

## PAPER

# How fantasy benefits young children's understanding of pretense

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### Abstract

*Sobel and Lillard (2001) demonstrated that 4-year-olds' understanding of the role that the mind plays in pretending improved when children were asked questions in a fantasy context. The present study investigated whether this fantasy effect was motivated by children recognizing that fantasy contains violations of real-world causal structure. In Experiment 1, 4-year-olds were shown a fantasy character engaged in ordinary actions or actions that violated causal knowledge. Children were more likely to say that a troll doll who was acting like but ignorant of the character was not pretending to be that character when read the violation story. Experiment 2 suggested that this difference was not caused by a greater interest in the violation story. Experiment 3 demonstrated a similar difference for characters engaged in social and functional violations that were possible in the real world. These data are consistent with the hypothesis that preschoolers use actions and appearance more than mental states to make judgments about pretense, but that those judgments can be influenced by the context in which the questions are presented.*

### Introduction

The field of theory of mind has closely examined the relationship between children's understanding of pretense and their understanding of mental representation. Pretense requires representational abilities similar to false belief: one must represent the world one way, when in fact it is another (Leslie, 1987; Lillard, 1993). Children begin to engage in pretense at 18 months (Piaget, 1962), and understand others' pretense by 28 months (Harris & Kavanaugh, 1993). However, children do not succeed on other tasks that require an understanding of mental representation, such as standard false belief tasks, until approximately 4 years old (Wellman, Cross & Watson, 2001).

This discrepancy has sparked a debate in the theory of mind literature centering on whether young children understand pretense in terms of mental representation. Several researchers argue that young children understand the mental characteristics of pretense before that of belief, and that children scaffold their understanding of belief from their understanding of pretense (Bruell & Woolley, 1998; Custer, 1996; Flavell, 1988; Ferguson & Gopnik, 1988; Hickling, Wellman & Gottfried, 1997; Leslie, 1987, 1988). Other researchers argue that young

children do not fully understand the representational demands of pretense; instead, they treat pretending as 'acting as if' (Harris, 1991; Harris, Lillard & Perner, 1994; Lillard, 1993, 1994, 2001; Perner, 1991).

This debate has mostly revolved around a procedure established by Lillard (1993): the Moe task. Children are shown Moe the troll who is hopping up and down. Children are told that Moe is hopping like a kangaroo, but since Moe is from the land of the trolls, he does not know what kangaroos are or that they hop. Children are then asked whether Moe is pretending to be a kangaroo. Lillard's hypothesis was that if children understood that pretense involved mental representation then they should recognize that Moe could not pretend to be something that he could not represent. However, only approximately 30% of 4-year-olds claimed that Moe was not pretending. In contrast, the majority of these children passed standard false belief tasks.

Various studies have replicated these results (see e.g. Lillard, 2001; Richert & Lillard, 2002). Researchers have also found that most 4-year-olds fail to appreciate that pretending involves the use of one's mind (Lillard, 1996; Sobel & Lillard, 2002), animacy on the pretender's part (Lillard, Zeljo, Curenton & Kaugers, 2000), intentionality on the pretender's part (Lillard, 1998), or pretenders'

awareness of their appearance or actions (Sobel, 2004). However, some research has demonstrated that 4-year-olds' understanding of pretense is affected by the context in which the pretense is presented. Lillard and Sobel (1999) demonstrated that 4-year-olds were more likely to categorize pretense actions with other mental states (e.g. thinking, dreaming, remembering) when those pretense actions were about fantasy characters (e.g. the Lion King, Pocahontas) as opposed to ordinary animals or entities (e.g. cats, kings/queens).

This fantasy effect has been demonstrated in other areas of cognitive development. Dias and Harris (1988, 1990) found that a fantasy context improved children's syllogistic reasoning. Richert (2003) demonstrated that fantasy affected children's ability to reason about certain types of analogies. Taylor and Carlson (1997) found that children with stable imaginary companions (a measure of fantasy orientation) succeeded on various theory of mind measures earlier than their age-matched counterparts. It is possible that fantasy provides a more general boost to children's reasoning abilities beyond just their understanding of pretense.

Sobel and Lillard (2001) examined this question by modifying Lillard's (1993) Moe the troll procedure. They showed 4-year-olds a troll doll 'running like the Lion King', but who had no knowledge of the Lion King. Children were asked whether the doll was pretending to be the Lion King. They also showed the same children a different troll doll, 'running like a cat', but who had no knowledge of cats. Children were asked whether this doll was pretending to be a cat. The two dolls performed the same action – the only difference was the fantasy context. Four-year-olds were more accurate at rejecting pretense when asked about pretending to be the Lion King than when asked about pretending to be a cat. This study also suggested that fantasy did not provide a general boost to all cognitive tasks. Children were also given two versions of a false belief task, one with and one without a fantasy context. False belief performance was not improved by a fantasy context, and was unrelated to performance on the pretense task.

Sobel and Lillard (2001) also demonstrated that the improvement in performance was not the result of fantasy characters being intentional agents, having scripted action, or having a specific identity. Using Lillard's (1996) box method, they found that 4-year-olds were more likely to categorize pretending as a mental state when asked about inanimate fantasy objects as opposed to inanimate ordinary objects (e.g. pretend to be a crystal ball vs. pretend to be a glass ball). They also found that 4-year-olds were more likely to make this judgment when the fantasy content, but not the action, was contrasted (e.g. pretend to be a light saber vs. pretend to be

a sword). These fantasy stimuli did not have their own intentions or a particular identity to which the child could relate.

These data suggest that children's judgments of the mental characteristics of pretense depend on the fantasy context of the pretense. There are other examples of contextual cues affecting children's reasoning about mental representation. Barrett, Richert and Driesenga (2001) found that 3-year-olds reasoned differently about God's mental states than an ordinary person's on a standard 'unexpected contents' false belief task. Similarly, Woolley, Boerger and Markman (2004) found that judgments about the reality status of a novel entity (the 'Candy Witch', a character associated with Halloween) were influenced by children's exposure to a ritual. Children whose parents 'called' the Candy Witch before the child went to sleep were more likely to believe that the Candy Witch was real than children whose family engaged in no such ritual.

