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Revisiting the Fantasy-Reality Distinction: Children as Naïve Skeptics

Jacqueline D. Woolley and Maliki Ghossainy

Department of Psychology, The University of Texas at Austin

Abstract

Far from being the uncritical believers young children have been portrayed as, children often exhibit skepticism toward the reality status of novel entities and events. This paper reviews research on children's reality status judgments, testimony use, understanding of possibility, and religious cognition. When viewed from this new perspective it becomes apparent that, when assessing reality status, children are as likely to doubt as they are to believe. It is suggested that immature metacognitive abilities are at the root of children's skepticism, specifically that an insufficient ability to evaluate the scope and relevance of one's knowledge leads to an over-reliance on it in evaluating reality status. With development comes increasing ability to utilize a wider range of sources to inform reality status judgments.

In both popular and scientific literature, young children are consistently portrayed as being confused about a basic ontological distinction – that between reality and non-reality. The first to make this claim was Piaget (1929), who argued that children did not have this distinction firmly in place until around age 12, the age at which most children start middle school. According to Piaget, and as demonstrated empirically by others as well (*e.g.*, Morison & Gardner, 1978, Flavell, Green, & Flavell, 1986; Sharon & Woolley, 2004) children often err in mistaking non-reality, such as fantasy, appearance, and illusion, for reality. For example, they are confused about whether dragons are real, and whether someone dressed up as a ghost really is one.

More recent research shows, however, that children are not globally poor at making this distinction, and that certain basic abilities are in place as early as age 3. For example, children distinguish pretend actions from real ones (Flavell, Flavell, & Green, 1987), imaginings from reality (Woolley & Wellman, 1993), and toys from the objects they represent (Woolley & Wellman, 1990). Yet children do still make particularly salient mistakes about reality status. Confirming the experience of most parents in the United States, experimental work with young children reveals high levels of belief in Santa Claus, the Tooth Fairy, and various other fantastical beings (Clark, 1995; Prentice, Manosevitz & Hubbs, 1978; Prentice & Gordon, 1986; Principe & Smith, 2008a; 2008b; Rosengren & Hickling, 1994; Sharon & Woolley, 2004). Research also shows that, given the right combination of age, evidence, and testimony, children will come to believe in a completely novel fantastical being (Woolley, Boerger, & Markman, 2004; Boerger, Tullos, & Woolley, 2009). This tendency to believe in fantastical beings consistently captures the attention of parents and researchers, and is a popular subject in the media (*e.g.*, Woolley, 2006).

In this paper we argue that a disproportionate amount of attention has been given to this error, which is one of two possible errors children might make regarding reality status.

Consider the task of determining reality status as a signal detection problem. The majority of entities in a child's world can be roughly classified into one of two categories – real and not-real. (Of course, not all objects and entities lend themselves to this simple dichotomy, and how precisely such entities are categorized will vary individually and by culture. A very large percentage however - see examples following- are close to unanimously categorized as one way or another by one's culture.) Given this, children can either judge these entities as real or pretend, resulting in the two by two matrix shown in Table 1. Hits, or correct classifications, comprise the upper left-hand cell, and consist of situations in which a child correctly identifies a factual entity as real (*e.g.*, most children understand that chairs, and even germs, are real; Harris, Pasquini, Duke, Asscher, & Pons, 2006). Correct rejections comprise the lower right-hand cell; these consist of correct classifications of fictional things as unreal (*e.g.*, most preschool-age children seem to be perfectly confident that dancing carrots do not exist in the real world; Woolley, Ma, & Lopez-Mobilia, 2011). False alarms, in this analysis, would be those cases in which children misidentify pretend things as real, for example, the common belief that Santa Claus exists. This is the error that has received the majority of the attention to date.

Yet, as is apparent from Table 1, there is another kind of error -- assignment of not-real status to real things. This error, mistaking something real as unreal, would be considered a miss in signal detection analysis. Perhaps because of the cultural and epistemic salience of children's beliefs in fantastical beings like Santa Claus, false alarms have captured the majority of parents', researchers' and journalists' attention. Much less studied is this second type of error -- judging a real entity or event as pretend or fictional. In fact, only recently have some researchers explicitly raised this possibility (Corriveau, Kim, Schwalen, & Harris, 2009; Guerrero, Enesco, & Harris, 2010; Harris, Pasquini, Duke, Asscher, & Pons, 2006). Our general argument is that children are considerably more skeptical, and assign reality status much more sparingly, than one might expect. Specifically, children often show misplaced reliance on their own, albeit limited, knowledge and experience when evaluating the reality status of novel information. Our goal is not to convince the reader that this error is necessarily more common or more important than the other, but to argue that both types of error are present, and that both have important consequences for our models and theories of development.

Theoretical positions on the starting state

It is worth considering, although difficult to assess, what the starting state is with regard to forming beliefs about reality status. At least four different prominent hypotheses have been articulated in response to this question, each favoring naïve or initial credulity. As noted above, Piaget (1930) argued that young children are overly credulous, in part a result of their inability to differentiate reality and fantasy. Taking an evolutionary perspective, Dawkins (1995) argues that an early credulity bias, or a tendency to believe everything we are told, is adaptive in part because children would never be able to learn as rapidly as they do if they were skeptical of adults' claims. According to Dawkins, mistaken belief in various sorts of fantastical entities and events is a result of this otherwise adaptive credulity. Gilbert (1991) puts forth a cognitive processing proposal derived from a Spinozan philosophical analysis of belief formation. Empirical studies conducted by Gilbert and colleagues (Gilbert, Krull, & Malone, 1990; Gilbert, Tafarodi, & Malone, 1993) support this proposal that the default state is to believe, and that disbelief takes extra cognitive work. Finally, based on their own research, Morison and Gardner (1978) propose that initially all objects and events are believed to be real, and that, through social exchange, children come to group things into real and not-real. According to their view, "children initially attribute reality status indiscriminately and (that) a category of unreal elements only gradually begins to form, leaving as an undifferentiated whole the larger category of reality" (p. 648).

In the remainder of this paper we put forth a proposal that challenges these positions. Specifically we offer the following proposition: Children are, in many cases, skeptics, albeit often misguided ones. Our theoretical stance is consistent with and inspired by the work of Eugene Subbotsky (1993; 1994; 2010; see also Harris, in press) who has proposed that magical and rational views of reality coexist throughout development. Unlike the previous positions discussed, Subbotsky does not argue that one way of thinking (*e.g.*, skepticism) replaces another more immature one (*e.g.*, credulity). Rather, he argues that different aspects of people's situations will favor or elicit different ways of thinking. Along these lines, we contend that development consists in finding a balance between acceptance and doubt. As is the case with credulity, adopting an overly skeptical stance can result in errors (*e.g.*, rejecting as unreal something that does exist) as well as correct judgments (*e.g.*, correctly judging something as unreal). As we will discuss in the final sections of this paper, development in accurately making reality status decisions is proposed to involve a decreasing reliance on one's own knowledge and experience and an increased consideration and use of a wide range of other sources of information.

Evidence of skepticism in assessing reality status

In this section we present recent experimental evidence of skepticism in children regarding reality status. Our sole focus on skepticism is not meant to imply that there is not also evidence of credulity; it is our aim to revisit and unify a group of previously scattered findings from the fantasy-reality literature to demonstrate that there is a considerable amount of skepticism along with the more highly documented credulity. Some of the studies we discuss are from areas in which the traditional perception of children is that they are credulous rather than skeptical (*e.g.*, regarding television reality). Other studies are those that have been primarily discussed as evidence of children's increasingly sophisticated reality status judgments but upon a second look reveal strong degrees of skepticism. Finally, the remainder consists of studies that, although not designed to study skepticism *per se*, reveal a strikingly large amount of it in young children.

