Journal of Experimental Child Psychology xxx (2015) xxx–xxx

Contents lists available at ScienceDirect

Journal of Experimental Child Psychology

journal homepage: www.elsevier.com/locate/jecp

Brief Report

Wishful thinking in preschoolers

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ARTICLE INFO

Article history:
Available online xxxx

Keywords:
Wishful thinking
Optimistic predictions
Motivated reasoning
Probabilistic cognition
Representativeness heuristic
Preschoolers

ABSTRACT

The current experiment sought to demonstrate the presence of wishful thinking—when wishes influence beliefs—in young children. A sample of 77 preschoolers needed to predict, eight times in a row, which of two plastic eggs, one containing one toy and the other containing three toys, would be drawn by a blinded experimenter. On the four trials in which the children could not keep the content of the egg drawn, they were equally likely to predict that either egg would be drawn. By contrast, on the four trials in which the children got to keep the content of the egg, they were more likely to predict that the egg with three toys would be drawn. Any effort the children exerted would be the same across conditions, so that this demonstration of wishful thinking cannot be accounted for by an effort heuristic. One group of children—a subgroup of the 5-year-olds—did not engage in wishful thinking. Children from this subgroup instead used the representativeness heuristic to guide their answers. This result suggests that having an explicit representation of the outcome inhibits children from engaging in wishful thinking in the same way as explicit representations constrain the operation of motivated reasoning in adults.

Introduction

Children often seem to engage in wishful thinking, letting their desires influence their perception of reality and their predictions. For instance, children might say that they can accomplish impossible feats to achieve desirable goals. This propensity is often seen as being caused by a genuine cognitive

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http://dx.doi.org/10.1016/j.jecp.2015.07.018
0022-0965/

confusion in which children would act as if their "desires [were] efficacious in themselves" (Piaget, 1930, p. 261). Explicit questions about children's understanding of wishing have revealed that wishing is seen not as an ordinary desire but rather as an act with magical properties (Woolley, Phelps, Davis, & Mandell, 1999) that can affect physical reality (Vikan & Clausen, 1993; Woolley, Browne, & Boerger, 2006).

Other studies suggest that children's wishes affect their predictions about their own performance, leading to overly optimistic predictions. For instance, even after a practice trial, 4-year-olds estimated that they would manage to throw nearly twice as many balls in a basket as they did in fact manage to throw in (Schneider, 1998, Experiment 1). Such optimistic predictions have been observed across many different tasks, whether physical (e.g., Plumert & Schwebel, 1997; Schneider, 1998; Schwebel & Plumert, 1999; Stipek & Hoffman, 1980; Stipek, Roberts, & Sanborn, 1984) or purely cognitive such as memory tasks (e.g., Lipko, Dunlosky, & Merriman, 2009; Shin, Bjorklund, & Beck, 2007). Moreover, children generally do not make such optimistic predictions when asked about others' performance (Stipek, 1984; Stipek & Hoffman, 1980; but see Lipko et al., 2009), which might be explained by children not desiring others to perform well as much as they desire to perform well.

It has been suggested, however, that these behaviors might result not from genuine wishful thinking but rather from children's reliance on an "effort heuristic" in which children fail to differentiate effort from ability (Stipek & MacIver, 1989; Wellman, 1985). For young children, the amount of effort one puts into a task would relate to one's success at the task. Thus, when children invest a lot of effort in a task, expect to invest a lot of effort, or have reasons to believe that a peer has invested a lot of effort, they should predict good performance for themselves or their peer. In the tasks in which children have been found to make optimistic predictions, they always needed to expend some effort or could expect to do so—in accomplishing a physical act or in remembering something, for instance—so that the reliance on the effort heuristic could account for the results above. Moreover, children have much easier access to their own feelings of effort than to others' feelings of effort. As a result, reliance on the effort heuristic can also account for the fact that children do not make overly optimistic predictions about others' performance. Thus, the effort heuristic is a plausible explanation for all of the existing demonstrations of wishful thinking.

