

Research Report

CHILDREN ARE CURSED: An Asymmetric Bias in Mental-State Attribution

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Abstract—*Young children have problems reasoning about false beliefs. We suggest that this is at least partially the result of the same curse of knowledge that has been observed in adults—a tendency to be biased by one's own knowledge when assessing the knowledge of a more naive person. We tested 3- to 5-year-old children in a knowledge-attribution task and found that young children exhibited a curse-of-knowledge bias to a greater extent than older children, a finding that is consistent with their greater difficulty with false-belief tasks. We also found that children's misattributions were asymmetric. They were limited to cases in which the children were more knowledgeable than the other person; misattributions did not occur when the children were more ignorant than the other person. This suggests that their difficulty is better characterized by the curse of knowledge than by more general egocentrism or rationality accounts.*

Young children have difficulty reasoning about false beliefs. A classic demonstration of this fact involves a story in which one character, Sally, places a chocolate into a box and goes outside. In Sally's absence, a second character, Ann, moves the chocolate to a basket. Then Sally returns to the room. The question is, where will Sally look for the chocolate? Adults and children older than 3 usually answer that Sally will look for her chocolate in the box where she left it, appreciating that she will have a false belief about its location. In contrast, younger children tend to answer that she will look in the chocolate's current location, the basket (see Baron-Cohen, Leslie, & Frith, 1985; Wimmer & Perner, 1983).

This general finding has been repeatedly replicated using a range of different methods (see Wellman, Cross, & Watson, 2001, for a review), and young children's poor performance is not a matter of debate. However, there is considerable controversy with regard to the nature of their difficulty. Many researchers see it as reflecting a qualitative difference, and posit a developmental shift in the ability to appreciate mental states (e.g., Gopnik, 1993; Wellman, 1990; Wellman et al., 2001). Others suggest that young children's problem in reasoning about false beliefs is due to more general difficulties, such as memory load, pragmatic constraints, assumptions of rationality, and processing limitations, and thus is not necessarily due to a lack of understanding (e.g., Bloom & German, 2000; German & Leslie, 2000; Koos, Gergely, Csibra, & Biro, 1997; Moses, 1993).

Here we explore a novel explanation for this developmental difference, one most consistent with the view that young children's errors are due to more general factors. We propose that children exhibit an exaggerated form of the same bias that has been observed in adults:

the *curse of knowledge* (Camerer, Lowenstein, & Weber, 1989), a tendency to be biased by one's own knowledge when judging the perspective of a more ignorant other. For instance, adults who know the solution to a problem tend to overestimate how easy it is for someone else to solve that problem (Kelley & Jacoby, 1996). Similarly, people who know a company's earnings (Camerer et al., 1989), the outcome of an event (Fischhoff, 1975), or whether or not a statement is sarcastic (Keysar, 1994) will be biased in the direction of what they know when assessing the judgments of a naive person (see also Keysar & Bly, 1995; Keysar, Ginzel, & Bazerman, 1995; Newton, 1990; see Wilson & Brekke, 1994, for a discussion of related *mental-contamination* effects).

Classic false-belief tasks are cursed. Because the participant knows where the chocolate actually is, he or she should be biased to assume that Sally knows, too. We suggest that although the curse for adults and older children is relatively subtle, enabling them to succeed in false-belief tasks, it is greater for young children, and thus a source of difficulty in mental-state attribution. If this is true, the curse of knowledge should also manifest itself in tasks that do not involve false-belief assessment, and it should be more potent in younger children (who tend to fail the false-belief task) than older children (who tend to pass).

To explore this hypothesis, we presented 3-, 4-, and 5-year-olds with two sets of toys—one described as being familiar to the experimenter's puppet friend, Percy, and one described as being unfamiliar to Percy. The children were told that each toy had an object inside and were asked to judge whether Percy would know what was inside the toys. Half of the time, the children were shown the toys' contents; the other half of the time, they were not. On the basis of previous literature demonstrating young children's sensitivity to the knowledge and ignorance of another person (e.g., Birch & Bloom, 2002; O'Neill, 1996; Sabbagh & Baldwin, 2001), we expected that even the youngest children would appreciate that Percy should be knowledgeable of the contents of the toys with which he was familiar and ignorant of the contents of the toys with which he was unfamiliar. However, we predicted that the curse-of-knowledge bias would work against this appreciation to a certain extent, so that children would overestimate Percy's knowledge when they themselves knew the toys' contents. In contrast, we predicted that children would not overestimate Percy's ignorance when they were ignorant. In addition, we predicted that the tendency to overestimate knowledge would decrease with age.

