

Magical Thinking: Outcome Bias Affects Children's Evaluation of Testimony

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Abstract

In a series of three experiments we examined how preschool children assess testimony in relation to the relative desirability of the outcome for themselves and for the individual providing the testimony. The first two experiments reveal evidence for an outcome bias: children are more likely to believe an extraordinary claim when they have little to lose in doing so (Exp.1), and when they stand to gain if the claim is true (Exp. 2). The final experiment (Exp. 3) showed that children are less likely to believe extraordinary claims when the person making the claim has ulterior motives (e.g., stands to potentially gain from the child's belief). These data show that children's beliefs acquired from testimony are subject to outcome bias, and that children are capable of exercising skepticism when the source of testimony is likely to have ulterior motives.

Keywords: preschoolers; prediction; supernatural events; child beliefs; belief acceptance; testimony.

Introduction

Beginning in childhood, much of what humans believe about the world derives from indirect evidence, in the form of testimony from other people. In day to day life, we rely on testimony in order to inform a variety of activities like navigation, food choice, and the selection of social partners, where direct evidence is possible but impractical to acquire first hand. We also use testimony to acquire information that is very difficult, if not impossible, to learn oneself – like knowledge of historical events (e.g., the holocaust), scientific facts (e.g., cell structure), and religious beliefs.

Crucially, not all information that humans receive from testimony is equally good. In some cases sources may be poorly informed (e.g., a poorly trained doctor), while in other cases they may seek to intentionally mislead, perhaps for their own benefit (e.g., a used car salesman). Consequently, in order to make effective use of testimony, humans must learn to assess the credibility of sources, and to evaluate the information that they provide.

Young children, who have relatively little direct experience with the world, and relatively weak prior knowledge against which to assess new information, are both highly dependent on testimony and highly vulnerable to misinformation. A growing body of research has investigated how children assess testimony, focusing on the strategies that they employ to assess the reliability of sources (Kushnir & Sobel 2013, Gelman, 2009; Harris, 2007; Heyman, 2008). For example, these studies find that children as young as 3 to 4 years differentially trust

informants based on factors like their age (Jaswal & Neely, 2006; VanderBorght, & Jaswal, 2009), and their previous history of accuracy (Birch, Vauthier, & Bloom, 2008; Corriveau & Harris, 2009; Jaswal & Neely, 2006), and that they sometimes weigh the testimony over their own direct perceptual experience (Jaswal, 2010).

There are also other factors that influence how humans evaluate testimony when forming beliefs. In some cases, beliefs that are fundamental to how we understand the world are formed in direct contravention with expert testimony and despite considerable physical evidence to the contrary (e.g., climate change, evolution). In these cases many claims are assessed on the basis of prior convictions, in conformity with *cognitive dissonance* – i.e., ignoring evidence because of the desire to hold mutually consistent beliefs (Festinger, Riecken, & Schachter, 1956). Also, all else equal, humans are more likely to endorse beliefs that predict positive outcomes over beliefs that predict negative ones – a tendency sometimes referred to as “outcome bias” or the “valence effect” (Cohen & Wallsten, 1992; Granberg & Brent, 1983).

In the present study, we investigated how children's developing ability to assess testimony is affected by their own potential to gain – or to lose – if a claim is true. To test this, we presented children with a situation in which they heard extraordinary claims not directly supported by past experiences (i.e., of supernatural abilities) and in which these abilities had the potential to yield benefits or losses to the child. Previous studies have explored children's belief in a range of supernatural phenomena as a window into their assessment of testimony, including familiar fictional entities like Santa Claus and the Easter Bunny, religious entities like Angels, and also novel supernatural beings. These studies have investigated differences between children who believe in such entities and those who don't (Woolley, Boerger, & Markman, 2004), the role that physical evidence plays in belief (Woolley, et al., 2004), and the properties children ascribe to different beings (Shtulman, 2008). However, relatively little attention has been given to whether children are sensitive to the possible outcomes of beliefs – e.g., receiving chocolate eggs, or living eternally in heaven – when assessing their truth. In one past study (Woolley et al., 2004), children were introduced to a fictional character called the Candy Witch. They were told that she would visit them after Halloween to take their candy in exchange for toys. Results showed not only that children were more likely

to believe in the witch if their candy was indeed traded for a toy, but also that they were more likely to believe if they had a preference for toys over candy. Building on this, we conducted three experiments in which a character named Morla claimed that she could perform actions on candy or stickers with her mind. We asked (1) how children's belief in this claim was affected by the amount they would gain or lose if it were true, (2) how degrees of belief differed according to whether the movement of items was framed as loss or gain to the child, and (3) whether the source of testimony stood to gain from the child's belief in her claims.

