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Children's difficulty with true belief tasks: Competence deficit or performance problem?

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ABSTRACT

According to the standard picture of explicit theory of mind (ToM) development, children begin to (explicitly) ascribe beliefs to others and themselves from around age 4. The empirical basis of this picture comes from numerous studies consistently showing that children master verbal false belief (FB) tasks from around age 4 while children much younger have no difficulty in mastering structurally analogous true belief (TB) tasks. The standard picture, though, has come under serious attack from recent studies using TB tasks with wider age ranges. These studies have found that, paradoxically, children begin to fail TB tasks once they master FB tasks. Such findings cast doubt on the standard picture and suggest, instead, that FB tasks may be solved by much simpler strategies than proper belief reasoning. In the present study, we tested for the development of FB and TB performance in comprehensive and systematic ways. In particular, we tested the competing predictions of competence accounts (according to which TB failure reflects lack of conceptual competence) versus performance limitation accounts (according to which the standard picture is true yet children from around age 4 fail TB tasks due to performance factors). Studies 1 and 2 showed that performance in a variety of novel TB tasks showed a clear U-shaped curve, with children until age 3 and from age 10 performing competently and children in between failing, with strong negative correlations between TB and FB. Crucially, these patterns were found for various kinds of TB tasks, including those for which existing competence limitation accounts would not even predict any difficulty. Study 3, therefore, directly tested performance limitation accounts in terms of pragmatic and related factors and found that these patterns (failure in TB and negative TB-FB correlations) disappear once the relevant performance factors have been removed from the TB tasks. Taken together, these findings suggest that previous TB findings constitute false negatives, clearly speak for performance limitation accounts and thus corroborate the standard picture of the development of explicit theory of mind.

1. Introduction

The social-cognitive capacity to ascribe mental states to others and ourselves, also known as Theory of Mind (ToM) is crucial to almost all aspect of our social lives. Concerning its measurement, false belief (FB) tasks have emerged as the developmental litmus tests for tapping basic ToM (Wimmer & Perner, 1983; for an overview see Wellman, Cross, & Watson, 2001). Such tasks require the prediction or explanation of an agent's rational action on the basis of her outdated or otherwise mistaken beliefs. Empirically, hundreds of studies have consistently shown that children younger than 4-years systematically fail FB tasks (while they do not have problems in passing analogous true belief control tasks) whereas children older than 4 years systematically pass. These converging results have standardly been interpreted as indicating a deep conceptual change or even revolution around age 4 (Perner, 1991).

This standard interpretation of a conceptual 4-year-revolution, however, has recently come under serious attack from different directions (see Rakoczy, 2015). On the one hand, much new research with implicit tasks (showing sensitivity to other agents' belief in looking time and interactive measures) has been taken to suggest that toddlers' incompetence may constitute false negatives (e.g. Buttelmann, Carpenter, & Tomasello, 2009; Onishi & Baillargeon, 2005; Southgate, Chevallier, & Csibra, 2010; Southgate, Senju, & Csibra, 2007; Surian, Caldi, & Sperber, 2007; for review see Baillargeon, Scott, & Bian, 2016; Baillargeon, Scott, & He, 2010; Baillargeon et al., 2015).

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1.1. Do 4-year-olds really operate with a concept of belief? Skeptical concerns

From the opposite direction it has been argued that children's passing of standard FB tasks from around age 4 may actually constitute false positives and massively over-estimate children's ToM competence. It is this attack on the standard interpretation that will be the focus of the present paper.

A number of recent empirical findings constitute the empirical basis of this line of attack. One set of such findings suggests that children, when they master standard FB tasks, still do not understand a fundamental feature of beliefs and thus cannot properly be said to ascribe any beliefs at all: beliefs and other propositional attitudes are essentially aspectual, that is they only hold under certain aspects and not under others (Frege, 1980 [1892]; Searle, 1983; for an overview see McKay & Nelson, 2014). An agent may believe, for example, that Clark Kent is at home without thereby believing that Superman (in fact identical to Clark Kent) is at home. Yet many studies have suggested that children up to 6–8 years of age fail to respect this aspectuality in their belief ascriptions (Apperly & Robinson, 1998; Kamawar & Olson, 1999; Kamawar & Olson, 2009; Kamawar & Olson, 2011; Russell, 1987; Sprung, Perner, & Mitchell, 2007). For example, in one kind of scenario, children were presented with an obvious eraser in box 1, and a dice that was also non-obviously an eraser in box 2, and an agent who was unaware of the hidden identity of the dice. When asked where the agent would look for an eraser (correct answer: "box 1"), children failed to take into account the aspectuality of the agent's beliefs and answered incorrectly, indifferently or "both" (Apperly & Robinson, 1998). Recent work, however, suggests that once they are suitably modified and simplified, even 4-year-olds master such aspectuality tasks (Rakoczy, Fizke, Bergfeld, & Schwarz, 2015 see below).

