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Don't Mention the Marble! The Role of Attentional Processes in False-Belief Tasks

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Abstract In the last 30 years, the key issue in developmental Theory of Mind has been if and when children are capable of representing false beliefs. Moving away from this research question, the aim of this study was to investigate the role of attentional processes in false-belief tasks. We focused on the design of the test phase and investigated two factors that may be critical for 3-year-old children's success: the form of the wh-question and the salience of the target object. The results of two experiments confirmed that 3-year olds are able to explicitly choose the correct answer in a false-belief task provided that they are allowed to focus on the protagonist throughout the task. The salience of the target object, however, was a critical factor in the design of the test phase, as increasing it had a negative effect on children's performance. These results suggest that the experimental record of the last 30 years may be skewed since standard false-belief tasks do not control for the relative salience of the wrong response, potentially hindering the performance of children under 4. We conclude that a careful investigation of performance factors in false-belief tasks has the potential to reveal deep insights into the development of Theory of Mind skills, even if not directly focused on children's representation of beliefs.

1 Introduction

When Sally comes back, where will she look for her marble? This is probably one of the most famous test questions in cognitive psychology, and certainly the one that has received the most attention in developmental psychology over the past 30 years. In the classic Sally-Anne task, Sally puts her marble in a box before going out to play. In her absence, Anne moves the marble to a basket, setting the scene for the famous false-belief (FB) question (Baron-Cohen et al. 1985). Despite the innumerable modifications

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that were made to the original task as designed by Wimmer and Perner (1983), the main pattern of results remained unchanged in hundreds of Theory of Mind studies: the large majority of children were not able to pass the FB task before their 4th birthday, with younger children predicting that Sally would look for her marble in its current location rather than in the container where she left it (Wellman et al. 2001).

The last 30 years of Theory of Mind research have mainly focused on the question of whether children younger than 4 years can understand false beliefs, despite their inability to pass FB tasks. Moving away from the main research question in the field, the aim of this paper was to investigate the role of attentional processes in 3-year olds' performance in FB tasks, independently of their capacity to represent other people's beliefs. We report a study that tested the hypothesis that the form of the FB question may be critical for 3-year olds' success in a change-of-location task; more specifically, the form of the wh-question and the salience of the wrong response.

2 General Beliefs About FB Tasks

Wellman et al.'s (2001) extensive meta-analysis indicated that the form of the FB question does not have a reliable effect on young children's performance. Children under 4 years performed significantly below chance level in change-of-location tasks regardless of whether the FB question was 'Where will Sally look for her marble?', 'Where does Sally think the marble is?' or some other alternative formulation. Asking children where Sally will look *first* improved performance in some age groups, but not across the board (Siegal and Beattie 1991; Yazdi et al. 2006). Given the results of Wellman et al.'s meta-analysis, the wording of the FB question has not been a focus of research in recent years, with a few exceptions (Abu-Akel and Bailey 2001; Hansen 2010; Lewis et al. 2012).

The systematic results of the change-of-location FB task have been interpreted as evidence that 3-year-old children either do not yet have the capacity to mentally represent other people's beliefs (e.g., Perner and Roessler 2012), or lack the necessary executive control to inhibit the wrong response to the test question (e.g., Baillargeon et al. 2010). The question of whether passing FB tasks necessarily requires representing other people's beliefs has only been an issue when discussing the non-verbal tasks that more recently have been used to test Theory of Mind in infants (e.g., Onishi and Baillargeon 2005), which have been argued to require only behavioural rules (e.g., Perner and Ruffman 2005) or domain-general processes in terms of low-level novelty (Heyes 2014). It should be noted, however, that the standard FB question, 'Where will Sally look for her marble?', *can* be correctly answered in purely behavioural terms, even by adults with a mature concept of belief: 'Sally will look for her marble where she put it' or 'She will look where she last saw it'. By contrast, a correct response to the FB question, 'Where does Sally think the marble is?', requires understanding the meaning and syntax of the verb 'to think', which does involve a relatively sophisticated understanding of propositional attitudes (de Villiers 2005). These observations raise the issue of why 3-year olds do not perform better with the 'look for' version of the FB question than with the 'think' version. This issue has not been previously addressed, yet it needs to be explained given the obviously different cognitive demands that the two FB questions pose.

