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'You Could Call It Magic': What Parents and Siblings Tell Preschoolers About Unobservable Entities

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How can we explain children's understanding of the unseen world? Young children are generally able to distinguish between real unobservable entities and fantastical ones, but they attribute different characteristics to and show less confidence in their decisions about fantastical entities generally endorsed by adults, such as Santa Claus. One explanation for these conceptual differences is that the testimony children hear from others about unobservable entities varies in meaningful ways. Although this theory has some experimental support, its viability in actual conversation has yet to be investigated. Study 1 sought to examine this question in parent–child conversation and showed that parents provide similar types of content information when talking to children about both real entities and entities that they generally endorse. However, parents use different pragmatic cues when they communicate about endorsed entities than they do when talking about real ones. Study 2 showed that older siblings used discourse strategies similar to those used by parents when talking to young children about unobservable entities. These studies indicate that the types of cues children use to form their conceptions of unobservable entities are present in naturalistic conversations with others, supporting a role for testimony in children's early beliefs.

In many fields of knowledge, children learn through active exploration of their environments. Through perceptual observation, imitation, and even play, they are able to discern the roles of the people, objects, and actions that surround them. This has advanced the idea of ''the child as scientist'' in much historical and current developmental theory (Gopnik, Meltzoff, & Kuhl, 1999; Piaget, 1954). However, it is sometimes impossible for children to rely on such direct experience, either because an entity, like a microscopic being, is difficult to observe, or because it is impossible to see, as is the case with abstract concepts such as infinity or fantasy entities like unicorns. In these cases, children must depend on the testimony of others (Harris & Koenig, 2006).

This testimony hypothesis proposes that the verbal input children receive from others varies in important ways, and that these variations inform children's conceptions of the unseen world (Harris & Koenig, 2006). Such variations in testimony arise in the content of speech as well as in other more subtle, discourse cues. For instance, children may hear the same types of information

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about historical figures (''Christopher Columbus sailed in a big boat.'') and fantastical ones (''Santa Claus rides in a sleigh.''), but they are unlikely to ever hear explicit statements of reality or belief when they hear testimony about historical people (Harris, 2007). Although most previous research on children's understanding of unobservable entities has focused exclusively on children's conceptions (e.g., Harris, Pasquini, Duke, Asscher, & Pons, 2006; Rosengren & Hickling, 1994; Sharon & Woolley, 2004), recent research has begun to assess the efficacy of the testimony hypothesis. Woolley, Ma, and Lopez-Mobilia (2011), for instance, suggested that there are two basic tenets of the testimony hypothesis: that conversation about different types of unobservable entities actually differs, and that children are sensitive to these differences. They examined the second of these principles in an experimental paradigm in which children watched a video of two experimenters talking to each other about a novel entity. They found that preschoolers as young as 3 years of age were able to determine the reality status of the entity when explicit statements (e.g., ''Bilbies are real. I believe in them.'') were present in the verbal input. By 5 years of age, children could pick up more subtle cues, such as statements that presume an entity's existence (e.g., ''We saw a baby dugong being born!''), in assessing whether an entity was real or not (Woolley et al., 2011). Earlier research has also indicated that children can use statements about belief or denial to make judgments about an entity's reality status (Woolley & Ma, 2009). Thus, it seems that by the time they enter kindergarten, children are sensitive to discourse cues that relate to the reality status of unobservable entities.

The first tenet of the testimony theory, however, remains unexplored. We do not know to what extent the naturalistic input that children receive about nonobservable entities actually varies across different categories. Conversations between young children and their parents and older siblings provide an important starting point for an investigation of such input. Much of the testimony children hear about unobservable entities, especially early in life, comes from family members in unstructured conversations, but not much is known about whether and how these conversations differ based on the type of entity discussed.

Children's Sensitivity to Cues in Naturalistic Conversation

Although there has been little examination of parent–child conversations about unobservable entities, it is clear that children generally are eager to learn from important and familiar others (see Csibra & Gergely, 2009; Gelman, 2009), and it seems that they readily accept and internalize everyday assumptions about some nonobservable entities from their parents. For instance, during the preschool years, children acquire the tendency to refer to the heart as the source of emotions (Gottfried & Jow, 2003). Recent studies have also indicated that infants and young children are sensitive to a variety of conversational cues in parents' speech. Gallerani, Saylor, and Adwar (2009) report that infants as young as 11 months old are able to use the properties of their mothers' speech to differentiate types of reference. Mothers use more mental-state terms, such as ''remember,'' when talking about absent objects, and 11-month-old infants are able to distinguish between these variations and respond appropriately by looking toward the place in which an absent object was last seen (Gallerani et al., 2009). Mothers also seem to talk more about their actions when engaging in pretend scenarios, such as eating a pretend snack, than when engaging in real ones (Lillard & Witherington, 2004). Although young infants do not seem to use this information to advance their understanding of pretend play, they do use other aspects of pretend interactions, such as mothers' looking at them and smiling after performing an action, to

distinguish between a pretend and a real action (Lillard & Witherington, 2004). Such behavioral cues may make complex concepts easier to understand, as even high-level physicists use gestures to convey dynamic aspects of complicated physical processes (Ochs, Gonzales, & Jacoby, 1996).

