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Report

Reflexively mindblind: Using theory of mind to interpret behavior requires effortful attention

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ABSTRACT

People commonly interpret others' behavior in terms of the actors' underlying beliefs, knowledge, or other mental states, thereby using their "theory of mind." Two experiments suggest that using one's theory of mind is a relatively effortful process. In both experiments, people reflexively used their own knowledge and beliefs to follow a speaker's instruction, but only effortfully used their theory of mind to take into account a speaker's intention to interpret those instructions. In Experiment 1, people with lower working memory capacity were less effective than people with larger working memory capacity in applying their theory of mind to interpret behavior. In Experiment 2, an attention-demanding secondary task reduced people's ability to apply their theory of mind. People appear to be reflexively mindblind, interpreting behavior in terms of the actor's mental states only to the extent that they have the cognitive resources to do so.

Introduction

By age two, humans have acquired a capacity for social intelligence that outperforms our nearest primate relatives—the capacity to interpret others' actions in terms of intentions, beliefs, knowledge, and other mental states (Herrmann, Call, Hernandez-Lloreda, Hare, & Tomasello, 2007). This capacity—generally referred to as "theory of mind"—continues to develop through adulthood, at which point it seems almost inevitable that people will interpret others' actions in terms of underlying mental states. A man running down the street is not simply seen as an object moving in space but rather as a motivated and thoughtful agent. His behavior is understood differently if we know that he is wanting to get some exercise than if we know that he is wanting to elude the police. Understanding a person's actions often requires considering an agent's beliefs, and in this sense people appear to use their theory of mind spontaneously to interpret others' actions.

There are good reasons to believe that the spontaneous use of beliefs to interpret action is effortless. Consider, for example, how people interpret language. The back and forth of conversation occurs quickly, requiring people to understand and formulate utterances without much time to reflect. To understand what others are saying, people constantly resolve the ambiguity inherent in the language so that they can use what speakers believe in order to understand what they mean. The ease of conversation has led to the conclusion that people's "Use of theory of mind is also rapid ... automatic, requiring no effortful attention ... and universal." (Stone, Baron-Cohen, & Knight, 1998, p. 640).

However, there are also good reasons to believe that the use of beliefs to interpret action is effortful. A person's own perspective is likely to be primary. Considering another's differing perspective requires both time and motivation (e.g., Epley, Keysar, Van Boven, & Gilovich, 2004), and people appear less able to imagine themselves in another person's perspective when they are distracted by a concurrent processing task (Davis, Conklin, Smith, & Luce, 1996). Actively monitoring another person's belief in the midst of conversation also appears to require attentional resources (Apperly, Riggs, Simpson, Chiavarino, & Samson, 2006; Vorauer, Martens, & Sasaki, 2009), and people are more likely to correctly use knowledge about others' beliefs to predict their actions when put in a negative mood that stimulates more elaborate thinking (Converse, Lin, Keysar, & Epley, 2008). If inferring another's differing perspective and monitoring others' beliefs in interaction are both effortful processes, then using what is known about another's beliefs to interpret their action may be effortful as well.

We examined in two experiments whether people effortlessly use their knowledge about another's beliefs to interpret their actions. Based on existing research in the effort required to infer and track others' beliefs, we predicted that people would be reflexively mindblind (Baron-Cohen, 1995), meaning that they would fail to consider others' beliefs and knowledge to interpret their behavior unless they had sufficient attentional resources to do so.

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Clarifying concepts

Language is often ambiguous, and it is not unusual for the same term to be used by different researchers to describe very different processes. In this research, we examine how people use what they know about another's beliefs to interpret what he or she says. This involves employing one's knowledge about how beliefs relate to behaviors, such as speaking, a process that entails using one's "theory of mind" (Wellman, Cross, & Watson, 2001).

This is not to be confused or equated with the broader concept of perspective taking, a term that describes almost any attempt to overcome one's own perspective to consider another's differing vantage point (e.g., Birch & Bloom, 2007; Davis et al., 1996; Gilovich, Medvec, & Savitsky, 2000; Nickerson, 1999). This differing vantage point may be another's visual perspective, as when people consider what others can physically see, or it may be another's differing psychological perspective, as when people attempt to read others' minds to infer their beliefs, attitudes, knowledge, or other mental states. Perspective taking therefore describes the active attempt to understand another's mind, whereas we focus on how people use what is already understood about another's mind to interpret his or her actions.