The fact that it is generally taken for granted that children need to mentally represent the protagonist's false belief in order to pass the 'look for' question highlights a deeply engrained assumption in the Theory of Mind literature of the last 30 years: since FB tasks were originally designed to test children's capacity to mentally represent other people's beliefs, failing such tasks must reveal either a conceptual or a maturational deficit closely related to Theory of Mind development (e.g., Carlson and Moses 2001).

We have recently challenged this assumption, hypothesizing that 3-year olds' performance in change-of-location FB tasks is negatively affected by design features that are extrinsic to Theory of Mind development (Rubio-Fernández and Geurts 2013). In contrast to Baillargeon et al. (2010), our approach does not presuppose that 3-year olds understand false beliefs but FB tasks are ill-suited for tapping that capacity. Rather, our investigation focused on 'perspective tracking', broadly understood as an ability to form expectations about other people's actions on the basis of observations of their behaviour. At what age and in what situations this ability involves the mental representation of other people's beliefs is beyond the scope of our research. We therefore remain uncommitted as to whether 3-year olds possess a concept of belief and whether or not such a concept is required for passing all versions of the FB task.

The only assumption that we make in our investigation of 3-year olds' FB reasoning is that perspective tracking is a continuous process that requires focusing on an agent and is therefore dependent on attentional resources. This dependence on attentional resources makes perspective tracking susceptible to disruption by task manipulations, both in children (Rubio-Fernández and Geurts 2013) and in adults (Rubio-Fernández 2013, 2015). However, while we defend that focusing on an agent is a necessary condition for successful perspective tracking, we are not claiming that it is a sufficient condition. It might turn out that future FB studies will show that, in addition to focusing on the protagonist during a course of events, 3-year olds must also mentally represent the protagonist's false belief in order to pass a change-of-location task. However, such an investigation is beyond the scope of the present study, which focused, exclusively, on the role of attentional processes in 3-year olds' performance in change-of-location FB tasks.

3 Challenging the Received View: the Duplo Task

The results of Rubio-Fernández and Geurts (2013) have recently challenged the general consensus in the Theory of Mind literature that children under 4 are not able to pass a standard FB task: 3-year olds proved to be able to pass the 'Duplo task' with an unprecedented success rate of 80 %. The protocol for the Duplo task was a variation on the Sally-Anne task. The experimenter used a set of Duplo toys (i.e., large Lego toys for small children) that she had on a table: a girl figure, a bunch of bananas, and two little cupboards. As in the standard task, the Duplo girl puts her bananas in one of the containers and leaves the scene. In the remaining of the task, only two sets of variations were introduced to the original paradigm, both intended to help the child stay focused on the Duplo girl's perspective.

The first set of variations was introduced in the displacement phase of the task. First, it was ensured that the child could see the Duplo girl throughout the session. Rather than making the figure disappear, as is standardly done in change-of-location tasks, the

experimenter made the Duplo girl walk in the direction of the child and turn her back on the scene. Also, rather than introducing a second character in the story, which might have resulted in the child losing track of the protagonist's perspective, it was the experimenter herself who moved the bananas from one cupboard to the other. Finally, before and after the experimenter moved the bananas, she checked with the child whether the Duplo girl could see the experimenter from where she was: 'Can the girl see me from where she is?' / 'She hasn't seen what I did, has she?' The aim of these prompts was to keep the child's attention focused on the Duplo girl during the displacement.

The second set of task variations was introduced in the test phase. When the experimenter returned the girl figure back to the centre of the scene, rather than asking the child the standard FB question, she placed the girl figure in front of the two cupboards and asked the child whether he would like to play with the girl now. The experimenter then encouraged the child to take the lead by saying: 'What happens next? What is the girl going to do now?'

The results of the study by Rubio-Fernández and Geurts (2013) suggested that both sets of variations were crucial for 3-year olds' success in the Duplo task, supporting the hypothesis that perspective tracking is a continuous process that is dependent on attentional resources and is therefore susceptible to disruption by task manipulations.