METHOD

Participants

Sixteen 3-year-olds (5 males, 11 females; mean age = 44.4 months; range: 39.8–49.0 months), sixteen 4-year-olds (9 males, 7 females; mean age = 53.6 months; range: 49.3–57.5 months), and sixteen 5-year-olds (7 males, 9 females; mean age = 61.6 months; range: 57.6–69.6 months) participated.

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Materials

Twelve pairs of opaque containers were presented as toys. Each container held a small object (e.g., a yo-yo). The containers were divided into two bags, with one member of each pair in either bag. Star stickers covered the containers in one bag, and smiley-face stickers covered the containers in the other bag. An additional container that held a plastic sheep was used to demonstrate that each container had an object inside. A gray puppet also was used.

Procedure

The children were tested individually in a quiet area of their child-care center. They participated in two conditions, the child-knowledgeable and child-ignorant conditions, in a counterbalanced within-subjects design. The experimenter began by drawing their attention to the bags of toys and saying, "These toys are special. Do you know why they are special? These toys are special because each one has a different little thing inside." The experimenter then opened one of the toys and said, "See this toy? Look, it has a sheep inside." Gesturing to all of the other toys she said, "Each one of these toys has a different little thing inside. That's what makes them special. Each one has something different inside."

The experimenter then said, "I also brought my puppet friend, Percy, with me today." She placed her hand inside the puppet and donned a deeper voice to animate Percy. Percy said, "Hi! My name is Percy. What is your name? Hi, ____! Nice to meet you." Percy was then placed behind the experimenter, and the child was told that when he was back there he could not see or hear them.

The children were told that the toys in one bag were Percy's, and that he had seen and played with all of those toys before (i.e., familiar toys). The children were told that the toys in the other bag were new, and that Percy had never seen or played with those ones before (i.e., unfamiliar toys). To help make this distinction clearer to the children, the experimenter drew their attention to the types of stickers on the objects. She said, "All of these toys have smiley-face stickers on them. Percy put these stickers on the toys. All of these new toys have different stickers on them. They have star stickers on them."

One toy was then retrieved from each bag and placed in front of the child. The experimenter said, "Let's show Percy the toys. Here comes Percy." Percy reappeared, picked up the familiar toy, and said, "Hey, I've played with this toy before." He then picked up the unfamiliar toy and said, "Hey, I've never, ever seen this toy before." The order in which Percy picked up the toys was counterbalanced. The experimenter then pointed to each toy and asked, "Does Percy know what is inside this toy?"

For half of the trials (the child-knowledgeable condition), the child was shown the object inside each toy prior to Percy's appearance. The two toys were opened up one at a time, and the child heard, "What's inside here? It's a ____." Then, the toys were closed. For the other half of the trials (the child-ignorant condition), the child was not shown the contents of the toys.

RESULTS AND DISCUSSION

A 2 (puppet familiarity) \times 2 (child knowledge) \times 3 (age) repeated measures analysis of variance (ANOVA) was performed, with puppet familiarity and child knowledge as within-subjects variables and age as a between-subjects variable. For each child-knowledge condition, we totaled the number of times each child responded "yes" to "Does

Percy know what is inside this toy?" These totals served as the dependent measure.

Not surprisingly, there was a significant main effect of puppet familiarity, $F(1, 45) = 69.57, p < .01$. Children were more likely to attribute knowledge to Percy when he was familiar with the toys ($M = 4.32$) than when he was unfamiliar with the toys ($M = 1.28$). Even the youngest children were sensitive to whether Percy was familiar with the toys when assessing his knowledge of the contents. Three-year-olds were significantly more likely to attribute knowledge to Percy when he was familiar ($M = 3.84$) than when he was unfamiliar ($M = 2.22$), $t(15) = 2.94, p < .01$. The same pattern was found for the 4-year-olds (familiar $M = 4.16$, unfamiliar $M = 1.53$), $t(15) = 3.35, p < .01$, and the 5-year-olds (familiar $M = 4.97$, unfamiliar $M = 0.09$), $t(15) = 9.24, p < .01$. The omnibus ANOVA also revealed a significant puppet-familiarity-by-age interaction, $F(2, 45) = 6.95, p < .01$, suggesting that with age children become more sensitive to the relationship between knowledge and familiarity.