When others' knowledge, beliefs, or attitudes are unknown, perspective taking is often egocentrically biased (e.g., Birch & Bloom, 2007; Epley, Keysar, et al., 2004; Epley, Morewedge, et al., 2004; Keysar & Barr, 2002). For instance, people who are told the answer to a riddle are more likely to think that others will be able to guess the answer than people who do not know the answer (Nickerson, 1999). Such thinking about others' thoughts is not fully automatic, as people may not monitor others' thoughts unless instructed to do so (Apperly, Samson, & Humphreys, 2009; Apperly et al., 2006; Converse et al., 2008; Epley, Caruso, & Bazerman, 2006). Being put under cognitive load can also diminish people's ability to comply with instructions to imagine oneself in another's perspective (Davis et al., 1996). The traditional focus in the study of perspective taking, then, has been on how people intuit others' thoughts or experiences. Our focus is related, but conceptually distinct. Our research examines the next step in this social cognition process. We investigate how people use what they do know about another's beliefs or knowledge to interpret his or her actions, investigating how people spontaneously *use* their "theory of mind" rather than how they *intuit* others' perspectives.

Using a theory of mind: beyond active perspective taking

Having a theory of mind is crucial for social functioning because it enables people to anticipate and interpret others' actions based on what is known about another's beliefs, attitudes, or knowledge (Perner, 1991; Wellman et al., 2001). Because behavior, such as spoken language, is often ambiguous, it is critical to consider another's mental states in order to interpret their actions. Saying that a math question is "easy," for instance, is likely to mean very different things coming from a physics professor than from a preschooler. And hearing that one's hair looks "fantastic" should be understood very differently coming from one's sarcastic roommate than from one's loving mother. A fully developed theory of mind is precisely the tool that enables people to use their knowledge of others' beliefs, attitudes, and intentions to interpret their otherwise ambiguous actions.

We argue that when interpreting others' actions, the reflexive default is to rely on one's own beliefs and mental states, and that effortful attention is required in order to use what is known about others' beliefs. People's reflexive interpretations of others' actions are therefore likely to be based on one's own beliefs rather than on those attributed to the actor, and in that sense are reflexively insensitive or "blind" to another person's mind. Overcoming this egocentric default in order to use one's theory of mind should therefore require effortful attention and rely on working memory resources. We report two experiments that test this hypothesis.

These experiments used a version of the referential communication task where a "director" gives instructions to a participant (Keysar, Barr, Balin, & Brauner, 2000; Keysar, Lin, & Barr, 2003; Krauss & Glucksberg, 1969). The participant and the director sat across the table from each other, with several objects arranged in a grid of boxes between them. Some of the objects were mutually visible, whereas others were visible only to the participant. Participants were therefore aware that the director did not know about certain objects. For instance, the participants saw two glasses. One glass was mutually visible, and one was occluded for the director. On critical trials, the director instructed the participant to move an object, but the instructions could also occasionally apply to a hidden object. For instance, the director would say "move the glass up one slot" referring to the mutually visible glass. If the participants use knowledge about the director's perspective to interpret what she said, then they will identify the mutually visible glass as the target. If they interpret "the glass" egocentrically, the expression would be ambiguous because the participant can see two glasses. Participants would then have to resolve the ambiguity by using their theory of mind to consider the director's beliefs.

Earlier studies with this task showed that even when people know what the director knows, they still interpret at least some of the instructions egocentrically (Epley, Morewedge, et al., 2004; Keysar et al., 2003). Here we propose that overcoming an egocentric interpretation to use what is known about the director's beliefs requires effortful mental resource. To test this, we examined whether performance would be impaired among people who have fewer attentional resources to expend (Experiment 1), and whether performance would be impaired when attentional resources were diminished by a concurrent processing task (Experiment 2).