A first goal of the current experiment is to offer the first evidence of wishful thinking in children that could not be accounted for by the effort heuristic. To this end, it relies on a paradigm in which children neither exert nor expect to exert much, if any, effort. In previous experiments, children at least needed to engage in effortful cognitive activities such as remembering the location of 10 different objects. In the current experiment, they were only asked to take a guess. Moreover, in the current experiment, any effort exerted or expected would be identical across two conditions. By contrast, children should have wishes about the predicted outcome in only one of the two conditions. Any difference in the predictions between the conditions, thus, could be attributed to the effect of wishes.

Wishful thinking distorts one's representation of the world and, therefore, has the potential to lead to poor decisions and to jeopardize one's status as a competent agent. Indeed, this is true of the larger category of "motivated reasoning," encompassing various mechanisms through which motivation affects reasoning (for a review, see Kunda, 1990). To mitigate its potential epistemic or social damages, motivated reasoning in adults is heavily modulated by participants' explicit beliefs—that is, beliefs that can take a verbal form. For instance, although participants might wish that they were better at math, this wish does not seem to affect their representation of their mathematical abilities (Dunning, Meyerowitz, & Holzberg, 1989). Believing that one has high mathematical abilities when this is not the case would too blatantly conflict with one's knowledge of, for instance, one's grades in mathematics classes. By contrast, participants believe, on average, that they are smarter than average. In this case, one can more easily find a definition of intelligence (cultivated, street smart, socially apt, etc.) that fits with one's self-knowledge (Dunning et al., 1989).

Some factors have already been shown to moderate children's optimistic predictions in a way that is compatible with the motivated reasoning framework. For instance, children made less optimistic predictions about a task they were already very familiar with (a jumping task) than about a task they were less familiar with (a ball throwing task) (Schneider, 1998). With a familiar task, overly optimistic predictions should be more likely to conflict with children's memory of their own performance in the task, which might explain why they are less overconfident. Similarly, if children have explicit beliefs about a given outcome, these explicit beliefs should moderate the extent to which they can engage in

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motivated reasoning and wishful thinking. A second goal of the current experiment was to test this hypothesis; in one condition we evaluated children's explicit representations of an outcome when they had no wish about the outcome, and in the other condition children had wishes about the outcome and we could test how their explicit representation of the outcome moderated the effect of the wishes.

In the current experiment, children were asked to predict how many toys would be in one of two identical plastic eggs drawn by a blinded experimenter from a box—an operation repeated eight times (four times by condition), with two new eggs each time, for each child. Children had been shown that in one egg there were three toys and in the other egg there was only one toy. In the No Desirability condition, children did not keep the content of the egg drawn by the experimenter; in the Desirability condition, they did. If children engaged in wishful thinking, they should predict that the egg with the three toys would be drawn more often in the Desirability condition than in the No Desirability condition. Such an effect could not be explained by the effort heuristic because there was no difference in the amount of effort exerted by children in the two conditions.

The representation of the outcome—which egg will be drawn—depends on the children's understanding of probability. Although infants can already form representations of probabilistic outcomes (e.g., Teglas et al., 2011), this implicit understanding fails to translate into explicit predictions until 5 years of age. For instance, Teglas, Girotto, Gonzalez, and Bonatti (2007) showed 3- and 5-year-olds a computer display of a box with three doors on one side and one door on the other side. Inside the box was a moving ball. Both the 3- and 5-year-olds looked longer when the ball exited the box from the side with one door (less probable event) than when it exited the box from the side with three doors (more probable event). However, only the 5-year-olds were able to explicitly predict that the ball would come out on the side of the three doors (see also Girotto & Gonzalez, 2008). A convergent result is provided by Kuzmak and Gelman (1986), who found that 4-year-olds knew they could predict a predictable phenomenon but not a random phenomenon; however, contrary to 5-year-olds, the 4-year-olds could not explain why they provided different answers for the predictable and random phenomena. Moreover, 5-year-olds are able to integrate the odds of an outcome and its desirability; they can provide explicit judgments of the happiness of a character as a function of the character's likelihood of receiving a prize and the chances it will receive the prize (Schlottmann & Anderson, 1994). This suggests that, in the current experiment, 5-year-olds could form an explicit representation of the outcome of the draw, whereas younger children might form only an implicit representation.