4 The Role of Attentional Processes in FB Tasks

Especially relevant to the role of attentional processes in verbal FB tasks is an eye-tracking study by Altmann and Kamide (2009), who used a blank-screen paradigm with adults and showed that different spatial representations of an object compete for attention during the processing of a narrative. For example, in a short story in which a woman picked up a wine glass from the floor and put it onto a table, participants' eye movements revealed that, once the screen had been blanked and the narrative continued, processing the expression 'the wine glass' caused the two locations previously occupied by the wine glass to compete for attention. Analogously, Altmann and Kamide (2009) and Rubio- Fernández (2013, 2015) have hypothesized that in a FB narrative, two spatial representations of the target object compete for attention during processing: the old location (corresponding with the protagonist's perspective) and the new location (corresponding with the participant's perspective).

In two FB studies with adults using continuous eye-tracking measures, Rubio-Fernández (2013, 2015) showed that as long as participants' attention was focused on the protagonist, they were able to anticipate her behaviour without suffering interference from their own perspective. However, when participants were momentarily distracted by a sudden disappearance of the two containers at the time when they had to anticipate the protagonist's actions, they showed an initial preference for the actual location of the object rather than for the empty container. We interpret these results as evidence that perspective tracking is dependent on attentional resources and can be disrupted by subtle task manipulations, even in adults.

The results of the second experiment by Rubio-Fernández and Geurts (2013) confirmed that disrupting the continuity of perspective tracking in 3-year olds is also detrimental to their performance. In the original version of the Duplo task, the

protagonist turned her back on the scene, remaining visible to the child throughout the story while the experimenter moved the target object. However, when the protagonist was made to leave the scene before the object was moved (as is standardly done in change-of-location FB tasks), 3-year-old children performed below chance level. The different results observed with these two versions of the Duplo task highlight the importance of preserving the continuity of perspective tracking in verbal FB tasks for young children.

5 The Effect of the FB Question in 3-Year olds' Performance

The results of the last experiment by Rubio-Fernández and Geurts (2013) challenged Wellman et al.'s (2001) claim that the form of the test question is not a critical performance factor in FB tasks: while 3-year olds were able to pass the Duplo task, their performance dropped below chance level when a standard FB question was asked at the end of the task. One of the critical manipulations in the Duplo task was the form of the test questions, which were open and did not mention the target object (i.e., 'What happens next? You can take the girl if you want… What is she going to do now?'). The point of using open questions was to avoid drawing children's attention towards the target object, and thus raising the salience of the wrong response.

It is striking that, during the test phase, FB tasks tend to make children focus on the target object rather than on the protagonist, sometimes using a battery of questions about the object (e.g., 'In the beginning, where did Sally put the marble? And where is the marble now? And where does Sally think the marble is?'; adapted from Friedman and Lesie 2004; Yazdi et al. 2006). This protocol seems particularly unsuitable for young children if we consider that Wellman et al.'s (2001) meta-analysis revealed that the relative salience of the target object in a change-of-location task is a critical performance factor for 3-year olds, who perform better when they are ignorant of the exact location of the target object. In our view, the child's focus of attention during the test phase is critical for young children's success in change-of-location FB tasks – in particular, whether their focus is on the object or on the protagonist.

Our approach is novel in so far as we do not take it for granted that children have a prepotent tendency to respond to the FB question according to their own knowledge (e.g., Carlson and Moses 2001; Friedeman and Leslie 2004; Baillargeon et al. 2010). Indeed, Rubio-Fernández (2015) has recently argued that the protagonist's disappearance from the scene (which may disrupt perspective tracking) and the mention of the target object in the test question (which increases the salience of the wrong response) might be directly related to the need for inhibition response in change-of-location FB tasks. Thus, if the child is allowed to focus on the protagonist throughout the narrative, the wrong response may not need to be actively inhibited since the protagonist's perspective on the location of the object may be more salient than the new location.

Since the 3-year olds who failed the Duplo task when they were asked the 'look for' question had been focusing on the protagonist throughout the narrative, the present study addressed the following question: Why does the standard FB question disrupt perspective tracking? None of the current accounts of Theory of Mind development offers a satisfactory response to this question. For example, as was recently pointed out

by Helming et al. (2014), there is no principled reason why the standard FB question, but not the open questions used in the Duplo task, should require inhibition of the true-belief (TB) response, which according to Baillargeon and colleagues overwhelms young children's processing capacity in standard FB tasks (Baillargeon et al. 2010; see also Carlson and Moses 2001).