The omnibus ANOVA revealed a significant main effect of child knowledge, $F(1, 45) = 7.17, p = .01$. The children were more likely to attribute knowledge to Percy when they knew the contents ($M = 3.06$) than when they were ignorant of the contents ($M = 2.54$). Of particular interest was whether there was a difference between the child-knowledgeable and child-ignorant conditions for the unfamiliar toys but not for the familiar toys. The curse of knowledge applies only when attempting to assess the knowledge of someone more ignorant than oneself. It leads one to overestimate that person's knowledge. In contrast, attempting to assess the knowledge of someone more knowledgeable than oneself should not pose a problem. There should not be a curse of ignorance. Being ignorant should not lead one to overestimate another person's ignorance.

In accord with this line of reasoning, the omnibus ANOVA revealed a significant Child Knowledge \times Puppet Familiarity interaction, $F(1, 45) = 5.47, p < .05$. A significant Child Knowledge \times Puppet Familiarity \times Age interaction, $F(2, 45) = 4.21, p < .05$, was also revealed. As predicted, there was no curse-of-ignorance effect for any age group. Paired-samples t tests revealed that when Percy was familiar with the contents of the toys, there were no significant differences between the child-knowledgeable and child-ignorant conditions for 3-year-olds (knowledgeable $M = 4.13$ vs. ignorant $M = 3.56$), $t(15) = 1.23, n.s.$; 4-year-olds (knowledgeable $M = 4.00$ vs. ignorant $M = 4.31$), $t(15) = -1.05, n.s.$; or 5-year-olds (knowledgeable $M = 5.19$ vs. ignorant $M = 4.75$), $t(15) = 1.28, n.s.$ (see Fig. 1).

In contrast, there was a curse-of-knowledge effect for the two younger age groups. Paired-samples t tests revealed that when Percy was unfamiliar with the contents of the toys, there was a significant difference between the child-knowledgeable and child-ignorant conditions for the 3-year-olds (knowledgeable $M = 2.88$ vs. ignorant $M = 1.56$), $t(15) = 2.34, p < .05$, and 4-year-olds (knowledgeable $M = 2.06$ vs. ignorant $M = 1.00$), $t(15) = 2.22, p < .05$. Five-year-olds did not exhibit a significant curse-of-knowledge bias (knowledgeable $M = 0.13$ vs. ignorant $M = 0.06$), $t(15) = 1.00, n.s.$ (see Fig. 2).

Also of particular interest was whether the magnitude of this bias decreased with age. We computed the magnitude of the curse of knowledge by taking the difference between the children's responses in the child-knowledgeable and child-ignorant conditions. As predicted, the magnitude of the curse had a significant negative correlation with age, $r(48) = -.29, p < .05$. An independent-samples t test revealed a significant difference in the magnitude of the curse between age 3 ($M = 1.31$) and age 5 ($M = 0.06$), $t(30) = 2.22, p < .05$.

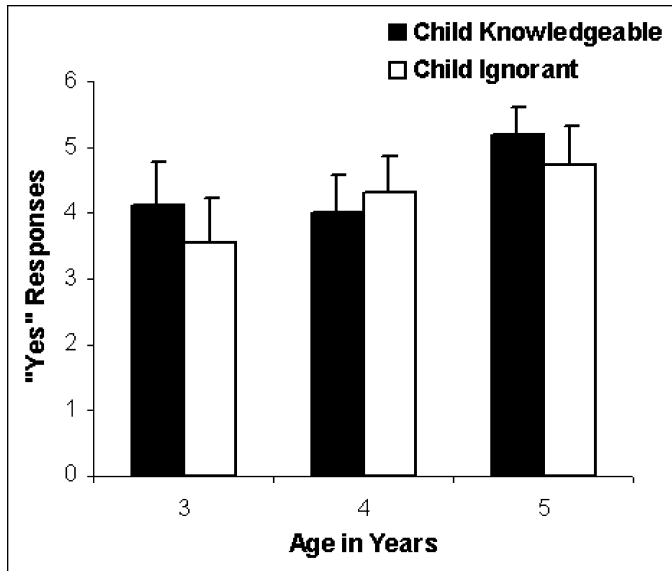


Fig. 1. Knowledge assessment of a knowledgeable other: Mean number of “yes” responses to “Does Percy know what is inside this toy?” for toys with which Percy was familiar. Results are shown separately for the conditions in which the children did and did not know the toys’ contents themselves.