More specifically, older children might rely on an explicit representation of the outcome of a random process generated by the representativeness heuristic (Tversky & Kahneman, 1983). This heuristic generates representations of random samples that closely match the underlying distribution. In this case, a representative outcome would be any outcome in which each answer ("three toys" or "one toy") comes out equally often, that is, two times out of the four draws from each condition (*representative randomness*). Previous research has shown that reliance on the representativeness heuristic increases with age in children (Davidson, 1995; Jacobs & Potenza, 1991). Therefore, we might expect at least some of the older children in our sample to use this heuristic. Note that reliance on the randomness heuristic is normatively problematic because this heuristic does not accurately represent randomness (Tversky & Kahneman, 1983). If answers were truly random, the representative randomness pattern (twice "one toy" and twice "three toys") should emerge on 37.5% of the trials.[1]

The No Desirability condition provides a strong indication of the type of probabilistic representation formed by children. If children rely on implicit mechanisms of probabilistic understanding, and given that each egg is equally likely to be drawn, they should answer at random for each egg. As a result, there should be no more children answering twice "three toys" and twice "one toy" than expected at chance level ($p = .375$). By contrast, if some children rely on the representativeness heuristic, more children should have this representative randomness profile than expected at chance level.

If some children rely on the representativeness heuristic in the No Desirability condition, this might affect their answers in the Desirability condition. More specifically, this heuristic might guide the predictions even in the Desirability condition, thereby moderating the effects of wishful thinking.

[1] This chance level of obtaining the representative randomness can be obtained by dividing the number of answer patterns (e.g., first "one toy," then "one toy," then "three toys," then "one toy") that comprise two "one toy" answers and two "three toys" answers by the total number of possible answer patterns (6/16 = .375).

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To sum up, our predictions are as follows. First, if children engage in wishful thinking, their answers should be affected by their desires in the Desirability condition compared with the No Desirability condition. This should translate into more "three toys" answers in the Desirability condition than in the No Desirability condition. Second, if wishful thinking in children is moderated by explicit beliefs as it is in adults, the effect of wishful thinking observed should be moderated by children's explicit beliefs generated by the representativeness heuristic. More specifically, children who seem to rely on the representativeness heuristic in the No Desirability condition should not be more likely to answer "three toys" in the Desirability condition.

Method

Participants

This experiment involved 77 children: 25 3-year-olds (10 girls, M_{age} = 42.4 months, SD = 3.81, range = 36–47), 24 4-year-olds (10 girls, M_{age} = 53.12 months, SD = 3.69, range = 48–59), and 28 5-year-olds (16 girls, M_{age} = 67 months, SD = 3.49, range = 61–71) from two schools in Lyons, France. All of the participants were French, and all of the experiments were conducted in French. Most children came from middle- and upper-middle-class families. Each child was seen individually in a quiet room by a single experimenter for approximately 10 min.

Materials and procedure

Each child took part in the two phases of the experiment: a toy selection phase and a test phase (with two conditions). Four kinds of toys, presented in a fixed order, were used in each phase: clown vignettes, magnetic letters with animal drawings, balloons of different colors, and animal-shaped elastic bracelets of different colors.

Toy selection phase

For each kind of toy, the experimenter presented three different exemplars placed on a table in front of the child and asked the child to select which one he or she preferred. Exemplars from the preferred toys were then used in the test phase.

Test phase

The test phase had two conditions: a No Desirability condition and a Desirability condition. In each condition, the same procedure was used (Fig. 1). A clear box (so that the child could see the eggs being properly shaken and drawn at random) and two identical opaque plastic eggs were placed on the table for each kind of toy (one egg on each side of the box). The eggs could be unscrewed into two parts, and the experimenter opened them in front of the child. To begin, four sample exemplars of the clown vignette preferred by the child in the toy selection phase were introduced. Three exemplars were placed in front of the opened egg at the left of the box, and one exemplar was placed in front of the opened egg at the right of the box (order counterbalanced). The child's attention was then especially drawn to the two eggs. The experimenter put the three exemplars in the egg on the left-hand side and closed the egg. Then the experimenter put the one remaining exemplar in the egg on the right-hand side, closed the egg, and put the two eggs in the box (order counterbalanced). The experimenter said, "Now I'm going to close my eyes and shake the two eggs in the box. Then I will take one of the two eggs, again with my eyes closed. So I will not know which one I will take. When I have an egg in my hand, you will tell me if there are one or three clowns in the egg [order counterbalanced]. Okay? Then I will put away the egg and we will continue the game with the other toys. At the end of the game, we will look into the eggs." After the first draw, the experimenter asked, for instance, "According to you, are there one or three clowns in this egg?" (order counterbalanced). The same question was used for the three other kinds of toys (with six other eggs and four similar exemplars of the same toy preferred in the toy selection phase for each kind of toy). In the No Desirability condition, before shaking the two eggs, the experimenter said, "After we have looked into the eggs, I will keep the eggs and the toys to