Children can also use speaker-specific cues, such as a speaker's confidence, to assess the value of his or her testimony. Jaswal and Malone (2007) had an adult experimenter label an ambiguous object in either a straightforward manner (''That's a spoon.'') or a more hesitant manner (''I think that's a spoon.'') and then asked 3-year-old children to demonstrate the object's function. The children displayed more label-based functions when the speaker had been confident than they did when the speaker had used ''I think.'' Further, 2-year-olds are able to use speech disfluencies—pauses such as ''uh'' or ''um''—to attend to new or infrequent words and to infer a speaker's meaning (Kidd, White, & Aslin, 2011). Thus, young children can use linguistic cues in others' speech to infer both the meaning and quality of the testimony they hear.

The goal of the current study is to determine if these types of cues—to which we know children are sensitive—occur in the testimony children hear from both parents and siblings about different types of unobservable entities. If discourse about unobservable entities does vary according to the type of entity discussed, this would provide evidence for the first tenet of the testimony hypothesis and would suggest that variations within conversations account for children's varying conceptions of different types of unobservable entities.

How Children Think about Unobservable Entities

A large body of research on children's conceptions of unobservable entities suggests that children readily endorse the existence of several entities that they could not possibly have seen, indicating that they are not simply taking an ''empiricist'' view of the world (Harris, 2012). Neither do children merely believe in all entities that they hear about from others; they rarely affirm the existence of imaginary creatures like dragons (Harris, 2012). Further, although 4- and 5-year-old children consistently claim that fantasy entities with strong social support (i.e., ''endorsed'' entities, such as Santa Claus) exist, when asked to describe the characteristics of those entities, they separate them from real entities in much the same way adults do. They attribute significantly more human-like physical and social properties to real entities than they do to fantasy entities, even though they only correctly categorize endorsed entities as ''not real'' about one third of the time (Sharon & Woolley, 2004).

Similarly, Harris et al. (2006) have found that children have a clear and confident dichotomy between those entities that they believe are real (e.g., germs, Santa Claus) and those that they believe do not exist (e.g., ghosts). In addition, although young children generally categorize both scientific and endorsed entities as real, they divide them in more subtler ways. For instance, even though children provide the same types of explanations for their beliefs in scientific and endorsed entities, they are more confident in the existence of scientific entities and are more likely to claim that other people also believe scientific entities exist (Harris et al., 2006).

The Current Study

To summarize, children distinguish among unobservable entities and make subtle distinctions between scientific entities and endorsed entities, even when they classify both as real. Because these entities are unseen, researchers such as Harris and Woolley have theorized that children depend on others' testimony in forming these conceptions, and previous research demonstrates

that children are able to track and use cues in others' speech to determine the reality status of an entity, at least in controlled experimental settings. Do children's naturalistic conversations with others provide the same types of cues that experimental data have shown to influence their beliefs about nonobservable entities? If so, how do these cues differ when different types of entities are discussed? Do these variations in everyday testimony about nonobservable entities provide cues that enable children to form different concepts?

To answer these questions, we asked parents (Study 1) and older siblings (Study 2) to speak with young children about a variety of unobservable entities. First, we hypothesized that the naturalistic conversations would display the cues used in previous experimental work focused on children's conceptions of unobservable entities. Second, we hypothesized that the testimony to which young children are exposed would vary in content across entity types, and that it would especially vary in the types of subtle cues that can guide children's beliefs—such as cues to consensus, speaker confidence, or placement in the real world (e.g., examples).

If the testimony children hear from others does differ depending on the type of entity discussed, this would provide evidence for more than simply the feasibility of the testimony hypothesis put forward by Harris and colleagues (2006). It would indicate that children actually encounter linguistic cues about the nature, including the reality status, of different entities in their day-to-day lives. This has direct relevance to theories of children's concept formation and supports previous work suggesting that children form, update, and elaborate their concepts of unseen entities through their sensitivity to both direct and more subtle cues in the testimony they hear. Studies investigating the actual linguistic input children receive have thus far been missing from this field of research, and thus, the current studies will specify the role of others' input in young children's learning.

To provide a clear picture of potential variations in testimony, parents in Study 1 were asked to talk about topics in scientific, historical, endorsed, and nonendorsed categories. Previous research on children's conceptions of unobservable entities has suggested that children think about generic classes of fantastical entities differently than they think about specific, endorsed fantasy entities, and that they reason differently about real, invisible entities than they do about fantastical ones (Harris et al., 2006; Rosengren, Kalish, Hickling, & Gelman, 1994; Sharon & Woolley, 2004). Recent research has also indicated that young children sometimes have trouble determining the reality status of unfamiliar historical figures (Corriveau, Kim, Schwalen, & Harris, 2009). The specific entities chosen for the parent–child conversations were based on previous research and were similar to those used in studies assessing children's conceptions of unobservable entities (i.e., Harris et al., 2006). This enabled us to better relate the current findings to the previous literature. Further, for each category, we chose topics for which children had some previous knowledge, so that we could assess cues encountered in parents' everyday conversations, rather than in conversations that are focused on explicit teaching.

STUDY 1

Method

Participants

A total of 48 children participated, each with 1 parent, almost all of whom were mothers (87.5%). The children were divided into three age groups: 3-year-olds ($N = 16$; range = 2;

11–3;7; $M_{age} = 3;3$), 4-year-olds ($N = 16$; range = 4;1–4;10; $M_{age} = 4;6$), and 5-year-olds ($N = 16$; range = 5;0–5;11; $M_{age} = 5;3$). There were approximately equal numbers of boys ($N = 23$) and girls ($N = 25$). The parent–child dyads were drawn from a community sample in Massachusetts and included mostly well-educated, middle- to upper-middle-class European Americans. More than three quarters of the parents in the current sample had a bachelor's degree or higher (89.5%; $N = 85$), and in only one family, neither parent had a college degree. More than half of the families reported practicing a religion (60.4%), although level of religiosity was not directly assessed.

