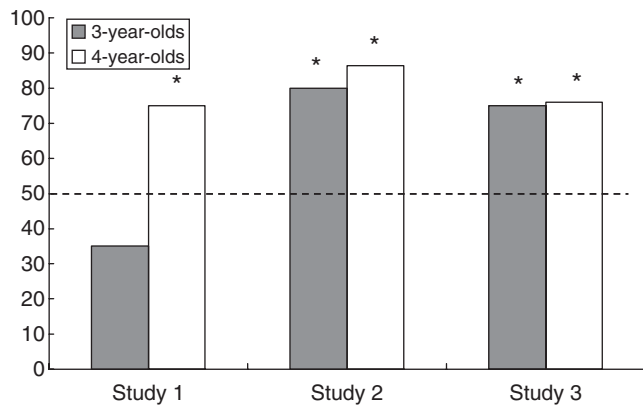
The spatial alignment and the roles of the three containers were counterbalanced. Children were randomly assigned to one of two alignment conditions: (a) the correct container was closer to the child as he or she entered the outer space than the misleading one (i.e. 'CMN', 'CNM', or 'NCM') or (b) the misleading container was closer than the correct one (i.e. 'MCN', 'MNC', or 'NMC'). At each age, there were equal numbers of boys and girls in each alignment condition.

#### Coding and reliability

Children's searching patterns and their explanations for the false testimony were noted by E1 right after the experiment. Later a trained undergraduate student coded the complete sample from videotapes. There were no disagreements between the two coders.

#### Results and discussion

When asked to retrieve the hidden toy, the majority of the 5-year-olds (80%, 16/20) disregarded the false testimony and searched where they had actually seen the toy being



**Figure 1** Percentages of the 3- and 4-year-olds who disregarded the false testimony (by Age and Study).

hidden, which is significantly greater than what would be expected by chance (50%),<sup>1</sup>  $\chi^2(1, 20) = 7.20, p < .01$ ; so did most 4-year-olds (75%, 15/20),  $\chi^2(1, 20) = 5.00, p < .03$ . In contrast, only 35% of the 3-year-olds (7/20) did so,  $\chi^2(1, 20) = 1.80, p = .18, ns$ ; the majority of them (65%, 13/20) acceded to the false testimony and searched in the misleading container first (see Figure 1). The 3-year-olds who searched based on their own observation were approximately the same age as those who acceded to the false testimony ( $M_s = 40.2$  and  $42.2$  mos, respectively),  $t(19) = 1.30, ns$ .

With children's first search as the dependent variable ('1' if searching in the correct container first and '0' if searching in the misleading container first), a logistic regression was conducted to examine the effects of age (3), gender (2), and the interaction between them. The results revealed a significant main effect of age,  $\chi^2(2, 60) = 9.64, p < .01$ . Post-hoc comparisons indicated that 5-year-olds were more likely to disregard the false testimony and rely on their own observation than were 3-year-olds,  $\chi^2(1, 40) = 8.29, p < .01$ , as were 4-year-olds,  $\chi^2(1, 40) = 6.47, p < .02$ . There was no significant difference between 4- and 5-year-olds. The main effect of gender and the interaction between age and gender were not significant.

The tendency of the 3-year-olds to search in the misleading container first was not due to their forgetting the actual hiding location: After seeing that the misleading container was empty, the majority of them (77%, 10/13) immediately searched in the correct container rather than in the neutral one. The remaining three children searched in the neutral container before they searched in the correct container.

The spatial alignment of the containers did not differ between the 3-year-olds who searched in the correct container first and those who searched in the misleading

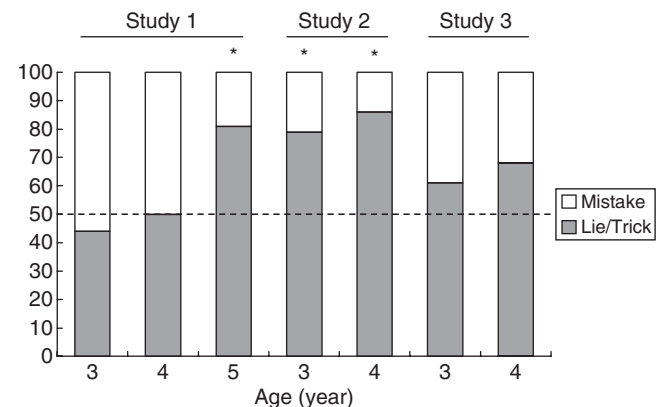
container first (the correct container was closer to the child: 3/7 vs. 7/13). Thus, the spatial alignment of the containers did not seem to influence children's searching patterns.