What these data suggest is that the fantasy context itself might not motivate the boost in performance on the Moe task. Instead, it is possible that children interpret fantasy contexts in the same way that they interpret various kinds of religious rituals: they recognize that fantasy contexts involve violations of their natural intuitions about causal events. Several researchers have suggested that adults' interpretations of novel religious rituals follow this structure: ritualized actions can bring about real-world causal violations through non-natural causal mechanisms (e.g. Lawson & McCauley, 1990). More generally, Woolley (1997) argued that fantasy events are 'phenomena . . . violating, or at least being inconsistent with, our naïve theories of the world' (p. 991) and that 4-year-olds' understanding of fantasy was potentially similar to that of adults.

Given this definition of fantasy, the goal of the present study is to investigate whether *any* fantasy context benefits children's knowledge of pretense, or whether that benefit relies on the presence of such causal violations. To this end, in Experiment 1, children were asked about pretending to be one of two fantasy characters. One character clearly could violate many examples of real-world causal knowledge. The other came from a similar environment, but engaged in behaviors typical of an ordinary child. Would 4-year-olds respond differently when asked about pretending to be this character? Would both be considered fantasy contexts or are the causal violations necessary for a boost in performance?

## Experiment 1

Children were told one of two stories about a novel fantasy character: Zoltron from the planet Zolnar. In

one story, Zoltron engaged in a set of ordinary behaviors typical of a 4-year-old child's day. In the other story, Zoltron engaged in similar behaviors, but violated various aspects of real-world causality. Importantly, one scene – Zoltron playing in a sandbox – was similar across the two stories. In both conditions, children were clearly given a fantasy context. What differed was whether the fantasy character appeared capable of violating ordinary causal knowledge. Then, following Lillard (1993), children were shown a troll doll named Moe who was playing in a sandbox. Children were told that Moe looked like Zoltron, but that Moe did not know about Zoltron. Children were asked whether Moe was pretending to be Zoltron.

If performance on measures that demonstrate understanding mental representation in pretense, such as the Moe task, are influenced by fantasy contexts in general, then children should perform equally well on both of these tasks. Critically, both stories present a character from another planet, which introduces a fantasy context used in previous research (e.g. Dias & Harris, 1990). In contrast, if children are sensitive to the causal violations within a fantasy context, then only children read the causal violation story should show a benefit in performance.

### Method

#### Participants

Thirty-two 4-year-olds were recruited from flyers posted in preschools in an urban area. Approximately half of the sample was boys. Children ranged in age from 52 to 58 months (mean age 53.88 months). Participants were predominantly from middle-class families, spoke English as or as if it were their native language (as judged by the experimenter), and were mostly white, although a range of ethnic backgrounds was represented.

#### Materials

Two storybooks were designed. Each consisted of 12 pictures on standard 20 cm × 28 cm white paper, mounted on 31 cm square pieces of yellow cardboard, laminated and bound together by three metal rings. Both storybooks were covered with a title page. The first picture of each story showed the protagonist, Zoltron, with the caption, 'This is Zoltron, and he lives on the planet Zolnar'. The second picture of each story showed Zoltron in his bedroom with the caption, 'Let's follow Zoltron around during the day and see what he does.'

The remaining pictures differed between the two storybooks. In the *ordinary* storybook, Zoltron engaged in a set of behaviors typical of an ordinary child. Zoltron

lives with his mommy and daddy, and brother and sister; Zoltron is driven to school by his mommy; he walks through doors; he plays catch with a ball; he has grilled cheese sandwiches for a snack; and he gets tired and goes to sleep. In contrast, in the *causal violation* storybook, Zoltron engaged in certain actions that were not possible given real-world physical and biological constraints. Each action, however, corresponded to an action from the ordinary story. For instance, instead of going outside through a door, Zoltron walks through the wall to get outside; instead of getting tired and going to sleep, Zoltron never gets tired and always stays awake.

One picture across the two storybooks was similar. In this picture, Zoltron plays in a sandbox and builds a sand castle. In the causal violation story, Zoltron does this with his mind, while in the ordinary story he does this with his hands. This example is used in the test question of the experiment. Appendix A provides the exact script of each story, and Figures 1a and 1b show examples of a picture pair from the storybooks.

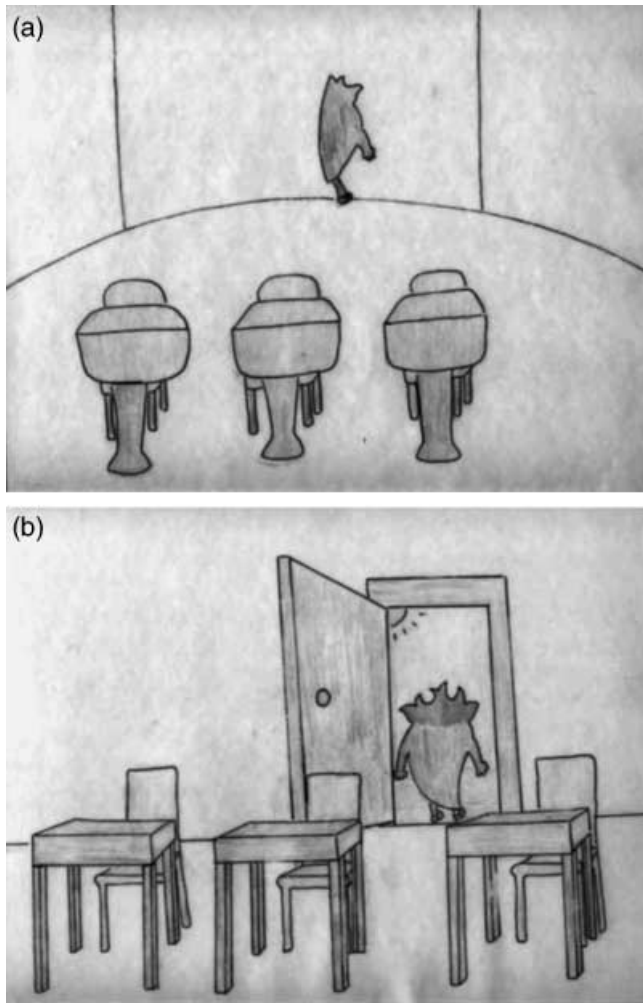
A small, human-like troll doll, approximately 9 cm in height, was used for the pretense question. The doll was placed in a 12 cm × 17 cm brown cardboard container, filled with salt mixed with yellow chalk dust so that it resembled sand. Children were also shown a 48-count Crayola crayon box and a set of birthday candles.