Rubio-Fernández and Geurts (2013) hypothesized that, relative to the open questions used in the original Duplo task, the standard FB question might be too difficult for young children for three reasons: (a) it confronts children with a binary choice, (b) it draws children's attention to the target object, and (c) it requires a naming or pointing response (for other pragmatic analyses of FB questions, see Csibra and Southgate 2006; Hansen 2010; Lewis et al. 2012; Helming et al. 2014). In the study reported below, we investigated the potential effects of these factors using three variations on the Duplo task. Overall, the aim of the study was to investigate how young children's performance in change-of-location tasks may be affected by the formulation of the FB question, independently of Theory of Mind development.

6 Experiment 1

The first factor to be investigated was the form of the wh-question and the related issue of presenting children with a choice. In the context of a change-of-location task, children must choose between two containers in order to respond to a standard FB question (e.g., 'Where does Sally think the marble is?). This binary choice, however, is determined by the pragmatics of the wh-question, and not by the mention of the target object in the actual question. For example, asking the FB question 'Where will Sally go when she comes back?' would also present children with a choice of two locations in the same situational context. It is therefore possible to investigate the effect of the two factors separately; namely, the form of the wh-question and the mention of the target object.

In order to investigate the effect of the form of the wh-question on children's performance, 3-year olds were tested on the following version of the Duplo task: instead of prompting the child with the open questions 'What happens next? What is she going to do now?' the experimenter asked a where-question that confronted the child with a choice between the two containers but did not mention the target object (i.e., 'Where will Lola go now?' as Lola is standing in front of the two containers). From an attentional point of view, a where-question might be harder for young children than an open question because one of the two containers hides the object: if young children have to consider this alternative response, they might find that container more attractive than the empty one.

In her eye-tracking study with adults, Rubio-Fernández (2013) showed that when adult participants process the FB question, they tend momentarily to consider the alternative response (i.e., the actual location of the object) before responding to the question correctly. Crucially, this tendency was not observed in an indirect FB task that did not end the narrative with a question. Therefore, by presenting participants with a binary choice, the standard FB question draws

participants to considering the container that hides the object, thus potentially biasing young children towards the wrong response.

Another potential performance factor was the form of the children's response. Rubio-Fernández and Geurts (2013) argued that the FB question may be a pragmatically unnatural test because it is unclear why the experimenter suddenly starts questioning the child. It is for this reason that the design of the Duplo task was more interactive, using open prompts and encouraging the child to act-out the rest of the story. It is generally accepted in the developmental literature that act-out responses may improve young children's performance (Garnham and Perner 2001; Buttelmann et al. 2009; Southgate et al. 2010). All children in the present study were therefore encouraged to act out their responses.

6.1 Method

6.1.1 Participants

Forty-three children were recruited from a local nursery in Asturias, Spain. The nursery is part of a public primary school and serves middle-class families. The group consisted of 18 girls and 25 boys and their mean age was 3;7 (range: 3;3–4;0).

6.1.2 Design and Procedure

The FB tasks used in the present study were variations on the Duplo task used by Rubio-Fernández and Geurts (2013) and described in §3. The two variations used in Experiment 1 only differed from the original Duplo task in the design of the test phase. The Experimenter showed the child a set of Duplo toys that she had on a table: a girl figure called 'Lola', a bunch of bananas and two little cupboards, one with a blue door and one with a red door. The child was told that Lola loved bananas and had one every time she was hungry. This morning Lola had had a banana and wanted to return the remaining ones to the cupboard. At this point the Experimenter had Lola put the bananas into one of the two cupboards (counterbalanced between participants), and told the child that Lola wanted to go for a walk. Up to this point, the procedure was the same as in a standard FB task.

The Experimenter then had Lola walk towards the child and turn her back on the scene. Adopting a secretive stance, the Experimenter asked the child: 'Can Lola see me from where she is?' This was only a prompt: if the child did not answer, the Experimenter filled in, saying: 'She surely can't see me from over there'. Then the Experimenter moved the bananas from one cupboard to the other. At this point, the Experimenter turned to the child again, pointed at Lola, and asked in a low voice: 'Lola hasn't seen what I did, has she?' This, too, was merely a prompt: if the child did not answer, the Experimenter would say: 'No, she hasn't seen what happened!' Up to this point, the procedure and script were the same in all three FB conditions used in this study.

