Cognitive Development 33 (2015) 28–39

Contents lists available at ScienceDirect

Cognitive Development

Real or Not? Informativeness Influences Children's Reality Status Judgments

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ARTICLE INFO

Keywords:
Trust
Testimony
Reality judgments
Belief
Gricean maxims

ABSTRACT

Do children use the Gricean maxim of informativeness ("Make your contribution as informative as is required") to guide judgments about the reality status of novel entities? In three studies, 9-year-olds watched video clips of two adults discussing novel entities. In Studies 1 and 2, children were less likely to believe in entities introduced with only explicit belief statements (e.g., "I believe in cusk") than those introduced with other information (e.g., "We saw some cusk in the trees") or both explicit belief statements and other information. In Study 3, children were more likely to believe in entities about which speakers made an explicit belief statement and appeared to be providing additional information (even though that information was unintelligible) than those about which they only made an explicit belief statement. Consistent with the maxim of informativeness, 9-year-olds expect speakers to introduce novel entities by providing more information about them than a mere statement of belief.

How do children learn the reality status of things they have heard about but have never seen—that germs are real, for example, but ghosts are not? One possibility is that speakers could mark whether an entity was real or not each time they made reference to that entity. But they generally do not do this. Indeed, people often talk about both real and fantastical non-observable entities as if they were real: "Germs make you sick" and "Ghosts are scary." In the studies here, we investigated the possibility that

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http://dx.doi.org/10.1016/j.cogdev.2014.08.004
0885-2014/

one cue children use to decide whether a novel entity is real is the amount of information a speaker provides. Simply put, if a speaker introduces a novel entity without providing any details about it (or, as we will show, without *appearing* to provide any details about it), children may question its existence.

Our hypothesis follows from one of the two Gricean maxims of quantity—namely, informativeness: Listeners expect speakers to make their contributions as informative as is required (Grice, 1975, p. 45). Previous work suggests that children may be sensitive to violations of informativeness on an implicit level as early as four years of age (Eskritt, Whalen, & Lee, 2008), and on an explicit level by the age of 6 or 7 (Ackerman, 1981; Conti & Camras, 1984). For example, in one of the stories used by Conti and Camras (1984), children heard speakers discussing what they wanted to be when they grew up, with two different story endings. First graders, but not preschoolers, indicated that the story ending in which the speaker responded by saying she wanted to be an adult was "funny or silly" compared to the story ending in which the speaker responded by saying she wanted to be a teacher. The "I want to be an adult" response, while technically appropriate, is not informative. One might even refer to the speaker who says this as a "smart aleck," because of course all children will grow up to be adults.

In the context of a conversation about a real novel entity, an informative contribution would link that entity to the listener's existing knowledge base. This could take many forms, including information about its origin, size, shape, smell, causal properties, similarity to other things, and so on. Indeed, a recent study by found that 10-year-olds were more likely to believe in novel entities that were described with elaborate compared to simple descriptions. For example, they were more likely to believe in entities described with two informative statements (e.g., "Sernets are small fish that live at the bottom of the Great Lakes. Sernets have sharp teeth that they use to eat zebra mussels") than to believe in entities described with one fairly general, less informative statement (e.g., "Sernets run when they are scared") even when both were described in a scientific context. Elaborate descriptions can, of course, also be provided about entities that are not real (e.g., "Ghosts are the souls of dead people," "Fairies live in the forest"). But given that a courteous speaker is expected to do his or her best to create common ground with the listener (Clark, 1996), a failure to offer informative testimony about a novel entity—to simply say, for example, "I believe in X" or "Xs are real" without any details—could lead a listener to question its existence.

Interestingly, an explicit belief statement like "I believe in X" may lead a listener to doubt the existence of an entity not only because it provides too little information, but also because in another sense it provides too much. As noted earlier, there are two parts to Grice's (1975) maxim of quantity. The first, as we have argued, is that listeners expect speakers to make their contributions as informative as required. The second is that listeners expect speakers will not make their contributions more informative than required. When a speaker purposely provides extra information, Grice suggests that it could be "an oblique way of conveying that it is to some degree controversial whether or not" what the speaker says is true, or even that the speaker is not certain of what s/he says (p. 53).

When discussing real things—both observable and unobservable—we rarely stipulate that we believe in them. But when adults and children talk about culturally endorsed fantastical beings, like Santa Claus, conversations about their existence are much more common (e.g., "Santa is real" and "I believe in Santa"). Harris, Pasquini, Duke, Asscher, and Pons (2006) have argued that as children learn that culturally endorsed fantastical beings are not real, they might also detect this difference in the way real versus endorsed entities are discussed. That is, they might come to recognize that the reality status of real things is almost never the topic of conversation, but the reality status of fantastical things is (Canfield & Ganea, 2013). Harris et al. hypothesized that children who have detected this difference might assign questionable reality status to entities that are introduced with an explicit belief statement.

