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A re-examination of the broccoli task: Implications for children's understanding of subjective desire

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ABSTRACT

Repacholi and Gopnik (1997) found that the "broccoli" task revealed precocious understanding of desire in 18-month-olds. We review the findings of this study and six similar studies, and also present the results of a new broccoli task given at two time points. Repacholi and Gopnik's findings for 18-month-olds stand out as an outlier. The broccoli task reveals some nascent understanding of desire in children aged about 24 months, but at best, only about 1/3 of such children show clear evidence of understanding, leaving much room for further development in children's understanding of desire.

1. Introduction

Twenty years ago, Repacholi and Gopnik (1997) published a paper arguing that from 18 months of age children recognised that their own desires are different to those of others. This finding was influential because it lowered the age at which children come to understand desire. Previously, the earliest positive findings were obtained with older 2-year-olds and 3-year-olds, with Wellman and Woolley (1990) demonstrating that such children recognise that an agent who wants a dog will be happy and stop searching if he finds it, but will not be happy and keep searching if he doesn't find it. Thus, Repacholi and Gopnik's (R & G's) finding of competence at 18 months cut in half the age at which children first show insight into desire.

Repacholi and Gopnik (R & G) presented children with a desirable food item (crackers) and an undesirable item (broccoli). The children first were given the opportunity to taste each food type. Then, in one (Match) condition the experimenter expressed pleasure when eating the crackers and disgust when eating the broccoli. In the other (Mismatch) condition, the experimenter's preferences were reversed. Children were given either the Match condition or the Mismatch condition but not both. After each emotional display, the experimenter placed her hand in between the two food containers and asked, "Can you give me some?" Most 14-month-olds (68%) failed to give either food to the experimenter. Of those who did give food, 72% gave the correct food on the Match trial but only 13% did so on the Mismatch trial. The 18-month-olds were more likely to comply with the experimenter's request to give food with only 30% failing to do so. Of those who gave food, 76% gave the correct food on the match trial and 69% did so on the mismatch trial.

Since the publication of (R & G) study, various researchers have run similar studies, yet have not obtained very good performance in young children. Below, we discuss these studies, which are summarized in Table 1. However, first we note one factor that makes it unclear how many of the children who "passed" the broccoli task really understood desire in R & G, as well as subsequent studies. Although a few studies (Carlson, Mandell, & Williams, 2004; Chiarella, Kristen, Poulin-Dubois, and Sodian, 2013; Hobbs & Spelke, 2015; Ruffman, Puri, Galloway, Su, & Taumoepeau, unpublished) employed multiple trials, there was no analysis of answer patterns. Instead, authors simply computed mean correct performance, which though informative, provides less information than answer

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Table 1
Summary of Studies Using Tasks Similar to the Broccoli Task.

		Match Trials			Mismatch Trials			Equally Desirable Items		
	Age (mos)	*N*	% Gave Object	% Correct[1]	*N*	% Gave Object	% Correct[1]	*N*	% Gave Object	% Correct[1]
Repacholi and Gopnik (1997)	14	40	46	72	41	19	13	–	–	–
Repacholi and Gopnik (1997)	18	39	70	76	39	70	69	–	–	–
Hobbs and Spelke (2015)	14	–	–	–	–	–	–	18	72	44[2]
Hobbs and Spelke (2015)	24	–	–	–	–	–	–	18	96	64[2]
Sodian et al. (2016)	24	–	–	–	–	–	–	71	Not reported	46
Wright and Poulin-Dubois (2011)	18	11	Not reported	70	15	Not reported	33	–	–	–
Chiarella et al. (2013)	32	–	–	–	54	Not reported	52[2]	–	–	–
Carlson et al. (2004)	24	74	–	–	81	Not reported	49[2]	–	–	–
Carlson et al. (2004)	39	–	–	–	81	Not reported	65[2]	–	–	–
Ruffman et al. (unpublished)	35	50	Not reported	78	50	Not reported	34	–	–	–
Ruffman et al. (unpublished)	36	50	Not reported	80	50	Not reported	50	–	–	–