Experiment 1

Our first experiment explored whether, when forming beliefs, children are sensitive of the potential cost to themselves should the claim be true. Preschoolers played a game to win 8 candies, and then were required to place either all 8 of these candies into a covered box, or only 2 of the 8 (keeping 6). They were then told that a character named Madame Morla (played by a second experimenter) claimed that she could eat food just by thinking about it, and that she would try to eat the candies the child had put in the box from a second room (visible through a large window). First, we asked whether children who stood to lose all 8 of their candies (if Morla was telling the truth) would be less likely to believe her claim than those who only stood to lose 2 of their candies. Second, we asked whether children's degree of belief would increase after seeing Morla attempt to mentally transfer their candies from the covered box.

Participants

Participants were 32 4- and 5-year-olds ($M=5;0$, range = 4;0 to 5;11, 18 girls and 14 boys) recruited from the Child Study Centre Database at the University of Toronto. There were 16 4-year-olds ($M=4;4$, range = 4;1 to 4;10) and 16 5-year-olds ($M=5;7$ range = 5;3 to 5;11).

Procedure

The experiment was carried out in a laboratory at the University of Toronto in a two-room suite separated by a wall with a two-way mirror. The child and the experimenter sat together at a table in one room, with the child facing the two-way mirror. Parents were seated behind the child to prevent their reactions from cuing the child. The woman playing Morla was in a darkened room behind the mirror.

The experimenter began by explaining to the child that she had met someone special named Madame Morla. The experimenter told the child, "Madame Morla says she can eat food by thinking about it. She just thinks about eating and the food goes right into her stomach. Madame Morla is here today and we are going to find out if she really can eat food by thinking about it." While waiting for Madame Morla to arrive, children played a game of Simon Says with the experimenter, until they won 8 pieces of Hershey's Kisses candy, with the hope that the children would feel ownership and attachment to the candy they had just won (see Kahneman, Knetsch & Thaler, 1991). The experimenter

then said to the child, "Madame Morla must be here by now" and brought out Madame Morla's box to inspect. The box was a standard shoebox (11.5" x 7" x 3.75") covered in white wrapping paper. Children were randomly assigned to put 2 of the 8 (Low Cost condition) or all 8 of the 8 (High Cost condition) candies that they had just won in the special box for Morla to try to eat. The experimenter explained that if Morla could really eat just by thinking about it, then they wouldn't get their candies back, but that if she couldn't do it, they would get their candies back because the candies would still be in the box. Next, she collected their Before Ritual Belief: "Do you think Madame Morla can eat candy by thinking about it?" Children were then asked to rate their belief by pointing to pictures on a scale (from Woolley, Boerger & Markman, 2004) indicating 'really sure', 'little sure', 'not sure'. Next, the experimenter turned off the lights making Madame Morla visible in the other room behind the two-way mirror. The woman playing Morla carried out her 'ritual' of pretending to eat the candy by rubbing her temples as if she was concentrating intensely and then rubbed her stomach. The lights were then turned back on, so Morla was no longer visible. We then gathered the children's After Ritual Belief: "Do you think Madame Morla ate the candy by thinking about it?"

Finally, the children were shown the inside of the box (still full of candy), revealing that Morla could not eat candy by thinking about it. They were then debriefed and allowed to keep the candy with the permission of their caregiver.

Results and Discussion

We examined whether children in the High Cost condition would be less likely to believe in Morla compared to those in the Low Cost condition. There was not a significant effect of Cost on Before Ritual Belief, $p = .35$, but there was a significant effect on After Ritual Belief $\chi^2(1, 32) = 3.14$, $p < 0.04$. This suggests that children were more likely to believe in Morla after they saw her ritualized performance of the act when two candies were at stake than when eight were at stake (Figure 3). Also, although there was no main effect of age on belief, age did have a significant effect on initial belief ($\chi^2(1, 32) = 3.46$, $p = 0.06$), indicating that 4-year olds were marginally more likely than 5-year-olds to believe prior to observing the ritual.