Procedure

Parent–child dyads were asked to converse in an informal sitting-room setting. Parents were told that the researchers were interested in how children learn from conversations about things that they cannot see or experience directly. Children were given small prizes for their participation, but no incentives were provided for parents. Parents and children were given four possible topics to talk about in each of four categories: scientific, historical, endorsed, and nonendorsed. Categories were not named for the parents. Instead, parents were simply presented with the topics, four at a time, and were asked to choose one from each group to talk about.

The topics included the brain, germs and viruses, electricity, and magnetism in the scientific category; Christopher Columbus, Mother Theresa, Princess Diana, and John F. Kennedy in the historical figures category; God, Santa Claus, Easter Bunny, and Tooth Fairy in the endorsed category; and unicorns, mermaids, dragons, and witches in the nonendorsed category. Presentation order of the topics was counterbalanced across parent–child dyads. There were no time constraints placed on the conversations.

Sessions were video-recorded starting when the parent and child entered the sitting room, and the videotapes of the conversations were transcribed for coding.

Coding

The conversations were first transcribed for all participants. Then the transcripts were coded into various categories (described in this section) by one coder. Categories were based on content and pragmatic cues that emerged during pilot-testing. Reliability of coding was conducted on 50% of the transcripts. Cohen's kappa fell within the acceptable range for coding in the scientific (.85), historical (.83), endorsed (.80), and nonendorsed (.77) categories, as well as for the sample overall (.81). All disagreements were resolved through conversation between the coders.

Endorsement of entities. Whether parents affirmed or denied the existence of an entity was coded using a binary rating. This rating included explicit statements regarding the reality or invented nature of the entity, as well as more implicit indications as to whether the entity was real or imaginary.

Parent discourse. Parents' utterances were also coded for a number of discourse cues. Because previous research has indicated that young children can use both the content of conversations as well as the way things are said to determine the meaning of others' testimony, the coding of parents' discourse included both the content and form of the testimony provided.

Conversations were coded for 17 possible cues, derived from a pilot study of 16 parent–child dyads. In the pilot study, two independent coders categorized each parent statement by its content and pragmatic properties, resulting in cues measured in the current study. The frequency with which each parent used each of the 17 cues was recorded for each topic category. While some content cues may be specific to the types of entities discussed in these conversations, the pragmatic cues closely matched those studied in previous work on how children can learn from conversation. After coding, those cues that were used by at least one third of the parents in the sample were analyzed. Both spontaneous explanations by parents and answers to children's questions were coded. Examples of phrases in each category are included in Table 1. The cues through which possible changes in the content of explanations, from here on called content cues, could be measured included the following.

Actions. Utterances that involved describing the things that the current topic did, or could do, were coded as actions.

Physical features. Physical features were used to code descriptions of what an entity looked like, including parts of that entity or physical characteristics common to the entity.

Internal features. Utterances that involved aspects of personality, or intrinsic qualities or characteristics of an entity, were coded as internal features.

Location. Utterances that included a location were coded as such. These included references to where entities lived or were from, as well as where to find entities that did not share the same characteristics of personification. Fantastical locations or locations indicating that an entity did not exist (e.g., ''Unicorns are only in stories.'') were also coded as location statements.

Related actions. When parents spoke about the actions of other people or other entities in relation to the topic entity, those utterances were coded as related actions. Traditions that the family or that people in general carry out, as well as more specific behaviors related to the topic entity were among the utterances included in this category.

TABLE 1
Examples of Coded Statements

Discourse Cue	*Example*
Action	''And Mermaids swim. Do you know why?''
Physical Feature	''I think [dragons] are usually green.''
Internal Feature	''Mother Theresa was a very nice lady . . . ''
Location	''Where in your body is your brain? Can I show you? . . . It's inside [your head].''
Related Action	''When you lose a tooth, you put it under your pillow . . . ''
Lack of Expertise	''Well, we don't actually know this but I think he's really big.''
Lack of Consensus	''Some people think [God] is like this big guy, up in the sky . . . ''
Example	''. . . the lights are electric. What about our stove?''
Analogy	''Mother Theresa was a nun, like Sister Lois at our church.''
Demonstration	Indicating one end of table: ''North America is here.'' Sliding hand across table: ''. . . and then there's the Atlantic Ocean . . . '' Indicating other end of table: ''and then over here is Europe.''

Cues that related to the properties or form of the parents' discourse, called pragmatic cues from here on, were those that related more to the way in which information was conveyed, rather than the information itself. These cues include both linguistic and paralinguistic cues and provided a context for parents' testimony. These included the following.

Lack of expertise. Utterances that conveyed a parent's own doubts about the existence of an entity or explanations that indicated the parent was unsure about the entity's characteristics were coded as ''lack of expertise.''

Lack of consensus. Statements concerning variation in other people's beliefs about an entity were coded as ''lack of consensus.''

Real-world examples. Utterances that included real-world examples were coded as such. These included things that had happened to the parent or child, things that might happen, and general observations about the world (e.g., ''Lightning carries electricity.''). Examples often conveyed the same information about an entity as other content-related strategies, such as physical features of an entity or related actions, but did so by referencing real events or prior experience.

Analogy. Utterances in which the parent compared the topic entity to something known to the child were coded as analogies.

Demonstrations. In addition to linguistic cues, parents' use of gestures and other physical demonstrations to aid in their explanations were coded.