Choice condition once it had been established that Lola had not seen the Experimenter moving the bananas, the Experimenter returned Lola back to the centre of the scene, placed her in front of the two cupboards, facing the empty space in between, and asked

the child if he would like to take Lola and continue the story. The Experimenter encouraged the child to take the lead by asking 'Where will Lola go now?' The Experimenter made sure not to look to either container while inviting the child to continue the story.

TB control this condition was identical to the Choice condition, except that during the displacement phase of the narrative, Lola witnessed the Experimenter move the bananas from one cupboard to the other and the child was positively prompted about Lola seeing the events. The test question was the same as in the FB condition. This control condition served to confirm that when children took Lola to the empty cupboard in the Choice condition, they did so because Lola wanted to fetch her bananas.

Children were tested individually in a quiet area of their nursery by the first author, who coded their responses on-line. Hiding in the room was an uninformed observer, who was also a native speaker of Spanish and coded the children's responses simultaneously. Each session lasted approximately 10 min. Children were randomly allocated to the Choice condition or the TB control.

6.2 Results

The Experimenter and the observer coded the children's responses as follows: (a) child takes Lola to the empty container, (b) child takes Lola to the container with the bananas, or (c) child refuses to co-operate. In the last case, children either held the Duplo figure and refused to continue the story, or even refused to hold the Duplo figure. This type of responses was not included in the statistical analyses because there was not enough information to decide whether these children would pass or fail the task if they engaged with the Experimenter.

Inter-observer reliability was 100 %. Of the 21 children who participated in the Choice condition, 1 failed to co-operate. Of the remaining 20 children, 16 passed the task and 4 failed (80 % success rate). This performance is significantly above chance level ($p=.012$, two-choice Binomial test, two-tailed). Of the 21 children who participated in the TB control, 1 failed to co-operate. All of the remaining 20 children took Lola to the actual location of the bananas. This pattern of results supports the interpretation of the correct responses obtained in the Choice condition discussed above (i.e., that Lola was going back to the empty container to fetch her bananas).

6.2.1 Discussion

The results of Experiment 1 suggest that the form of the wh-question is not a critical factor in young children's performance in FB tasks: 3-year olds are able to perform significantly above chance in the Duplo task when they are asked a where-question that confronts them with a choice between the two containers. We can therefore dismiss the hypothesis that standard FB questions disrupt the process of perspective tracking because they present young children with a binary choice.

The results of the first experiment also contradict an alternative hypothesis recently put forward by Perner and Roessler (2012): namely, that young children fail change-of-location FB tasks because they only consider the protagonist's objective reasons (according to which she should go to the actual location of the object) but fail to consider the protagonist's subjective reasons (according to which she should go where she falsely believes her object is). If this hypothesis was correct, the 3-year olds in Experiment 1 should have responded according to Lola's objective reasons and failed the task. The fact that they did not suggests that the key factor in the formulation of the FB question may be the mention of the target object, as it potentially increases the salience of the wrong response. This hypothesis was investigated in the next experiment.

7 Experiment 2

The second factor that was investigated in this study was the salience of the target object during the test phase. We hypothesize that increasing the salience of the object in the test phase should make a FB task even harder than using a where-question because directly drawing the children's attention to the target object may prime the wrong response.

Experiment 2 included two FB conditions that tested two different features of standard FB questions which may increase the salience of the target object in the test phase. The Control Question condition investigated the effect of asking young children a question about the target object, independently from the protagonist's perspective. This condition aimed to test Rubio-Fernández and Geurts's (2013) hypothesis that asking children about the target object can disrupt their perspective tracking (see also Rubio-Fernández 2013), which has recently been referred to as a 'referential bias' (Helming et al. 2014).

In the Control Question condition 3-year-old children were asked a control question about the location of the target object ('Where are the bananas now?') before they were invited to continue acting out the story with open questions ('What happens next? You can take Lola if you want… What is Lola going to do now?'). Importantly, this and similar control questions have been frequently used in Theory of Mind studies and in fact, Wellman and colleagues used children's performance on such control questions as a screening criterion in their extensive meta-study (2001).