Experiment 1: working memory

People vary in their working memory capacity (Just & Carpenter, 1992), with those high in capacity having more available resources to devote to attention-demanding processes than those lower in working memory capacity. If using theory of mind is an effortful process, then people with less working memory capacity should have more difficulty using it in the referential communication task than people with more working memory capacity.

Recall that directors, in the example just described, can see only one glass whereas participants can also see another glass occluded from the director's perspective. When the director says move "the glass," participants must use what they know about what objects are known to the director to find the target glass. We compared this condition to a baseline condition in which the hidden object was not a potential competitor. For instance, we used a ball instead of a glass, in which case participants need not utilize the director's knowledge in order to find the target glass. The difference in the time required to find the target object in these two conditions represents the time needed to apply one's theory of mind to interpret the instructions.

We tracked participants' eye movements as an online measure of how they interpret the director's instructions, and used the speed of those eye movements to measure the ease of finding the target (Tanenhaus, Spivey-Knowlton, Eberhard, & Sedivy, 1995). We defined the first eye fixation on the target as "noticing" it, and the final fixation on it before reaching as the "decision point." The lag between these two points in time is a "decision window," our main dependent variable. A larger decision window reflects more difficulty finding the target on critical trials. If the *in-*

crease in the decision window compared to baseline trials is larger for those who are low in working memory, compared to those high in working memory, then this would suggest that using one's theory of mind relies on working memory resources.

Methods

Working memory pre-test

In order to identify participants with low and high working memory capacity, we recruited 110 native English-speaking University of Chicago undergraduates and asked them to complete the working memory measure (La Pointe & Engle, 1990). On each trial, participants saw a mathematical equation on the screen above a single syllable word. For example:

$(1 \times 2) - 8 = -6$
JAIL

Participants were to read the equation aloud when it appeared, verify its accuracy, and then read the word aloud. There were 42 equation–word pairs altogether. Half of the equations were correct and half were incorrect. These equation–word pairs were organized into groups of increasing size as the task proceeded, beginning with groups of two pairs each, then groups of three pairs each, then four pairs, and ending with groups of five pairs. Following each group, participants were asked to recall the words. Increasing the number of pairs in the group therefore increased the difficulty of recalling the words.

Recall ranged from 38% to 98% accuracy, showing large differences in working memory capacity. Following Cantor and Engle (1993) we selected low and high working memory individuals from the ends of the distribution. Participants at the bottom 20th percentile remembered 59% of the words or less and were selected as the low working memory capacity group ($N = 21$); participants at the top 20th percentile remembered at least 86% of the words and were selected as the high working memory capacity group ($N = 20$).

Participants

Of the 41 eligible students, 39 agreed to participate in the experiment. Data from seven participants could not be used due to poor calibration of the eye-tracker (6) or computer breakdown (1), leaving 32 participants in the final analysis (16 per group).

Materials

Participants played a communication game with a confederate "director." They used a 4×4 horizontal grid of boxes with either six or seven objects. All objects were visible to the participants, but five of the slots were occluded so that the director could not see the objects in those boxes. There were eight different sets of objects, with each set containing one target object. The target object appeared with a hidden competitor object on half of the trials ("competitor present" condition), and without a competitor on the other half ("competitor absent" condition). In the competitor absent condition, an unrelated "baseline" object occupied the occluded slot. The target was always visible to both the participant and the director, but the competitor (or the baseline object) was visible only to the participant. For instance, one of the target objects was a small toy mouse, and the competitor was a computer mouse. On this trial, the director said "move the mouse to the bottom left corner." Targets and competitors were counterbalanced, so the animal mouse was the target for half the participants and the computer mouse was the target for the other half. The occluded object in the baseline condition was not a referent of the critical phrase (i.e., a non-mouse). Target order was random, except that no more than two targets in the same condition appeared consecutively.

A SensoMotoric Instruments eye-tracker recorded the participants' eye movements. Each participant wore a helmet with a small camera lens and a magnetic head-tracker. The lens filmed the left eye, and the magnetic head-tracker provided information about head position. A computer integrated the eye and head measures to determine the gaze position. This integration provided a video image of the grid from the participant's point of view with a superimposed crosshair representing the participant's fixation (sampled at 30 Hz), and a computer file with the spatial coordinates of the fixations (sampled at 60 Hz). The eye-tracking equipment is designed so that it does not impair participants' natural movements.