Cross-cultural evidence

A common claim is that people from non-Western cultures are more credulous than are people from Western cultures about beings and events that are unavailable to first-hand experience. Yet there is clear evidence against this claim, in both anthropological and psychological literatures. One of the earliest and most well known documentations of skepticism comes from the work of Margaret Mead (1932). Mead visited the Manus Island with her husband, who was sent there on a grant to study the Manus language. Intrigued by Piaget's claims of magical thinking in young children, Mead set out to document these sorts of beliefs in the children who inhabited the island. Much to her surprise, her research revealed a striking resistance toward animism and spiritual thinking among Manus children as compared to the adults of that culture. Indeed children seemed to exhibit a sort of aversion towards providing animistic, humanizing explanations for events compared to rational, matter of fact explanations.

As a more specific example of her findings, Mead (1932) reports that young Manus boys are told by their parents and other adults in their community that they each have their own guardian ghost who joins them wherever they go and can be sought out for advice when necessary. The properties of this spirit are introduced at an early age and are expected to remain with the boys throughout adulthood. Yet Mead reports that young boys show no interest in their ghosts and often dismiss their existence. Conversely, Manus adults are described as believing in ghosts and as behaving in accordance with ghosts' wishes. Manus adults also hold magical beliefs about physical objects, like charms, and consider these charms to be capable of bringing about specific effects in the physical world. Adults in this

culture have a variety of these charms, each ascribed their specialized magical function. When Mead introduced her own “charm” to the community -- a wind chime -- adults assimilated the object immediately, often hypothesizing about its particular spiritual function. Unlike the adults, children seemed uninterested in the magical properties of Mead’s charm, instead examining its physical properties inquisitively, with a particular interest in explaining the mechanism responsible for causing the foreign object to sound.

A more recent study of children and adults from Madagascar reveals further support that adults are often more supernatural in their thinking. Astuti and Harris (2008) asked Vevo children and adults about their understanding of biological (*e.g.*, the eyes), psycho-biological (*e.g.*, seeing), and cognitive functioning (*e.g.*, knowing) after death. Their data revealed that both Vevo children and adults understood that biological processes cease to function after death. Concerning psycho-biological and cognitive processes, however, children were more likely to claim that such processes stop working after death than were adults. Thus, the authors contend that the distinction between biological and cognitive functioning becomes stronger with age, with adults believing more than children that cognitive processes continue after death (see Astuti, Solomon, & Carey, 2004 for further evidence). Similar to these findings, Legare and Gelman (2008) studied explanations for AIDS among children and adults in two South African communities. They report that the adults in their samples were more likely to entertain supernatural explanations for disease than were adolescents.

Children’s media: Assessing the reality status of depicted events

Children in Western culture are often introduced to novel entities and events through books, television, and movies. Often these media forms are intended to convey accurate information about the real world, whether it is information about animals, how to read, or scientific principles. However, there is increasing evidence that young children are genuinely skeptical of the reality status of information they encounter in the media. Anecdotally, in 2005, filmmakers produced “The March of the Penguins, ” a fascinating documentary about emperor penguins on their winter mating journey. A *New York Times* article (June 12, 2005) reports children’s reactions to the film. Among other things, children’s reactions included the conviction that the film was created using special effects and animation. One child in particular (age 10) asked, “If they wanted to make the film so real, why did they use special effects..?”

Wright, Huston, Reitz, and Piemyat (1994) systematically addressed 5- and 7-year-old children’s understanding of television reality. When shown various types of TV programs and asked whether the events happened in real life or only on TV, the youngest children tended to respond that all the events only occurred on TV, that is, that they did not happen in real life. Even with regard to very realistic genres, like the news, 5-year-olds overall responded that they could not tell if the events were real or not. The authors concluded that, although 5-year-old children often make clear distinctions between reality and fiction, they “have a bias toward assuming that television is unreal” (p. 236). By age 7, they propose, children are better able to understand that certain TV programs are factual.

A similar skepticism about media representations is found in children’s beliefs about storybooks. Storybooks are probably the most common form of media to which young children are exposed. Woolley and Cox (2007; Vaden & Woolley, 2011) have studied preschool-age children’s beliefs about the reality of both people and events in storybooks. In Woolley and Cox’s (2007) study, children were presented with realistic, fantastical, and religious storybooks, and asked to state whether characters in the books were real and whether the events in the books really happened or could happen. With regard to the main characters in the stories, children in Experiment 1 were quite skeptical about their existence, even for the realistic books. Across the three types of book, only about 30% of 3- to 5-year-

olds responded that the characters were real. In Experiment 2, 4-year-olds exhibited the same level of skepticism about the characters, however 5-year-olds' belief in the reality status of the religious characters increased. Additionally, not only did children think the characters in the books never existed, they did not seem to think the characters could potentially represent real people. Approximately 60% of the time children responded negatively to a follow-up question asking whether someone like the main character could exist in real life.

Children were also skeptical about the reality status of events in storybooks. In Woolley and Cox's (2007) Experiment 2, less than one third of 4-year-olds responded that the events in all three (religious, realistic, fantastical) storybooks had really happened. Among 5-year-olds, fewer than 10% responded that the events in the realistic and fantastical books really happened (they were more likely to claim that events in religious books did really happen). Children were also somewhat unlikely to claim that the events could possibly happen, however the magnitude of this effect varied across the different types of book. Three- and 4-year-olds were more likely to claim that the events in realistic books could happen versus events in fantastical books. Older children were more likely than younger children to claim that storybook events, particularly realistic and religious ones, could actually happen.

Belief in the reality of religious entities and events is a particularly interesting case. One could make equally compelling predictions in favor of both skepticism and credulity regarding children's acceptance of the events that are presented in religious parables from the Bible, for example. Because these events (*e.g.*, Moses parting the Red Sea) violate children's naive theories, one might expect them to be judged as fantastical. However these events are presented as historical by authority figures such as parents and Church leaders. Vaden and Woolley (2011) hypothesized that, whereas children would judge physical violation events as fantastical normally, when God was purported to play a role in such events, children would accept their veracity. Interestingly they found this to be the case, but only among the oldest children – 6-year-olds. The youngest children, 4-year-olds, were extremely skeptical of the reality status of both the focal characters and the events in both religious (God-involved) and non-religious (no mention of God) versions of the stories. By age 6, children who heard the religious versions were significantly more likely to claim that the events and characters were real. Hence, skepticism decreased with age, as, presumably, children incorporated information from their religious communities.

Shtulman and Carey (2007) also provide clear evidence of early skepticism. These researchers created a story containing a set of possible, improbable (*e.g.*, a person drinking onion juice), and impossible (*e.g.*, a person eating lightning) events, with a realistic depiction of each event. They read the story to children between the ages of 4 and 8 years as well as to a group of adults, and asked the participants to decide whether each event was possible in reality. As expected, adults distinguished impossible events from both improbable and possible events, claiming that only the former set could not happen in real life. Children however showed remarkable resistance to the possibility of improbable events and judged them largely as impossible. Not until 8 years of age did children begin to show a shift towards more adult like response patterns. These older children correctly judged improbable events as possible 65% of the time, a marked improvement over the responses given by their younger counterparts (22% among 4-year-olds and 50% among 5-year-olds). Shtulman and Carey conclude that, unlike adults, children seem to treat the realm of possibility as a dichotomy with strict and unwavering biases about what can and cannot happen in the real world.

