When Knowledge Is a Curse

Children's and Adults' Reasoning About Mental States

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ABSTRACT—*The ability to reason about mental states is critical for predicting and interpreting people's behavior and for communicating effectively. Yet both children and adults exhibit some remarkable limitations in reasoning about mental states. In this article, I outline some of the parallels between children's and adults' fallacies in reasoning about the mind and suggest that a fundamental bias in social cognition contributes to these limitations. This bias is the curse of knowledge—being biased by one's own knowledge when trying to appreciate a more naive perspective. I offer the curse of knowledge as a possible alternative to the popular claim that a qualitative conceptual change occurs in the development of mental-state reasoning and discuss the implications of this bias for social cognition.*

KEYWORDS—*social cognition; cognitive development; theory of mind; false belief; hindsight bias; perspective taking*

The ability to reason about mental states is critical for predicting and interpreting people's behavior and for communicating effectively. For example, to make sense of why a woman is looking for her cat outside when the cat is really inside, we must posit that she does not know that the cat is inside—that she thinks, or falsely believes, that the cat is outside. When we want to communicate with someone, we need to take into account what that person likely knows, and does not know, to present our message at a comprehensible level.

Surprisingly, young children show some remarkable deficits in reasoning about mental states. The limitation that has received the most attention involves young children's understanding of false beliefs. False-belief tasks are a stringent test of a theory of mind because they involve predicting behavior on the basis of an inferred mental state (i.e., one cannot succeed by simply observing the true state of the world; Dennett, 1978). In one classic false-belief task, Sally places candy into a basket and goes outside. While she is away, Ann moves the candy to a box. Children are then asked some variant of the question: When Sally comes back and wants her candy, where will she look for it? Around age 4, children begin to choose correctly. They appreciate that Sally will look where she left the candy—she will hold a false belief about its location. Prior to age 4, however, children fail the task (and others like it). They do not answer randomly: They say that Sally will look in the box where they know the candy to be (Baron-Cohen, Leslie, & Frith, 1985; Wimmer & Perner, 1983; see Wellman, Cross, & Watson, 2001, for review).

These findings are rarely disputed, but why children experience difficulty is of great controversy. Some researchers propose a radical developmental shift in the way children understand the mind. They argue that young children lack a concept of belief or of mental representation more generally (see Wellman et al., 2001, for a review). Other researchers believe children's difficulties on these tasks are due to general factors such as memory load, assumptions that individuals should behave rationally, and demands posed by the linguistic nature of the task and are not necessarily indicative of a conceptual deficit (see Bloom & German, 2000, for a review).

Recently, cognitive, social, and developmental psychologists have been converging on a different view—one that is consistent with this latter perspective but offers a unique explanation for children's limitations. The claim is that children's limitations are the result of a fundamental bias in social cognition that persists across development but is more potent early on, leading to more blatant errors early in development (Birch & Bloom, 2003; see also Bernstein, Atance, Loftus, & Meltzoff, 2004; Keysar, Lin, & Barr, 2003; Royzman, Cassidy, & Baron, 2003). I believe this bias can accurately be described by borrowing a term from economics—the *curse of knowledge*. This term refers to difficulty appreciating a more naive perspective as the result of being biased by one's own knowledge (Camerer, Loewenstein, & Weber, 1989).

PARALLELS IN CHILDREN'S AND ADULTS' LIMITATIONS IN MENTAL-STATE REASONING

There are important similarities between curse-of-knowledge findings with adults and the false-belief findings with children.

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For example, Fischhoff (1975) provided adults with descriptions of events and told them that these descriptions were also presented to other students. Some participants were told the outcomes of the events; others were not. All participants were then asked to estimate what outcome-naive students would predict as the likelihood of the different outcomes. Participants who were told the outcome of an event overestimated the naive students' predictions of that particular outcome. Like children in the Sally-Ann false-belief task who respond as if naive Sally shares their knowledge, adults who were told the outcomes of events responded as if those who were naive of the outcomes shared their knowledge.