One experimental study addresses this possibility. Woolley, Ma, and Lopez-Mobilia (2011) presented children with videos of conversations in which adults either implicitly acknowledged the existence of a novel entity (e.g., Speaker A: "When we went to Africa this summer, we saw a baby *dugong* being born!" Speaker B: "Wow, that's neat. When we went there, we met some people who were trying to protect *dugongs* from hunters") or explicitly acknowledged the existence of a

novel entity without providing additional information (e.g., Speaker A: "*Bilbies* are real. I believe in them." Speaker B: "I believe in *bilbies* too."). Nine-year-olds behaved as Harris et al. (2006) predicted: They were more likely to say that the entities were real when their existence was implicitly acknowledged than when their existence was explicitly acknowledged. Younger children did not discriminate between the two types of conversations. Woolley et al. (2011) concluded that by nine years of age, explicit belief statements about a novel entity lead children to doubt the existence of the entity.

The design of Woolley et al.'s (2011) study, however, leaves open the possibility that the 9-year-olds were responding to the lack of information in the explicit belief conversations rather than the fact that belief in the novel entities was explicitly acknowledged. That is, they may have expected to hear new information that would allow them to infer something meaningful about the novel entity, such as its characteristics, origin, or causal properties. This kind of information was provided in the conversations in which the entities were implicitly acknowledged, but not in those in which they were explicitly acknowledged. Children might use both a lack of information and explicit belief statements as cues to question the reality status of an entity; but in the Woolley et al. (2011) study, the cues were confounded,. Thus it is not clear whether children are sensitive to one, or to the other, or to both.

Study 1 provided a conceptual replication of the Woolley et al. (2011) finding that 9-year-olds were less likely to believe in novel entities introduced with explicit belief statements than those introduced with more substantive information. Study 2 examined whether the explicit belief statements themselves undermined children's belief in those entities, or whether the lack of information available about those entities led them to question their existence. Study 3 investigated whether children would be more likely to believe in novel entities introduced with explicit belief statements if it appeared that the speakers were providing additional information about them even if that information could not be heard.

1. Study 1

1.1. Method

1.1.1. Participants

Participants were 16 9-year-olds ($M = 9;6$, range 9–0 to 9–11; 7 girls). One additional child participated but was excluded due to technical difficulties. Children were drawn from a database of families willing to bring their children to the laboratory to participate in research. Children were primarily White and middle to upper-middle class, reflecting the composition of families in the area who volunteer for research with their children.

1.1.2. Procedure

During an initial training phase adapted from Harris et al. (2006), the experimenter asked children about four known entities: dogs (real: can be seen and exists), flying pigs (impossible: definitely does not exist), germs (scientific: invisible to naked eye but real), and angels (equivocal: supernatural and not consistently endorsed to children). Children were asked whether each entity was real ("Do you think dogs are real or do you think they're not real?") and then asked to indicate their confidence in their answer ("How sure are you that dogs are real/not real–not sure at all, a little bit sure, or very sure?"). Children were not given any feedback on their responses, as the goal of the training trials was to introduce children to the kinds of judgments they would be asked to make during test trials.

All children identified dogs and germs as "real" and flying pigs as "not real," and they were generally "very sure" about their responses. The *angels* trial represented a more stringent test of children's use of the confidence scale, given that we expected more variability in children's responses and less confidence overall. Indeed, children's responses on this trial were split between real and not real, and children were less confident in their responses for angels than for other training trials ("Not sure at all" – 2 children, "A little bit sure" – 8 children, "Very sure" – 5 children).

Eight test trials followed. Children were told that they were going to watch videos and answer questions about them. Each of eight videos showed two women conversing about a novel entity, and lasted 10–15 s. There were four pairs of actors; each pair appeared in two videos of the same trial type.

Following Woolley et al. (2011), four of the videos involved a conversation in which the two actors explicitly acknowledged the existence of a novel entity, but provided no other information (*Explicit* trials):

A: Hey, do you know about *kita*?
B: Oh yeah, I know about *kita*. *Kita* is real. I believe in it.
A: Yeah, I believe in it too.
B: Okay, I've got to go!