This research suggests that young children conceive of events that are out of the ordinary as equivalent to events that violate fundamental laws about the world around us. Shtulman and

Carey (2007) suggest two possible explanations for these results. The first is that children base their judgments on experience, thus classifying events that they have not experienced for themselves as impossible. Although they argue against this hypothesis, we will reconsider it toward the end of this paper. Alternatively, they suggest that children's inability to imagine situations that would facilitate the occurrence of an improbable event precludes their ability to think the event is possible.

Woolley and Ghossainy (2010) assessed this possibility by presenting children aged 4 and 6 years with a series of improbable and impossible events for which they sometimes heard an explanation. Each event was also depicted in a photograph. These researchers contended that children might need to be provided with an explanation for how improbable events could occur to overcome or compensate for their incapacity to provide one on their own. More specifically, they predicted that children who heard about an improbable event coupled with an explanation would be more likely to correctly categorize that event as possible than children who only heard about the improbable event. Contrary to expectations, there was no effect of explanation of children's responses. Both age groups failed to distinguish between improbable and impossible events, judging them both as incapable of occurring in real life. Thus, even with an explanation and a realistic illustration of the event, children's expectations about what can happen in reality appear restricted and do not include events that are out of the ordinary or improbable.

Determining the reality status of novel entities

Research also identifies an initial resistance to the existence of novel entities, and a shift with development first toward increasing acceptance and then, in many cases, returning later to a skeptical view. Level of belief in novel beings appears to form an inverted U-shaped developmental pattern rather than the traditional pattern of a linear decrease with age common in discussions of belief in cultural fantasy figures such as Santa Claus (*e.g.*, Prentice & Gordon, 1986) and the Tooth Fairy (Principe & Smith, 2008a; 2008b). In Woolley, Boerger, and Markman (2004), for example, children were introduced in their preschool to a novel fantastical being, the Candy Witch. Some children were "visited" in their home by this being, who removed their Halloween candy and replaced it with a new toy. Although the majority of children believed in the Candy Witch, researchers found that, among children who were "visited" by her, belief was stronger in the older (older 4- and 5-year-old) group than in the younger (3- to young 4-year-old) group. They suggest that older children were better able to infer the existence of the Candy Witch from the evidence of her visit. Thus, contrary to Gilbert's (1991) proposal that it takes more mental effort to disbelieve, this finding suggests that belief, at least in some cases, may require particular cognitive abilities that young children lack (see Rosengren & Hickling, 2000 for a similar argument).

Research by Bering and Parker (2007) suggests that belief in the communicative ability of novel supernatural beings may require more cognitive sophistication than disbelief. Their findings showed that young children, but not older children, are generally unreceptive to the idea that a novel invisible agent can communicate with them symbolically in the physical world. The researchers introduced children to a game of chance in which they were asked to guess which of two boxes housed a ball. Half of the children were primed to expect a "sign" from an invisible agent, Princess Alice, if they had made the wrong guess, although they were ignorant about how the sign would be expressed. Children were given 15 seconds to settle on a choice, an interval that included either an iconic event - a picture of Princess Alice fell to the ground - or an ambiguous event - the lights in the room flickered on and off. After the 15 seconds had elapsed, children's final choices were coded as either receptive to the communicative intent of the unexpected event or non-receptive. The researchers found that younger children (3 through 6 years old) who were primed to expect a sign from

Princess Alice were no more likely to respond receptively to the unexpected events than were children who did not receive the prime. Only by 7 years of age were children more likely to respond differentially across conditions.

The skepticism observed in these studies may in fact be representative of a more global initial skepticism toward novel entities in general. Woolley and Van Reet (2006) presented children with novel entities that were encountered in either a scientific context (*e.g.*, children were told that doctors used them) or a fantastical context (*e.g.*, children were told that dragons collected them). Although the authors observed an effect of context, in that children who encountered the novel entities in a scientific context were more likely to judge them as real, overall children were quite skeptical of the novel entities. Of the three novel entities presented to the participants, children judged on average 1.44 of them to be real. In fact, the rate of 'real' judgments of the novel entities, with the exception of those presented within a scientific context, was comparable to the rate of 'real' judgments for a set of fantastical beings (*e.g.*, monsters, fairies). The authors interpret children's performance as reflecting a tendency to assume that a novel entity was *not* real unless given certain information otherwise.

Supporting this, in a series of studies, Tullos and Woolley (2009) repeatedly observed a subset of children who consistently exhibited a high level of initial skepticism toward the existence of novel entities. In those studies, children were told that they would hear about a variety of animals -- some real and some not -- and be shown some evidence, and that their job was to help the experimenter figure out which ones were real and which were not. Before being shown the evidence, children were first presented with the names of the 6 novel animals, all of which were rare, and asked to make an initial guess about their reality status. Results showed that many children exhibited a bias to respond consistently one way or the other throughout the experiment, that is, some children appeared to exhibit a "skepticism bias" whereas others demonstrated a "credulity bias." Among children with such biases, 4-year-olds were more likely to have a skepticism bias, guessing that most or all of the novel animals were pretend, whereas 6-year-olds were more likely to guess that the animals were real. It is conceivable that both biases operate in all children. Credulity biases could reflect a more general tendency to assume that adults only talk about real things. This bias might compete with a more specific bias to be skeptical toward the reality status of novel entities. Although it is unclear why some children yielded to one bias and others yielded to the other, the data indicated that, with age, the predominant pattern shifted from one of skepticism toward one of belief.

Finally, research by Cook and Sobel (2011) indicates that children's skepticism toward novel entities extends beyond the domain of novel beings to the domain of novel machines. They presented 4- and 6-year-olds with familiar possible machines (*e.g.*, a machine that plays music) and unfamiliar possible machines (*e.g.*, a machine that beeps when you come into a room) and asked them to judge whether the machines were real or make-believe. They found that children were significantly less likely to categorize the unfamiliar machines as real than the familiar ones and also less likely than adults to judge them as real. Thus children appeared to be overly skeptical toward the possibility of machines with which they lacked first-hand knowledge or experience.

Factors that affect belief

The studies discussed thus far make it clear that skepticism is prevalent. However it is also unambiguous that young children in Western culture exhibit strong beliefs in a wide range of fantastical beings, most notably Santa Claus, but also various other event-related (*e.g.*, the Tooth Fairy) and generic (*e.g.*, mermaids) beings. Our proposal is that children are not necessarily initially credulous toward these beings. In fact, we suspect that it is equally or

even more plausible that the initial reaction is one of skepticism. However, a variety of factors can pull children away from skepticism and toward belief. A particularly potent factor is cultural support -- parental testimony, the provision of evidence in favor of these beings' existence (*e.g.*, the money found under a child's pillow after losing a tooth), engagement in rituals (*e.g.*, leaving out cookies and milk for Santa) -- all these behaviors can result in children overriding any potential biases toward these entities they may have originally had. As we will discuss, a certain level of metacognitive maturity may be necessary to take advantage of these factors. In this section we briefly touch on these factors and others, along with providing evidence of their effectiveness.