In a second type of false-belief task, the unexpected-contents task, children are shown a box of candy, for example, and asked what is inside. When they answer "candy," the box is opened to reveal something else, such as pencils. The box is then closed, and the children are asked what they thought was in the box before it was opened. Again, children younger than 4 answer incorrectly, stating they initially thought there were pencils inside. That is, they fail to recall their own earlier false belief (Perner, Leekam, & Wimmer, 1987; see Wellman et al., 2001, for a review). Consider now a more subtle, but parallel, limitation in adults: On the eve of former President Nixon's trips to China and the Soviet Union, Fischhoff and Beyth (1975) asked participants to estimate the probability of various possible outcomes. Two weeks to 6 months after the trips' completion, they were asked to recall their original predictions. Participants' recollections of their predictions of the likelihood of the actual outcome were significantly higher than their original predictions. Like children in the unexpected-contents task who report their new knowledge of what is in the box (e.g., pencils), instead of their earlier predictions (e.g., candy), these adults inaccurately recalled their earlier predictions; their recollections of their original predictions were biased by their new knowledge of the actual outcome. This bias is often referred to as the *hindsight bias*. In summary, once we acquire knowledge, this knowledge biases our ability to appreciate a more naive perspective—whether it is our own earlier naive perspective or someone else's.

FOUR PREDICTIONS FROM A CURSE-OF-KNOWLEDGE ACCOUNT

If the curse-of-knowledge bias contributes to young children's limitations in mental-state reasoning, four predictions follow: First, children should exhibit difficulty appreciating another person's perspective when they are knowledgeable, but not when they are ignorant. Second, younger children, who tend to fail false-belief tasks, should exhibit the curse of knowledge to a greater extent than older children, who tend to pass false-belief tasks. Third, adults should experience the same difficulties with false belief as children, only to a lesser degree. Fourth, young children should find it easier to reason about false beliefs the less specific, and therefore less biasing, their knowledge of the outcome.

An Asymmetry in Mental-State Reasoning

If the curse of knowledge contributes to children's difficulties with mental-state reasoning, children should exhibit difficulty appreciating another person's perspective when they are knowledgeable about the situation, but not when they are ignorant, even on tasks that have nothing to do with attributing a false belief to someone else. Paul Bloom and I found support for this prediction in a study with preschool children who were presented with pairs of novel toys and told that each contained "something special" inside (Birch & Bloom, 2003). One toy was presented as familiar to the experimenter's puppet friend Percy (i.e., he had played with it before). The other was presented as unfamiliar to Percy (i.e., he had never seen it before). The children were subsequently asked whether Percy knew what was inside each toy. The key manipulation was whether the children themselves knew what was inside the toys. For half of the trials, the children were "cursed" by showing them what was inside prior to Percy's appearance. When the children knew what was inside the toys, they overestimated Percy's knowledge of the contents. In contrast, when the children did not know what was inside, they did not underestimate Percy's knowledge of the contents; that is, when the children were ignorant of the toys' contents, they were significantly more accurate at judging Percy's knowledge (or ignorance) of the toys' contents.

Similarly, Taylor, Esbensen, and Bennett (1994) found that when 4- and 5-year-olds learned about novel facts, they said that both an "expert" and a child "like them" would also know those facts—even though they themselves had learned the facts only moments before. In contrast, when the children did not know other novel facts, they appreciated that someone else like them would not know either, but that an expert would know. This asymmetry demonstrates a critical distinction between traditional notions of egocentrism (an inability to appreciate any perspective other than one's own) and the curse of knowledge (a difficulty appreciating a more ignorant perspective, but not one that is more knowledgeable).

Developmental Changes in the Magnitude of the Curse of Knowledge

If the curse of knowledge is to account for the developmental differences in children's performance on false-belief tasks, then younger children should exhibit the curse of knowledge to a greater extent than older children. Results from the study with Percy (Birch & Bloom, 2003) indicate that this is indeed the case. The extent to which knowledge of the toys' contents affected children's performance significantly declined from age 3 to age 5—the same age children begin succeeding at false-belief tasks. That is, 3-year-olds' knowledge of the toys' contents compromised their ability to appreciate Percy's ignorance

to a greater extent than 5-year-olds' knowledge of the toys' contents did. Bernstein et al. (2004) and Taylor et al. (1994) found similar developmental changes in the magnitude of the curse of knowledge, though they did not find them on all variants of their tasks, suggesting that subtle manipulations can attenuate age-related differences in this bias. It is unclear, at this time, what particular factors nullify or obscure such age differences. Further research in this area may shed light on the mechanisms underlying the curse of knowledge and on potential means for overcoming its effects.

Of particular interest is why younger children are more vulnerable to the curse of knowledge than older children are. Presumably the answer lies in developmental changes in the mental processes underlying this bias. One plausible explanation centers on inhibitory control. It seems reasonable that knowledge can be a curse when reasoning about a perspective more naive than one's own because it is difficult to fully inhibit one's own knowledge. Another mechanism that may contribute to this bias is source monitoring. Source monitoring refers to processes involved in making attributions about how and when one acquired information. Source-monitoring abilities may help us appreciate the sometimes unique and privileged nature of our knowledge. It is important to note that age-related increases in inhibitory control and in source-monitoring skills have been found across the preschool years. Furthermore, an abundance of literature has demonstrated that decreasing inhibitory demands improves children's false-belief reasoning. In a similar vein, experimental procedures that foster source monitoring may also facilitate mental-state reasoning.