To summarize, when searching for a hidden toy, 4- and 5-year-olds relied on their first-hand observation and disregarded the hider's false testimony about the hiding location. However, most 3-year-olds used the false testimony for their first attempt to retrieve the toy, even though they themselves had directly witnessed the hiding event.

Children's explanations for the false testimony also exhibited developmental changes. Across all three ages, 10 children did not respond: three of them refused to answer the question and seven of them said 'I don't know'. Among the remaining children, most of the 5-year-olds (81%, 13/16) thought E2 was trying to trick them or lying (10 spontaneous answers),  $\chi^2(1, 16) = 6.25, p < .01$  (as compared to chance expectation; see Figure 2). When children provided spontaneous answers, some of them (4/10) explicitly attributed deceptive intent to E2, 'She tricked me/lie to me because she didn't want me to find it/to know where it is.' Thus, 5-year-olds appealed to the underlying intention to explain the informant's behavior as a trick or purposeful deceit.

In contrast, only half of the 3- and 4-year-olds (7/16 and 9/18, respectively) thought E2 was lying or trying to trick them, and the differences between the younger groups and the 5-year-olds were significant,  $\chi^2(1, 32) = 4.80, p < .03$ , and  $\chi^2(1, 34) = 3.62, p < .05$ , respectively. The other half of the younger children chose to explain the false testimony as a mistake. These patterns of explanation were similar across children who relied on their direct observation and those who deferred to the false testimony.

This developmental difference appears consistent with previous findings on children's attributions of lying to a false belief statement (Berthoud-Papandropoulou & Kilcher, 2003). For example, when introduced to a matchbox with unexpected content (e.g. a pencil), most 5-year-olds judged a puppet as lying if she falsely claimed



**Figure 2** Percentages of children who explained the false testimony as a mistake versus as a lie or trick (by Age and Study).

<sup>1</sup> There were three containers to choose from in this study. However, when children looked for the toy, their first search was always between the correct container and the misleading container. None of them searched in the neutral container first. Thus, chance was set at 50% instead of 33% for more strict comparisons.

that 'there are matches inside'; whereas only a few 3-year-olds and about half of the 4-year-olds did so. Note that in this false belief situation, the container had a suggestive appearance and the character had no visual access to its inside, so the false statement was likely to be caused by ignorance. In the current study, however, E2 had privileged knowledge about the hiding location, in that she was the one who hid the toy. Thus, compared to a false belief statement regarding the content of a container with a suggestive appearance, E2's false testimony was more likely to be a lie. Why is it that the 'lie' explanation was not the dominant response in the younger children in this study?

Past research has shown that children as young as 3 years of age are able to distinguish lies from mistakes, on the basis of whether the misinformation is created by intentional acts or ignorance (Siegal & Peterson, 1996, 1998). In the current study, it is possible that the younger children felt reluctant to attribute deceptive intent to the adult informant, due to the authority status of the adult. On the other hand, the younger children might have a stronger expectation that adults would *attempt* to convey truthful information. In a relatively novel situation, they might be inclined to view her false testimony as a mistake rather than providing false information on purpose.

The most important finding of Study 1 is the developmental difference in children's reliance on what they had directly seen versus what they were told by an adult. Four- and 5-year-olds weighed their first-hand observation over the adult's false testimony when searching for a hidden present. In contrast, the majority of the 3-year-olds were credulous toward the false testimony, despite their own observation. One explanation for this developmental difference may be that compared to the older children, 3-year-olds lacked sufficient confidence in their own observation after they received the false testimony from an adult, for at least two reasons.