#### Procedure

Participants were brought into a game room by an experimenter with whom they were familiar. Children were usually tested with a caregiver present in the room (usually their mother). Children were told that the experimenter would read them a story and then ask them some questions about it. Half of the children were read the *causal violation* story, the other half were read the *ordinary* story.

*Pretense task.* When the story was finished, children were shown the troll doll in the sandbox. Children were told that the troll doll was named Moe, and that Moe was playing in the sandbox. The experimenter flipped to the page of the story in which Zoltron was playing in the sandbox, and told the children that while Moe was playing in the sandbox, he looked just like Zoltron. Then, the experimenter took away the storybook and said that Moe did not know anything about Zoltron. He had never seen Zoltron before, and had never read the story, so he did not know who Zoltron was.

Children were then asked two control questions: whether Moe looked like Zoltron, and whether Moe knew about Zoltron. If the child answered either of these



**Figure 1** An example of a picture pair used in Experiment 1 (p. 5, see Appendix A). In the causal violation story, Zoltron wants to play outside, and walks through the wall in the back of the classroom to do so. In the ordinary story, Zoltron wants to play outside, and walks through the door in the back of the classroom.

questions incorrectly, corrective feedback was given reminding the child of the story elements. Children were then asked whether Moe was pretending to be Zoltron. No feedback was given on this question.

*False belief task.* To ensure that any boost in performance observed by the causal violation manipulation was not the result of these children having a deeper understanding of mental representation, all children were also given a standard ‘unexpected contents’ false belief task (Gopnik & Astington, 1988). Performance on this task should be the same between the conditions. Children

were shown a Crayola crayon box and were asked what was inside. All children responded ‘crayons’ or a synonym. Children were then shown the actual contents of the box, which were birthday candles. The candles were put back into the box and the box was closed. The experimenter then asked the *other* question: ‘Let’s say your [caregiver not present in the room, usually Daddy] comes in here. [Daddy] has never seen this box before. What will [Daddy] think is in the box?’ After children responded, the experimenter asked the *self* question: ‘Before I showed you what was in the box, what did you think was in the box?’ After children responded, the experimenter asked the *control* question: ‘What is really in the box?’ No feedback was given on any of these questions.

#### Coding

Children were coded as passing the pretense task if they stated that the troll doll was not pretending to be Zoltron. On the false belief task, children received a score of 1 for answering each of the ‘self’ and ‘other’ questions correctly. Thus, children could score within a range of 0 to 2, provided they answered the control question correctly. The control question served as a baseline for whether children understood the questions. Children received a score of 0 if they answered the control question incorrectly.

#### Results and discussion

Fourteen children required feedback on one of the two control questions (22% of questions overall). No child required feedback on both questions. Children tended to require feedback on the ‘knowledge’ question more often than the ‘appearance’ question: McNemar  $\chi^2(1) = 3.50$ ,  $p = .06$ . However, these children were divided evenly between those read the two stories, and they did not show a different pattern of performance on the Moe task: both  $\chi^2(1) < 2.10$ , both *ns*.

Eight out of the 16 children (50%) who were read the causal violation story correctly stated that Moe was not pretending. Only two children (13%) who were read the ordinary story responded in this manner, a significant difference,  $\chi^2(1) = 5.24$ ,  $p = .02$ . These differences were not due to age or mental representation abilities. The mean age of the children read the ordinary story was 53.75 months; the mean age of the children read the violation story was 54.00, not significantly different,  $t(30) = -0.58$ , *ns*. Children also did not differ on their false belief scores between the two conditions, mean of 1.40 out of 2 in the causal violation condition and 1.31 out of 2 in the ordinary condition,  $t(30) = 0.33$ , *ns*.

Similar to findings by Lillard (1993), children read the ordinary story responded that Moe was pretending to be Zoltron more often than chance performance (50%), binomial test,  $p = .004$ . Children read the causal violation story, however, performed no differently from chance. This is consistent with the slight, but significant boost in performance found in previous research when fantasy contexts were used that all contained violations of real-world causal knowledge (Lillard & Sobel, 1999; Sobel & Lillard, 2001).

These data suggest that children recognize causal violations in fantasy, and these violations motivate the benefit of a fantasy context. However, an alternative explanation for these results is that children might have been more interested in the causal violation story, and as a result, more engaged by the task in this condition. If children are more interested in a cognitive task, they will allocate more resources to solving that task, which could explain their superior performance (e.g. Renninger & Wozniak, 1985). In particular, Frye (2000) suggested that success on the Moe task requires children to inhibit their knowledge of Moe's actions in favor of the critical mental state knowledge. Children who are more attentive to the experimental procedure might be more able to engage this inhibitory mechanism.

It is important to note that a general version of this hypothesis was not supported. Performance on the false belief measure also requires inhibition. However, in neither Experiment 1 nor previous experiments in which the fantasy context of the false belief measure was manipulated (Sobel & Lillard, 2001) did performance differ between the groups. Experiments 2 and 3 considered the more specific proposal that children's interest level potentially affects performance on the Moe task. Specifically, in Experiment 2, we directly examined whether children who succeeded on the Moe task when read the causal violation story were more likely to remember elements of the story better than children who did not succeed.