Adults Can Have Difficulty Reasoning About False Beliefs

If young children's difficulties with mental-state reasoning stem from an exaggerated version of the curse-of-knowledge bias found in adults, then a third prediction is that adults should experience the same difficulties as children in reasoning about mental states, only to a lesser extent. This is an important prediction because if adults, who undoubtedly possess the concept of belief, have difficulty reasoning about false beliefs under conditions in which they have outcome knowledge, then these limitations in false-belief reasoning result from the curse of knowledge rather than a conceptual deficit. It seems parsimonious, then, to posit that children's limitations on these same types of tasks also stem from the curse of knowledge (a more exaggerated version), rather than to posit an additional conceptual deficit.

To test this prediction, Bloom and I (Birch & Bloom, 2004) gave adults a variant of the Sally-Ann task that differed from the typical children's task in two important ways (see Fig. 1). First, participants were asked to report the probability that the protagonist would look in each container, rather than to report which container the character would look in. Second, instead of two containers, four were used, so we could manipulate the participants' knowledge of the outcome: All participants were told that the object (a violin) was moved when the protagonist (Vicki) left, but some were told that the object was moved to a specific container, whereas others were told that the object was moved to "another," unspecified container. Adults in the outcome-ignorant condition, who did not know the precise location of the violin, estimated that the probability Vicki would first look in the red container was 23% and the probability that she would act on her false belief and look in the blue container where she left it was 71%. In contrast, adults in the outcome-knowledgeable condition knew precisely where the violin was moved to (i.e., they read that the violin was moved to "the red container"). These participants were biased by this knowledge and gave significantly higher probability estimates that Vicki would first look in the red container (34%) and significantly lower estimates that she would act on a false belief (59%).[1] These findings show that outcome knowledge can compromise even adults' ability to reason about false beliefs (see also Keysar et al., 2003).

Can Young Children Reason About False Beliefs When the Curse of Knowledge Is Minimized?

If the curse of knowledge contributes to children's difficulties with false-belief reasoning, then reducing the curse of knowledge should make false-belief tasks easier for younger children. An example of a "less cursed" false-belief task for children follows the logic of the Sally-Ann variant in which adults were told that an object was moved, but not specifically where it was put. In such a task, children could be presented with three boxes and told the following story: Sally places her object in Box A and goes outside. While she is outside, Ann moves her object from Box A to one of the other boxes (the child is not told whether the object is moved to Box B or Box C). This task still requires attribution of a false belief because Sally should think the object is in Box A, and the children know this is false. The only difference between the standard Sally-Ann task and this task is that the children do not have specific knowledge of where the object was moved. Courtney Edgar and I are currently using this modified, less cursed version of the Sally-Ann task to test the prediction that young children will find it easier to reason about false beliefs when they have less specific outcome knowledge.

CONCLUSION AND FUTURE DIRECTIONS

The evidence to date does not rule out the possibility that children experience conceptual deficits in addition to the curse of knowledge. However, given that younger children's performance is more contaminated by their outcome knowledge

[1]In a different condition, the plausibility of the outcome was manipulated. Plausibility may play an important role in the curse of knowledge, at least for adults.