A second set of findings that suggest that FB tasks may overestimate children's competence comes from true belief control tasks. In standard FB studies, true belief (TB) conditions, in which everything is more or less like in FB conditions with the exception that the protagonist is not mistaken, usually serve as mere baseline measures with younger children to rule out that they fail FB tasks because they somehow cannot cope with the narrative task structure. Standardly, 3-year-olds indeed have no problems in mastering TB tasks while systematically failing FB tasks. However, TB control tasks have rarely been used with older children who have come to master FB tasks – based on the background assumption that children master explicit TB tasks from early on and continue to do so but only come to master FB tasks around age 4 when they acquire true meta-representational capacities (e.g. Perner, 1991).

1.2. Older children's failure in true belief tasks

However, some recent research has used FB and TB tasks with wider age ranges and has produced surprising patterns of findings. Some of these studies have used change-of-location TB tasks matched to the standard change-of-location ("Maxi"/"Sally-Anne") FB tasks (Wimmer & Perner, 1983). In the TB versions, the protagonist failed to witness some relevant events, but luckily ended up having a true belief. For example, she put object O in box 1 and left. Her sister then removed O and thought about putting it into box 1 or box 2, finally deciding for box 1. Then the protagonist came back and the test question was where she believed O was/where she was going to search for O (Fabricius, Boyer, Weimer, & Carroll, 2010). These scenarios thus present something similar to what is known in philosophical epistemology as "Gettier cases" (after Gettier, 1963): cases where an agent has a justified true belief (that O is in box 1), in which, however, we would be hesitant to attribute to her knowledge of the fact in question, simply because her belief has not the right kind of history (she failed to witness too many crucial steps). Empirically, the results with these kinds of TB and FB tasks have produced striking findings: 3-year-olds passed TB and failed FB tasks, 4- to 6-year-olds showed the reverse pattern, and only children from age 6 passed both FB and TB tasks (Fabricius et al., 2010). Another recent set of studies has used FB and TB versions of aspectual belief tasks with a similar age range and has found similar patterns of performance between the ages of 3 and 6 (Perner, Huemer, & Leahy, 2015).

1.3. Failure in true belief tasks: Competence or performance limitation?

What do these patterns of findings in TB tasks show? In general, there are two potential kinds of explanations: Performance accounts assume that negative results in TB tasks present false negatives that do not reflect a lack of competence, but merely some performance limitation due to extraneous factors. Competence accounts, in contrast, claim that these negative results do reflect limitations of conceptual (meta-representational) competence. If they were true, competence accounts would have far-reaching implications. In particular, they would put into question the standard assumption that children acquire true meta-representational capacities by age 4.

1.3.1. Competence limitation I: Perceptual Access Reasoning

One competence account, the so called *Perceptual Access Reasoning* (PAR) account assumes that the patterns of FB and TB findings show that children before age 6 do not use proper belief ascription but simpler conceptual strategies (Fabricius et al., 2010; Hedger & Fabricius, 2011; Recanati, 2012; Westra & Carruthers, 2016). Children's reasoning in FB/TB tasks, according to this account, undergoes three stages. In the first stage, before age 4, children use merely reality-based reasoning (agents search objects were they are) and thus pass TB while failing FB. In the second stage, between ages 4 and 6, children use so-called Perceptual Access Reasoning (PAR) according to which agents with full perceptual access to a situation get things right and agents lacking full perceptual access get things wrong. This strategy leads to correct performance in FB tasks. However, in TB tasks with Gettier-like cases such as the ones used by Fabricius et al. (2010) mentioned above, in which the agents fails to witness some crucial event and luckily ends up with a true belief, this strategy yields wrong answers. It is only in the third stage, from around age 6, that children then use belief reasoning proper, resulting in competent TB and FB performance. This specific account thus would predict U-shaped development in performance on a specific class of TB tasks, namely those in which the protagonist ends up with a TB despite limited perceptual access to a crucial step in the course of events.

1.3.2. Competence limitation II: Immature Mental File Card architecture

Another competence account predicts a similar U-shaped curve for TB performance, yet from a very different theoretical point of view, and for a different sub-class of TB tasks. The so-called *Mental File Card Account* by Perner and colleagues (Perner & Leahy, 2015; Perner et al., 2015) presents a formal theory of the sub-personal underpinnings of ToM reasoning with the help of the machinery of mental files (Recanati, 2012). The basic assumption is that representation of individuals in the world is realized via object files – representational structures that individuate referents (e.g. "Clark Kent") and that can include predicative information (e.g. "lives in a terraced house"). In discourse and thought, once a new object is encountered, a new object file is opened. Children operate with such basic object files from very early on in ontogeny, as can be seen, for example, in their object individuation and numerical