Testimony—A particularly powerful form of cultural support is the testimony provided by other people (Harris, in press). As noted earlier, there may in fact be a bias toward believing testimony more generally, at least that of trusted others. Verbal testimony can clearly play a strong role in overcoming any initial skepticism that might be present concerning reality status. Harris, Pasquini, Duke, Asscher, and Pons (2006) suggest that, if children rely solely on their own first-hand experience to make reality status judgments, they would certainly doubt the existence of invisible scientific entities like germs and oxygen. Based on their findings, they argue instead that, due to children's attention to and incorporation of other people's testimony, they come to understand that invisible scientific entities like germs indeed do exist. The authors go on to further explicate the role of testimony by showing that children are more likely to believe in the existence of invisible beings that are endorsed verbally by their culture (*e.g.*, God) than those that are not (*e.g.*, ghosts; see also Guerrero, Enesco, & Harris, 2010 for similar findings).

Evidence—Testimony can be especially powerful when combined with evidence. As discussed previously, Woolley, Boerger, and Markman (2004) found that many preschool children were receptive to the real existence of a novel being -- the Candy Witch -- presented to them at their preschool. Older, but not younger, children in the experimental condition -- who set out their least favorite candy on Halloween night and in the morning found a new toy -- were significantly more likely to believe than children in the control condition. The authors argue that the higher levels of belief resulted largely from the older children's use of evidence to infer reality status. Tullos and Woolley (2009) document significant development between 4 and 6 years of age in children's ability to use evidence to make reality status judgments. Finally, Subbotsky (1993) has explicitly demonstrated that evidence can overturn initial skepticism. In his research, he presented children with a "magic" table purported to turn toy animals real. Although most children were initially skeptical of the table, they became credulous once the experimenter (using a hidden magnet) made the animals move around.

Context—As discussed earlier, Woolley and Van Reet (2006) showed that when children encountered novel entities in a scientific context they were more likely to endorse their reality than when they encountered them in a fantastical context. This ability to utilize context developed significantly between the ages of 3 and 5. Corriveau, Kim, Schwalen, and Harris (2009) showed that the type of narrative that frames discussion of a novel character can inform children's reality status decisions. That is, if a story character participates in an impossible event, then the character is more likely to be judged as fictional than a character who participates in a real event. It is likely that other contexts (*e.g.*, school, church) have similar facilitative effects. As discussed by Vaden and Woolley (2011), instruction in church or Sunday school has the potential to confer reality status on events that might otherwise seem fantastical (*e.g.*, a man escaping from the mouth of a whale, as in the story of Jonah from the Bible).

Emotion—Effects of emotion vary according to valence. The presence of negative emotion appears to increase children’s tendencies toward skepticism, making children overly reluctant to admit that negatively valenced events could take place in reality. Samuels and Taylor (1994) showed children images of emotional or neutral real life and fantastical events and asked them to determine which images could happen in real life. These researchers found that, contrary to the performance of children in the neutral condition, children who were presented with scary images tended to judge them as fictional, stating that they could not happen in real life. Furthermore, the authors found that children who expressed higher levels of distress and fear from the images were more likely to deny the possibility of the events than were children who did not show these intense emotional reactions. These results suggest that when children are emotionally aroused by an event (particularly a negative event) or entity, their reasoning about reality status errs on the side of dismissing real events as fictional.

Extending this work, Carrick and Quas (2006) confirmed that children not only exhibit skepticism towards frightening events but also those that elicit anger. In their study, children were presented with real and fantastical pictures depicting events that were either angry, frightening, happy, or neutral. The researchers found that children who viewed angry or frightening events denied that the events were real irrespective of whether the depiction was fantastical or realistic. Conversely, however, Carrick and Quas (2006) also reported that children displayed a bias to judge happy and neutral events as real regardless of their fantastic content.

Although the findings discussed in this section do not directly answer the question of whether and when children are more prone towards skepticism or credulity, they do underscore that children's stance towards novel information is not universally credulous. Rather, we propose, in many cases children may initially be quite skeptical regarding reality status. It also appears that there may also be important individual differences, with some children tending toward initial credulity and others toward initial skepticism. In many of the studies discussed, with age, greater attention to and use of factors like context and testimony served to instill higher levels of belief. In the following sections we address developmental achievements that facilitate the effects of the factors discussed in this section. Essentially, we propose that increased metacognitive ability, specifically, the ability to assess one’s knowledge and its relevance to reality status, facilitates access to and use of testimony, evidence, context, and other factors in making reality status judgments.

The credulity bias revisited

The research reviewed thus far reveals a much higher level of skepticism in young children than is traditionally acknowledged in views of development. Given this, it is worth reconsidering the theoretical viewpoints supporting a credulous to skeptical shift with development that we reviewed at the beginning of the paper. Regarding the evolutionary argument that initial credulity is adaptive, we would argue that such a view is overly simplistic and undermines the complexities of human behavior and parent-child interactions. Specifically, this view assumes that throughout evolutionary history, all adults were equally trustworthy and that children would benefit from believing anything they were told by their elders. As Gelman (2009) points out, there are myriad ways adult input can mislead children, “intentionally or not, by means of deception, fiction, metaphor, and just plain old mistakes” (p. 127). If we consider the countless situations in which people lie or misrepresent information to others, it becomes implausible that evolution would have selected for an overly credulous child. As Harris (in press) argues, indiscriminate trust in everyone would be “perilous and maladaptive” for the child (p. 96). Moreover, following from the research presented in the previous section, it is simply not borne out by the data.

With regard to Gilbert's (1991) claim that children are "especially credulous, especially gullible, especially prone toward acceptance and belief" (p. 111), Gilbert bases this claim primarily on findings that adults under cognitive load are more likely to accept various propositions as true rather than as false. However in arguing for childhood credulity on the basis of his findings with adults, Gilbert is conflating two senses of the term *credulity*. The standard dictionary definition of credulity is "The readiness or willingness to believe especially on slight or uncertain evidence" (Merriam Webster Dictionary, 2011). Gilbert's working definition focuses more on the general tendency to accept false propositions. One might argue that believing that, say, Santa Claus is real is indistinguishable from accepting the proposition, "Santa Claus is real." It is certainly true that anyone who believes in Santa Claus would also accept the proposition, "Santa Claus is real." However our claim is that the process of assigning reality status to Santa Claus and other entities is distinct from the processes involved in accepting propositions generally.

Finally, Morison and Gardner (1978) proposed that children initially believe everything to be real and slowly develop a realm of fantasy and the unreal. This is a reasonable conclusion to draw from the set of fantastical beings probed in that research, as, with age, children's correct classifications of fantasy figures improved. However it is important to note that even the kindergartners in that study were 70% correct on identifying the reality status of the entities. Much of the credulity they observed, we suggest, is largely a function of the culturally supported nature of the entities included in the study. When entities receive a high level of cultural support, even slightly older children find it difficult to deploy a skeptical stance (see *e.g.*, Harris, Pasquini, Duke, Asscher & Pons, 2006).

It should be clear from the evidence presented that it is not accurate to characterize children as being biased toward credulity. In fact, much of children's apparent credulity, we propose, can be accounted for by their receptivity to the testimony of others; in fact, this receptivity may be precisely what makes children seem, to many, to possess a credulity bias. But what explains children's skepticism? This has received much less attention and so we devote the remainder of our paper to this question.