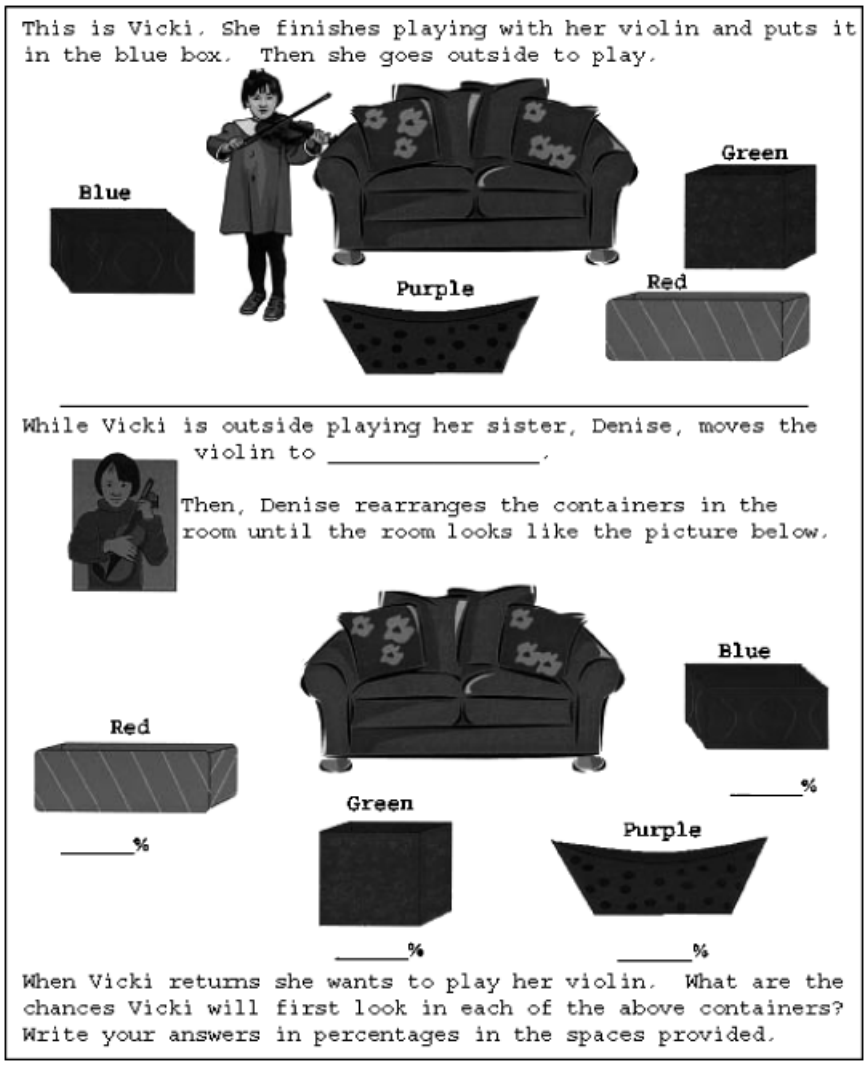

Fig. 1. A modified false-belief task given to adults to test the role of the curse of knowledge in false-belief reasoning. Adults in the outcome-ignorant condition read that the violin was moved to ''another container'' and thus did not know the precise location of the violin. Adults in the outcome-knowledgeable condition read that the violin was moved to ''the red container'' and thus knew precisely where the violin was moved.

than older children's performance is, standard false-belief tasks will either mask children's true competencies or exacerbate their difficulties because such tasks involve an unnecessary source of difficulty for younger children (i.e., the increased difficulty of rescinding their own outcome knowledge).

In this review, I have focused largely on children's limitations in false-belief reasoning because of its popular status as a litmus test of the ability to reason about mental states. Equally important, however, are the implications that the curse of knowledge has for other aspects of social cognition. In education, for example, teachers are typically more informed than the students they intend to educate. If teachers fail to fully appreciate their audience's ignorance, they may pitch their message at a less than optimal level. Implications of this bias also abound in business and politics. For example, our knowledge of the events that transpired on September 11, 2001, probably bias our assessments of how informative potential warning signs in the preceding months were (i.e., potential clues appear more telling now that we know what transpired than they would have without such knowledge).

Direct effects of the curse of knowledge occur when our ability to appreciate what someone else knows is biased by our own knowledge. However, indirect effects may also arise when these biased assumptions about what someone else knows lead to erroneous expectations about how that person will behave or feel. These more covert effects will likely influence children's and adults' feelings and attitudes toward other people, their assessments of other people's behavior and personality, and their moral judgments. For example, if Mary knows that John is going through a tough time at home, she may wrongfully assume, because of the curse of knowledge, that other people share her knowledge. Consequently, she may judge individuals who act negatively toward

John more harshly than she would if she were ignorant of John's hardships. Indeed, Keysar et al. (2003) found that one can explicitly acknowledge that someone else does not share one's knowledge, but still be biased by this knowledge when one needs to take the other person's perspective. Perhaps, then, even if Mary explicitly knew that the people who treated John unkindly were unaware of his hardships, her privileged knowledge might still implicitly bias her moral judgments and attitudes toward those individuals. Similarly, the curse of knowledge may lead to decreased empathy for individuals who are the victims of accidents or crimes—we assume they "should have known" what would happen now that we know. Given the key role knowledge assessment plays in everyday life (i.e., in making sense of, and evaluating, the actions of other people and communicating with them), future research needs to address exactly how and why knowledge is a curse, and explore potential antidotes for dispelling this curse.

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