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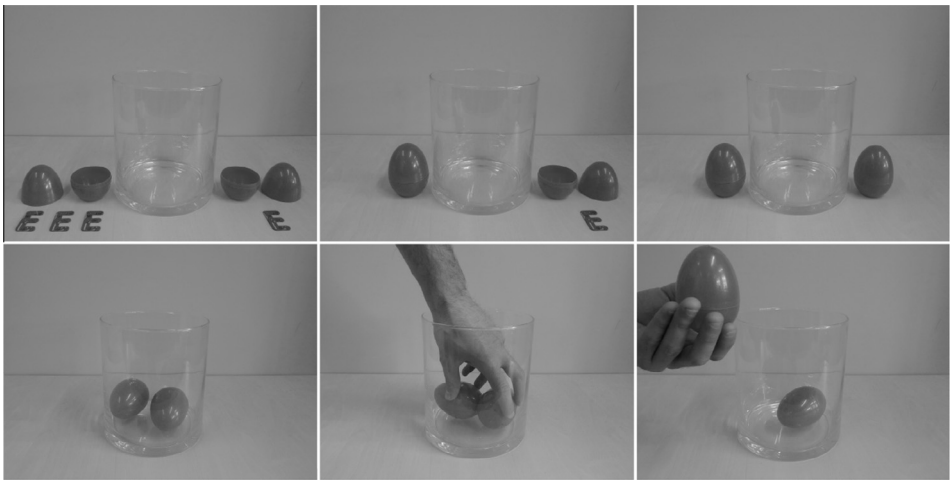

Fig. 1. Steps through which the eggs were drawn in both conditions (here the toys were magnetic letters with animal drawings).

play with them with another child. Okay?" For the first two draws, before the child's response regarding the number of toys in the egg drawn, the experimenter said, "Remember, at the end of the game, I will keep the eggs and the toys to play with them with another child. Okay?" The eggs were not opened at the end of the No Desirability condition.

After the four drawings and the child's four responses of the No Desirability condition, the Desirability condition was introduced as follows: "Now before looking into the eggs, we will play the same game with the same kind of toys, but this time there is a difference. This time what is in the egg will be for you. And you can bring it home. Okay?" For the first two draws, before the child's response regarding the number of toys in the egg drawn, the experimenter said, "Remember, this time what will be in the egg will be for you and you can bring it home. Okay?" Again, after the child's response, the egg that had been drawn was set apart. The child was told that he or she could look inside the egg once the game was over. Eight other eggs and four other identical exemplars of the same toy for each kind of toy were used in the Desirability condition.

The Desirability condition differed from the No Desirability condition only in that children were informed that they would win the content of the eggs after the game. If the Desirability condition preceded the No Desirability condition, this information might have affected children's behavior in the latter condition; children might want to know right after the end of the Desirability condition whether they won the toys and thus refuse to engage in the second condition, or they might believe that they would also win the toys in the No Desirability condition even if told otherwise. As a result, the Desirability condition was always presented after the No Desirability condition.

After the two conditions, the four eggs drawn in the Desirability condition were opened and the toys in each egg were given to the child.

Results

In the No Desirability condition, the percentage of "three toys" responses was 53.0% for the 3-year-olds, 54.2% for the 4-year-olds, and 55.3% for the 5-year-olds.[2] In the Desirability condition, the percentage of "three toys" responses was 74.0% for the 3-year-olds, 67.7% for the 4-year-olds, and 57.1% for the 5-year-olds (Fig. 2). A repeated measures analysis of variance (ANOVA) with age group (3, 4, or 5 years) as the between-participants variable and condition (No Desirability or Desirability) as the within-participants variable was calculated for the proportion of times (with an arcsin

[2] Preliminary analyses revealed no significant effects of gender. Thus, this factor is not introduced in the following analyses.