Also following Woolley et al. (2011), the other four videos involved a conversation in which the two actors implicitly acknowledged the existence of the novel entity by referring to it in the context of a school assignment (2 trials) or a trip to a foreign country (2 trials); these were *Implicit* trials:

School assignment:

A: Hey, I have so much homework for my science class tonight. We have to write a five-page report about *bosa*.
B: I remember that science class. When I took it, we studied *bosa* for 2 weeks.
A: Wow, that's a long time.
B: Yeah. Good luck with your report!

Trip to a foreign country:

A: Hey, do you know what happened?
B: What?
A: When we went to Africa this summer, we saw some *cusk* in the rocks.
B: Oh, really? When we went there, we met some people who had *cusk* near their houses.

Videos were presented in blocks by trial type, and children were randomly assigned to have either the *Explicit* or *Implicit* block first. Each video was played twice to ensure that children processed the content. After the second presentation, children were asked: "Do you think [entity] is real or do you think [entity] is not real?" They were then asked to indicate their confidence in that answer using a 3-point scale: "How sure are you that [entity] is real/not real – not sure at all, a little bit sure, or very sure?" Real/not real judgments and confidence ratings were combined to create a belief score for each trial from −3 (very sure that it is not real) to +3 (very sure that it is real). Thus, for the four trials of each trial type, the possible total belief score could range from −12 to +12.

To prevent children from developing a response set and to ensure that they had experience answering both "real" and "not real" in the context of our procedure, we also included four trials that involved two women having a conversation but the conversations on these trials concerned known entities—two trials involving known real things (cats and fish) and two involving fantastical entities (fairies and unicorns). The conversations included general information about the entities, such as that fish live under water and have fins, and that fairies live in the woods and make fairy dust. One real and one fantastical catch trial occurred before the first block of test trials and one of each type occurred before the second block of test trials. The actors in these videos were not in any of the test trial videos and each pair of actors appeared in one trial of each type. All children responded as expected on these "catch" trials, identifying cats and fish as real and unicorns and fairies as not real and indicating that they were "very sure" about their responses.

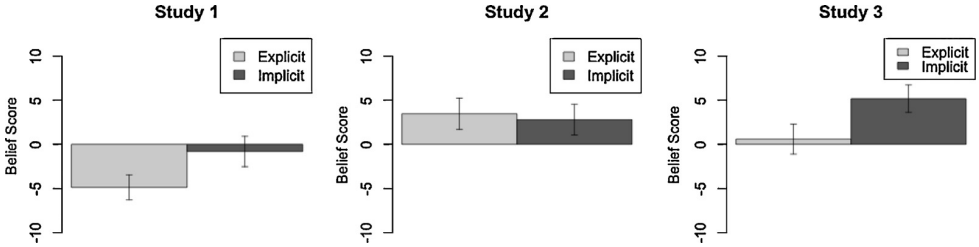

Fig. 1. Belief scores by trial type and study (possible range: −12 to +12).

Table 1
Distribution of children's real responses by trial type for Study 1.

Item type	Number of "real" responses				
	0	1	2	3	4
Explicit	9	4	0	2	1
Implicit	3	4	4	2	3

1.2. Results and discussion

There was no effect of age in months, gender or presentation order (*Explicit* block first vs. *Implicit* block first) on belief scores for either trial type, so data were collapsed across these variables.

As the left panel of Fig. 1 shows, children's belief scores were significantly higher on *Implicit* trials than on *Explicit* trials ($M = .81$ vs. -4.88), $t(15) = 2.56$, $p = .02$, $d = .65$, showing that children had higher levels of belief in entities whose existence was implicitly acknowledged compared to entities whose existence was explicitly acknowledged. These results replicate the findings of Woolley et al. (2011). Indeed, children's average belief score on *Explicit* trials was significantly below 0, $t(15) = 3.47$, $p = .003$, $d = .87$, suggesting that they were unlikely to believe in entities that were introduced by making reference to their reality status. The average belief score on *Implicit* trials did not differ from 0, $t(15) = -0.47$, $p = .66$, $d = .12$.

These data can also be examined looking at only children's real/not real judgments, without taking into account confidence ratings. Table 1 shows the number of children who said the novel entities were "real" on 0, 1, 2, 3, or 4 of the four *Explicit* and *Implicit* trials. The median response for *Explicit* trials was to say "real" for 0 out of the 4 trials, whereas the median response for *Implicit* trials was to say "real" for 2 out of 4 trials. A Wilcoxon signed-rank test confirmed that the distribution of responses differed between the two trial types, $Z = 2.15$, $p = .03$, $r = .38$.