The second FB condition investigated the effect of making the protagonist's desire for the object explicit, as in the 'look for' version of the FB question. Suggesting that the protagonist wants to get the object is likely to interfere with the process of perspective tracking by drawing children's attention to the desired object. This hypothesis was tested in the Goal condition: just before 3-year-old children were asked the same open questions as in the original Duplo task, the Experimenter mentioned that the girl wanted to get the target object (i.e., 'Now Lola is very hungry and wants a banana. What happens next? You can take Lola if you want… What is Lola going to do now?').

Both FB conditions in Experiment 2 increased the salience of the target object in the test phase and hence potentially primed the wrong response. However, only the Control Question condition required children to respond to a question about the target object, making this condition potentially more disruptive than the Goal condition. Our

prediction, however, is that drawing young children's attention to the target object in the test phase should have a disruptive effect in both the Control Question and the Goal conditions as it increases the salience of the wrong response.

7.1 Method

7.1.1 Participants

Forty-six children were recruited from the same local nursery as in Experiment 1. The group consisted of 19 girls and 27 boys and their mean age was 3;6 (range: 3;0–3;11).

7.1.2 Design and Procedure

In both conditions, the materials, design and procedure were the same as in Experiment 1, up to and including the point at which it had been established that Lola had not seen the Experimenter move the bananas.

Control Question condition the Experimenter then said that Lola was going to continue her walk and moved her a little bit further along the table, still turning her back on the scene. At this point the Experimenter asked the child in a secretive voice: 'Where are the bananas now?' When the child had responded, the Experimenter returned Lola to the centre of the scene and placed her in front of the two cupboards, facing the empty space in between. The Experimenter then asked the child if he would like to take Lola and continue the story, encouraging him to take the lead with the same open questions used in other versions of the Duplo task: 'What happens next? You can take Lola if you want… What is Lola going to do now?'

Goal condition the Experimenter returned Lola to the centre of the scene and placed her in front of the two cupboards, facing the empty space in between. Then the Experimenter told the child: 'Now Lola is very hungry and wants a banana'. The Experimenter then asked the child if he would like to take Lola and continue the story. The Experimenter encouraged the child to take the lead using the same open questions as in the Control Question condition.

7.2 Results

Inter-observer reliability in the Control Question condition was 93 %. The one case where there was disagreement (because the child first gave the wrong answer to the control question, and then corrected it) was coded most conservatively as an incorrect response. Of the 24 children who participated in the Control Question condition, all responded to the control question by pointing to one of the two containers. Twenty-two passed the control question and correctly pointed to the current location of the bananas. Of these 22 children, 2 refused to co-operate further. Of the remaining 20 children, 1 passed the task and took Lola to the empty container, while 19 failed the task and took her to the bananas (5 % success rate).

Children performed significantly below chance level in the Control Question condition ($p < .001$, two-choice Binomial test, two-tailed). Moreover, a chi-square test with Yates' correction revealed a significant difference between the Control Question condition and the Choice condition (Experiment 1), $\chi^2(1, N=40) = 20.051$, $p < .001$.

Inter-observer reliability in the Goal condition was 100 %. Of the 22 children who participated in the Goal condition, 2 children failed to cooperate. Of the remaining 20 children, 1 passed the task and 19 failed it (5 % success rate). Performance in the Goal condition was therefore identical to that observed in the test question of the Control Question condition.

7.2.1 Discussion

It was hypothesized that increasing the salience of the target object in the test phase should make a FB task harder for young children than using a where-question. The negative results of the Control Question and the Goal conditions confirm this prediction. Moreover, these results suggest that it is not necessary for 3-year-old children to have to respond to a question about the target object in order for them to fail a standard FB task: simply suggesting that the protagonist wants to get the object is enough for young children to make the wrong prediction. The results of Experiment 2 therefore confirm that the relative salience of the target object in the test phase is a critical performance factor for 3-year-old children.

The results of the Control Question condition are also relevant to those studies that included control questions about the target object prior to the FB question (e.g., Friedman and Leslie 2004; Yazdi et al. 2006). The negative effect of a control question on the following test question may be related to the type of perseverance errors that have been found with the Appearance/Reality task, in which 3- and 4-year-olds tend to give the same answer to two different questions (see Deák and Enright 2006). Thus, young children in change-of-location tasks may correctly answer a control question about the location of the marble, for example, and then give the same answer to the FB question (hence failing the task).

