Infants' false belief understanding: A non-replication of the helping task

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ABSTRACT

False belief understanding in infancy can be measured through helping tasks. However, there has been controversy surrounding the interpretation of such data. In order to better understand the nature of infants' false belief understanding, replication of the original findings is critical. The objective of the present study was to conduct a conceptual replication of the helping task designed by Buttelmann, Carpenter, and Tomasello (2009). In Experiment 1, 41 18-month-olds were tested using the false belief task. A larger sample (n = 97) was tested in Experiment 2 with this task in order to increase statistical power. Additionally, 33 infants were tested on a true belief task. Results from both experiments failed to replicate those from the original study. The discussion addresses the potential reasons for this lack of replication, as well as the implication of these findings regarding the debate on the interpretation of infants' behavior in this prompted-action task.

1. Introduction

Theory of mind is defined as the ability to explain and predict others' behaviour by attributing beliefs, knowledge, intentions, and desires (Wellman, 2014). Much of the research on children's theory of mind has been on false belief understanding, which refers to the process of recognizing that others may have beliefs that are different from reality (Schneider, Slaughter, & Dux, 2015). Although early research suggested that children pass a false belief task only by the age of five (Wellman, Cross, & Watson, 2001), research conducted over the last decade has provided evidence for false belief understanding in infancy (see reviews by Baillargeon, Scott, & He, 2010; Sodian, 2011).

Understanding of false belief in infancy has mainly been demonstrated with violation of expectation and anticipatory looking paradigms (also known as spontaneous-response tasks), which are tasks based on infants' spontaneous looking responses, as opposed to prompted verbal responses (Baillargeon et al., 2010; Yott & Poulin-Dubois, 2016). These paradigms measure implicit false belief understanding, in which "implicit" refers to a spontaneous, non-elicited behaviour that does not require selecting a response or holding information in working memory (Baillargeon, Scott, & Bian, 2016). In an implicit false belief task, demands are minimal, which allow infants to demonstrate their competence with minimal language and executive function skills (Baillargeon et al., 2010). In contrast, explicit (also known as elicited-response) false belief tasks refer to tasks that require verbal answers regarding the informant's false belief (Baillargeon et al., 2010). Previous research has found that both children and adults have implicit and explicit false belief understanding, whereas infants only have implicit false belief understanding (Apperly and Butterfill, 2009). According to Apperly and Butterfill (2009), the development of implicit and explicit theory of mind is independent from one another. Specifically,

they argue that there are two systems to belief reasoning: one efficient system which is automatic, fast, and does not require much cognitive abilities (i.e., implicit) and one flexible system which is slow and does require language and executive function abilities (i.e., explicit). Implicit false belief is presumed to develop in infancy (e.g., Kovács, Téglás, & Endress, 2010; Onishi & Baillargeon, 2005) and remains stable across the lifespan (Apperly & Butterfill, 2009). In contrast, explicit false belief is presumed to develop later than implicit false belief, at approximately four years of age (Baillargeon et al., 2010).

Although implicit false belief tasks are frequently used in infancy, the rich interpretation of infant's behaviors in these tasks is currently a topic of debate (e.g., Heyes, 2014; Ruffman, 2014), and low pass rates as well as recent failures to replicate the original findings suggest a lack of robustness (Burnside, Ruel, Azar, & Poulin-Dubois, 2017; Dörrenberg, Rakoczy, & Liszkowski, 2017; Kulke & Rakoczy, 2017; Poulin-Dubois, Polonia, & Yott, 2013; Poulin-Dubois & Yott, 2017; Sodian et al., 2016; Thoermer et al., 2012; Yott & Poulin-Dubois, 2016). The criticisms against the VOE paradigm have led researchers to develop interactive tasks, also known as helping paradigms (Buttelmann, Carpenter, & Tomasello, 2009; Buttelmann, Over, Carpenter, & Tomasello, 2014; Knudsen & Liszkowski, 2012a; Knudsen & Liszkowski, 2012b; Southgate, Chevallier, & Csibra, 2010). The classic procedure involves having the child help the experimenter by informing (i.e., pointing) or retrieving an object for him/her, which requires the child to understand that the experimenter has a false belief about the location of the object (Poulin-Dubois & Yott, 2017). According to Baillargeon and colleagues (2015), the helping task is a hybrid between spontaneous- and elicited-response tasks, as a response selection is required, but no response inhibition is needed. Thus, there are fewer processing demands than explicit, elicited-response tasks, but more processing demands than implicit, spontaneous-response tasks, such as VOE paradigms.