The illusion of omniscience

In this final section we will consider the proposal that the skeptical stance taken by children is often the result of an over-reliance on their own knowledge and personal experience. Simply put, young children often appear to overestimate their knowledge and, consequently, its relevance in assessing reality status. Because of this, events and entities outside their experience are often judged as not real. Development is proposed to consist in increased awareness of one's knowledge (or lack thereof) and its relevance to making reality status judgments. This results in decreased over-reliance on personal experience and knowledge and increased use of a wider range of cues to assess reality status. In the discussion that follows we provide background evidence from three domains for our claim that children over-rely on their own knowledge and experience in making various kinds of judgments; we then discuss evidence of this over-reliance in the domain of reality.

Johnson and Wellman (1982) discuss a group of fifth-grade students who were tested about their knowledge that the brain controls both voluntary and involuntary behaviors. These children clearly understood that the brain controls voluntary mental acts, such as thinking and remembering, but did not seem to know that the brain controls involuntary acts such as coughing and blinking. Johnson and Wellman compared this group to a second group of fifth graders who had just completed a classroom unit on the voluntary and involuntary functions of the brain, expecting that the latter group would understand the role of the brain in both types of event. Contrary to their predictions, they found no difference between the

groups. Children clearly had their own ideas about what the brain does, which was that it controls voluntary acts, and their reliance on their model of what the brain does made it difficult for them to accept that it also plays a role in what most likely were considered very different sorts of events.

Vosniadou and Brewer (1992) found that children's initial idea about the shape of the Earth is that it is flat, consistent with their everyday experiences. They also found that children go through a period in which they resist new information indicating that the Earth is round, and continue to rely on their initial ideas in forming mental models of the Earth. Children in this period often generated models of the Earth that, although incorporating what they had been taught about the Earth's roundness, retained the basic idea of flatness in the form of a disc-shaped Earth (cf. Siegel, Butterworth, & Newcombe, 2004, who argue that these patterns instead result from inconsistent responding). Siegel, et al. (2004) also found that many children younger than age 8–9 identified the sky as on top of the Earth rather than all around it; a belief that clearly originates in their personal experience.

A third example of the tension between personal experience and new information can be seen in research on children's concepts of the origins of species. Work by Evans (2000, 2001, 2008) shows that children are initially quite resistant to acquiring an evolutionary explanation of species origins and actually find creationism easier to assimilate. She suggests that three cognitive biases stemming from children's naive theories interfere with learning evolutionary concepts and principles. Specifically, children are biased to assume that living things are stable and unchanging, that behavior is goal directed, and that behavior is intentional. Although she (and others, see *e.g.*, Wellman & Gelman, 1998) suggests that these biases appear very early in development, they are consistent with and supported by children's everyday personal experiences. For example, with the exception of tadpoles and caterpillars, most animals with which children are familiar do not change their identities.

In general, children's naïve theories can be quite resistant to change (Bloom & Weisberg, 2007; Carey, 1985), and this appears to be due, in many cases, to children's over-reliance on their own personal experience and knowledge. More specific to the topic of this paper, children also exhibit an over-reliance on their own knowledge and experience with regard to reality status. The flavor of this error is illustrated in data from Woolley, Ma, and Lopez-Mobilia (2011). These researchers presented 3- to 9-year-old children with videos in which two people held short conversations about a novel animal. Children's task was to decide, based on the information in the conversations, whether the entities were real or not. Although explanations were not solicited, spontaneous comments justifying decisions indicated a strong over-reliance on personal experience in making reality status decisions. One participant, typical of many, explained his rejection of the reality status of a galah (a real but unfamiliar animal), by saying, "I've never heard of them before; I doubt they exist." Other children justified their rejection by referring to the fact that they'd "never seen one." In these and other cases, what was most striking was how children rarely considered the fact that their experience or knowledge could be limited. Although this task dealt with novel animals, similar domains in which children often show high levels of engagement, like, for example, dinosaurs, or fossils, might also foster overestimations of knowledge, which in turn could generate similar levels of skepticism with regard to novel information from testimony.

There is also evidence regarding children's reliance on their own knowledge and experience in some of the traditional fantasy-reality work discussed earlier. Morison and Gardener (1978), for example, found that children often mistakenly categorized entities like knights, Indians and dinosaurs as pretend. Sharon and Woolley (2004) report similar findings. Specifically, they found that 3-year-olds judged knights as real only 19% of the time and

dinosaurs as real 33% of the time. By 4 years, children's judgments about knights improved somewhat, to 35%, but dinosaurs were still judged as real only 29% of the time. By 5 years of age, children had again improved but still were not at ceiling, judging knights as real 59% of the time and dinosaurs as real 64% of the time. What these entities all have in common is that they are far removed from children's everyday experience. So here too children appear to be using their own knowledge and experience, or lack thereof, as a basis for judging whether something exists.

Further evidence comes from the Samuels and Taylor (1994) research discussed earlier. In addition to collecting reality status judgments, Samuels and Taylor also solicited children's explanations for their judgments about the reality status of fantastical and realistic events. They found that children's judgments fell into 6 categories: (1) No explanation, (2) Knowledge or experience, (3) Fantasy-reality, (4) Emotion, (5) Dream, and (6) Other. By far the most common response given by these preschool children was to refer to their own knowledge and experience, both in accepting the reality status of an event and in rejecting it. Examples given by Samuels and Taylor include, "Because I never saw them do it," and "Because cats can't smell flowers" (p. 423).

Carrick, Quas, and Lyon (2010) explicitly propose that the pattern of reality status judgments in Samuels and Taylor (1994) and in Carrick and Quas (2006) reflects children's personal experiences. More specifically, they hypothesized that because maltreated children have experienced more negative personal events than non-maltreated children, they should not show the bias to judge novel negative events as fantastical as children did in the previous studies. Using a set of events similar to those used in the previous studies, they found that, indeed, maltreated children were more likely to correctly report that negative real events could occur than were non-maltreated children; there were no group differences for positive events.

It is perplexing that a young child could believe that his or her knowledge of the world is complete enough to deny the existence of anything new. It would seem that young children would understand that there are many things that exist in the real world that they have yet to experience. As intuitive as this seems, it appears not to be the case. From this perspective, development regarding beliefs about reality involves, in addition to decreased reliance on knowledge and experience, increased awareness of one's own knowledge and its limitations for assessing reality status. This realization that one's own knowledge is limited gradually inspires a waning reliance on it alone for making reality status decisions and a concomitant increase in the use of a wider range of strategies for assessing reality status, including, for example, seeking more information, assessing contextual cues, and evaluating the quality of the new information.

Evidence for metacognitive limitations in children

What do we know about children's understanding of their own knowledge and its limitations? Metamemory research has consistently shown that children are poor at predicting their own memory performance, in most cases overestimating their abilities. For example, Kreutzer, Leonard, and Flavell (1975) asked children whether they had ever experienced forgetting and found that a significant minority of kindergartners denied ever having such memory difficulties. Similarly, Flavell, Freidrichs, and Hoyt (1970) showed preschool and elementary school age children a series of pictures to remember. Children claimed they could recall more than a dozen items, whereas in reality they could only recall two or three. Schneider and Pressley (1997) conclude that the younger children are, the more likely they are to overestimate their memory.