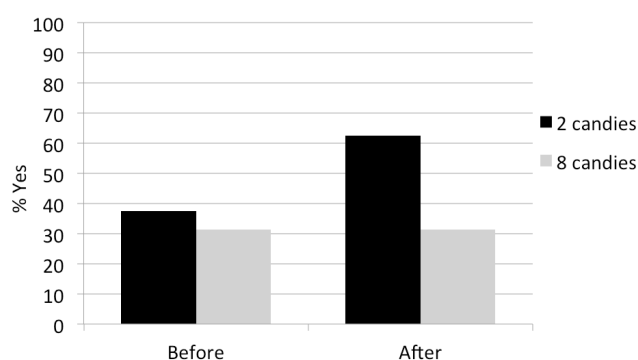


Figure 1. Belief ratings collapsed across age groups in the low and high cost conditions before and after observing the ritual in Experiment 1.

To compute the children's degree of belief, a composite score was created that took into account children's belief judgments and their certainty ratings (following Woolley, Boerger, and Markman, 2004). Children who responded "yes," when asked if they believed received a score of 4 if they rated themselves as "not sure," a score of 5 for "a little sure," and 6 for "really sure." Children who responded "no," received a score of 3 if they responded "not sure," 2 if they responded "a little sure," and 1 if they responded "really sure." Thus, scores ranged from 1 to 6, with 1 indicating that the child was really sure that Morla could not eat candy by thinking about it, and 6 indicating that the child was really sure that she could. The composite score was only assessed and computed for the Before Ritual Belief. The mean score was 3.5 (SD=1.7) for the age groups combined, 4.3 (SD=1.8) for 4-year-olds and 2.8 (SD=1.1) for 5-year-olds. There was a significant difference in the composite score for 4- and 5-year-olds ($t(15)=2.91, p = 0.007$).

These findings indicate that while 4-year-olds are generally more credulous than 5-year-olds prior to observing a ritualized performance of a magical act, participants are more likely to show increased belief after observing such a ritualistic display when the truth of the claim would result in a lower cost. It is noteworthy that the ritual had this influence, since the ritual did not provide the participants with evidence for the truth of the claim. When the truth of a claim would entail a high cost to the child, 4- and 5-year olds seem to ignore such observations.

Experiment 2

Experiment 1 provides evidence that young children are sensitive to the potential cost of an outcome when assessing claims of supernatural abilities. In Experiment 2 we investigate this question by making the outcome difference between conditions more substantial. Specifically, we investigated whether children are more likely to believe a claim if it entails a personal gain as opposed to a personal loss, and provided a behavioral post test to probe the strength of their conviction. As before, children were introduced to a novel magical being called Morla. They were randomly assigned to one of two conditions, where they either stood to gain stickers (because Morla attempted to transfer them to the child's box) or lose stickers (because Morla attempted to transfer them out of the child's box). As before we measured self-reported belief in Morla's claim. However, after Morla's effort we also asked children to choose the box they wished to take. This allowed us to test whether their initially expressed beliefs were merely wishful thinking, or reflected what they actually believed to be true.

Participants

Participants were 39 4-year-olds ($M = 4;6$, range = 4;0 to 5;1) recruited through the Language and Development Lab at the University of California in San Diego and through various preschools in the San Diego area.

Procedure

Participants were randomly assigned to one of two conditions, Loss or Gain. Participants in the Loss condition risked losing lost stickers (in the event Morla's claim were true) whereas participants in the Gain condition stood to gain. As with Experiment 1, a female experimenter played Morla, but instead of wearing a costume she dressed in plain clothes.