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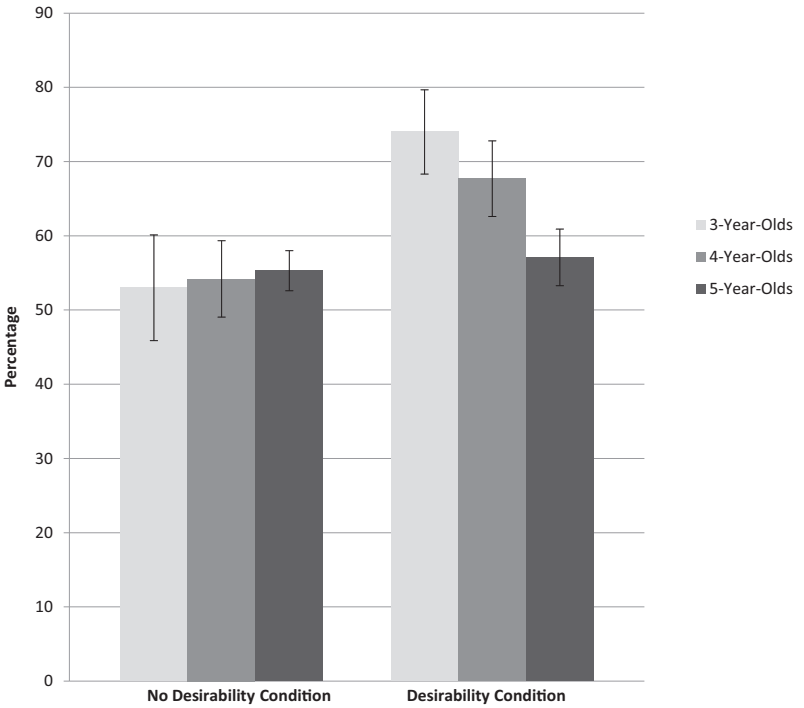

Fig. 2. Percentage of "three toys" responses in each condition for each age group.

Table 1
Proportion of times (and standard deviation) children responded "three toys" by condition and age group, out of four trials in each condition.

Condition:	No Desirability			Desirability		
	M (*SD*)	*t*	*d*	*M* (*SD*)	*t*	*d*
3-year-olds	.53 (.36)	0.42	0.17	.74 (.28)	4.23***	1.73
4-year-olds	.54 (.25)	0.81	0.34	.68 (.25)	3.47**	1.45
5-year-olds	.55 (.14)	1.99	0.66	.57 (.20)	1.87	0.72

** $p < .01$.
*** $p < .001$.

transformation) children responded "three toys." This analysis revealed a significant main effect of the condition factor, $F(1, 74) = 10.39$, $p = .002$, $\eta^2 = .12$, and a significant main effect of the age group factor, $F(2, 74) = 3.44$, $p = .037$, $\eta^2 = .08$. The Condition × Age Group interaction was not significant, $F(2, 74) = 1.58$, $p = .212$, $\eta^2 = .04$. When all of the children are considered together, they were significantly more likely to answer "three toys" in the Desirability condition ($M = 2.64$, $SD = 1.01$) than in the No Desirability condition ($M = 2.17$, $SD = 1.03$), $p = .002$. Collapsing across conditions, 3-year-olds ($M = 2.54$, $SD = 1.34$) were significantly more likely to answer "three toys" than 5-year-olds ($M = 2.25$, $SD = 0.69$), $p = .032$. No significant difference was found between the performances of 3- and 4-year-olds ($M = 2.44$, $SD = 1.03$, $p = .725$) or those of 4- and 5-year-olds ($p = .519$).[3]

In the No Desirability condition, the performance was at chance for each age group (see Table 1). In the Desirability condition, the performance was at chance for the 5-year-olds and significantly above chance for the 3- and 4-year-olds (Table 1).

[3] All comparisons were calculated according to the Bonferroni procedure.

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Table 2
Percentage (%) of children who fit with each of the five possible "three toys" answer profiles, from 0 of 4 "three toys" answers to 4 of 4 "three toys" answers, by condition and age group.