Children's tendency to overestimate their knowledge and abilities extends beyond memory to other cognitive tasks including text comprehension (Markman, 1977, 1979), understanding of instructions (Flavell, Speer, Green, & August, 1981, and judgment of learning (Pressley, Levin, Ghatala, & Ahmad, 1987). Young children also appear not to be cognizant of transitions in their own knowledge and often claim to have known about novel information for a long time (Taylor, Esbensen, and Bennett, 1994). In one study, researchers provided children with novel information of two types. One type involved learning a new behavior and the other learning a new piece of factual information (Esbensen, Taylor, and Stoess, 1997). Overall, 4- and 5-year-olds were moderately good at discriminating between novel behaviors and familiar ones, but were largely inaccurate with regard to novel factual information. Specifically, the majority of children claimed to have known the novel facts the day before (79% of 4 year olds and 53% of 5 year olds).

Metacognitive limitations may affect reality status judgments in multiple ways. One consequence of overestimating one's knowledge of a particular domain might be outright rejection of the existence of anything new. In a situation in which novel information is encountered, children might jump too readily to the conclusion that the novel entity or event is not real. In some situations, though, children may have the opportunity to recruit more knowledgeable others to provide helpful information about reality status. This situation is more difficult, however, because it involves the child realizing that his or her knowledge is lacking and also that someone else might know more. Research by Fitneva (2010) shows that these abilities vary as a function of the type of knowledge involved. Fitneva presented children with 3 types of knowledge - procedural (*e.g.*, how to make cookies), factual (*e.g.*, what the word 'haberdashery' means), and explanatory (*e.g.*, why children prefer bicycles to scooters). Exemplars of each included child-specific knowledge, or topics that children know a lot about (*e.g.*, why children want to play with Legos), and adult-specific knowledge, or topics that children typically know less about than adults (*e.g.*, why balloons fly up and balls fall down). Results revealed that 4-year-olds accurately judged adults as knowing more than children about adult-specific knowledge across all three domains (see also Jaswal & Neely, 2006). However, regarding child-specific knowledge, children were equally likely to say that adults and children knew about factual and explanatory information but were more likely to judge (correctly) that children knew more than adults about procedures. Fitneva suggests that this pattern is due to the fact that procedures (*vs.* facts and explanations) are tangible and visible, and hence children can use their personal experience to make an accurate judgment. Lutz and Keil (2002) make a similar point – that one of the first cues children use to differentiate experts from non-experts is whether they perform a specific action or behavior.

Also addressing the interaction between metaknowledge and seeking information from others, Aguiar, Stoess, and Taylor (2012) report that 4- and 5-year-olds, although quite good at differentiating others on the basis of their expertise, had difficulty identifying when an expert was needed to answer a question, often overestimating their own knowledge and not seeking help. The task of assessing their own knowledge also proved to interfere with their ability to select the adult with the relevant type of expertise. To avoid being overly skeptical with regard to reality status judgments then, children must first have the ability to assess their own knowledge level. Once they recognize that their knowledge of the real world is not exhaustive, they can employ a wide range of other strategies, including seeking testimony and evaluating various sources of information. Although children may still make errors in assigning reality status, misguided skepticism should become significantly less common.

As a concrete example, consider a child who is asked about the reality status of a Manx, a cat with no tail. A child with low metacognitive awareness might respond that, since she has never seen or heard of a cat without a tail, a Manx is not real. If queried about her

knowledge of cats our model would predict that she would report a high level of knowledge. According to the results of studies previously discussed, skepticism should be a fairly common reaction to novel information like this. A child (or adult) with higher metacognitive awareness, on the other hand might think, “I know a lot about cats but not everything there is to know,” or “I know very little about cats,” or even, “perhaps my knowledge about cats is not what I should be using to make this judgment.” This awareness permits the realization that a confident decision is not possible without further information or reflection. This opens the possibility of the use of a variety of strategies. These could include, for example: a) assess whether the novel information contradicts or violates real-world knowledge, b) seek further information, which could include testimony or information from books or TV, or c) consider the context in which the information is encountered.

Our proposal is consistent with Shtulman’s (2009) model of how children and adults make possibility judgments. He proposes that children differ from adults in the extent to which they each reflect on their ideas before making judgments, specifically that adults “check their modal intuitions against explicitly known principles,” engaging in reflection before making a modal judgment (p. 296). We too propose a strong role for reflection, but attempt to be more precise in specifying the factors that might lead to lack of reflection (metacognitive deficits) and the types of processes involved in the reflection process (*e.g.*, evaluation of evidence and testimony seeking), and also attempt to account for the role played by cultural support.

Importantly, the ability to use additional sources of information in making reality status judgments enables alignment of children’s beliefs with those of adults in their culture, regardless of the degree of empirical support for those beliefs. So, for example, even if a child has never seen an angel, he may, in the face of substantial cultural support, decide that his experience (or lack thereof) is not what is needed to form a belief in the existence of angels, rather that the testimony of certain others (*e.g.*, priests) is more germane to belief. Of course a different person may, in spite of such cultural support, decide that her model of reality precludes the existence of angels. In both of these cases, the reality status judgment results from use of a wider range of cues or information sources than are accessible to young children with limited metacognitive abilities. Implicit in this proposal is that the processes that produce skepticism in young children are quite different than those that operate in older children and adults. Whereas a young child who rejects the existence of angels is likely to do so because she has not reflected on her judgment, an adult may come to the same conclusion because her reflection involves consideration of a large number of factors (*e.g.*, angels violate her physical knowledge, mistrust of religious authorities, etc.) that combine to result in rejection. With age, the ability to weigh one source of knowledge (*e.g.*, testimony) versus another (*e.g.*, personal experience) increases and becomes more subject to reflection.

This is not to say that adults never overestimate their knowledge, or its relevance to making decisions. There are various demonstrations in the literature of adults’ metacognitive limitations (*e.g.*, Dunning, Johnson, Ehrlinger, & Kruger, 2003; Rozenblit & Keil, 2002). For example, Rozenblit and Keil (2002) propose that in certain domains, particularly those involving complex causal relations, adults’ limited knowledge combines with metacognitive limitations to result in an “illusion of explanatory depth” (p. 522). This causes adults to feel that they can understand and would be able to explain complex phenomena when, in reality, they are found to be terribly lacking. This phenomenon could potentially also result in misplaced skepticism in adults, in particular in domains in which adults consider themselves experts.

Future directions

It will be important to assess empirically the validity of our proposal relating over-reliance on experience and knowledge to children's skepticism. Because much of the research on reality status involves introducing children to novel animal-like entities, one first step might be to better document children's knowledge about animals – what properties and abilities children believe they have and lack, for example. Then researchers could present novel animal-like entities to children, systematically varying the properties the entities purport to possess. For example, since young children have never seen or heard of a fish with hands, they should presumably judge any such creature as pretend. They should also be equally resistant to the existence of a fish with legs, for example, as they most likely have never encountered that either. With increased metacognitive abilities, children should come to realize that their knowledge is limited in its deductive power. Decreased reliance on their own knowledge and beliefs should allow increased seeking and acceptance of new information, eventually enabling children to agree that a fish with legs exists, whereas a fish with hands does not. Soliciting explanations could reveal the extent to which children rely on personal experience or perceived knowledge versus on other factors such as logic, context, or the source of testimony.

It will also, of course, be important to vary systematically the type of novel information to which children are introduced in these studies, including both entities and processes with which children have a lot of knowledge and experience (*e.g.*, animals) and entities and processes with which they lack knowledge. There may be certain domains in which children are particularly cognizant of the paucity of their own knowledge. Presumably in these domains children should exhibit less misplaced skepticism. In the few domains in which some young children really are experts (*e.g.*, dinosaurs), the decision process would more closely approximate that of older children and adults, with an accurate assessment of relevance most likely to lead to correct assessment of reality status. Thus, we expect that both age and individual differences in metacognitive awareness will play a role in this process.