8 General Discussion

We used the Duplo task to investigate how the design of the test phase may affect young children's performance in change-of-location FB tasks. Following up on earlier work by Rubio-Fernández and Geurts (2013), we investigated two factors that might have hindered 3-year olds' performance in earlier studies: the form of the wh-question and the salience of the target object.

The 3-year olds in the study were able to perform significantly above chance in a version of the Duplo task that allowed them to act out their response to a where-question that presented them with a choice between two locations (Experiment 1). Therefore, 3-year-old children are able not only to continue the FB narrative when prompted with open questions (Rubio-Fernández and Geurts 2013), but also to explic-itly choose the correct answer when asked a where-question that does not mention the

target object. The form of the wh-question is therefore not critical in young children's success in FB tasks.

However, asking open questions and allowing children to act out their response is not enough for 3-year-old children to pass the Duplo task (Experiment 2): when the 3-year olds in this study were asked a control question about the current location of the bananas before being invited to continue the story, they performed significantly below chance level, even though the test questions were open prompts and they were allowed to act out their responses. These results were replicated in a third condition, in which 3-year-old children were told that the protagonist wanted to get the target object before being invited to act out the rest of the story.

The main conclusion from this study is that the salience of the target object is a critical factor in designing the test phase of a change-of-location FB task for 3-year olds. In the following we discuss the implications of this finding for other Theory of Mind paradigms.

8.1 The Salience of the Wrong Response to a FB Question

Our results suggest that standard FB questions (e.g., 'Where will Sally look for her marble?') draw children's attention to the target object, thereby priming the wrong response. The question remains, however, as to why mentioning the target object in the FB question should disrupt perspective tracking any more than mentally representing the agent's desire for the object, which is arguably necessary to pass change-of-location FB tasks, even those without a test question (e.g., Onishi and Baillargeon 2005). Eye-tracking research suggests an answer to this question: adults spatially index verbal information and look at the region of a blank screen that was previously occupied by an object when the object is mentioned (e.g., Altmann and Kamide 2009; Johansson and Johansson 2013; for a study with 6-months olds, see also Richardson and Kirkham 2004). Thus, by being asked about 'the marble', for example, children may shift their attention to the container that hides the marble, which in turn increases the salience of the wrong response. This interpretation of 3-year olds' performance in FB tasks explains why they perform comparably with the 'look for' and the 'think' versions of the FB question, even if these questions pose very different cognitive demands.

Related to this issue is the old finding that children under 4 perform at chance (rather than below chance) in unknown-location FB tasks in which the object is moved to an unknown location (Wimmer and Perner 1983; Bartsch 1996). Devine and Hughes (2014) have recently challenged Baillargeon et al. in this connection: if Baillargeon et al. are right and young children fail standard FB tasks because the object's actual location induces a prepotent response to the test question (Baillargeon et al. 2010), why is it that young children do not perform above chance level in unknown-location tasks? It is unclear what the prepotent response would be in those FB tasks, since the child does not know where the object is. Moreover, without a prepotent response, it is unclear why passing unknown-location tasks would require response inhibition, or by the same token, why the inhibitory demands of the task should prevent young children from succeeding.

The results of the present study suggest an alternative explanation to this puzzle: in an unknown-location task, mentioning the target object in the FB question draws

children's attention towards the missing object and away from the protagonist, which disrupts the process of perspective tracking. When this happens, the outdated location of the object (corresponding with the protagonist's perspective) stops being in the child's focus of attention. Thus, by making children focus on an object that has been removed from the scene, the standard FB question leaves 3-year-olds to choose randomly between the two containers because the object is in neither.

The importance of the relative salience of the wrong response to a FB question has also been observed with unexpected-contents tasks, such as the Smarties task (Perner et al. 1989). In the standard version of this task, children are shown a tube of Smarties (a familiar box of chocolates) whose actual contents is unconventional (e.g., pencils) and they have to predict what somebody else would say is inside the container (e.g., 'When the next kid comes in and we ask him what's in here, what is he going to say?'). As in change-of-location FB tasks, children under 4 tend to fail unexpected-contents tasks. However, in this type of FB task only the wrong response is physically present in the setting (e.g., there are no Smarties in the scene, only pencils) and early studies have shown that physically representing the two possible responses to the FB question improves performance in younger groups, probably because it reduces the salience of the wrong response (Mitchell and Lacohée 1991; Freeman and Lacohée 1995).