Procedure

The experimenter appeared to assign the confederate and participant to roles at random, but in fact always assigned the confederate to the role of director. The experimenter explained that they would be playing a communication game in which the director would instruct the participant to move objects from one slot to another. For each set of objects, the director received a picture that showed the grid from her perspective, with the objects in new locations. The goal was to collaborate in re-arranging the grid so that the objects' final location corresponded to the picture.

The director was a trained confederate to ensure uniformity of the critical instructions across participants. The confederate did several things to lead participants into believing that she was a real participant who did not have any prior knowledge of the hidden objects. She arrived about 5 min after the participant, and feigned difficulty with the task by occasionally hesitating and making errors with non-critical objects. She improvised most of the instructions, except that instructions for the target objects were scripted. None of the participants suspected that the director was a confederate.

The experiment started with two practice rounds. The experimenter reiterated the instructions and stressed that the director did not know what was behind the occluded slots. In the second practice round, the pair switched roles and the participant played the role of the director, in order to make the director's lack of knowledge of the hidden objects absolutely clear to the participant. Then the experimenter placed the eye-tracker on the participant's head, calibrated the equipment, and began the experiment.

To create uniformity in the initial location of the eye gaze, the participant looked at the center of the array before receiving instructions. For each object, the director said "Ready?" to cue the participant to fixate on the center of the grid. When the participant confirmed, the director began the instructions to move the object. If the participant moved a hidden object, the director acted surprised, repeated the instruction, and said something to prompt a correction. For instance, "No, I couldn't see this brush."

Coding

We defined a temporal window of observation, starting at the noun phrase that identified the target (e.g., the "m" in "mouse"), and ending at the last fixation on the target right before reaching for it. When the participant did not fixate on the target object, the end of the window of observation was the initial touch of the target. We counted a fixation on an object if the eye gaze remained in its slot for at least 100 ms consecutively. A coder who was blind to the hypothesis coded video recordings for the end points of the window, and a computer program used the digital information of eye fixation coordinates to determine the values of the dependent measures.

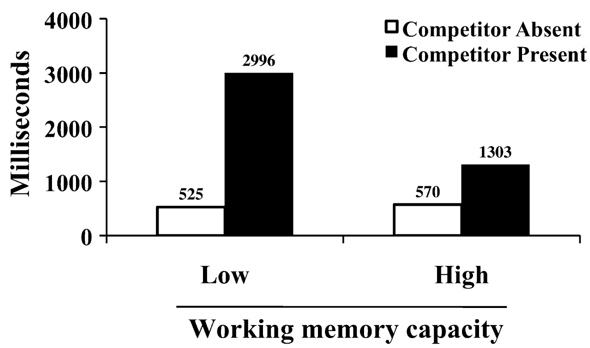

Fig. 1. Latency of decision window for the target as a function of working memory capacity and the presence of a competitor (Experiment 1).

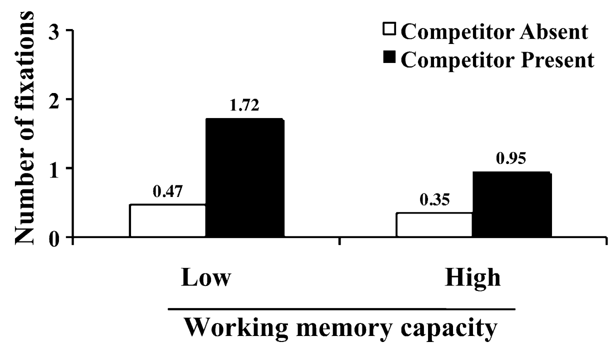

Fig. 2. Number of fixations on the competitor as a function of working memory capacity and presence of a competitor (Experiment 1).

Results and discussion

Our primary dependent measure was the decision window – the time difference between first noticing the target and finally reaching for it. Because participants were often confused when both the target and the competitor fit the instructions, we observed some relatively long decision windows. To keep these long latencies from inflating our effects, we truncated all decision windows at two SDs from the mean.