2. Study 2

In Study 1, 9-year-olds were skeptical about the reality status of novel entities introduced with explicit belief statements, consistent with Harris et al.'s (2006) prediction and with findings from Woolley et al. (2011). But the amount of information provided about entities introduced on *Explicit* trials was minimal compared to the amount of information provided on *Implicit* trials. Study 2 was designed to equate the amount of information provided in the explicit and implicit conversations: On *Explicit* trials, children heard the speakers profess a belief in the novel entities, but they also heard the speakers describe other things about them. If children in Study 1 were more skeptical of novel entities on *Explicit* than *Implicit* trials because of the explicit belief statements alone, the pattern of results in Study 2 should be the same. If, however, children in Study 1 were more skeptical of the novel entities on *Explicit* than *Implicit* trials because the *Explicit* trials were less informative, equating the two types of trials for informativeness should eliminate any difference between them.

2.1. Method

2.1.1. Participants

Participants were 15 9-year-olds (M = 9–4, range 9–0 to 9–11; 8 girls). One additional child participated but was excluded for refusing to answer test questions. Other participant characteristics and the recruitment method were as in Study 1.

2.1.2. Procedure

The procedure was the same as in Study 1 except for the following changes. Both *Explicit* trials and *Implicit* trials consisted of conversations including a statement that the entity was unobservable and information about where the entity came from and what it was made of. The *Explicit* trial videos also included three explicit belief statements, which are underlined in the following example:

A: Do you know about *kita*? I believe in *kita*. *Kita* is stuff that is in sand at the beach, but you can't see it.
B: Oh yeah, I know about *kita*. *Kita is real*. *Kita* is the stuff that comes from the salty water in the ocean, right?
A: Yeah that's right. And *kita* is made up of some different kinds of gases and a little bit of metal.
B: Right. So *kita* is always in sand, but you just can't see it. Yeah, I definitely believe in *kita*.

Implicit:

A: Do you know about *cusk*? *Cusk* is stuff that is in rocks, but you can't see it.
B: Oh yeah, I know about *cusk*. *Cusk* is the stuff that comes from the dirt in the ground around the rocks, right?
A: Yeah that's right. And *cusk* is made up of lots of different kinds of minerals and also a little bit of dust.
B: Right. So *cusk* is always in rocks, but you just can't see it.

The videos were approximately 20–30 s in length. As in Study 1, children generally responded appropriately to the training trials and catch trials.

2.2. Results and discussion

There were no significant effects of age, gender, or presentation order (*Explicit* block first vs. *Implicit* block first) on belief scores for either trial type, so data were collapsed across these variables in subsequent analyses.

As the middle panel of Fig. 1 shows and consistent with our predictions, children's belief scores for *Explicit* and *Implicit* trials were not significantly different in this study, (M = 3.47 vs. 2.80), $t(14) = 0.63$, $p = .54$, $d = .095$. This suggests that when conversations were equated for amount of information, children did not distinguish between those that included explicit belief statements and those that did not. Indeed, unlike Study 1 where the average belief scores for *Explicit* trials were significantly below chance, the average belief score for *Explicit* trials in Study 2 actually trended toward being above chance, $t(14) = 1.89$, $p = .08$, $d = .49$. As in Study 1, the average belief scores for *Implicit* trials were not significantly different from chance, $t(14) = 1.56$, $p = .14$, $d = .40$.

As in Study 1, we can also examine these data by considering only children's real/not real judgments, without taking into account confidence ratings. Table 2 shows the number of children who said the novel entities were "real" on 0, 1, 2, 3, or 4 of the four trials of each type. The median response for *Explicit* trials was to say "real" for all 4 trials, whereas the median response for *Implicit* trials was to say "real" for 3 out of 4 trials. A Wilcoxon signed-rank test suggested that the distribution of responses did not differ by trial type, $Z = -1.09$, $p = .41$, $r = .20$.

To compare children's responses to each trial type in the current study to children's responses in Study 1, a mixed effects model was conducted predicting belief score from study (1 vs. 2), trial type (*Explicit* vs. *Implicit*), and the interaction between these variables, as well as the random effect of

Table 2
Distribution of children's real responses by trial type for Study 2.

Item type	Number of "real" responses				
	0	1	2	3	4
Explicit	2	2	1	2	8
Implicit	3	0	3	4	5

subject to account for the repeated measures design within study. There was a significant interaction between study and trial type, $B = 4.73$, $p = .02$. To further examine this effect, follow-up regressions were conducted examining the simple effects of study on each trial type. This analysis confirmed that children's belief scores on *Explicit* trials were significantly higher in Study 2 than in Study 1, $B = 8.34$, $p = .001$, showing that children were more likely to believe in entities described using an explicit belief statement when other information was also provided, compared to entities described using an explicit belief statement with no other information. In contrast, children's responses on *Implicit* trials were not significantly different between the two studies, $B = -3.61$, $p = .16$. These results suggest that children are sensitive to a lack of information in conversations and that this lack of information can lead them to doubt the existence of entities described in this way.