In order to manipulate children's condition while still making them believe they had made a personal choice, we used two boxes each of which had two compartments, unbeknownst to the participants. One of the compartments in each box contained stickers and one was empty. Participants were told that one of the boxes contained stickers and the other was empty, and that they could choose a box. They were told that if they chose the box with stickers, they could take the stickers home. When participants assigned to the Loss condition chose a box, the experimenter opened the compartment that contained the stickers and told the participants that they would get to take these stickers home. When participants who were assigned to the Gain condition chose a box, the experimenter opened the empty compartment of the chosen box and told the participants they would not take any stickers home because they chose the empty box.

The experimenter then introduced the participants to "a friend of hers" named Morla and told them, "Morla says if she thinks really hard about the stickers in this box she can move them into this box. That means she says that she can move the stickers without touching them." To make sure that loss or gain was salient to the participants they were explicitly told about the possibility that they would lose or gain stickers if Morla is really able to move stickers mentally.

To measure the participants' Before Ritual Belief, they were asked, "Do you think she can switch what's inside the boxes just by thinking about them?" After they had given a clear answer, participants watched as the woman playing Morla closed her eyes and appeared to concentrate very hard for 10 seconds. Participants were then asked the same question a second time to measure their After Ritual Belief. Degrees of belief were measured on the same 6-point scale used in Experiment 1.

After taking these verbal measures, a behavioral measure was also recorded, in which the experimenter told participants that they were allowed to choose again which box they wanted to take home. Before the participants chose a box, the experimenter asked them memory questions to ensure the participants remembered which box originally contained the stickers, and which box they had originally chosen. Finally, the experimenter revealed the contents of the boxes with the stickers in their original position. She explained that Morla was not able to switch the contents without touching the boxes. All participants were allowed to keep the stickers.

Results and Discussion

There was an effect of condition on the Before Ritual Belief self-report measure ($\chi^2(1, 39) = 3.14, p = .04$, one tailed), with 75% of participants in the Gain condition and 47% of participants in the Loss condition expressing belief in Morla's claim. The same trend was seen in the After Ritual Belief self-report measure, though this effect was not significant ($\chi^2(1, 39) = 1.28, p = .12$, one- tailed), with 75% in the Gain condition and 57% in the Loss condition expressing belief. There was no effect of observing the ritual on self-reports for either condition.

There was an effect of condition on the behavioral measure ($\chi^2(1, 39) = 5.77, p = .008$, one tailed). Approximately 75% of participants in the Gain condition and 37% of participants in the Loss condition chose the box that was the target location of Morla's magical act, suggesting belief in the magical ability. The behavioral measures in each condition were not statistically different from the self-report measures.

In summary, Experiment 2 found that children are more likely to believe a person's claim about being able to perform a magical act when the claim entails a gain to the child than when it entails a loss. This finding supports the hypothesis that children have an outcome bias when it comes to believing surprising claims. Together, Experiments 1 and 2 suggest a troubling vulnerability for children, as framing outcomes favorably may permit people with malicious motives to manipulate children's beliefs even when their claims are extraordinary.

Experiment 3

Experiments 1 and 2 demonstrate that young children's belief in extraordinary claims differs based on what they stand to gain or lose if the claim is true. In Experiment 3 we examine whether young children also consider what the individual making the claim stands to gain or lose if the child believes the claim. We did this by comparing an Explicit Incentive condition in which participants were explicitly told that Morla would benefit if they accepted her claim, to a Control condition in which no such incentive was described. Belief was again assessed through self-reported verbal and behavioral measures.

Participants

Participants were 23 4-year-olds ($M = 4;6$, range = 4;0 to 4;11, 11 females), recruited through the Language and Development Lab at the University of California in San Diego and through various preschools in the San Diego area.

Procedure

Participants were randomly assigned to one of two conditions, Control or Explicit Incentive. Those in the Explicit Incentive condition were informed that Morla stood to potentially gain from their belief in her claim; the experimenter disclosed that Morla loves stickers, wants to

get as many stickers as she can, and consistently takes away children's stickers to keep them for herself.