Fig. 1 shows the decision window for participants with high and low working memory capacity. As predicted, there was no difference in the decision window between those high versus low in working memory when the competitor was absent, $t(30) < 1$.[1] There was, however, a significant difference when the competitor was present, $t(30) = 2.56$, $p < 0.05$, $d = .93$. This pattern produced a significant interaction, $F(1, 30) = 7.41$, $p < .05$, $\eta^2 = .20$, demonstrating that the increase in the decision window between competitor present versus absent trials was larger for those with low working memory capacity ($M_{increase} = 2441$ ms) compared to those with high capacity ($M_{increase} = 736$ ms).

We also calculated the number of times participants gazed at the competitor. The more participants are using their theory of mind and considering the director's beliefs, the less they should consider the competitor object. These results mirror those from the decision window (see Fig. 2). There was no difference in the frequency of gazes between those high versus low in working memory capacity when the competitor was absent, $t(30) < 1$, but a significant difference when it was present, $t(30) = 2.49$, $p < 0.05$, $d = .91$. This pattern produced a significant interaction, $F(1, 30) = 4.425$, $p < 0.05$, $\eta^2 = .13$, demonstrating that the increased frequency of looking at the incorrect object in the competitor present versus absent trials was larger for those with low working memory capacity ($M_{increase} = 1.25$) compared to those with high capacity ($M_{increase} = .6$).

A final measure shows that those who are low in working memory capacity are not only slower when employing their theory of mind than those high in working memory capacity, but that they are also likely to make more mistakes when called upon to use it. Failing to successfully use one's theory of mind was evident when participants either asked for clarification (as in asking "which glass?"), or moved the competitor object. We combined these two measures into one index of theory of mind error. Indeed, 38% of participants low in working memory capacity made a mistake compared to only 18% of participants high in working memory capacity, $\chi^2 = 4.23$, $p < .05$. This shows that participants low in working memory capacity are more likely to fail to employ their theory of mind.

Working memory capacity selectively influenced the use of the actor's mental state to interpret his or her behavior. Without the competitor, when theory of mind was not necessary, working memory capacity did not impact the decision window. In addition, the ability to detect any matching referent from one's own perspective was not impacted by working memory capacity. On average, participants low in working memory capacity were not slower to fixate on a match than participants high in working memory capacity (*M*s = 1316 and 1333 ms, respectively), when the competitor was absent or present (all Fs < 1). Interpreting instructions from one's own perspective therefore does not vary with working memory resources. Our results, then, specifically represent the impact of working memory on the use of theory of mind.

Experiment 2: cognitive load

Experiment 1 investigated how naturally occurring variability in working memory is related to theory of mind use. Such individual differences in working memory, however, may co-vary with other factors that also influence theory of mind use, such as general intelligence. Experiment 2, therefore, sought convergent evidence by experimentally manipulating participants' ability to expend attentional resources, rather than simply measuring them.

We manipulated the availability of resources by adding a concurrent processing task to the experimental set-up in Experiment 1. While participants in Experiment 2 followed the director's instructions, the concurrent task induced high cognitive load on half the trials and low cognitive load on the other half. The high load condition taxes working memory capacity more than the low load condition (Logan, 1979). If theory of mind use depends on effortful attentional resources, then it should be impaired by high cognitive load.

Method

Participants

Forty native English-speaking undergraduates from the University of Chicago contributed data for the study. Following Gilbert and Hixon's (1991) criterion, we pre-set a minimum performance level on the secondary task of 50% recall. Six participants who performed below this level were replaced. In addition, we replaced six other participants due to poor calibration of the eye-tracking equipment (5), and computer breakdown (1).

Materials and procedure

The procedure was identical to Experiment 1, except for the working memory manipulation. Participants were asked to

[1] This is important because people look around and may randomly fixate on objects. The competitor absent condition captures this variation.

memorize numbers while performing each trial. They received a high load (memorize four two-digit numbers) on half of the items and low load (memorize one two-digit number) on the other half. This yielded a 2(competitor: present vs. absent) × 2(load: high vs. low) within-participants design.