Another concern with Experiment 1 is that Zoltron's action in the sandbox does differ between the two stories. In the causal violation story, the picture indicates that Zoltron builds a sandcastle with his mind while in the ordinary story he uses his hands. It is possible that children only made a comparison between Moe's actions and Zoltron's actions in this picture, and were not making a judgment based on the overall story context. To address this concern, we changed this particular aspect of the causal violation story to make Zoltron's actions in the sandbox not violate real-world causal knowledge. The expectation is that this change will have no effect, and children's level of performance will parallel the results of Experiment 1.

## Experiment 2

If children's interest in the story influenced their performance on the Moe task, then one might expect children who succeeded on the Moe task to exhibit different behaviors on measures of attentiveness than children who do not succeed. In Experiment 2, children were read a similar causal violation story and given the same measures as in Experiment 1. Later in the session, they were given a surprise memory task, in which they had to recall items from the Zoltron story. If the benefit shown by the causal violation story was due to children's higher interest level, then one might expect children who succeeded on the Moe task to perform better on this memory task.

The causal violation story in this experiment differed from the previous experiment in one way. In the previous experiment, when Zoltron was in the sandbox, he engaged in a causal violation (he built a sandcastle with his mind). It was possible that children only paid attention to this particular action, which did vary between the causal violation and ordinary stories. In this experiment, when Zoltron was in the sandbox, he did not engage in a causal violation. This enabled us to measure whether the benefit of causal violations shown in the first experiment generalized beyond Zoltron's direct actions.

### *Method*

#### Participants

Twenty 4-year-olds were recruited from flyers posted in preschools. Four additional children were tested, but not included due to experimenter error. Children ranged in age from 48 to 61 months (mean age 53.45 months). All other characteristics of this sample were similar to Experiment 1.

#### Materials

The causal violation storybook, troll doll, sandbox and crayons-candles box from Experiment 1 were used. The violation story had one change. Instead of Zoltron building a sandcastle with his mind, no mention of a causal violation was made in this picture: Zoltron built a sandcastle with his hands. The picture from the ordinary story in Experiment 1 was used.

In addition, children were shown five sets of three pictures. In one set, one picture was of Zoltron playing in the sandbox, while the other two pictures were of Zoltron engaged in actions not in the story (playing in the park and the garden). In the remaining four sets, one picture in each set was identical to a picture in the causal violation storybook, one picture was identical to the

analogous picture in the ordinary storybook, and the third picture was a picture of Zoltron engaging in a novel action that also violated real-world causal knowledge. For example, one set consisted of a picture of Zoltron flying to school in a rocket ship (the correct answer), a picture of Zoltron walking to school, and a picture of Zoltron flying to school in a jetpack. Each picture was on a 10 cm × 15 cm index card, mounted to a 23.5 cm × 56 cm piece of blue cardboard.

### Procedure

All children were given the same procedure as those children who were read the causal violation story in Experiment 1, using the modified storybook described above. After children received the Moe task, false belief task and an unrelated measure, they were given a surprise memory task. The set of pictures with Zoltron playing in the sandbox was brought out and children were reminded that in the story, Zoltron played in the sandbox, but not in the garden or in the park. Children were then shown the four sets of pictures, with the content of each picture read to them, and children were asked to point to the picture that was in the story.

### Results and discussion

Ten children required feedback on one of the control questions (25% of the control questions overall). No child required feedback on both questions. In particular, all ten required feedback on the appearance question: McNemar's  $\chi^2(1) = 8.10$ ,  $p = .004$ . The children who did require feedback did not differ in their responses to the pretending question from the children who required no feedback:  $\chi^2(1) = 0.20$ , *ns*.

Nine of the 20 children (45%) stated correctly that Moe was not pretending to be Zoltron, while eleven of the 20 children stated that Moe was pretending. The children who passed the Moe task did not have higher false belief scores – the mean for each group was 1.00 out of a possible 2, Mann-Whitney  $U = 49.50$ ,  $z = 0.00$ , *ns*.

The memory test was scored as follows: children were given a score of 1 if they pointed to the picture in each set that was in the story and score of 0 otherwise. A preliminary analysis revealed that children were not more likely to perform better on any one set of pictures. Performance on the memory test was independent of success on the Moe task. Children who stated that Moe was not pretending answered on average 3.81 out of 4 memory questions correctly. Children who stated that Moe was pretending answered on average 3.66 out of 4 memory questions correctly, not a significant difference: Mann-Whitney  $U = 42.00$ ,  $z = -0.76$ , *ns*.

These data suggest that the improvement in performance given the causal violation story that was observed in Experiment 1 was not due to children being more interested in the story. If children's interest level motivated their success on the Moe task, then one would expect that children who succeeded on this task to remember more of the story than those who did not. This was not case.

However, a concern with these data was that children showed near ceiling levels on their responses to the memory questions. The memory questions might have been too easy for children since each memory probe was explicitly mentioned in the story and the pictures themselves likely served as a recall cue. As a result, these memory questions might not have been sensitive enough to measure children's level of engagement with the story. In Experiment 3, we used a memory control for events in the story that were incidental to the story elements, and thus not explicitly mentioned. We also introduced a longer delay between the story and the memory test.

Further, in Experiments 1 and 2, the causal violations were all impossible events in the real world. In contrast, the 'ordinary' Zoltron lives on another planet, but acts like an ordinary child. Dias and Harris (1988, 1990) demonstrated that 'coming from another planet' was sufficient to introduce a fantasy context in their experiments. But in some of those experiments, the experimenter also told children that on this different planet, 'lots of funny things happen, like fish living in trees'. Such events aren't necessarily impossible in the real world (one could imagine a fish living in a fish bowl in a tree), but they are clearly violations of social and functional conventions. Do the causal violations that motivate the fantasy effect have to be impossible in the real world, or are children sensitive to violations of causality in the social realm, such as violations of conventions? Experiment 3 examined whether the causal violations that children were shown in the Zoltron story had to be impossible. In the social domain, violations in obligations and permissions can occur that do not break the boundaries of real-world causality. Similarly, violations of artifact function – using artifacts in ways they were not intended – are possible in the real world. Children appear to understand these deontic violations at a relatively early age, and use them in everyday reasoning (Cummins-Dellarosa, 1996; Nunez & Harris, 1998).