Buttelmann and colleagues (2009) were the first to develop an active behavioural measure based on helping to assess infants' understanding of false and true belief. In this study, children were randomly assigned to a true belief or false belief condition. In both conditions, children observed an experimenter switch the location of a toy from one box to the other. Another experimenter (the protagonist) observed this switch in the true belief condition, whereas he did not in the false belief condition. Following the switch, the protagonist attempted but failed to open the box in which the toy was originally placed. Children in the true belief condition were expected to help the experimenter open the empty box, as they should have inferred that the experimenter did not try to open the empty box to retrieve the toy as he observed the toy being moved. In contrast, children in the false belief condition were expected to open the box where the toy was presently located in order to retrieve it for the experimenter. This behaviour would be aligned with children's understanding that the experimenter had a false belief about the location of the toy and inferred that the experimenter wanted to retrieve it from the location he thought the toy remained. The authors demonstrated that 75% of 2.5-year-olds correctly opened the empty box the experimenter had tried to open in the true belief condition, whereas 83.3% of the children correctly opened the box containing the toy in the false belief condition. These results were successfully replicated in a second experiment with 18-month-olds, demonstrating a pass rate of 84% in the true belief condition and 72% in the false belief condition. Although similar results were obtained for the 16-month-old group, infants' performance in the true belief condition was not above chance. Of importance is the exceptionally high attrition rate in this study (54%). Specifically, 119 of the 16- and 18-month-olds were excluded from the analyses, resulting in a final sample of 50 infants in each group.

In addition to the high attrition rate, other criticisms have been raised regarding Buttelmann and colleagues' (2009) false belief task. One argument is that children may not be using the experimenter's false belief to decide which box to open, but may simply be influenced by the broader social situation (i.e., playing a trick on the experimenter) (Allen, 2015). In other words, playing a trick on the experimenter by hiding the toy makes the toy more salient and therefore increases the children's expectancy that the experimenter will search for his toy (Allen, 2015). This trickery only occurs in the false belief condition, making it an important difference across conditions (Allen, 2015). In Buttelmann and colleagues' (2009) study, it was noted that before E2 tried to open the box that originally had his toy inside, approximately seven participants attempted to inform the experimenter (e.g., by pointing) that the toy was no longer in the original box, whereas only one child attempted to inform the experimenter of this in the true belief condition (Allen, 2015). Children should not have been able to infer the experimenter's goal since he had not yet tried to open the box where he had initially place his toy. Therefore, Allen (2015) concluded that there must be an additional variable, such as the social situation of playing a trick on the experimenter, which led children to assume that the experimenter wanted his toy. In fact, Allen (2015) investigated preschoolers' helping behaviour with the Buttelmann and colleagues' false belief task, and included two control conditions that involved no opportunity to play a trick on the experimenter. The results demonstrated that the preschoolers did not use the experimenter's false belief in order to help, but instead used the broader social situation. In agreement, Perner (2014) argued that the conspiratorial context of the false belief condition relates to hide and seek, which could explain why infants try to help the experimenter find his toy. In a hide and seek game, children expect individuals to initially look in the wrong location before finding the person, and they enjoy providing hints as to where the hidden person is located (Perner, 2014). Taken together, researchers have argued that children's responses on an interactive false belief task could be driven by social context (i.e., playing a trick, hide and side), and not necessarily by children's ability to understand others' mental states.

Furthermore, Priewasser, Rafetseder, Gargitter, and Perner (2017) have suggested an alternative explanation from a teleological perspective. First, a strict replication of Buttelmann and colleagues' false and true belief tasks was conducted in Study 1. Although the researchers could not replicate the true belief task (helping E2 to open the empty box), they replicated the original pattern of responses for the false belief task (helping E2 open the box with the toy) as well as a significant difference in the box opened across the false and true belief conditions. In Study 2, an alternative interpretation to Buttelmann and colleagues' findings was tested by introducing a third box in the false and true belief task to test the teleological interpretation. The new false belief condition was identical to the original condition except that E2 tried to open this third, empty box, instead of trying to open the box where the toy was before the transfer. In the false belief condition, the authors hypothesized that infants would recognize that E2 was interested and emotionally engaged with the toy. Therefore, according to a teleological view, when E2 tries to open the third box, infants should