Children may have a default assumption that 'adults know best'. This may be especially the case for the younger children. Thus, it might be more difficult for the 3-year-olds to override this assumption with their own visual experience. Also, in the current study, the false testimony was offered by an adult who was supposed to have privileged knowledge of the hiding location (given that she was the one who hid the toy), which might have added to the 'adults know best' assumption and led 3-year-olds to question their first-hand observation. If the informant (and hider) were a same-age peer, perhaps children would be more likely to disregard the false testimony. Previous research has indicated that 3- to 4-year-olds tend to trust an adult more than a child if there is no evidence about their past reliability (e.g. Jaswal & Neely, 2006).

Another reason may have to do with the novelty aspects of the situation in this study. The experimental setting was relatively novel, in that children observed a hiding event through a window in a curtain. In addition,

children encountered a stranger (E2) as the hider and informant for the first time, and they did not have any experience about her past reliability as an information source. These aspects of novelty might have led children to question what they had directly observed. It is possible that children might be more confident in their own observation if the novelty of the situation were reduced. For example, if given some prior perceptual experience with the windowed curtain and search task, children might be more likely to weigh their own observation over the hider's false testimony in a subsequent situation. Study 2 was designed to examine this possibility.

## Study 2

### Method

#### Participants

The final sample consisted of 20 3-year-olds ( $M = 41.2$  mos, range = 36.3–46.9 mos; 10 girls) and 22 4-year-olds ( $M = 54.5$  mos, range = 48.4–59.7 mos; 12 girls). Six additional children were excluded due to uncooperativeness (2), experimenter error (2), shyness (1), or perseveration error (1). Most children were from White, middle-class families.

#### Materials, setting and procedure

The same materials and setting from Study 1 were used, with the addition of a stuffed animal. The procedure was the same as in Study 1 except for one important change: A positive searching experience based on the child's own observation was introduced.

At the end of the *orientation phase*, E1 asked the child to watch through the window as she hid a stuffed animal in the *neutral* container. Then E1 asked the child to find the stuffed animal. After the child's successful retrieval, E1 told the child that E2 was coming to hide a present in one container and asked the child to watch carefully through the window.

The *test phase* and the *interview* followed as in Study 1, with one minor change: During the interview, the two potential explanations for E2's false testimony were 'mistake' and 'trick' (instead of 'lie' in Study 1). This change was made based on children's spontaneous explanations for the false testimony in Study 1 (e.g. 'She said that because she wanted to *trick* us and she didn't want me to find the toy').

#### Coding and reliability

Children's searching patterns and their explanations for the false testimony were coded in the same manner as in

Study 1. There were no disagreements between the two coders.

### Results and discussion

Before the test phase, when direct observation was the only source of information, most children (75% of the 3-year-olds, 15/20; 86% of the 4-year-olds, 19/22) correctly searched in the neutral container first to retrieve the toy animal that E1 hid. The remaining eight children searched sequentially: They first opened the container that was closest to where they entered the outer space, then the one in the middle, and finally the one at the far end.

During the test phase, when asked to find a hidden present, most 3-year-olds (80%, 16/20; 9/10 girls and 7/10 boys) disregarded the hider's false testimony and relied on what they had actually seen,  $\chi^2(1, 20) = 7.20$ ,  $p < .01$  (as compared to chance expectation); so did the 4-year-olds (86%, 19/22; 10/12 girls and 9/10 boys),  $\chi^2(1, 22) = 11.64$ ,  $p < .01$  (see Figure 1). No age or gender differences emerged. Compared to the 3-year-olds in Study 1, the 3-year-olds in Study 2 were more likely to search based on their own observation,  $\chi^2(1, 40) = 8.29$ ,  $p < .01$ . The searching patterns of the 4-year-olds did not differ across two studies.

Thus, unlike the 3-year-olds in Study 1, after a positive searching experience based solely on their own observation, children were less susceptible to an adult's false testimony. Instead, they relied on what they saw to retrieve the hidden object. As discussed earlier, the situation was relatively novel in Study 1, and 3-year-olds might lack sufficient confidence in their own observation and thus did not have a strong experiential base to skeptically evaluate the hider's false testimony. In Study 2, however, children had a prior, successful retrieval of a hidden object based on their own observation through the window in the curtain, which might have reduced the novelty of the setting and enhanced children's belief in their own perception as a reliable source of information.