3. Study 3

Children in Study 2 were as likely to say that novel entities were real when they heard them introduced with an explicit belief statement plus additional information as when they heard them introduced with the additional information but no explicit belief statement. This suggests that explicit belief statements themselves do not undermine 9-year-olds' belief in novel entities. Instead, these results suggest that it may be the lack of information—a violation of one part of Grice's (1975) maxim of quantity—that led children to doubt the existence of novel entities introduced with explicit belief statements in Study 1 and in Woolley et al. (2011).

However, it is possible that children in Study 2 were responding to the specific content provided on *Explicit* trials rather than to the mere fact that additional information was provided. Indeed, as described in the Introduction, by age ten, children are more likely to believe in novel entities that were introduced with more elaborate and informative descriptions than in entities that were introduced with more simple and general descriptions.

If children's responses on the *Explicit* trials of Study 2 were driven by the provision of additional information rather than its content, whether children could actually hear that information should not matter, so long as it appeared that it was being provided. To investigate this possibility, we conducted Study 3. We used exactly the same materials as in Study 2, but on *Explicit* trials bursts of static (attributed to a computer error) covered all of the audio except the explicit belief statements. Thus, on these trials, children saw and heard the speakers profess a belief in the novel entity, and they could see that both speakers appeared to provide additional information about it, but they could not hear that additional information.

We expected that belief could be higher on *Implicit* than *Explicit* trials because children actually heard more information on *Implicit* trials. Importantly, however, we expected that belief on *Explicit* trials would be higher than on the *Explicit* trials of Study 1, because in *Explicit* trials in the present study, the two speakers seemed to be providing additional information (even though it could not be heard), whereas on the *Explicit* trials of Study 1, they did not.

3.1. Method

3.1.1. Participants

Participants were 17 9-year-olds ($M = 9$–4, range 9–0 to 9–11; 9 girls). Two additional participants were excluded, one for technical problems and the other for failure to use the confidence scale appropriately. Other sample characteristics and the recruitment method were as in the previous studies.

Table 3
Distribution of children's real responses by trial type for Study 3.

Item type	Number of "real" responses				
	0	1	2	3	4
Explicit	3	1	7	1	5
Implicit	0	3	2	1	11

3.1.2. Procedure

The procedure was the same as in Study 2 except for the following changes. After the initial training phase and prior to beginning the video presentation for the reality status test trials, the experimenter told children that some of the videos were "not working very well lately," but that they would just have to try and hear what they could. In *Explicit* trials, bursts of static covered the all of the audio except the explicit belief statements. For example,

A: Do you know about *kita*? I believe in*kita*. [STATIC]
B: Oh yeah, I know about *kita*. *Kita* is real. [STATIC]
A: [STATIC]
B: [STATIC] Yeah, I definitely believe in *kita*.

Otherwise, the videos were exactly the same as those used in Study 2. The *Implicit* trials were identical to those in Study 2. Importantly, as in Studies 1 and 2, half the children received *Explicit* trials before *Implicit* ones, and half received the *Implicit* trials before the *Explicit* ones. Also, as in Studies 1 and 2, children generally responded appropriately to the training trials and catch trials.

3.2. Results and discussion

There were no significant effects of age or gender on belief scores for either trial type, so data were collapsed across these variables in the subsequent analyses.

As the right panel of Fig. 1 shows, children's belief scores were significantly higher on *Implicit* than *Explicit* trials ($M = 5.18$ vs. 0.59), $t(16) = 3.28$, $p = .005$, $d = .71$, presumably reflecting the fact that there was more information about the entities available on *Implicit* than *Explicit* trials of this study. Belief scores for *Implicit* trials were significantly higher than chance, $t(16) = 3.46$, $p = .003$, $d = .84$, whereas belief scores for *Explicit* trials were not different from chance, $t(16) = 0.36$, $p = 0.73$, $d = .09$.