Children's reality status comments. In addition to parents' cues, the frequency of children's spontaneous comments about the reality status of the entities discussed, as well as the number of children who mentioned an entity's reality status, was coded.

Results

Parent and child conversations lasted, on average, 10 min and 6 s and were generally evenly split between topic categories (Table 2). Although parents spoke longer with older children than with younger children, there were no significant differences between the age groups in length of conversation or in the proportion of each overall conversation that was spent on each category. Further, there were no significant conversation time differences between the categories of entities.

Preliminary analyses using repeated-measures analysis of variance (ANOVA) showed a significant difference in discussion of related actions across age groups, $F(1, 182) = 11.23$, $p < .001$, $\eta_p^2 = .06$. However, as this was the only difference involving age, gender, or order of topic presentation, all groups were collapsed for subsequent analysis. The proportion of parents who chose to talk about each entity can be found in Table 2.

Parents' affirmation of an entity was analyzed according to the category of unobservable entity they were discussing. The number of parents who affirmed or denied the existence of the entity discussed in each category is presented in Figure 1. We conducted a logistic regression analysis ($R^2 = .37$) to determine whether parents' affirmation of an entity was related to the category to which the entity belonged. Parents were significantly more likely to deny the existence of nonendorsed entities than they were to deny the existence of scientific entities ($\beta = 4.49$, $p < .001$), historical figures ($\beta = 4.49$, $p < .001$), or endorsed beings ($\beta = 1.97$, $p < .001$).

TABLE 2
Descriptive Statistics of Conversations (Study 1)

Topic	*% of Conversations*	*Mean Time*
Endorsed Category		
Tooth Fairy	40.4%	2 min 43 s
Santa Claus	27.7%	3 min 3 s
Easter Bunny	14.9%	2 min 50 s
God	17.0%	1 min 39 s
Nonendorsed Category		
Unicorns	25.5%	2 min 31 s
Witches	17.0%	2 min 15 s
Mermaids	29.8%	1 min 45 s
Dragons	27.7%	3 min 27 s
Historical Category		
Christopher Columbus	36.2%	2 min 9 s
Mother Theresa	14.9%	2 min 2 s
Princess Diana	34.0%	2 min 55 s
John F. Kennedy	14.9%	2 min 23 s
Scientific Category		
Brain	23.4%	2 min 3 s
Germs	40.4%	3 min 14 s
Magnetism	17.0%	2 min 45 s
Electricity	19.2%	1 min 51 s

Parents were also more likely to deny the existence of endorsed beings than they were to deny scientific entities ($\beta = 2.52$, $p < .05$) or historical figures ($\beta = 2.52$, $p < .05$).

Children's spontaneous remarks about the reality status of the various entities closely matched the endorsement of parents. They differed significantly in how often they mentioned the reality status of the entities across category, $F(3, 188) = 12.86$, $p < .001$, $\eta_p^2 = .17$. On average, more children commented on the reality status of nonendorsed entities than on any other

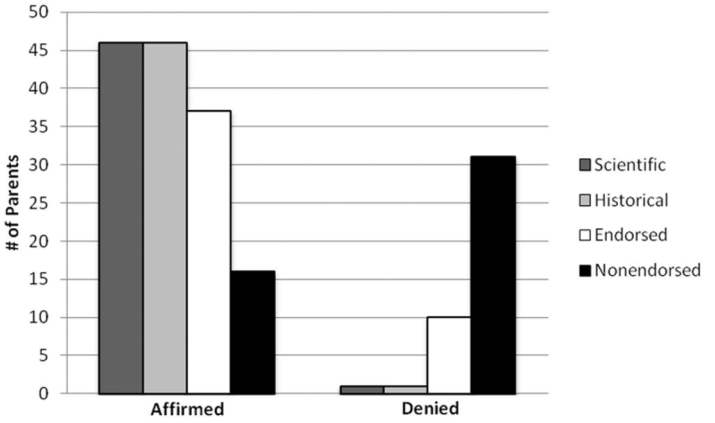

FIGURE 1 Number of parents who affirmed or denied the existence of entities in each category.

category of entity ($N = 20$, 41.7%). Of those, 15.0% claimed the entity was real, 70.0% said the entity was not real, and 15.0% mentioned the reality status, but remained undecided as to the entity's nature. More children also commented about the reality status of endorsed entities ($N = 11$, 22.9%) than they did for either scientific or historical topics, with 54.5% of those children claiming the entity was real and 45.5% claiming it was not.

Next we conducted a cluster analysis, using Ward's minimum variance method and a squared Euclidean distance of the mean frequencies of all discourse cues used by parents across all four topics discussed. The cluster analysis revealed three distinct clusters of discourse cues. One cluster encompassed the scientific and endorsed categories, a second one included the nonendorsed category alone, and a third cluster included the historical category.

We conducted a series of repeated-measures ANOVAs to determine whether parents differed in the discourse cues they used across clusters. Mauchly's tests of sphericity indicated that the sphericity assumption was violated for several cues, so degrees of freedom were corrected using Greenhouse-Geisser's estimates of sphericity where appropriate. Results from the ANOVAs are displayed in Table 3. Parents varied in several features of the content of their conversations across the three clusters. They differed in their discussions of physical features, of actions, and of the locations of the topic entities across clusters. Planned Scheffe pairwise comparisons revealed that parents relied on physical descriptions of entities significantly more frequently when talking about nonendorsed entities ($M = 3.06$, $SD = 2.21$) than they did when talking about entities in either the historical cluster ($M = 0.40$, $SD = 1.10$) or the scientific and endorsed cluster ($M = 0.80$, $SD = 1.04$), which may indicate that these conversations were more superficial in nature. Interestingly, parents were significantly less likely to talk about the actions of historical figures ($M = 2.40$, $SD = 1.79$) than they were for nonendorsed entities ($M = 3.91$, $SD = 3.03$) or scientific and endorsed entities ($M = 3.69$, $SD = 2.34$). However, they were more likely to talk about the locations where historical figures were from ($M = 1.26$, $SD = 1.07$) than they were to discuss places associated with scientific and endorsed entities ($M = 0.91$, $SD = 1.31$).