There is some question whether this manipulation would benefit children's understanding of pretense in the same manner as the impossible causal violations used in Experiments 1–2. Following the work by Dias and Harris (1988, 1990), Seier (1994) demonstrated that ordinary characters who violated social norms provided no improvement to children's conditional reasoning abilities.

This work, however, examined how children reasoned about two different ordinary characters; it did not contrast two fantasy characters. Experiment 3 examined whether fantasy characters who violated these kinds of possible causal relations produced a similar boost in performance on the Moe task.

### Experiment 3

In this experiment, children were read one of two stories about a novel fantasy character. In one story, the character engaged in a set of ordinary actions, typical of a 4-year-old's day. In the other, the character engaged in the same actions, but in most scenes, the character violated a social and functional norm in such a way that did not violate physical, psychological or biological causality. As in Experiments 1 and 2, one picture – of the character playing in the sandbox – was the same across the stories. Children were then given the same Moe task in which they were asked whether Moe was pretending to be the fantasy character.

This experiment provided an additional control that children's interest level drove the differences observed in the previous experiments. Children were also given a similar memory control as in Experiment 2, but instead of asking children about the exact events mentioned in the story, children were asked about items that were shown in the pictures but that were not explicitly mentioned. If children were more interested in the violation story, then they should be more likely to recall this information, since it would have caused them to pay more attention to the violation storybook. In contrast, if recognizing the violations motivated children's improved performance, then responses to these questions should not differ between the two storybooks.

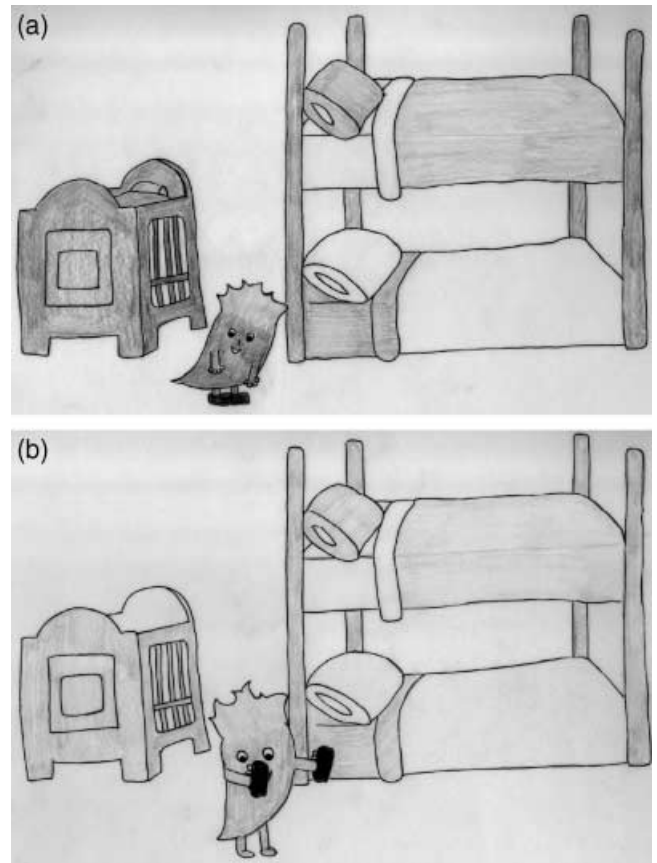
#### Method

##### Participants

Thirty-two 4-year-olds were recruited from flyers posted in preschools and from classrooms from a local area preschool. Two additional children were tested, but not included due to experimenter error. Children ranged in age from 48 to 64 months (mean age 55.37 months). All other characteristics of this sample were similar to Experiments 1–2.

##### Materials

Two new storybooks were designed similar to those used in Experiment 1. The cover page and first two pictures were the same as the storybooks in Experiment 1. The



**Figure 2** An example of a picture pair used in Experiment 3 (p. 2, see Appendix B). In the social violation story, Zoltron gets dressed by putting his shoes on his hands. In the ordinary story, he gets dressed by putting his shoes on his feet.

remaining pictures differed between the two storybooks. In the *violation* story, Zoltron engaged in a set of actions that violated no causal relations, but did violate particular social and functional norms. In the *Ordinary* storybook, Zoltron engaged in analogous behaviors that did not violate such social norms. Figures 2a and 2b show an example. In these figures, Zoltron gets dressed each morning. In the violation story, he wears his shoes on his hands. In the ordinary story, he wears his shoes on his feet.

As in Experiment 2, one picture in the two storybooks was identical: Zoltron playing in a sandbox and building a sand castle. This example is used in the test question of the Moe test. Appendix B shows the exact script of each story.

For each storybook, three sets of three pictures were designed. Each picture was on a 10 cm × 15 cm index card, mounted to a 24 cm × 56 cm piece of blue

cardboard. One picture in each set was identical to a picture in the story. The other two pictures were similar, but differed on a feature that was not mentioned in the story. For instance, in one set, Zoltron was shown with shoes on his feet or hands (dependent on whether the child was in the ordinary or violation condition respectively). The three pictures differed only on what color the shoes were: purple, red or blue (correct answer: purple).

In addition, the same troll doll, sandbox and crayons-candles box from Experiments 1 and 2 were used.

### Procedure

The procedure was similar to Experiment 1. Children were read either the *violation* or *ordinary* story and then given the Moe task. Children were also given a false belief task, similar to Experiments 1–2. After these procedures, children participated in an unrelated experiment and then took a break by either taking a walk with the experimenter or by playing with blocks.

Approximately 20 minutes after the initial participation, children were then given a surprise memory procedure, similar to that used in Experiment 2. They were shown sets of three pictures. One picture was a replica of a picture from the story. The other two were subtle manipulations of that picture. These manipulations were pointed out to the child, and they were asked which picture was in the story. For instance, in the violation story condition, children were shown three pictures of Zoltron wearing shoes on his hands. The shoes were red, purple or blue. Children were asked what color Zoltron's shoes were. This fact was not explicitly mentioned in the story itself. Children were asked three such memory questions, shown in detail in Appendix B.