There was also a significant effect of order on children's belief scores for the *Implicit* trials, such that belief on *Implicit* trials was higher when the *Implicit* block was first ($M = 8.63$) than when the *Explicit* block was first ($M = 2.11$), $t(15) = 2.52$, $p = .02$, $d = 1.22$. Children's belief scores for the *Explicit* trials were not significantly different when the *Implicit* block was first ($M = 2.88$) than when the *Explicit* block was first ($M = -1.44$), $t(14) = 1.33$, $p = .20$. A possible explanation for the order effect on *Implicit* trials is that when children heard the *Explicit* trials first, their skepticism on *Explicit* trials caused them to be more skeptical on the *Implicit* trials as well. However, this order effect did not interact with the effect of trial and results for trial remained the same controlling for the main effect of order. To keep the presentation of analyses consistent with the earlier studies, order is not included in the analyses presented here.

As in the previous studies, we also examined children's real/not real judgments, without taking into account confidence ratings. Table 3 shows the number of children who said that novel entities were "real" on 0, 1, 2, 3, or 4 of the four trials of each type. The median response for *Explicit* trials was to say "real" for 2 out of 4 trials, whereas the median response for *Implicit* trials was to say "real" for all 4 trials. A Wilcoxon signed-rank test showed that there was a significant effect of trial type on real/not real judgments, $Z = 2.40$, $p = .02$, $r = .41$.

To compare children's responses to each trial type in Study 3 to children's responses in the previous studies, two mixed effects models were conducted predicting belief score from study, item type, and

the interaction between these variables, as well as the random effect of subject to account for the repeated measures design within study.

First, we compared Study 3 to Study 2 to investigate whether the inability to hear the additional information on *Explicit* trials of Study 3 affected children's belief scores. There was a significant interaction between study and trial type, $B = -5.25$, $p = .006$, reflecting the fact that, as Fig. 1 shows, children in Study 3 had lower belief scores on *Explicit* than *Implicit* trials, whereas scores on the two trial types did not differ in Study 2. However, follow-up regressions investigating the simple effects of study on each trial type showed that belief scores did not differ significantly on *Explicit* trials of the two studies, $B = 2.88$, $p = .25$, or on *Implicit* trials of the two studies, $B = -2.38$, $p = .31$.

Our primary interest was in how belief scores on *Explicit* trials in Study 3 compared with belief scores on *Explicit* trials in Study 1. Recall that on those trials in both studies, children heard each speaker profess a belief in the novel entity, but in Study 3, the two speakers also appeared to offer additional information about them (although children could not hear that content). As the right and left panels of Fig. 1 show, the relation between the two types of trials in Study 3 was similar to Study 1. Indeed, in the regression comparing these studies, there was no significant interaction between study and trial type, $B = 0.53$, $p = .80$. However, there was a main effect of trial type, $B = 4.06$, $p = .01$, showing that children's belief scores were higher overall for *Implicit* trials than for *Explicit* trials, and a main effect of study, $B = 5.46$, $p = .02$, showing that children's belief scores were higher overall in Study 3 compared to Study 1.

To further examine these effects, follow-up regressions were conducted examining the simple effects of study on each trial type. This analysis confirmed that children's belief scores on *Explicit* trials were significantly higher in Study 3 than in Study 1, $B = -5.46$, $p = .02$. As predicted, children were more likely to believe in novel entities that were introduced with an explicit belief statement when the two speakers appeared to be providing additional information about those entities (Study 3) than when they did not (Study 1). To emphasize, the audible parts of the conversation on *Explicit* trials of Study 3 were very similar to those on *Explicit* trials of Study 1: The same novel words were used and three explicit belief statements were used in each – two "I believe in . . ." statements and one ". . . is real" statement. Despite these similarities, belief scores on *Explicit* trials of Study 3 were higher than those of Study 1 because it appeared that the speakers in Study 3 were providing additional information about the novel entities.

To examine the effect of study on *Implicit* trials, we combined Studies 2 and 3, as the same videos were used in both studies and belief scores were not significantly different, $B = -2.38$, $p = .31$, and compared these scores to the *Implicit* trials in Study 1. Belief scores on *Implicit* trials were significantly higher in Studies 2 and 3 than in Study 1, $B = -4.88$, $p = .02$. We had not predicted this finding; however, it may be possible to explain this difference by appealing to differences in the kind of information provided on *Implicit* trials in Study 1 compared to Studies 2 and 3. Specifically, Study 1 was designed to be as similar to Woolley et al. (2011) as possible, and so as in that study, the speakers focused on where they encountered the entity (in the context of a school assignment, in a foreign country). In contrast, the speakers in Studies 2 and 3 described the novel entities in a way to suggest they were unobservable and explicitly linked them to other things that children knew were real (e.g., "*Cusk* is the stuff in rocks, but you can't see it").