TABLE 3
Repeated-Measures ANOVA for Discourse Cues Across Cluster (Study 1)

Cue Type	*df*	*F*	$\eta_p^{2\ddagger}$
Action	1.72†	7.88*	.15
Physical Feature	1.46†	39.13*	.46
Internal Feature	1.68†	0.63	.01
Location	2	3.95*	.08
Related Action	2	8.63*	.16
Lack of Expertise	1.54†	2.38	.05
Lack of Consensus	1.63†	2.63	.05
Example	1.55†	9.21*	.17
Analogy	2	4.06*	.08
Demonstration	1.53†	0.25	.01

‡Cohen (1988) provides suggested *f* values for small, medium, and large effect sizes for ANOVA, as well as conversions from η^2 to *f*. These conversions yield estimates of small, medium, and large effect size values for η^2 of .01, .06, and .14, respectively.

†Greenhouse-Geisser corrected.

*$p < .01$.

Parents also varied in their use of related actions and talked about the actions of others related to the topic entity significantly more often when discussing scientific and endorsed entities ($M = 1.43$, $SD = 1.93$) than when talking about nonendorsed beings ($M = 0.26$, $SD = 0.61$). Because preliminary analyses revealed an age difference in parents' use of related actions, individual ANOVAs were undertaken for each age group. The results of the overall sample remained true for parents of 3-year-olds, $F(2, 63) = 3.62$, $p < .05$, $\eta_p^2 = .14$, and 5-year-olds, $F(2, 59) = 4.26$, $p < .05$, $\eta_p^2 = .25$. It did not hold for parents of 4-year-olds, although there was a trend in the same direction, $F(2, 62) = 1.86$, $p = .16$, $\eta_p^2 = .07$. Discussing the actions of other people in relation to scientific and endorsed entities may serve the purpose of connecting these entities to the real world.

Parents varied in few of the properties of their testimony across clusters. However, their use of examples and analogies did differ significantly. Similar to the trend observed for related actions, parents used significantly more examples when talking about scientific and endorsed entities ($M = 1.52$, $SD = 1.50$) than they did when talking about nonendorsed entities ($M = 0.45$, $SD = 0.72$) or historical figures ($M = 0.83$, $SD = 0.80$), again connecting both scientific and endorsed entities to reality in a specific way. On the other hand, they used analogies most often when talking about nonendorsed entities ($M = 0.62$, $SD = 0.95$). Rather than indicating that these entities do exist, the way a real-world example might, analogies may suggest that nonendorsed entities are ''like'' real things but are different.

Although the scientific and endorsed categories fell into the same cluster, we were interested in determining if there were any differences in the discourse cues used when discussing entities in these two clusters. No differences were found in the content cues that parents used across these two categories, but parents did use different pragmatic cues when speaking about scientific entities than they did when talking about endorsed entities. For instance, although they rarely explicitly denied endorsed beings, they were more likely to indicate a lack of expertise, $F(3, 187) = 3.32$, $p < .05$, $\eta_p^2 = .07$, or consensus, $F(3, 187) = 3.46$, $p < .05$, $\eta_p^2 = .07$, when speaking about such entities than they were when talking about scientific entities. Parents were also more likely to use gestures and other physical demonstrations to aid their explanations when describing scientific concepts in comparison to endorsed entities. Their use of these cues diverged significantly across the two categories, $F(3, 187) = 6.77$, $p < .001$, $\eta_p^2 = .10$.

Discussion

These results indicate that parents use similar content cues when talking about scientific and endorsed entities, and they do not differ much in their discussions of historical figures. However, parents' discourse cues differ dramatically in conversations about nonendorsed entities. These clear differences in the content of parents' testimony may explain the confident dichotomy children draw when determining what is real and what is not.

However, more subtle variations arise in the pragmatic cues parents use when talking about scientific and endorsed entities, and these may account for children's lack of confidence in their knowledge about endorsed entities. Parents use more pragmatic cues—such as animated gestures—when talking about scientific entities, and they also show more confidence in their explanations of these real entities, whereas they tend to indicate a lack of expertise or consensus far more often when talking about endorsed beings. These cues may indicate to children that

endorsed entities are different from both nonendorsed and scientific entities, allowing children more room for interpretation and possibly encouraging them to pay even more attention to such pragmatic cues as they try to determine the nature of those entities. This was supported in the examination of children's spontaneous comments about the reality status of the different types of entities. They were most likely to talk about the reality status of nonendorsed entities, demonstrating, as has been shown in previous studies, their confidence in the fantastical nature of these beings. Further, although they also talked about whether endorsed entities were real more often than they did for scientific entities or historical figures, these comments were made with less confidence and included phrases such as ''I guess'' or were expressed as questions.