Condition:	No Desirability					Desirability				
Profiles:	0	1	2	3	4	0	1	2	3	4
3-year-olds	16	20	24	16	24	0	16	16	24	44
4-year-olds	0	29.2	37.5	20.8	12.5	4.2	4.2	29.2	41.7	20.8
5-year-olds	0	7.1	64.3	28.6	0	3.6	3.6	60.7	25	7.1

A detailed analysis of the pattern of responses, however, reveals significant age differences in the No Desirability condition (Table 2), with 24.0% of the 3-year-olds, 37.5% of the 4-year-olds, and 64.3% of the 5-year-olds displaying the profile compatible with representative randomness—two eggs with three toys and two eggs with one toy. When this profile is selected at chance level (i.e., .375; cf. footnote 1) within one group, this suggests that the children in that group do not use the representative randomness heuristic. This was true for the 3- and 4-year-olds ($p = .135$ and $p = 1.0$, respectively). By contrast, the 5-year-olds were more likely than chance to have selected this profile ($p = .007$). This suggests that the representativeness heuristic guided some of the 5-year-olds' choices.

Supplementary analyses suggest that the performance of the 5-year-olds in the Desirability condition can be explained by the use of the representativeness heuristic. The 18 5-year-olds whose answers followed the representative randomness profile in the No desirability condition were at chance in the Desirability condition ($M = 2.11$, $SD = 0.83$), $t(17) = 0.56$, $p = .579$, $d = 0.27$.[4] By contrast, the 10 5-year-olds who did not express this profile in the No Desirability condition were significantly above chance in the Desirability condition ($M = 2.60$, $SD = 0.69$), $t(9) = 2.71$, $p = .024$, $d = 1.81$.

Discussion

Preschoolers were asked four times which of two eggs, drawn at random, would be drawn. One egg contained three toys, and the other egg contained one toy. When children did not get to keep the content of the egg, they were equally likely to say "the egg with three toys" and "the egg with one toy." Although it is difficult to prove a null hypothesis, there were no indications that the younger children's pattern of response was different from that expected if they answered either at chance or based on an implicit mechanism of probabilistic predictions. By contrast, many 5-year-olds relied on the representativeness heuristic; more of them than expected at chance level answered "three toys" twice and "one toy" twice.

When children were told that they would keep the content of the eggs afterward, they were more likely than chance to predict that the egg with three toys would be drawn. This tendency was true of children of all ages, but not of the 5-year-olds who followed the representative randomness profile. Thus, 3- and 4-year-olds, as well as some 5-year-olds, demonstrated wishful thinking; their desires about the outcome of a random draw influenced their predictions about the draw.

The effort heuristic cannot explain these optimistic predictions because it would not have predicted a difference based on the conditions. Thus, this is the first demonstration of genuine wishful thinking in young children. Crucially, children who had an explicit representation of the outcome based on the representativeness heuristic did not engage in any wishful thinking. This result is in line with the observation that in adults wishful thinking, and motivated reasoning more generally, is moderated by people's beliefs.

The moderation of wishful thinking by explicit beliefs does not lead to answers that conform to normative statistical principles. If anything, it is the 5-year-olds' reliance on the randomness heuristic that is normatively problematic (Tversky & Kahneman, 1983). This result is in line with the social character of motivated reasoning; explicit beliefs make the decision appear more rational—in this case, by dampening wishful thinking—but not necessarily really more rational (see Mercier & Sperber, 2011).

[4] Note that this estimate is conservative because it includes children who likely selected the representative randomness profile at chance level.

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The existence of wishful thinking raises many questions. Why does wishful thinking exist? It has been suggested that overestimation, which can be seen as a form of wishful thinking, serves an adaptive purpose—motivating individuals to pursue even difficult tasks (Shin et al., 2007). Can wishful thinking extend beyond the self? Children sometimes overestimate not only their own ability but also that of their peers (Lipko et al., 2009). Although such results seem to militate against a wishful thinking interpretation, it is also possible that children might desire their peers to do well. Although the current experiment cannot answer these questions, the paradigm developed here could be used to address these, and other, questions in a methodologically sound way.

Acknowledgments

We thank all of the children and schools for their enthusiastic participation in the research. The study was supported by a public grant overseen by the French National Research Agency (ANR) as part of the program "Licornes" (ANR-12-CULT-0002). Hugo Mercier also thanks the Swiss NSF for its support through an Ambizione grant [PZ00P1_142388/1].

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