At the beginning of each trial, the experimenter gave participants index cards with the numbers to memorize. A metronome paced them through the cards, prompting the participants to move to the next card every 2 s. The participants then followed instructions for objects in the grid just as in Experiment 1, while simultaneously trying to keep the numbers in mind. After each item, participants wrote down the numbers they remembered.

Results and discussion

Recall was nearly perfect in the low load condition (99%), and high in the high load condition as well (83%). Recall did not differ between the competitor absent and competitor present conditions in the high load condition (Means = 85% and 81%, respectively; $F < 1$).

We coded and truncated the data exactly as in Experiment 1. Fig. 3 shows that the pattern for the decision window latencies parallels the results from Experiment 1. Cognitive load had no influence on the decision window when the competitor was absent, $t(39) < 1$, but had a significant effect when the competitor was present, $t(39) = 2.12$, $p < 0.05$, $d = .67$. This produced a significant interaction, $F(1, 39) = 4.91$, $p < .05$, $\eta^2 = .11$, demonstrating that the increase in the decision window was larger in the high load condition ($M_{increase}$ = 2841 ms) than in the low load condition ($M_{increase}$ = 1482 ms). These results again demonstrate that using one's theory of mind depends on the availability of working memory resources.

The results for the frequency of gazes at the competitor again mirror those for the decision window (see Fig. 4). There was no difference between cognitive load conditions when the competitor was absent, $t(39) < 1$, but a significant difference when the competitor was present, $t(39) = 2.42$, $p < 0.05$, $d = .78$. This produced a significant interaction, $F(1, 39) = 7.91$, $p < 0.01$, $\eta^2 = .17$, demonstrating that the increase in the frequency of gazing at the competitor was larger under high load than under low load ($M_{increase}$ = 2.1 and 1.1, respectively).

Finally, participants were again not only slower to employ their theory of mind when under high cognitive load, but they also made somewhat more mistakes when under high vs. low cognitive load (*Ms* = 47% and 34%, respectively, Wilcoxon test, $p = .1$). The difference in error rates is not as large as in Experiment 1, but it again suggests that reducing a person's attentional resources may also impair their ability to employ their theory of mind altogether.

As in Experiment 1, the availability of resources selectively influenced theory of mind use, rather than influencing performance in general. When the competitor was absent, cognitive load did not impact the decision window. In addition, the ability to detect any matching referent from one's own perspective was not impacted by cognitive load. On average, participants under high cognitive load were not slower to fixate on a match than participants under low cognitive load (*Ms* = 1205 and 1270, respectively), regardless of whether the competitor was absent or present (all *F*s < 1). Our results, again, reflect the specific impact of working memory on theory of mind use.

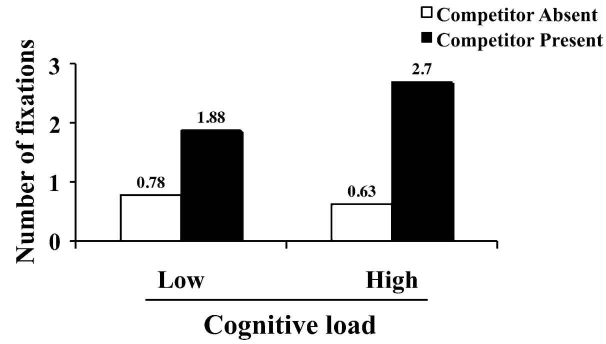

Fig. 4. Number of fixations on the competitor as a function of cognitive load and presence of a competitor (Experiment 2).

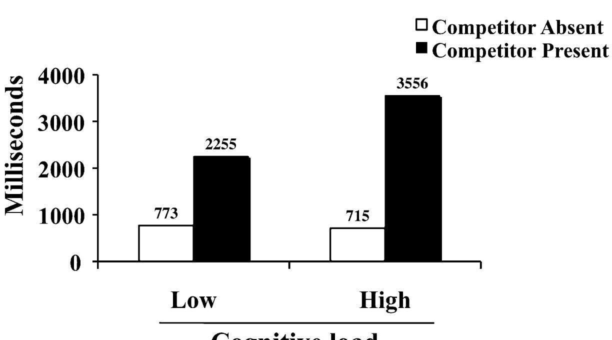

Fig. 3. Latency of decision window for the target as a function of cognitive load and presence of a competitor (Experiment 2).