Shtulman and Carey (2007) argue against children's reliance on experience in judging the reality of events, arguing that children in their study (described earlier) did sometimes affirm the possibility of events they had not personally experienced. Our interpretation of these findings is that children will be most likely to acknowledge the real status of an unfamiliar or improbable event when it is very similar to other experiences they have had. When events are far removed from personal experience, such as some of the ones used in Shtulman and Carey's research (*e.g.*, a polka-dotted airplane), children will be most likely to deny their existence. Essentially children will consider how similar a particular event is to their own experiences. Thus children should reason differently when they hear about what they consider a very strange (improbable) event (*e.g.*, a polka-dotted airplane) versus when they hear about what they consider simply an uncommon (also improbable) event, like a ball landing in a bird's nest in a tree. With the former, children might reason that because they have never heard of it or anything like it before it cannot be real, whereas for the latter event, children might have enough similar experiences with balls getting stuck in trees, or in bushes, that they feel that they have experienced components of it, and thus might judge it as real. Importantly the ability to make such judgments would increase with age. Because Shtulman and Carey primarily used strange events like the polka-dotted airplane in their work, a test of this claim awaits further research.

Conclusion

We have argued that research on children's understanding of reality and fantasy is best explored and explained if we, as researchers, become more aware of the different ways that children form their beliefs about reality. Correct judgments come in two forms, as do incorrect judgments. When children make incorrect judgments about the reality status of entities and events, they either err on the side of skepticism (being restrictive in assigning reality), or on the side of credulity (being permissive in assigning reality). Thinking only in terms of how children come to adopt a skeptical stance (i.e., to cast off their child-like beliefs in fantasy figures like Santa Claus and the Tooth Fairy) will therefore provide only part of the story. To complement our current knowledge base we must begin to unpack the factors associated with children's naïve skepticism and to document the factors that lead children to relax their biases toward that stance and eventually find a comfortable balance between acceptance and doubt.

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References

- Aguiar NR, Stoess CJ, Taylor M. The development of children's ability to fill the gaps in their knowledge by consulting experts. *Child Development*. 2012; 83:1368–1381. [PubMed: 22616878]
- Bering JM, Parker BD. Children's attributions of intentions to an invisible agent. *Developmental Psychology*. 2006; 42:253–262. [PubMed: 16569164]
- Bloom P, Weisberg DS. Childhood origins of adult resistance to science. *Science*. 2007; 316:996–997. [PubMed: 17510356]
- Boerger EA, Tullos SA, Woolley JD. Return of the Candy Witch: Individual differences in acceptance and stability of beliefs in a novel fantastical being. *British Journal of Developmental Psychology*. 2009; 27(4):953–970. [PubMed: 19994488]
- Carey, S. *Conceptual change in childhood*. Cambridge, MA: MIT Press; 1985.
- Carrick N, Quas JA. Effects of discrete emotions on young children's ability to discern fantasy and reality. *Developmental Psychology*. 2006; 42:1278–1288. [PubMed: 17087560]
- Carrick N, Quas JA, Lyon T. Maltreated and nonmaltreated children's evaluations of emotional fantasy. *Child Abuse and Neglect*. 2010; 34:129–134. [PubMed: 20153053]
- Clark, C. *Flights of fancy, leaps of faith: Children's myths in contemporary America*. Chicago: University of Chicago Press; 1995.
- Cook C, Sobel DM. Children's beliefs about the fantasy/reality status of hypothesized machines. *Developmental Science*. 2011; 14:1–8. [PubMed: 21159082]
- Corriveau KH, Kim AL, Schwalen C, Harris PL. Abraham Lincoln and Harry Potter: Children's differentiation between historical and fantasy characters. *Cognition*. 2009; 112:213–225. [PubMed: 19766203]
- Dawkins R. Putting away childish things. *Skeptical Inquirer*. 1995 Jan-Feb;:31–36.
- Esbensen BM, Taylor M, Stoess C. Children's behavioral understanding of knowledge acquisition. *Cognitive Development*. 1997; 12:53–84.
- Evans EM. The emergence of beliefs about the origins of species in school-age children. *Merrill-Palmer Quarterly: A Journal of Developmental Psychology*. 2000; 46:221–254.
- Evans EM. Cognitive and contextual factors in the emergence of diverse belief systems: Creation versus evolution. *Cognitive Psychology*. 2001; 42:217–266. [Reprinted In D. J. Sloane (Ed.) (2006) *Religion and Cognition: A Reader* Equinox Publishing]. [PubMed: 11305883]

- Evans, EM. Conceptual change and evolutionary biology: A developmental analysis. In: Vosniadou, S., editor. *International Handbook of Research on Conceptual Change*. Vol. 11. New York, NY: Routledge; 2008. p. 458-484. *Cognition and Development*, 11, (pp. 263-294)
- Flavell JH, Flavell ER, Green FL. Young children's knowledge about the apparent-real and pretend-real distinctions. *Developmental Psychology*. 1987; 23:816-822.
- Flavell JH, Friedrichs AG, Hoyt JD. Developmental changes in memorization processes. *Cognitive Psychology*. 1970; 1:324-340.
- Flavell JH, Green FL, Flavell ER. Development of knowledge about the appearance-reality distinction. *Monographs of the Society for Research in Child Development*. 1986; 51(1, Serial No. 212)
- Flavell JH, Speer JR, Green FL, August DL. The development of comprehension monitoring and knowledge about communication. *Monographs of the Society for Research in Child Development*. 1981; 46(5):1-65.
- Gelman S. Learning from others: Children's construction of concepts. *Annual Review of Psychology*. 2009; 60:115-140.
- Gilbert DT. How mental systems believe. *American Psychologist*. 1991; 46:107-119.
- Gilbert DT, Krull DS, Malone PS. Unbelieving the unbelievable: Some problems in the rejection of false information. *Journal of Personality and Social Psychology*. 1990; 59:601-613.
- Gilbert DT, Tafarodi RW, Malone PS. You can't not believe everything you read. *Journal of Personality and Social Psychology*. 1993; 65:221-233. [PubMed: 8366418]
- Guerrero S, Enesco I, Harris PL. Oxygen and the soul: Children's conception of invisible entities. *Journal of Cognition and Culture*. 2010; 10:123-151.
- Harris, PL. *Trusting what you're told: How children learn from others*. Cambridge, MA: Belknap Press/Harvard University Press; 2012.
- Harris PL, Pasquini ES, Duke S, Asscher JJ, Pons F. Germs and angels: The role of testimony in young children's ontology. *Developmental Science*. 2006; 9:76-96. [PubMed: 16445398]
- Jaswal VK, Neely LA. Adults don't always know best: Preschoolers use past reliability over age when learning new words. *Psychological Science*. 2006; 17:757-758. [PubMed: 16984291]
- Johnson CN, Wellman HM. Children's developing conceptions of the mind and brain. *Child Development*. 1982; 53:222-234. [PubMed: 7060424]
- Kreutzer MA, Leonard C, Flavell JH. An interview study of children's knowledge about memory. *Monographs of the Society for Research in Child Development*. 1975; 40(1, Serial No. 159)
- Legare CH, Gelman SA. Bewitchment, biology, or both: The co-existence of natural and supernatural explanatory frameworks across development. *Cognitive Science*. 2008; 32:607-642. [PubMed: 21635349]
- Lutz DJ, Keil FC. Early understanding of the division of cognitive labor. *Child Development*. 2002; 73:1073-1084. [PubMed: 12146734]
- Markman EM. Realizing that you don't understand: A preliminary investigation. *Child Development*. 1977; 48:986-992.
- Markman EM. Realizing that you don't understand: Elementary school children's awareness of inconsistencies. *Child Development*. 1979; 50:643-655. [PubMed: 498843]
- Mead M. An investigation of the thought of primitive children, with special reference to animism. *The Journal of the Royal Anthropological Institute of Great Britain and Ireland*. 1932; 62:173-190.
- Morgan S. Try convincing a child these are real penguins. *The New York Times*. 2005 Jun 12. http://www.nytimes.com/2005/06/12/movies/MoviesFeatures/12morg.html?_r=1&scp=1&sq=try%20convincing%20a%20child%20these%20are%20real%20penguins&st=cse.
- Morison P, Gardner H. Dragons and dinosaurs: The child's capacity to differentiate fantasy from reality. *Child Development*. 1978; 49:642-648.
- Piaget, J. *The child's conception of the world*. London: Routledge & Kegan Paul; 1929.
- Piaget, J. *The child's conception of physical causality*. London: Routledge & Kegan Paul; 1930.
- Prentice N, Gordon D. Santa Claus & the Tooth Fairy for the Jewish child and parent. *Journal of Genetic Psychology*. 1986; 148(2):139-151.