The current research provides the first evidence for the first tenet of the testimony hypothesis, indicating that parents do talk differently about real entities than they do about fantastical ones and that they speak differently about endorsed entities than they do about nonendorsed ones. An alternative interpretation may be that parents do not actually speak about different types of unobservable entities differently, but that the differences in the content of parents' speech about nonendorsed entities stems from the entities provided by the experimenters. For instance, it could be that parents can more easily describe the physical features of dragons than they can describe the physical features of germs. Although this may be the case, parents spoke about physical features more often for nonendorsed entities than they did for either endorsed entities or historical figures as well, and these topics are also arguably easier to describe physically than are scientific concepts. Further, physical features dominated the parent–child conversations about nonendorsed entities and accounted for almost 30% of their total discourse, while making up less than 10% of their discourse in the other categories. This lends support for the interpretation that these conversations were simply more superficial in nature and relied largely on description, rather than expanding into more detailed discussion.

Another possibility is that young children's differential beliefs about various types of unobservable entities stem not from the differences in content and pragmatic cues they perceive in testimony from a single source, but from differences in testimony they receive from several sources. For example, although children are unlikely to encounter anyone who believes that germs are large, they may encounter people who believe that Santa Claus is imaginary. One clear source of this possible conflict can be found in the testimony that older siblings provide to young children. Older siblings speak to young children about unobservable entities in both casual conversation and through direct teaching. Study 2 was aimed to examine the way in which older siblings talk to young children about unobservable entities.

STUDY 2

If young children hear varying testimony about unseen entities from different sources, siblings may be as important a source of information as parents are. Indeed, siblings are important sources of learning for young children. Older siblings are more likely than familiar older peers to spontaneously offer instruction and to allow younger children to have control over portions of a task in a cooperative-building paradigm (Azmitia & Hesser, 1993). They are also more likely than peers to provide positive feedback and explanation for mistakes.

Compared with parent–child conversation, studies of conversations between siblings seem to indicate that siblings and parents are quite similar in the information they provide to young

children. In one study that examined conversation during play, for instance, both older siblings and parents used labels repeatedly when speaking to toddlers (Perez-Granados, 2002). Both groups were also more likely to use referential labels for objects over other types of labels. However, siblings were less likely to use labels in action—that is, during the course of play—than parents were. They were also less likely than parents to use labels as a collaborative strategy and preferred instead to model references to objects for their younger siblings. Thus, although older siblings do not seem to be as supportive as parents in affording learning opportunities for young children in conversation, the information they provide does not differ from that provided by parents.

Therefore, we hypothesized that rather than being a point of potential conflict, older siblings' testimony would closely resemble parents' testimony, and many of the same discourse cues would be used. In Study 2, we examined cues used by older siblings when speaking to their younger siblings about unobservable entities.

Method

Participants

A total of 16 sibling pairs participated in this study. Each sibling pair consisted of a younger sibling aged 3 to 6 years old (range = 3;3–6;7; $M_{age} = 5;3$) and an older sibling aged 6 to 10 years old (range = 6;11–10;7; $M_{age} = 8;3$), with an average difference in age of 3;5. The sibling dyads were drawn from the same community sample in Massachusetts as in the first study. Nine older brothers and seven older sisters talked to their younger siblings in the current study. Of the 16 dyads, 8 pairs of siblings were of the same gender: 5 pairs of brothers and 3 pairs of sisters.

Procedure

A procedure similar to that used in Study 1 was employed in Study 2. Both siblings received small prizes for their participation. The older siblings in each dyad were asked to teach their younger sibling about topics in the same categories as those used for the parent–child pairs in Study 1. Older siblings were specifically asked to teach their younger siblings because pilot data showed that this helped the sibling pairs stay on topic in their conversations. To ensure that the older siblings had sufficient knowledge of all of the topics, those in the historical figures category were different from the topics presented to the parent–child dyads in Study 1. Specifically, Mother Theresa, John F. Kennedy, and Princess Diana were replaced with Rosa Parks, George Washington, and Betsy Ross. All conversations were videotaped and transcribed for coding.

Coding

The coding procedures used in Study 2 were identical to those used in Study 1. Reliability of coding was conducted on 31.25% of the transcripts. Cohen's kappa fell within the acceptable range for coding in the scientific (.67), historical (.82), endorsed (.87), and nonendorsed (.67) categories.

TABLE 4
Descriptive Statistics of Conversations (Study 2)

Topic	*% of Conversations*	*Mean Time*
Endorsed Category		
Tooth Fairy	12.5%	1 min 52 s
Santa Claus	37.5%	1 min 45 s
Easter Bunny	12.5%	1 min 22 s
God	37.5%	1 min 7 s
Nonendorsed Category		
Unicorns	18.8%	0 min 34 s
Witches	12.5%	1 min 14 s
Mermaids	31.3%	1 min 15 s
Dragons	37.5%	2 min 33 s
Historical Category		
Christopher Columbus	12.5%	1 min 31 s
Rosa Parks	18.8%	1 min 56 s
Betsy Ross	0.0%	0 min 0 s
George Washington	68.8%	1 min 10 s
Scientific Category		
Brain	18.8%	1 min 57 s
Germs	43.8%	1 min 23 s
Magnetism	6.0%	1 min 40 s
Electricity	31.3%	2 min 29 s

Results

Siblings' conversations were significantly shorter than were parent–child conversations, $t(61) = 2.37$, $p < .05$, $d = 0.75$, but the proportion of time spent on each topic did not differ between the parents and siblings. Table 4 presents more descriptive statistics about siblings' conversations. Like parents, older siblings were most likely to explicitly deny the existence of nonendorsed entities (see Figure 2). A Firth logistic regression was used because no siblings denied the existence of scientific or historical entities, creating a separation issue. This procedure indicated that topic category explained a significant portion of the variance in older siblings' endorsement or denial of the existence of an entity, $\chi^2(3) = 15.91$, $p < .01$. Further, older siblings were significantly more likely to deny the existence of nonendorsed entities than they were to deny existence of scientific entities ($\beta = 3.73$, $p < .001$), historical figures ($\beta = 3.73$, $p < .001$), and even endorsed entities ($\beta = 1.51$, $p < .05$).