General discussion

The ability to reason about others' mental states appears to be the mental capacity that makes humans uniquely intelligent (Herrmann et al., 2007). Possessing a capacity and actually using it to interpret social action, however, are two different things. Two experiments demonstrated that people's ability to use their theory of mind depended on their capacity to expend effortful attentional resources, in particular on their working memory. In Experiment 1, people with low working memory capacity had more difficulty applying their theory of mind to understand a speaker's instructions. In Experiment 2, people had more difficulty using their theory of mind when external demands taxed their working memory. Together, such findings demonstrate that using one's theory of mind requires effortful attention.

People need not always employ their theory of mind to understand others' behavior. In general, the more information a person shares with the actor, the less they need to consult their understanding of the actor's beliefs and instead can egocentrically use their own private mental states. In cases where information is perfectly shared, such egocentric defaults will be accurate. This is illustrated in our experiments in the competitor absent condition. When the only relevant object is mutually visible, a person can simply interpret the behavior of the director by considering information that is available from their own perspective, without consulting their theory of mind. Participants need not consider the director's mental state when instructed to move "the glass" if there is only one glass. Consulting one's theory of mind becomes necessary when people possess private information, and their own knowledge differs from others' knowledge (Dennett, 1978; Wimmer & Perner, 1983). Knowing who knows what is critical in such occasions. Our research shows that it also requires expending effortful resources.

Our findings converge with existing evidence that suggest that the use of theory of mind is effortful. Where our experiments focused on how people interpret what others say, studies investigating how speakers tailor what they say to their audience show a similar pattern (Horton & Keysar, 1996; Roßnagel, 2000). For instance, Roßnagel showed that speakers are less sensitive to an audience's informational needs when they are under cognitive load, suggesting that taking the perspective of an addressee is effortful. Another finding suggests that use of theory of mind gradually improves with age. In one experiment with the communication task we used here, children and adults tended to look with equal speed at an object suggested by an egocentric interpretation, but adults were faster to correct that interpretation and identify the intended target (Epley, Morewedge, et al., 2004). Such improvement in correcting an egocentric interpretation appears only in late adolescence (Dumontheil, Apperly, & Blakemore, 2009). Taken together, these findings suggest that while the use of theory of mind improves over time, it still requires substantial effort even for mature adults.

Before age four, children confound what they know with what others know. If they know where a piece of candy is hidden, they will believe that an uninformed other will know that as well. They have difficulty representing the fact that the other has a false belief, hence they fail the "false belief task". Four-year-olds begin to recognize that others' beliefs can differ from their own (Perner, 1991; Wellman et al., 2001; Wimmer, Hogrefe, & Perner, 1988). Yet even adults fail versions of the false belief task that are a bit more complex (Birch & Bloom, 2007), or when they are cognitively taxed (McKinnon & Moscovitch, 2007; Newton & de Villiers, 2007). Adults who fail these false belief tasks more routinely, such as those diagnosed with autism or Asperger's Syndrome, have been described as "mindblind" for their general failure to consider others' mental states in social interaction (Baron-Cohen, 1995). Here we showed that otherwise typically-developing adults who have perfect understanding of the other person's beliefs may be just as mindblind when they are cognitively busy, especially in their immediate and reflexive interpretations. Failing to consider another's thoughts to interpret their actions need not be taken as evidence of a deficiency in one's theory of mind, but may rather reflect general difficulties inherent in employing any effortful mental process.

Possessing a theory of mind is crucial for effective social functioning, but this does not mean that people automatically employ this capacity. Although it appears that people interpret others' mental states relatively effortlessly, what people do reflexively is use their own mental states. Using one's knowledge of another person's beliefs and mental states requires effortful attention. When attentional capacity is either chronically limited or momentarily constrained, a person is likely to interpret another's actions by relying on what is on his or her own mind, rather than what is on the others' mind.

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