- Prentice NM, Manosevitz M, Hubbs L. Imaginary figures of early childhood: Santa Claus, Easter Bunny, and the Tooth Fairy. *American Journal of Orthopsychiatry*. 1978; 48:618–628. [PubMed: 707613]
- Pressley M, Levin JR, Ghatala ES, Ahmad M. Test monitoring in young grade school children. *Journal of Experimental Child Psychology*. 1987; 43:96–111.
- Principe GF, Smith E. The tooth, the whole tooth and nothing but the tooth: How belief in the tooth fairy can engender false memories. *Applied Cognitive Psychology*. 2008a; 22:625–642.
- Principe GF, Smith E. Seeing things unseen: Fantasy beliefs and false reports. *Journal of Cognition and Development*. 2008b; 9:89–111.
- Rosengren KS, Hickling AK. Seeing is believing: Children's explanations of commonplace, magical and extraordinary transformations. *Child Development*. 1994; 65:1605–1626. [PubMed: 7859545]
- Rosengren, KS.; Hickling, AK. Metamorphosis and magic: The development of children's thinking about possible events and plausible mechanisms. In: Rosengren, K.; Johnson, C.; Harris, PL., editors. *Imagining the impossible: The development of magical, scientific, and religious thinking in contemporary society*. Cambridge University Press; 2000. p. 1-34.
- Samuels A, Taylor M. Children's ability to distinguish fantasy events from real-life events. *British Journal of Developmental Psychology*. 1994; 12:417–427.
- Schneider, W.; Pressley, M. *Memory development between two and twenty*. Mahwah, NJ: Lawrence Erlbaum Associates; 1997.
- Siegal M, Butterworth G, Newcombe PA. Culture and children's cosmology. *Developmental Science*. 2004; 7:308–324. [PubMed: 15595372]
- Sharon T, Woolley JD. Do monsters dream? Young children's understanding of the fantasy/reality distinction. *British Journal of Developmental Psychology*. 2004; 22:293–310.
- Shtulman A. The development of possibility judgment within and across domains. *Cognitive Development*. 2009; 24:293–309.
- Shtulman A, Carey SA. Improbable or impossible? How children reason about the possibility of extraordinary events. *Child Development*. 2007; 78:1015–1032. [PubMed: 17517019]
- Subbotsky, EV. *Foundations of the mind: Children's understanding of reality*. Cambridge, MA: Harvard University Press; 1993.
- Subbotsky EV. Early rationality and magical thinking in preschoolers: Space and time. *British Journal of Developmental Psychology*. 1994; 12:97–108.
- Subbotsky, EV. *Magic and the mind: Mechanisms, functions, and development of magical thinking and behavior*. New York, NY: Oxford University Press; 2010.
- Taylor M, Esbensen BM, Bennett RT. Children's understanding of knowledge acquisition: The tendency for children to report that they have always known what they have just learned. *Child Development*. 1994; 65:1581–1604. [PubMed: 7859544]
- Tullos A, Woolley JD. The development of children's ability to use evidence to infer reality status. *Child Development*. 2009; 80:101–114. [PubMed: 19236395]
- Vaden VC, Woolley JD. Does God make it real? Children's belief in religious stories from the Judeo-Christian tradition. *Child Development*. 2011
- Vosniadou S, Brewer W. Mental models of the earth: A study of conceptual change in childhood. *Cognitive Psychology*. 1992; 24:535–585.
- Wellman, HM.; Gelman, SA. Knowledge acquisition in foundational domains. In: William, W Damon, editor. *Handbook of child psychology: Volume 2: Cognition, perception, and language*. Hoboken, NJ, US: John Wiley & Sons Inc; 1998. p. 523-573.
- Woolley JD. Thinking about fantasy: Are children fundamentally different thinkers and believers from adults? *Child Development*. 1997; 68:991–1011. [PubMed: 9418217]
- Woolley JD. Do you believe in surnits? *New York Times*. 2006 Dec 23.:A19.
- Woolley JD, Boerger EA, Markman A. A visit from the Candy Witch: Children's belief in a novel fantastical entity. *Developmental Science*. 2004; 7:456–468. [PubMed: 15484594]
- Woolley JD, Cox V. Development of beliefs about storybook reality. *Developmental Science*. 2007; 10:681–693. [PubMed: 17683351]

- Woolley, JD.; Ghossainy, M. Unpublished manuscript. University of Texas at Austin: Department of Psychology; 2010. The role of explanations on children's judgments about improbable and impossible events.
- Woolley JD, Ma L, Lopez-Mobilia G. Development of the use of conversational cues to assess reality status. *Journal of Cognition and Development*. 2011; 12:537–555. [PubMed: 22241965]
- Woolley JD, Van Reet J. Effects of context on judgments concerning the reality status of novel entities. *Child Development*. 2006; 77:1778–1793. [PubMed: 17107460]
- Woolley JD, Wellman HM. Young children's understanding of realities, nonrealities, and appearances. *Child Development*. 1990; 61:946–961. [PubMed: 2209198]
- Woolley JD, Wellman HM. Origin and truth: Young children's understanding of imaginary mental representations. *Child Development*. 1993; 64:1–17. [PubMed: 8436024]
- Wright JC, Huston AL, Reitz AL, Piemyat S. Young children's perceptions of television reality: Determinants and developmental differences. *Developmental Psychology*. 1994; 30:229–239.

Table 1

Patterns of Correct and Incorrect Judgments Regarding Reality Status

Judgment	Reality Status	
	Real	Not Real
Real	HIT (<i>e.g.</i> , knowing that dinosaurs are real)	FALSE ALARM (<i>e.g.</i> , believing in Santa Claus)
Not Real	MISS (rejecting the reality status of real entities and events - the focus of this paper)	CORRECT REJECTION (<i>e.g.</i> , doubting the existence of dancing carrots)