By 9 years of age, children may expect that they have heard of most observable real entities (Woolley & Ghossainy, 2013) and so hearing novel entities described as unobservable in Studies 2 and 3 may have made their existence seem more plausible than they were in Study 1. Hearing the speakers link the novel entities to known, real things in Studies 2 and 3 may also have been important. Previous research suggests that children use contextual information to determine novel entities' ontological status (Woolley & Van Reet, 2006). Indeed, when we informally asked children at the end of Study 3 to explain how they made their decisions, some made reference to this latter point. For example, one child said, "I decided [*cusk*] were real because rocks are real so [*cusk*] must be real," and another said, ". . . they talked about rain, [so] I thought [*tulver*] was real because I know rain is real."

These possibilities are of course speculative. Our study was not designed to investigate differences on *Implicit* trials and so understanding how the type of content provided by speakers who assume the existence of novel entities affects children's beliefs in those entities is a question for future work.

4. General discussion

Our studies have addressed how children decide the reality status of things they have heard about but have never seen. The results suggest that one cue children use is the amount of information provided when the entities are introduced. Study 1 showed that when novel entities were introduced with only explicit belief statements, 9-year-olds tended to say that they were not real. Study 2 demonstrated that it was the lack of information rather than the explicit belief statements themselves that led to children's doubt in Study 1. Finally, Study 3 showed that belief was increased relative to the explicit condition in Study 1 when children saw that speakers had more to say about an entity and had the communicative intent to share that information, even when the information itself was unintelligible. Together, these three studies suggest that 9-year-olds are skeptical about the reality status of novel entities introduced without substantive information, or at least without the appearance of speakers providing substantive information.

These findings are consistent with the first part of the Gricean maxim of quantity—the expectation listeners have that speakers will make their contributions as informative as required (Grice, 1975). Children in Study 1 clearly expected that a conversation about a novel entity would consist of more than a profession of belief in the entity. Previous work has demonstrated that by age 6 or 7, children can identify when a violation of informativeness has occurred (Ackerman, 1981; Conti & Camras, 1984). The present work goes beyond these findings by demonstrating a specific effect of an uninformative contribution on child listeners—in the context of a conversation about reality status, it can lead to doubt.

Our results are consistent with those of who found that 10-year-olds were more likely to believe in novel entities that were described with elaborate compared to simple descriptions. The present results extend this finding by showing that children's belief is increased relative to a minimal information condition by seeing that the speakers intend to provide more information (presumably a more elaborate description) even when children do not have access to the actual description.

Interestingly, 9-year-olds did not seem to interpret the provision of an explicit belief statement as a violation of the second half of the Gricean maxim of quantity—the expectation listeners have that speakers will avoid making their contributions more informative than required (Grice, 1975). When adults hear someone profess a belief in something, it seems to indicate the reality status of that thing may questionable. But in Study 2, when children heard speakers provide information about novel entities and profess a belief in them, they were as likely to say that the entities were real as when they heard the speakers provide information without explicit belief statements. Contrary to the possibility suggested by Harris et al. (2006), then, hearing a speaker profess a belief in a novel entity did not undermine children's belief in that thing.

This finding also conflicts with conclusions from Woolley et al. (2011). In their study, 9-year-olds were less likely to believe in novel entities introduced with explicit belief statements than those introduced without them. Importantly, however, the speakers in Woolley et al. provided less information about the entities introduced with explicit belief statements than those introduced without. In our Study 2, when the amount of information available was equated, the level of belief in the two types of trials was the same. Furthermore, in Study 3 we showed that, relative to the explicit condition of Study 1, belief was increased when children saw that speakers had more to say about an entity, even when children could not hear the content of the information itself.

On a related note, on *Implicit* trials, the speakers provided information that could allow children to make inferences about each entity's characteristics, origins, or causal properties. That is, the information provided was arguably central to the ontology of the novel entity. If the speakers had instead provided more peripheral information (e.g., information about the speaker's preferences for the entity), children might have been less willing to believe that the entity was real. This is a question for further research.

This point is relevant because we do not know what children were assuming the speakers were saying during the inaudible parts of Study 3's *Explicit* trials. Importantly, the design of Study 3 allows us to rule out the possibility that children's responses on the *Explicit* trials were influenced by the specific kind of information provided during the *Implicit* trials. Recall that in Study 3 (as in the other

two studies), half of the children received the block of *Explicit* trials before the block of *Implicit* trials, and half received the reverse. There was no effect of trial block on how children responded to the *Explicit* trials: They were just as likely to believe in the novel entities introduced with an explicit belief statement and the burst of static when those trials came before the *Implicit* trials as they were to believe in them when they came after. Additionally, the finding of higher belief scores on *Explicit* trials of Study 3 than of Study 1 holds true regardless of whether one considers just those children who received the *Explicit* block first, $B = -4.69$, $p = .08$, or those who received the *Explicit* block second, $B = -6.5$, $p = .09$. The assumptions children made about the content of the inaudible portions of *Explicit* trial videos in Study 3 were naturally occurring and not influenced by the information in the other trials.