### Coding

The Moe task and false belief task were coded in the same manner as in Experiments 1 and 2. The memory control was coded as in the same manner as in Experiment 2. Since only three memory questions were asked, memory scores ranged from 0 to 3.

### Results and discussion

Twelve children required feedback on one of the two control questions (19% of questions overall). No child required feedback on both control questions. Children did not fail one of the control questions more often, McNemar  $\chi^2(1) = 0.75$ , *ns*. Children who did require feedback on one of the questions showed no difference in their performance on the Moe task than children who required no feedback,  $\chi^2(1) = 0.53$ , *ns*.

**Table 1** Percentage of children passing Moe task and scores on the false belief and memory control measures in Experiment 3

Story type	Pretense task	False belief	Memory control
Social violation	0.50 (0.52)	1.31 (0.87)	1.81 (0.75)
Ordinary	0.13 (0.34)	1.25 (0.77)	1.44 (0.89)

*Notes:* Moe task on pretense shown as percentages. False belief score out of a maximum of 2. Memory score is out of a possible 3. Standard deviations shown in parentheses.

Table 1 shows performance on all of the tasks between the two story conditions. Eight out of 16 children (50%) succeeded on the Moe task in the violation condition, while only two of 16 children (13%) did so in the ordinary condition, a significant difference  $\chi^2(1) = 5.24$ ,  $p = .02$ . As in Experiment 1, children responded that Moe was pretending when read the ordinary story significantly more often than what would be expected by chance (50%), binomial test,  $p = .004$ . Children read the violation story, however, performed no differently from chance. Further, the group difference was not the result of age or mental representation abilities. The mean age of the violation group was 56.06 months, while the mean age of the ordinary group was 54.63 months,  $t(30) = -0.92$ , *ns*. The mean score on the false belief task was 1.31 for the violation group and 1.25 for the ordinary group,  $t(30) = -0.21$ , *ns*.

The memory test was scored in the same manner as Experiment 2. A preliminary analysis revealed that children were not more likely to perform better on any one set of pictures. Children in the violation group scored slightly but not significantly higher on the memory control than children who were read the ordinary story, 1.81 vs. 1.44 out of a possible score of 3,  $t(30) = -1.29$ , *ns*. Further, looking across both conditions, those children who succeeded on the Moe task were not more likely to score higher on the memory control. Children who succeeded on the Moe task answered on average 1.80 out of 3 memory questions correctly. Children who did not succeed on the Moe task answered 1.55 out of 3 questions correctly, not significantly different,  $t(30) = -0.80$ , *ns*.<sup>1</sup>

To summarize, performance on the Moe task improved when children were asked about a fantasy character who violated possible social and functional norms, like one who violated impossible pieces of physical and biological causal knowledge in Experiments 1 and 2. This boost in performance did not seem the result of children's superior understanding of mental representation or their greater interest in the violation story.

<sup>1</sup> Since these two groups were of relatively unequal size, a nonparametric analysis was also performed. The findings paralleled the parametric analysis reported in the text, Mann-Whitney  $U = 89.00$ ,  $z = -0.91$ , *ns*.

Children showed no difference in performance on a false belief task. Children did not remember more information about that story than the ordinary story, nor did children who succeeded on the Moe task remember more information than children who did not succeed. Further, performance on the memory task was not at ceiling levels, suggesting that the task genuinely measured children's interest levels, and not information that would automatically be encoded by reading the story.

## General discussion

Previous studies of children's understanding of pretense found that 4-year-olds' performance improved when children were asked questions about fantasy characters (Lillard & Sobel, 1999; Sobel & Lillard, 2001). The present experiments were designed to examine why fantasy improved performance. These experiments indicated a small but demonstrable increase in 4-year-olds' performance when asked about characters that violate various kinds of causal structure. Across Experiments 1–3, of the 52 children read a story in which the novel fantasy character violated real-world causal structure, 25 performed correctly on the Moe task (48%). This proved to be significantly more than the children who were read stories in which the novel fantasy character did not violate causal structure, and slightly higher than the average number of children who succeed on ordinary versions of the Moe task (approximately 30%, Lillard, 2001).

These results suggest that performance on the Moe task – a measure of the role of mental representation in pretense – appears to be influenced by certain information in fantasy contexts. In Experiment 1, children only showed a benefit in performance on the Moe task when the fantasy context contained violations of impossible physical and biological causal structure. Experiment 2 replicated this finding, demonstrating that success was not indicated by a greater interest in the violation story. Experiment 3 generalized these findings to another context, in which the causal violations were actually possible in the real world, but were considered violations of social and functional norms and conventions. Experiment 3 also provided further evidence that the benefit in performance was not due to children's increased engagement with the causal violation stories.

What these data do not tell us is exactly *why* these different types of causal violations influence children's understanding of pretense. Why should recognizing that fantasy contexts involve violations of real-world causal knowledge improve children's success on Lillard's (1993) Moe task? One possibility is that children respond based on a judgment about the complexity of the pretense. Children might

find it more difficult for Moe (or anyone) to pretend to be the 'violation' Zoltron than the 'ordinary' one. Since keeping track of what is required to pretend to be the 'violation' Zoltron is more difficult than the 'ordinary' Zoltron, it might be more difficult to pretend to be him.

While there is little empirical evidence in the present study for or against this possibility, it is worth noting that the types of pretend play children engage in can be quite diverse. Taylor (1999), for example, documented great variability in young children's fantasy lives. There is some evidence that the complexity of children's fantasy lives (such as having a stable imaginary companion) influences children's knowledge of mental representation (e.g. Astington & Jenkins, 1995; Taylor & Carlson, 1997). However, it is not clear if the child's tendency to engage in various forms of pretend play is related to the child's ability to keep track or make judgments about others' pretense (see e.g. Harris & Kavanaugh, 1993). This is a question for future investigation.