The experimenter began by introducing herself and Morla, and then told the participants that they could try to win as many stickers as they can. The experimenter then played Simon Says with the participant three times, so the child won a total of three stickers. The experimenter then declared that in the next game, the participant had two choices: to either keep the stickers he or she won or take a chance and try to win more stickers. The experimenter then brought the child's attention to two boxes on a table. The participants were told that they can put their stickers in "a box" (in the Control condition) or in "Morla's box" (in the Explicit Incentive condition) in order to try winning more stickers. The experimenter then told the child that Morla says that if the child puts his/her stickers in a box then she will move the stickers and multiply them with her mind. The child was reminded that if Morla is unable to do this magical task, then the child would lose all of the stickers, and that if Morla could perform the magic, then the child would will a total of 10 stickers. Morla then leaves the room and the participant is reminded of the two choices.

The first verbal measure was the participant's response to the question, "Do you believe she can make the stickers appear in the other box and turn them into 10?" The behavioral measure was the child's decision in response to the question, "Do you want to put your stickers in one of the boxes or take your stickers home now?" (in the Explicit Incentive condition, the child was asked if he or she wants to put the stickers in *Morla's* box or take home the stickers). If the child chose to take home the stickers, the experimenter wrapped up the session by asking a series of questions: "Do you remember which of these boxes is Morla's box? Why did you decide to take the stickers home? Do you think Morla wanted your stickers?"

If the child chose to put the stickers in a box, the stickers were placed in the box and Morla was called back into the testing room. The participant then watched as the woman playing Morla closed her eyes, rubbed her temples, and appeared to concentrate intensely for 10 seconds. When she finished, she was thanked and asked to leave the room. The participant was then asked: "Do you think she moved the stickers and turned them into 10?" Next they were told, "You get to pick one box to open and if there's anything in there, you get to keep it! Which box do you want to open?" Lastly, the participants were asked whether they thought Morla wanted to take their stickers in order to determine if they were suspicious of Morla's intentions. Following the self-report verbal and behavioral measures, the experimenter debriefed the child and explained that Morla cannot really move stickers and multiply them. All participants were allowed to keep the stickers after the experiment.

Results and Discussion

In the Explicit Incentive condition, in which Morla had a clear motive for deceiving the child (so she could take their stickers), 33% of the participants chose to take a risk of

putting their stickers in Morla's box (see Figure 3). In the Control condition, in which Morla had no motive to deceive the child, 73% of participants took the risk of putting their stickers in the box ($\chi^2(1) = 3.57, p = .03$). However, 83% of participants in the Explicit Incentive condition expressed belief during the After Ritual Belief report even though Morla seemed deceptive. This was not significantly different from the 73% of participants who verbally expressed belief in Morla's ability to do magic in the Control condition, $p = .27$. Our data also revealed that 100% of participants in the Control condition had a consistent behavioral response to their verbal expression of belief after putting their stickers in the box but only 40% in the Explicit Incentive condition were consistent.

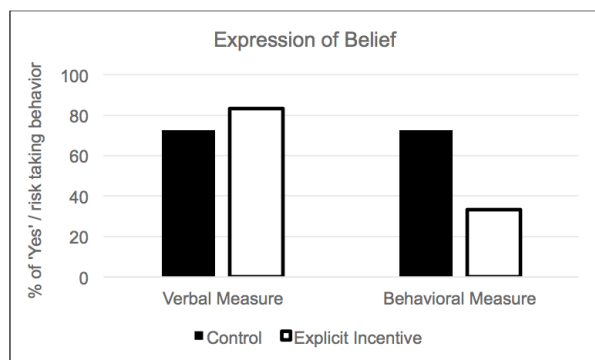


Figure 2. Verbal and behavioral data from Experiment 3.

Experiment 3 found an overall effect of condition on the behavioral measure and in comparison of the consistency between verbal and behavioral measures. Children who were given explicit information about Morla's position to gain from their trust were more skeptical in their behaviors than children who were not given such information.

There is a potential concern regarding the moral charge of the situation. It could be argued that since Morla has bad intentions she is a person that should be generally avoided. If children are generally uncomfortable with Morla, they may not want to play with her, and thus not put their stickers in her box. Indeed, since there was no effect of condition on verbal report, and only on the behavioral measure, the behavior may not be indicative of skepticism. This possibility will be taken into consideration in the design of future versions of this experiment.