In conversations with older siblings, younger siblings rarely mentioned the reality status of the entities discussed. No younger siblings spontaneously spoke about the reality status of scientific entities or historical figures, while one child (6.25%) mentioned it for endorsed entities and two (12.5%) talked about the reality of nonendorsed entities. There were no significant differences in younger siblings' talk about reality status across categories.

Repeated-measures ANOVAs revealed some differences in the content of siblings' conversations across the four topic categories, and all ANOVA results are reported in Table 5. Older siblings varied significantly in their discussion of physical features across categories. Planned Scheffe pairwise comparisons revealed that older siblings were much more likely to talk about

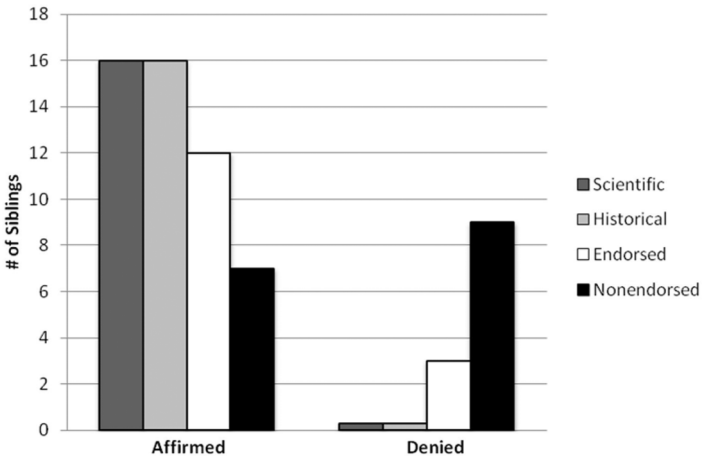

FIGURE 2 Number of older siblings who affirmed or denied the existence of entities in each category.

TABLE 5
Repeated-Measures ANOVA for Discourse Cues Across Category (Study 2)

Cue Type	*df*	*F*	η_p^2
Action	3	1.84	.11
Physical Feature	1.71†	5.50*	.27
Internal Feature	1.96†	3.50	.19
Location	3	0.82	.05
Related Action	2.14†	1.95	.12
Lack of Expertise	2.13†	2.37	.14
Lack of Consensus	1.75†	5.87*	.28
Example	2.01†	3.51	.19
Analogy	1.79†	3.00	.17
Demonstration	1.12†	2.45	.14

†Greenhouse-Geisser corrected.
*$p < .05$.

the physical features of nonendorsed entities ($M = 3.00$, $SD = 2.78$) than they were to talk about the features of historical figures ($M = 0.19$, $SD = 0.54$) or scientific entities ($M = 0.69$, $SD = 1.30$). Like parents, it seems, older siblings focused on physical descriptions of nonendorsed entities, rather than using other cues.

Older siblings also differed in talk of consensus across the topic categories. Planned Scheffe pairwise comparisons indicated that they demonstrated a lack of consensus significantly more often when speaking about endorsed entities ($M = 0.63$, $SD = 0.89$) than they did when speaking about historical entities ($M = 0.0$, $SD = 0.0$) or scientific entities ($M = 0.0$, $SD = 0.0$). Just like parents, by qualifying their discussions of endorsed entities in this way, older siblings may indicate to young children that these beings are somehow different from other, real entities.

Discussion

The substance of siblings' explanations, similarly to parents' conversations, varied most when speaking about nonendorsed entities. They often explicitly denied the existence of nonendorsed entities, therefore enabling young children to confidently report that these entities are not real. On the other hand, when older siblings told young children about scientific entities, historical figures, and endorsed beings, the content of their testimony remained relatively constant. Older siblings did provide one important pragmatic cue—namely, their indications of a lack of consensus on a topic—to differentiate their conversations about endorsed beings. This may contribute to young children's less confident but distinct conceptualizations of real and endorsed entities, in much the same way that the properties of parent testimony do.

When considered with the results of the first study, these findings suggest that there is merit in the testimony hypothesis. The conversations young children have about unobservable entities vary in several types of discourse cues, present in both the information they hear and in how that information is communicated. Further, we find that conversations with various important others in a young child's environment, including both parents and older siblings, seem to vary in the same types of ways. Exposure to these cues may affect the way in which children conceptualize different unobservable entities.

GENERAL DISCUSSION

The results of the current research indicate that the testimony children receive about unobservable entities in naturalistic settings varies with respect to the type of entity discussed and that both parents and older siblings provide young children with cues that signal the veridical nature of the entity they are talking about. Thus, these findings provide evidence for the first assumption of the testimony hypothesis and suggest that such differences in the speech children hear may in fact impact their conceptions of the unseen world.