Note. [1]Given as% of children who gave an object, excluding those who did not give. [2]These entries give the percentage of trials correct. All other entries give the percentage of children correct on a single match or mismatch trial.

patterns. For instance, imagine each child is given two trials and the mean across children is 50% correct. This could occur if all children were correct on one trial and incorrect on the other. Alternatively, it could occur if half the children were correct on both trials and half were incorrect on both trials. Obviously these two answer patterns have very different interpretations. The first case would evince a situation in which all children guessed but none understood desire, whereas the second would evince a situation in which half the children likely understood desire and the other half didn't. R & G used a between-subjects design so that they could not examine answer patterns, but their results would have been far more convincing if they had been able to show that children consistently pass multiple trials. Ruffman et al. did include two broccoli tasks (Match and Mismatch), but included the broccoli task in a battery of theory of mind (ToM) tasks given to children, and their interest was in the ToM battery as a whole rather than individual tasks, and thus, did not examine answer patterns. For this reason, we re-analyze the previous study by Ruffman et al. to examine answer patterns, and also do so for the study conducted anew for the present paper.

Below, we examine the studies that have followed (R & G) and then we present the findings of a new study.

1.1. Studies following (R & G)

Hobbs and Spelke (2015) examined 14- and 24-month-olds' tendency to hand an agent a desired item. There were several differences relative to (R & G). First, rather than food items, they used a teddy bear and a ball, which were placed on either side of the agent in front of the child. Second, rather than verbally expressing her desire, the agent revealed her desire by reaching to one item but not the other, with her hand resting on the item and gazing at the item for 10 s. On choice trials, the agent subsequently extended her hand midway between the objects and asked, "Can you help me?" There were four such (choice) trials. One could imagine that this task might be easier than the R & G task because (a) the child has already seen the agent reach for one object, and (b) one object is not more inherently desirable to children so that there is less need for them to set aside their own predilection when reasoning about the agent. Nevertheless, even at 24 months of age only 64% of children gave the correct object to the agent (see Table 1). This was above chance, but clearly not at ceiling and even below the percentage correct of children six months younger in R & G.

Like Hobbs and Spelke (2015), Sodian et al. (2016) examined desire understanding at 24 months of age using toys rather than food items. After playing with a block, the experimenter used similar language to (R & G) − "Yuck a block. I played with the block. Ugh. I don't like blocks" − and a similar methodology (putting her hand in between two containers and asking the child to give her something). Thus, like Hobbs and Spelke (2015), Sodian et al. used two equally desirable items. Yet, once again, the overall success rate shown in Table 1 is not near the level shown by R & G. Indeed, with 46% of 24-month-olds correct and but a single trial, children could not, as a group, have been different than chance performance (50%), indicating that children were potentially confused rather than insightful.

Other researchers have stuck more closely to the methodology of (R & G) by using one desirable and one undesirable food item (see Table 1). In the Wright and Poulin-Dubois (2012) task, there were two kinds of trials: Same Agent and Switched Agent. The Same Agent trials were similar to R & G and, therefore, we report these in Table 1. Chiarella et al. (2013) gave children a diverse desires task (that we do not discuss further) and also two Mismatch trials that were similar to R & G. Similarly, Carlson et al. (2004) gave children two Mismatch trials at Time 1 and four Mismatch trials at Time 2. Once again, performance was not at the level of R & G.

Ruffman et al. (unpublished) also included the broccoli task amongst a battery of ToM tasks. Children were given both a Match and a Mismatch condition at two time points six weeks apart. Children were aged between 26 and 40 months with a mean age of 35 months at the first time point. The procedure stuck very closely to the (R & G) task, with two conditions, Match and Mismatch, and a different pair of food items used in each condition (broccoli and crackers or cauliflower and cookies). In each condition, the experimenter established which food the child preferred. In the Match condition, the experimenter's desire matched the child's. After tasting the crackers the experimenter said, "Mmm. I tasted the crackers. Mmm." Then after tasting the broccoli, the experimenter said, "Eww. I tasted the broccoli. Eww." The experimenter then paused, placed her hand between the two food plates, and asked the