General Discussion

In the present research we investigated how preschool-aged children evaluate extraordinary claims under conditions in which they stand to lose or gain as a function of their truth. Specifically, we examined their willingness to accept a claim made by a character named Morla that she could perform actions on candy or stickers using only her mind (i.e. eat candy or move stickers). Of primary interest was whether the participants' level of belief was influenced by the extent to which children might benefit or lose from the truth of the claim. Also of interest was the children's ability

to take into consideration information about Morla having motives for deceptively making her claim.

In Experiment 1 preschoolers were told that Morla could eat candy just by thinking about it. They were required to place either all 8 of their 8 candies or 2 of their 8 candies in a box and then watched Morla try to eat the candies mentally. Using children's verbal reports, we found that before children observed Morla attempt to do her magic about a third of the children believed that she would be successful. After children observed Morla attempt to do her magic this percentage increased significantly in the condition where they stood to lose only 2 candies, but not when they stood to lose all 8. Thus, children who stood to lose more from the truth of the claim appear to have ignored the observed ritual while children who only stood to lose a little were influenced by the observation. This finding supports the hypothesis that children have an outcome bias when forming beliefs.

In Experiment 2 we added a behavioral measure of belief to the verbal measures, and allowed children to change their responses at the end of the study, at which point having the belief could have no possible causal role in determining which box actually contained stickers. This was done to probe whether their initial statement of belief was merely expressing a hope or desire, or whether it instead expressed a conviction that Morla could in fact move objects mentally. As before, Morla claimed that she could move stickers just by thinking about it. In one condition the preschool participants stood to gain stickers if Morla's claim was true, and in another they stood to lose stickers. The verbal measure revealed that children were significantly more likely to accept Morla's claim when they stood to gain stickers. Further, after Morla's effort, when children were given the option to change their response, children in the gain condition again showed evidence of believing, and chose the box into which Morla claimed she could move stickers (effectively choosing the "empty" box). Together Experiments 1 and 2 suggest that children are highly vulnerable when it comes to believing claims they want to be true.

In Experiment 3, we explored whether children become skeptical of a claim that yields a benefit to them when the person making the claim stands to gain from the child's trust. As with Experiment 2, Morla claimed that she could move stickers just by thinking about it, but this time we examined the effect of telling participants about a potential ulterior motive of Morla (i.e. Morla really likes stickers and tries to steal them). Here we found a condition difference in participants' willingness to "bet" on Morla's claim being accurate, with only one third of participants taking the risk in the ulterior motive condition and three fourths doing so in the control condition in which Morla had no ulterior motive. These results stood in contrast to their verbal reports of belief, where participants in both conditions tended to accept Morla's claim (see Woolley, 2006 for a discussion of verbal-behavioral dissociations).

The findings from our first two experiments provide evidence that children are influenced by the valence of outcomes when assessing supernatural claims. These findings suggest that in addition to using rational strategies to evaluate testimony, they also consider how much they want the outcome to be true. This suggests that an important obstacle to teaching children critical thinking may be children's reduced motivation to question claims they want to be true (see Heyman, Fu, & Lee, 2013 for a related argument).

Results of Experiment 3 provide evidence that just as preschool children are influenced by how desirable an outcome is to them, they do take into consideration what the individual making the claim stands to gain from their belief. This finding suggests that even young children have some understanding that people who stand to benefit from their trust are more deserving of scrutiny.

One limitation of these experiments is that we cannot be sure that the participants interpreted all of the words in the questions we asked in the intended way. For example, they may have interpreted "can" in the Before Ritual Belief question, "Do you think Madame Morla can eat candy by thinking about it?", as though we were asking the child if it is *alright* with her if Morla eats them. Future versions of the experiment will eliminate this interpretation by instead asking whether Morla is "*able*" to do the act.

New versions of the experiments are presently being conducted with more consistency across the experiments so that general lessons can be more clearly drawn. Firstly, there will always be a behavioral measure of choosing a box after the magical act was supposed to have taken place. To avoid politeness concerns, in future versions the experimenter will always be the one reporting a claim made by the magical being, and the questions about belief will always be asked when the magical being is absent. In all three experiments, there will be the same magical act on the same objects (moving stickers from one box to another), and all of the experiments will involve the same boxes, each with two compartments. Initial ownership over the stickers will always be established in the same way (by correctly guessing which box has stickers inside).

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