Both parents and older siblings were likely to affirm the existence of entities in the scientific and historical categories and were most likely to deny the existence of nonendorsed entities. Further, older siblings were just as likely to affirm the existence of endorsed entities as they were to affirm scientific and historical ones. Parents, on the other hand, were more likely to deny that those entities exist. In spite of this difference, parents spoke about scientific and endorsed entities so similarly that discussions in these categories could be clustered together for analysis. On the other hand, both parents and siblings spoke about nonendorsed entities much differently than they spoke about other entities. For instance, their conversations about nonendorsed entities were more superficial than was their talk about either scientific or endorsed entities, emphasizing the nonendorsed entities' physical features.

Although the parent–child and sibling conversations about scientific and endorsed entities were quite similar, subtle distinctions were found between discussions in these two categories. Parents and siblings were much more likely to indicate a lack of consensus or expertise when talking about endorsed entities than they were when talking about scientific entities. In addition, parents used physical demonstrations more often when talking about scientific entities than they did when talking about endorsed entities.

Previous work has found that young children categorize and conceptualize different types of unobservable entities differently (Harris et al., 2006; Sharon & Woolley, 2004). Harris and

colleagues (2006) have proposed that these differences may be due to variations in the testimony children hear from adults and important others, and subsequent work has indicated that children can use speech cues to an entity's reality status in experimental procedures (Woolley & Ma, 2009). The present study examined a primary tenet of the testimony theory—whether cues like the ones used in experimental designs actually occur in conversations that young children have. The current findings indicate that, in fact, these types of cues are present in naturalistic conversations and therefore provide further evidence for the testimony hypothesis. Thus, the confident distinctions children make between which entities they believe are real and which they do not believe are real may stem from differences in the content of the testimony of others. Nevertheless, it seems that the real variations in children's conceptions of unobservable entities—those seen when they are asked to make more fine-grained distinctions—may be based on the pragmatic cues in the testimony they hear rather than on explicit content. Older siblings and parents often indicated a lack of consensus when talking about endorsed figures, and previous research has demonstrated that young children can use this cue when deciding whether or not to trust others' testimony (Corriveau, Fusaro, & Harris, 2009).

Further, parents also often conveyed a lack of expertise about endorsed entities, expressing doubts in the existence of and their lack of knowledge about such entities. Lack of confidence in one's knowledge is a cue that children have been shown to use when assessing the quality of others' testimony (Jaswal & Malone, 2007), but it has not been explored in the context of testimony about unobservable entities. Although most parents encourage belief in many endorsed entities, conveying a lack of expertise when talking about endorsed figures may invite children to think critically about these entities, or to show uncertainty themselves when asked about the nature of such beings.

Because we wanted to make sure the conversations included in the current study were as naturalistic as possible, no time limits were placed on the discussions and experimenters were not present while the dyads talked, so there was no ability to keep conversations on the topics of interest. Thus, the conversations examined were relatively short and the mean frequencies of many types of discourse cues were low. Despite this, the differences in the mean frequencies of cues between the different categories of entities may be important, because children are exposed to many similar conversations in their day-to-day lives. So, although the differences between cues in one conversation may be small, continued experience with these sorts of cues can have a broader effect. This clearly seems to be the case when the present results are considered in the context of previous research showing that children are sensitive to cues manipulated in an experimental context (Harris et al., 2006; Woolley et al., 2011).

Future research should focus specifically on differences in parents' explanations about different types of endorsed entities. The present results indicate that parents provide less confident explanations about endorsed entities than they do about real entities. However, in previous studies, parents have reported that they would be more confident when speaking with their preschoolers about some endorsed entities than they would be when talking about other topics in the same category (Rosengren & Hickling, 1994). Because in the current research parents were allowed to choose which topic in the endorsed category to explain, the present results are not suited to analyze differences in talk about different endorsed entities. It is possible that if such differences were displayed in parents' conversations, they may lead children to differential beliefs between, for instance, religious entities and event-related fantasy entities.

Future research may also examine the conversations young children have with teachers, peers, and other significant people in their lives. This would provide a more complete picture

of the ways in which the testimony children receive varies both between categories of unobservable entities and between the people with whom they converse. Finally, studies in the future could determine whether socioeconomic status plays a role in the way parents speak with their children about unobservable entities. There is evidence from previous research that middle-class mothers tend to speak about nonpresent objects and people more often than working-class mothers do (Tizard & Hughes, 2002), and so their children may have different levels of experience in decoding the types of cues found in the current study. This could have implications for children's later scientific thinking because, according to many researchers, children's learning about science begins in informal settings, such as in conversations with family members (Ash, 2003; Callanan & Jipson, 2001; Ellenbogen, 2002; Leinhardt & Crowley, 2002). By the time they start school, children have spent hours engaged in conversations with adults and have already learned to make inferences about entities that they cannot experience directly. However, if differences exist in the conversations children of different socioeconomic statuses have, their ability to draw these inferences may be affected.

The present research provides empirical evidence for the existence of important variations in the naturalistic verbal input that children receive about different types of unobservable entities. This is consistent with the proposal that children's beliefs about the unseen world (including both real and fantastical entities) are shaped in important ways by the testimony that they receive from others. The current results also show that others' speech varies both in content and pragmatics across different types of unobservable entities and that children are likely to be exposed to such variations in everyday conversation about a variety of topics.

The present study did not empirically connect variations in testimony to children's conceptions of such entities, both because of the seminaturalistic nature of the study and because children had previous knowledge of most of the entities discussed. Further research examining whether differences in the testimony children hear are reflected in their categorization and description of unseen entities should provide important information about how children structure their knowledge about unobservable entities. This research shows that others' testimony may play a crucial role in this process, and it supports the validity of the last unresolved assumption of the testimony hypothesis.

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