Another possibility relating causal violations and children's understanding of pretense is that to respond correctly on the Moe task, children must recognize that one's actions and appearance do not necessarily warrant pretending. In the present procedure, children are told that Moe and Zoltron are engaged in a relatively ordinary action (and in Experiments 2 and 3, an action that does not violate any real-world causal structure). To determine whether Moe is pretending to be Zoltron (whom he is unaware of), children might engage in a particular piece of counterfactual thinking: they might question whether Moe's actions are representative of his possessing the ability to engage in the same set of actions as Zoltron. If they infer that those actions are not, then Moe is not likely to be pretending, and children will be more likely to answer correctly.

This representativeness hypothesis can be described in terms of likelihoods. Children are shown about 10 examples of Zoltron's actions and one ordinary act by Moe, which happens to be similar to one of Zoltron's actions. In the ordinary stories, Zoltron's actions are all ordinary actions. If Moe were pretending to be Zoltron, he would act like him in some way, so there is little reason to separate out this particular action from any other example. However, in the violation story, the likelihood that Moe pretends to be Zoltron by engaging in the one ordinary action as opposed to one of the other 10 actions in which a causal violation is present seems relatively low (and certainly lower than in the ordinary condition). As a result, children might recognize that this particular action does not indicate Moe's intention to pretend.

This hypothesis requires children to have two reasoning abilities. First, children must be able to engage in counterfactual thinking to come to a causal conclusion.

Several researchers who have investigated how children engage in counterfactual thinking suggest that this ability is present during the fourth year (e.g. Harris, German & Mills, 1996). Second, children must be able to recognize the difference between agents that do and do not have the ability to violate real-world causal structure. Johnson and Harris (1994) demonstrated that preschoolers were sensitive to violations of ordinary causal constraints: a ‘Magic Fairy’ could violate principles of folk physics, but an ordinary character could not. These data suggest that 4-year-olds could use this counterfactual reasoning process to make a judgment about whether Moe is pretending.

A question raised by this hypothesis is how many causal or social violations must a child observe to indicate that an ordinary action on Moe’s part would not represent what Zoltron can do. For example, in the causal violation story, Zoltron violated 9–10 pieces of causal knowledge. Is it necessary to present children with so many violations? Is only one sufficient? Osherson, Smith, Wilkie, Lopez and Shafir (1990) suggested that participants are more likely to make category-based inductions as the number of antecedent events increases. If children have to infer that Zoltron is an entity that violates causal relations (thus making another’s ordinary action insufficient to infer pretending), then the more instances of causal violation they observe, the more likely they would see a difference between the causal violation and ordinary stories. Since the present findings suggest a relatively weak boost in performance, we might infer that many instances of causal violation are necessary. However, one might emphasize quality over quantity. A Zoltron who violates the same piece of physical causality many times (e.g. a Zoltron who only has the ability to fly) might be considered less ‘fantastic’ than a Zoltron who violates different aspects of physical, biological and psychological causality (e.g. a Zoltron who can read minds, walk through walls and never sleeps). This, however, remains an empirical question.

Given that possible social violations produce as robust an effect in Experiment 3 as impossible causal violations do in Experiments 1–2, this hypothesis also suggests follow-up experiments that do not involve fantasy or real-world causal violations at all. If children recognize that a potential pretender’s actions are or are not representative of the actions of the pretense entity, then they should use this knowledge to infer whether characters are pretending regardless of the context. For example, if Moe the troll is driving a car just like a doctor, but had no knowledge of doctors, children should judge that he is less likely to be pretending to be a doctor than if Moe the troll is listening to someone’s heartbeat just like a doctor.

Research on adults’ judgments about fantasy might suggest procedures that would contrast this representative-

ness hypothesis with one that suggests that children recognize that it is more difficult to pretend to be the causal violation Zoltron. Adults often judge that the causal violations in fantasy are produced by an agent. For example, Barrett and Lawson (2001) told adult participants about a religious ritual in which a special agent performed an ordinary action that resulted in fertile crops. Participants judged that rituals in which the agent changed were less likely to be effective than rituals in which the action or instrument changed. This suggests that adults, and potentially young children, recognized that fantasy involves individual *agents* possessing mechanisms that produce causal violations.

One way of contrasting these two hypotheses would be to compare children’s reasoning about an agent who engaged in causal violations with their reasoning about an ordinary agent who possesses an instrument capable of such violations. One could imagine contrasting a story in which Zoltron’s abilities to violate causal structure were internal versus a story in which Zoltron was ordinary and relied on an instrument that produced the same causal violations. When playing in the sandbox, Moe’s actions more likely represent the Zoltron with the special instrument as opposed to the Zoltron who is the special agent. Even though both Zoltrons could violate the same causal knowledge, this suggests that the benefit to children’s understanding of fantasy would not be present when Zoltron is ordinary but has such a special instrument. We are currently exploring this possibility in the lab, and pilot data suggest this is the case. However, more research is necessary to describe and support this hypothesis further.

A limitation with the present data and these potential follow-up experiments is that there is no explanation of how these findings generalize beyond the Moe task to other fantasy effects, such as those found for syllogistic reasoning (Dias & Harris, 1988, 1990) or problem analogies (Richert, 2003). Dias and Harris (1990) argued that children’s improved performance on syllogisms in fantasy contexts was due to their engaging in a form of counterfactual thinking. This enabled children to use information they know to be false in their reasoning. This seems similar to the ‘representativeness’ explanation of these data: in the Moe task, the counterfactual inference involved a comparison between Moe’s actions and Zoltron’s. In syllogistic reasoning, children compare the truth-value of a premise in the real world and in the fantasy context. As a test of this hypothesis, we would expect that children would not show a benefit to their syllogistic reasoning if the ‘fantasy’ context was ordinary – if it clearly did not violate any kind of real-world causal knowledge – as in the present Experiment 1. This is also a subject for further investigation.