Children's explanations for the false testimony are in line with this interpretation. The majority of the 4-year-olds (86%, 19/22) thought E2 was lying or trying to trick them (12 spontaneous responses),  $\chi^2(1, 22) = 11.64$ ,  $p < .001$  (as compared to chance expectation). Among the 3-year-olds who responded to the question (14), most of them (79%, 11/14) chose to explain the false testimony as a trick,  $\chi^2(1, 14) = 4.57$ ,  $p < .03$  (see Figure 2). Thus, compared to the younger children in Study 1, children in Study 2 were more likely to attribute intent to E2's false testimony. Perhaps after a successful searching experience based on their direct observation, young children felt more confident in questioning the intent underlying the adult's false claims. Note that in Study 1 'lie' was provided as one potential explanation, whereas 'trick' was used in this study. It could be that 'lie' was a harsher word than 'trick' for children to use when explaining an authority figure's behavior. Nevertheless, children's endorsement of either the 'trick' or the 'lie'

explanation indicated that they viewed the adult as intentionally conveying false information.

In addition to their own perceptual experience, another factor that may influence children's decisions about which source of information to rely on is the experience with the informant's past reliability. In Study 1, children encountered the adult stranger as an information source for the first time. They lacked experience about whether the adult was reliable or not in the past. In this case, young children might take what the adult said at face value, given that she was the hider and thus was supposed to have privileged knowledge about the hiding location of the present. However, if provided an experience with the adult informant as unreliable, later young children might weigh her claims differently and rely on their first-hand observation. Study 3 was designed to examine this possibility.

## Study 3

### Method

#### Participants

The participants were 20 3-year-olds ( $M = 42.9$  mos, range = 38.8–46.3 mos; 10 girls) and 21 4-year-olds ( $M = 54.6$  mos, range = 48.0–59.7 mos; 11 girls). Two additional children were excluded due to uncooperativeness or shyness.

#### Materials, setting and procedure

The same materials and setting from Study 1 were used. The procedure was the same as in Study 1 except for one change: The child was given a negative experience with E2 as an unreliable source of information.

Just before the *orientation phase*, in the hallway outside the testing room, E2 directed the child's attention to two opaque, upside-down cups on a table, one yellow and one green. The green cup had a sticker under it. Then E2 provided false testimony about the location of the invisible sticker, 'I have a sticker for you! It's under the *yellow* cup. Go get it and I will be right back!' After E2 left, E1 asked the child to find the sticker. E1 did not ask the child to explain why E2 made the false statement during this session. The procedure then followed as in Study 1. During the *interview*, the two potential explanations for E2's false testimony were 'mistake' and 'trick'.

#### Coding and reliability

Children's searching patterns and their explanations for the false testimony were coded in the same manner as in Study 1. There were only two instances of disagreements between the two coders, which were resolved by the first author.

### Results and discussion

Before the test phase, when E2 provided the false testimony about the location of an invisible sticker (the only source of information), all children were misled to search under the wrong cup first. Thus, children experienced E2 as an unreliable source of information. After seeing that there was nothing under the wrong cup, all children spontaneously checked the correct cup and retrieved the sticker. Since E2 did not have direct visual access to the sticker at the moment, from the child's point of view, her false statement about the sticker could be either a mistake or a lie. In either case, E2 appeared unreliable.

During the test phase, when asked to find the hidden present, most 3-year-olds (75%, 15/20; 8/10 girls and 7/10 boys) disregarded E2's false testimony and relied on their own observation,  $\chi^2(1, 20) = 5.00$ ,  $p < .03$  (as compared to chance expectation); so did the 4-year-olds (76%, 16/21; 8/11 girls and 8/10 boys),  $\chi^2(1, 21) = 5.76$ ,  $p < .02$  (see Figure 1). No age or gender differences emerged. Compared across studies, the 3-year-olds in Study 3 were more likely to search based on their own observation than the 3-year-olds in Study 1,  $\chi^2(1, 40) = 6.47$ ,  $p < .01$ ; no significant difference emerged between the 3-year-olds in Study 2 and Study 3. The searching patterns of the 4-year-olds did not differ across studies.