Given the importance of attentional processes in 3-year-olds' success in change-of-location tasks, the two standard FB tasks may be fundamentally different. Since the two possible responses to a change-of-location FB question correspond with two different spatial representations of the same object (Altmann and Kamide 2009), it is possible that simply by focusing on the protagonist while following the FB narrative, young children are able to associate the protagonist with the outdated location of the object in the scene. By contrast, predicting what another child would say is inside a deceitful Smarties tube cannot rely on the same type of associative memory mechanisms. Even in those versions of the Smarties task in which the child is asked about their previous belief about the contents of the tube (e.g., 'When you first saw the box, what did you think was inside it?'; Gopnik and Astington 1988), their initial, erroneous response was not associated to a physical location, hence the child's response to the FB question could not rely on spatial indexing either. A testable prediction therefore follows from this analysis: unexpected-contents FB tasks must be harder for young children than change-of-location FB tasks.

Like the 'look for' and 'think' versions of the FB question, which have been widely considered equivalent on the basis of Wellman et al.'s (2001) meta-analysis, change-of-location and unexpected-contents FB tasks have also been treated as equivalent in view of 3-year olds' comparably poor performance in both types of tasks. However, this assumption is debatable, too, since the underlying memory mechanisms and attentional processes are likely to be different in the two tasks, and so are the possible reasons why young children may fail these tasks.

9 Concluding Remarks

Since standard FB tasks tend to increase the salience of the wrong response in the test phase, 3-year-old children may fail these tasks for reasons having to do with attentional processes, and not necessarily with their Theory of Mind development. This is not to

suggest that there are no important developmental differences between ages 3 and 4, or that some of these differences might not be specific to social cognition. We are only concerned with performance factors related to task design, and as it turns out, the Sally-Anne task and the numerous variations that have been used over the last 30 years of Theory of Mind research may all have been asking the wrong question. At least if the aim was to prompt 3-year olds to predict what Sally would do when she came back – rather than to go and find the marble.

Notwithstanding 3-year olds' success in the Duplo task, the results of the present study are compatible with both views on the three-decade-long debate about young children's capacity to mentally represent other people's beliefs. Given that not only adults but also children index verbal information in spatial locations (Richardson and Kirkham 2004), keeping a focus on the protagonist throughout a change-of-location FB narrative may help children bear in mind the protagonist's false belief, or simply make the association with the outdated location of the object more salient than its current location. Importantly, spatial indexing is a general memory process and not a behavioural rule that might precede a mature concept of belief, and therefore, even adults must rely on spatial indexing when performing change-of-location FB tasks (Altmann and Kamide 2009; Rubio-Fernández 2013, 2015).

Those researchers defending the view that children under 4 already possess a concept of belief may argue that 3-year olds' success in the Duplo task is evidence of such an early capacity. However, those researchers need to explain why preserving the continuity of perspective tracking is important for 3-year olds' success in the Duplo task. More generally, they need to explain why young children are not able to pass unexpected-contents tasks (e.g., Perner et al. 1989), which do not require tracking a protagonist's perspective during a series of events and therefore cannot rely on associative memory processes such as spatial indexing.

Those defending the view that only children older than 4 years are able to understand false beliefs may argue that when 3-year olds pass the Duplo task, they do so by establishing a non-mentalistic association between the protagonist and the last container where she saw the object – hence the importance of preserving the continuity of perspective tracking. Those researchers, however, need to explain why 3-year olds are able to correctly respond to the FB question 'Where will Lola go now?' but fail the standard FB question 'Where will Lola look for her bananas?' As it was suggested in the introduction, both of these FB questions could in principle be answered in behavioural terms and so the conceptual demands of the task cannot be determined post-hoc by the better or worse performance of young children.

The point of this discussion is not to suggest that 3-year olds' success in the Duplo task is uninteresting for Theory of Mind research. On the contrary, what this discussion tries to illustrate is how behavioural data is always ambiguous when it comes to the underlying representations, and hence by narrowly framing the Theory of Mind discussion as a debate on young children's capacity to mentally represent other people's false beliefs, we may be overlooking important performance factors and mechanisms that could help us understand what the cognitive precursors of a mature concept of belief may be, for example, or what kind of memory representations adults may use in perspective tracking as a proxy for an agent's beliefs.

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