This research demonstrates that young children are particularly susceptible to the curse of knowledge. When asked to judge whether another person would know the contents of unfamiliar toys, 3- and 4-year-old children were more likely to judge the person to be knowledgeable if they knew the toys’ contents than if they did not. The mag-

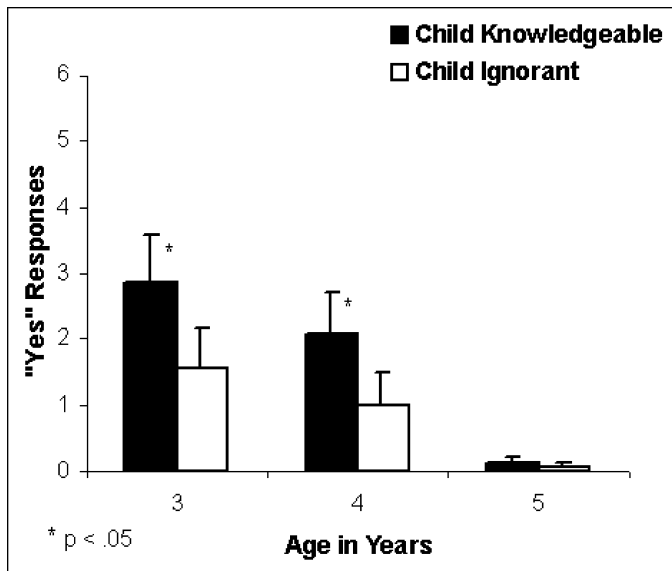


Fig. 2. Knowledge assessment of an ignorant other: Mean number of “yes” responses to “Does Percy know what is inside this toy?” for toys with which Percy was unfamiliar. Results are shown separately for the conditions in which the children did and did not know the toys’ contents themselves. Asterisks indicate a significant difference between these conditions.

nitude of this bias decreased significantly between age 3 and age 5, and this decrease may account for the developmental differences in children’s ability to succeed on false-belief tasks.

A different proposal is that children, and adults, possess a *rationality assumption*, assuming that people will act in such a way as to satisfy their goals (e.g., Koos et al., 1997). The default assumption in the classic false-belief task, according to this account, is that Sally will look in the basket, because this is the most rational act for an agent who wants to eat the chocolate. We do not doubt that such a bias might exist, but it differs in scope from the curse of knowledge. The curse-of-knowledge account applies to mental-state attribution in general, not just to predictions of action. In the experiment reported here, children tended to overattribute knowledge to a naive individual in a context that had nothing to do with goal-directed action.

The curse-of-knowledge account may seem reminiscent of the traditional Piagetian claim that children have difficulty appreciating a perspective that differs from their own (e.g., Piaget, 1930). But there is an important difference: The curse of knowledge is asymmetric, unlike egocentrism. The children in the current experiment did not have difficulty appreciating *any* perspective that was different from their own—only a more ignorant one. They were biased by their knowledge when attempting to appreciate the perspective of someone more ignorant than themselves, but were not biased by their ignorance when attempting to appreciate the perspective of someone more knowledgeable than themselves.

Our findings are consistent with the spirit of research on children’s inhibitory deficits (e.g., Carlson & Moses, 2001; Diamond & Taylor, 1996; Leslie & Polizzi, 1998; Zaitchik, 1991). We propose that overcoming the curse of knowledge requires inhibiting one’s own knowledge. Presumably, there is no curse of ignorance because when one is ignorant there is nothing to inhibit. Overcoming the curse of knowledge is hardest for young children, with their more limited processing capacities. In the task presented here, the oldest children overcame this bias. Yet even adults exhibit the curse when the tasks are more difficult and the measures are sufficiently sensitive, as when knowledgeable participants are asked to judge what uninformed individuals will perceive as the probability of various outcomes (Fischhoff, 1975).

In sum, this research suggests that young children are particularly susceptible to the curse-of-knowledge bias identified in adults, and this leads them to make mistakes in mental-state attribution. This research does not directly address whether there is a qualitative shift in children’s appreciation of beliefs, but it demonstrates the existence of a bias that contributes a greater source of difficulty in false-belief tasks for young children than for older children. This bias needs to be taken into account when drawing conclusions about what children do and do not know about mental states.

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