In sum, with a single exposure to the adult informant as unreliable, children disregarded her false testimony in a subsequent situation and relied on their first-hand observation to retrieve a hidden object. Therefore, although young children took the adult's false testimony at face value when they lacked relevant experience of whether she was a reliable source or not (Study 1), they did use the evidence of her past accuracy when it was available and disregarded her false testimony in preference to their first-hand observation (Study 3).

When asked why E2 provided the false testimony, among the children who responded to the question, 61% of the 3-year-olds (11/18; 3 spontaneous responses) and 68% of the 4-year-olds (13/19; 5 spontaneous responses) explained it as a lie or a trick,  $\chi^2(1, 18) = .89$ ,  $p = .346$  and  $\chi^2(1, 19) = 2.58$ ,  $p = .108$ , respectively (as compared to chance expectation). The other children chose to explain the false testimony as a mistake (see Figure 2). Thus, compared to the 3- and 4-year-olds in Study 1, after a single experience with the adult informant as unreliable, children were more likely to attribute intent to her false testimony, although this pattern is not significantly different from what would be expected by chance.

### General discussion

Direct senses and other people's testimony are two primary sources of knowledge about the world. The three

studies reported here provide important evidence of how young children weigh these two sources of information when they are in conflict. The results indicate that at first young children may be credulous toward other people's false testimony that contradicts their first-hand observation, but skepticism can develop quickly through experience. These two main findings will be discussed in turn.

Visual perception most often provides accurate information about reality (e.g. Bargh, 1989; Perner, 1991). In a simple situation where they can directly observe a hiding event, one would expect that children place greater trust in their own observation of the hiding location than in the false testimony of another person. The results of Study 1, however, indicated the opposite in 3-year-olds. When searching for a hidden object, 4- and 5-year-olds relied on their first-hand observation, whereas most 3-year-olds deferred to the hider's false testimony despite what they had seen. This striking credulity indicates how compelling the verbal reports of other people can be for young children.

One explanation for young children's credulity may have to do with their confidence in knowledge acquired through direct senses. Young children can treat visual perception as a reliable source of information in some circumstances (e.g. Pillow, 1989; O'Neil *et al.*, 1992). In a relatively novel situation, however, they may lack sufficient confidence in their own observation if challenged by the false testimony of an adult. This would be especially the case if the adult is supposed to have privileged knowledge of the event. As a result, young children may suspend their own knowledge acquired through direct observation and rely on what the adult tells them to solve the problem.

Another explanation is that children may have an initial bias to take the verbal claims of others at face value (Dawkins, 1995; Downing, 1992; Gilbert, 1991; Reid, 1764/1997). In everyday life, children are commonly exposed to truthful information provided by reliable sources, such as parents, teachers, and other adults (Dawkins, 1995; Downing, 1992). Given this perceived status of adults as a credible source, young children may have the tendency to take an adult's testimony as possibly true, even when the testimony conveys false information that contradicts their first-hand observation. This explanation is in line with the argument that credulity in early childhood is an adaptive mechanism (e.g. Dawkins, 1993, 1995). For learning from others to occur in the first place, young children must be receptive to others' verbal reports, especially since evidence about many domains is not accessible to children's direct senses.

Two important issues need to be discussed. First, the credulity in 3-year-olds as observed in our first study is contradictory to the findings of Clément *et al.* (2004), in which approximately two-thirds of the 3-year-olds stuck with what they had seen and ignored the false statements of two 'puppets' when reporting the color of a hidden

object. This inconsistency might have resulted from methodological differences. In Clément *et al.* (2004), the informants were two ‘puppets’ that were pretense in nature and did not have the same status as an adult in real life. We believe that our task is ecologically more valid for assessing young children’s evaluations of what they see versus what they are told, given the realistic aspects of our search task and the perceived status of adults as a major source of information in real life.