We have argued that it is the lack of information conveyed by explicit belief statements rather than explicit belief statements per se that lead children to be skeptical of novel entities. One alternative is that explicit belief statements themselves do lead children to be skeptical, but that the provision of additional information overrides this skepticism. We attempted to address this possibility in Study 3, in which the additional information on *Explicit* trials was inaudible. Nonetheless, one could argue that the appearance of the provision of additional information overrides the skepticism that accompanies explicit belief statements. Our data do not allow us to tease apart these possibilities. We would simply point out that in the real world, explicit belief statements are likely to be accompanied by additional information, in which case it is not clear how explicit belief statements in isolation would come to trigger skepticism.

Indeed, one explanation for why 9-year-olds in our studies were not more skeptical of novel entities introduced with explicit belief statements (so long as other information was provided) could be that they are exposed to explicit belief statements about a wider range of entities than researchers have traditionally assumed. Researchers have noted that children hear explicit belief statements in conversations about endorsed entities, like Santa Claus (Harris et al., 2006; Woolley et al., 2011). When talking to children, adults often profess belief in endorsed entities even though they do not actually believe they exist. However, parents also express belief in things that they *do* believe exist like God, evolution, and climate change. In these cases, the motivation for professing a belief seems to be to acknowledge that their existence is not universally accepted. If parents think it is important for their children to share their beliefs, they may use explicit statements of belief ("We believe in God," or "Evolution is real") to prepare children for (and perhaps inoculate them) against contrary testimony from others.

Our results do not reveal what it is that leads children to believe; for example, we cannot claim that children will believe in novel entities so long as they are introduced with more information. Indeed, across all of the studies, only on the *Implicit* trials in Study 3 were children's belief scores significantly above chance. In all other types of trials, even when more information was provided, children were ambivalent in judging the entities' reality status. In a way, this ambivalence about novel entities, even when they are introduced with some detail, is sensible because, of course, fantastical entities can be described using propositions that are fictionally true (Walton, 1990). For example, it is fictionally true that Santa Claus lives at the North Pole and that Harry Potter went to Hogwarts. Indeed, a speaker could have quite a lot to say about either of these entities, and so more information is not necessarily an indication that the entities are real.

Thus the question of why children use lack of information as cue for doubt is left open. One possible mechanism is that children infer that speakers who violate the informativeness maxim are being deceptive. When someone is lying they may have less information to provide because some liars may have difficulty generating believable details in real time. Similarly, perhaps children have a preference for openness or explanatory depth and do not see a speaker as trustworthy because she is not being open with her knowledge.

A question for future research concerns the inferences children make about speakers who violate the informativeness maxim. Eskritt et al. (2008) showed that even 4-year-olds stop trusting a speaker who does not provide enough information in the context of a sticker-finding task. But would children also be skeptical of other information provided by that speaker? One could imagine, for example, that speakers who violated informativeness might be considered poor informants more generally. It is also unclear whether children would stop trusting speakers like those in our paradigm who violated the

informativeness maxim by not providing any substantive information but, unlike in the Eskritt et al. (2008) study, were not charged with a specific task (helping the child find the sticker) and did not cause the child to fail to receive a reward (by failing to help them find the sticker).

In summary, 9-year-olds tend to respond skeptically about the existence of novel entities that are introduced with nothing more than an explicit belief statement. However, as we showed in Study 3, it is the lack of information rather than the explicit belief statement that drives children's skepticism. Simply thinking that more information is provided increases children's belief. At least by age nine, children appear to use speakers' communicative intent to provide information to infer trust.

Acknowledgements

This research was supported by NSF grant 1024293 and a Brady Education Foundation grant to ASL. We would like to thank Russel Houser and Natalie Ryan for assistance in collecting and coding data. Special thanks to Robyn Kondrad, Rachel Riskind, Carrie Palmquist, Emily Hopkins, Marissa Drell, Shaina Rowell, Kelly Hoffman, Emily Loeb, Katie Boguszewski, Antonela Cesar, Bernadette Blanchfield, Julie Vaisarova, Sarah Thomas, Elizabeth Gilbert, and Grace Chiarella for appearing in video stimuli.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at http://dx.doi.org/10.1016/j.cogdev.2014.08.004.

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