To conclude, these data demonstrate that the effect of fantasy shown in previous research on children's understanding of pretense (Lillard & Sobel, 1999; Sobel & Lillard, 2001) may not be about fantasy *per se*. Whether those fantasy characters violate causal knowledge seems to motivate the boost in performance, and those violations do not have to be impossible. What these data do not demonstrate is that the effect of fantasy allows children a complete understanding of the role of mental states in pretending. In no case did performance rise above the level of chance: rather performance rose from below chance levels to that of chance, consistent with previous findings (Sobel & Lillard, 2001). This suggests that young children's understanding of pretending is motivated more by characteristic actions than by an understanding of the mental states involved in pretense (e.g. Lillard, 2001). However, these data also suggest that 4-year-olds' knowledge can be heightened by introducing these causal violations. Investigating whether other types of causal violations facilitate performance and investigating whether other age groups or other reasoning tasks benefit from these manipulations is a source of future work.

## Appendix A

*Scripts of the two stories used in Experiments 1 and 2*

*Note:* In Experiment 2, the ordinary wording for page 6 is used in the causal violation story.

Ordinary story (pages demarked by numbers)

1. This is Zoltron and he lives on the planet Zolnar.
2. Let's follow Zoltron around during the day and see what he does.
3. Zoltron lives with his mommy and daddy. He also lives with his one brother and one sister.
4. Zoltron goes to school each morning. Mommy drives him to school in the family car.
5. After school is over, Zoltron wants to play outside. To get outside, he goes through the door in the back of the classroom.
6. Zoltron plays in the sandbox. He builds a sandcastle with his hands.
7. Zoltron and his friends play with a ball. They play a game of catch. They pick up the ball and throw it to each other.
8. Later, Zoltron goes home and he has a snack. He and his family have grilled cheese. Zoltron likes it when the cheese is warm.
9. Zoltron is going to grow up one day and be a grown-up, just like his mommy and daddy.

10. Now it is nighttime. Zoltron has to sleep. He gets pretty tired. He tries to stay awake, but he cannot. So, he and his brother and sister fall asleep.
11. Wow, what a long day. And who knows what will happen tomorrow. The end.

Causal violation story

1. This is Zoltron and he lives on the planet Zolnar.
2. Let's follow Zoltron around and see what he does all day.
3. Zoltron lives with his 32 mommies and daddies and his brothers and sisters. He has 64 brothers and 53 sisters.
4. Zoltron goes to school each morning. He flies to school in the family rocket ship.
5. After school is done, Zoltron wants to play outside. To get outside, he passes right through the wall in the back of the classroom.
6. Zoltron plays in the sandbox. He builds a sandcastle. He does not touch the sand. He just thinks about the castle and it gets built.
7. Zoltron and his friends play with a ball. They play a game of snorch. They think about the ball and the ball moves from one to another.
8. Later, Zoltron goes home and he has a snack. He and his family have glumps. Zoltron likes it when the glumps are warm.
9. Zoltron is never going to grow any older. He is going to stay the same age forever.
10. Now it is nighttime. Zoltron does not have to go to sleep. He never gets tired. He always stays awake. He stays up all night playing games with his brothers and sisters.
11. Wow, what a long day. And who knows what will happen tomorrow. The end.

## Appendix B

*Scripts of the two stories and memory questions used in Experiment 3*

Ordinary story

1. This is Zoltron and he lives on the planet Zolnar. Let's follow Zoltron around and see what he does.
2. Zoltron gets dressed every morning. He puts on his shoes. He wears his shoes on his feet.
3. Zoltron's mom drives him to school every morning. He rides in the back seat of the car.
4. At school, Zoltron and all of the children sit at their desks. Teacher teaches them while they sit at their desks.
5. Zoltron plays outside at school. He plays in the sandbox. He builds a sandcastle.

6. Now school is over. Zoltron goes home with his friend. Every now and then, they do a cartwheel.
7. Zoltron has a snack with his family. They eat soup. They eat their soup with a spoon.
8. Oops, Zoltron gets an owie. He puts a band-aid on his owie.
9. At the end of the day, Zoltron takes a bath. He washes himself with a washcloth.
10. Wow, what a long day. And who knows what will happen tomorrow. The end.

#### Social violation story

1. This is Zoltron and he lives on the planet Zolnar. Let's follow Zoltron around and see what he does.
2. Zoltron gets dressed every morning. He puts on his shoes. He wears his shoes on his hands.
3. Zoltron's mom drives him to school every morning. He rides in the trunk of the car.
4. At school, Zoltron and all of the children sit on the teacher's desk. Teacher teaches them while they sit at her desk.
5. Zoltron plays outside at school. He plays in the sandbox. He builds a sandcastle.
6. Now school is over. Zoltron goes home with his friend. Zoltron and his friend only do cartwheels. They don't walk, they only cartwheel home.
7. Zoltron has a snack with his family. They eat soup. They eat their soup with a fork.
8. Oops, Zoltron gets an owie. He puts stickers on his owie.
9. At the end of the day, Zoltron takes a bath. He washes himself with a mop.
10. Wow, what a long day. And who knows what will happen tomorrow. The end.

#### Memory questions

1. (For the picture in which Zoltron gets dressed): What color were Zoltron's shoes? Red, Purple or Blue (Correct answer Purple)
2. (For the picture in which Zoltron is at school): What did teacher teach at school? The ABC's, the 123s, or the Shapes (Correct answer: ABC's)
3. (For the picture in which Zoltron has a snack with his family): How many brothers and sisters does Zoltron have? One, two, or three (Correct answer: two)

## Acknowledgements

A portion of these data was presented at the 2003 Meeting of the Jean Piaget Society in Chicago, IL and at the 2003 Meeting of the Cognitive Development Society in Park

City, UT. I would like to thank Alisa Breetz and Emily Blumenthal for assistance with stimulus design and data collection, and Amy Hoff, Mark Johnson, Rebekah Richert, Steven Sloman and several anonymous reviewers for providing helpful discussion about this article.

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Received: 18 December 2002

Accepted: 16 June 2005