Another important issue to consider is whether young children who are credulous toward an adult’s testimony actually change their initial belief or simply modify their responses to comply with the adult (Jaswal, Lima & Small, 2009). In the first study reported here, children who first searched in the misleading container checked in the correct container immediately afterwards, indicating that they did not completely change their mind about the hiding location based on the adult’s false testimony. Nevertheless, being credulous toward others’ verbal reports does not necessarily involve definite change of beliefs. In our study, young children who were deferential might have suspended their knowledge based on direct observation only temporarily, due to insufficient confidence in their own perception and/or their tendency to accept at face value what they were told by adults. After being misled by the false testimony, they retrieved from memory the information obtained through direct observation for a second search.

Although credulity in early childhood may be an adaptive mechanism, there is one major byproduct: Young children may accept both true and false claims as true. To accurately represent the world, children must grow out of this undifferentiated trust and skeptically use information received from other people (e.g. Dawkins, 1995; Gilbert, 1991; Harris, 2007). One way children develop skepticism about what they are told is through developing understanding of other people’s minds. Many studies have shown that children younger than 4 years have limited understanding that people may sometimes misrepresent reality, hold false beliefs, or make false claims (e.g. Perner, 1988, 1991; Wellman, Cross & Watson, 2001). Thus, the 3-year-olds in Study 1 might have failed to represent the adult’s information as misleading, especially since the adult was supposed to have privileged knowledge about the hiding location of the present. This lack of understanding prevented children from skeptically assessing the adult’s false testimony against their own observation. As children get older, they develop sophistication in understanding that people can hold false beliefs or make false statements by mistake or on purpose, which may foster their selective trust in the verbal reports of others. In line with this hypothesis, the 4- and 5-year-olds in the first study disregarded the adult’s false testimony and responded based on their first-hand observation.

Another way to develop skepticism is through experience. As shown in the current research, both the searching experience based on their own observation and

the experience with an unreliable adult could lead young children to skeptically assess the adult’s testimony against what they had directly observed. Study 2 indicated that after having a successful searching experience based solely on their direct observation, 3-year-olds (and 4-year-olds) relied on what they had seen to search for a hidden present, disregarding the hider’s false testimony. Finding a hidden object based on direct observation might have strengthened children’s awareness that visual perception is a reliable source of information, which served to enhance their confidence in what they saw with their own eyes. To our knowledge, this finding is the first demonstration of how a successful experience based on their perception influences young children’s future evaluation of another person’s false testimony.

In addition, after having a single experience with the adult as unreliable (Study 3), children placed greater trust in their first-hand observation rather than in the adult’s testimony. This finding is in line with recent studies showing that by age 4, children are sensitive to the past reliability of others when learning novel information: After being given multiple exposures to a person as unreliable, children disregarded her statements about a novel object in preference to the testimony of a previously reliable person (e.g. Jaswal & Neely, 2006; Koenig *et al.*, 2004; Koenig & Harris, 2005; Pasquini *et al.*, 2007). What the current research shows is that even after just a single exposure to an adult as unreliable, 3-year-olds can take a skeptical stance and rely on their own observation rather than on the report of the adult.

Future work is needed to examine other circumstances under which young children might weigh these two sources of information differently. One possible circumstance is when children are highly motivated to make a serious choice. For instance, if told that they could search only once, children might be more motivated to cautiously assess their own observation against the adult’s false testimony. In addition, there is evidence that young children tend to be more suggestible when misinformation is provided by a stranger than by their parents (Jackson & Crockenberg, 1998). In light of this, children might be more likely to behave based on their own observation if the false testimony were provided by a familiar figure (e.g. the mother) as opposed to by a stranger.

Another line of future research concerns the broader implications of the current findings. Aside from first-hand observation and the testimony of others, children also acquire much of their knowledge from educational media like television and picture books. How do young children weigh information conveyed in representational media as compared to information received from their first-hand observation or the testimony of others? In addition, culture may play an important role in children’s evaluations of different sources of information. For instance, some cultures may value compliance with authority more than others. If that were the case, children from different cultures might differ in their



credulity toward adult false testimony that contradicts information obtained through direct senses. Examining these relevant topics could provide important insight into how children weigh different sources of information when learning about the world.

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