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Seeing Is Believing: Children's Explanations of Commonplace, Magical, and Extraordinary Transformations

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ROSENGREN, KARL S., and HICKLING, ANNE K. *Seeing Is Believing: Children's Explanations of Commonplace, Magical, and Extraordinary Transformations*. CHILD DEVELOPMENT, 1994, **65**, 1605–1626. Children's magical explanations and beliefs were investigated in 2 studies. In Study 1, we first asked 4- and 5-year-old children to judge the possibility of certain object transformations and to suggest mechanisms that might accomplish them. We then presented several commonplace transformations (e.g., cutting a string) and impossible events (magic tricks). Prior to viewing these transformations, children suggested predominantly physical mechanisms for the events and judged the magical ones to be impossible. After seeing the impossible events, many 4-year-olds explained them as "magic," whereas 5-year-olds explained them as "tricks." In Study 2, we replaced the magic tricks with "extraordinary" events brought about by physical or chemical reactions (e.g., heat causing paint on a toy car to change color). Prior to viewing the "extraordinary" transformations, children judged them to be impossible. After viewing these events, 4-year-olds gave more magical and fewer physical explanations than did 5-year-olds. Follow-up interviews revealed that most 4-year-olds viewed magic as possible under the control of an agent (magician) with special powers, whereas most 5-year-olds viewed magic as tricks that anyone can learn. In a third study, we surveyed parents to assess their perceptions and conceptions of children's beliefs in magic and fantasy figures. Parents perceived their children as believing in a number of magic and fantasy figures and reported encouraging such beliefs to some degree. Taken together, these findings suggest that many 4-year-olds view magic as a plausible mechanism, yet reserve magical explanations for certain real world events which violate their causal expectations.

Recent accounts of cognitive development portray young children as constructing systematic and coherent theories of the world. These accounts contrast with older accounts (e.g., Piaget, 1929, 1930) which viewed young children as inclined toward illogical, even magical, thinking. However, the modern accounts do not completely capture the nature of children's thought. Not all of children's thinking can be described as systematic, logical, or scientific. Numerous reports of young children have shown that they enjoy a rich fantasy life, engage in pretend play (Singer & Singer, 1990), and may

have imaginary playmates (Taylor & Cartwright, 1991). Other research suggests that it is not uncommon for children to hold beliefs in the reality of supernatural beings (Clark, 1991; Harris, Brown, Marriott, Whittall, & Harmer, 1991; Rosengren, Kalish, Hickling, & Gelman, 1994), have trouble differentiating fantasy from reality (Subbotsky, 1985), and label certain events as magic (Johnson & Harris, 1994). At issue, however, is the extent to which children truly believe that supernatural events and magic (seen as a supernatural force or mechanism) are possible. Children may merely use "magic" to

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label certain events that they see as extraordinary. It remains unknown what children mean when they use the term "magic." Do they use the term to refer to "tricks," as in parlor magic, simply as a fallback mechanism when all else fails, or does its use reflect an underlying belief in the possibility of extraordinary or supernatural events? The goal of the present research was to examine the types of events children label as magic, what it means for children to label events as magic, and how children might come to use magical explanations.

The term "magic" has been used by psychologists in two different ways (Chandler & Lalonde, 1994). First, "magic" has been used to label others' (usually children's) seemingly irrational thinking (Luhmann, 1986; Neusner, 1989; Piaget, 1930). For example, Piaget (1930) labeled as "magical" children's beliefs that they could cause some event merely through their own thoughts or gestures. Children acting as if they could obtain a prized toy by wishing would be said to be engaging in magical reasoning.

Magic has also been used to refer to a set of causal beliefs involving supernatural abilities held by particular individuals. In this second sense, magic is a causal mechanism invoked by the subjects of study themselves to explain certain events. Few researchers have devoted much attention to this sense of magic, although Piaget (1929) suggested that these beliefs, which he referred to as "social magical beliefs," are more systematic and stable than other aspects of children's early causal reasoning. Chandler and Lalonde (1994) have suggested that such thoughts about magic may play an important developmental role in allowing children to bracket occurrences which might otherwise threaten their "fledgling theories."

Several recent investigations have examined the extent to which children believe that magic and supernatural events are possible. These studies have shown that young children make a sharp distinction between possible and impossible events, yet leave open the possibility of certain extraordinary events. For example, Rosengren et al. (1994) found that while 4- and 5-year-old children did not accept the notion that animals could be made smaller or undergo changes in shape, they did accept the idea that a magician could bring about these changes. Few of these children suggested that magicians

would resort to tricks and deception to achieve these ends. It is not clear from this study, however, whether children believed that magicians are real people who have powers to perform impossible events or whether the children merely placed these impossible events in the context of a story or some sort of fantasy.

Subbotsky (1985, 1991, 1994) has shown that, in verbal reports, 4- and 5-year-old children normally make a clear distinction between events which are possible in the real world and those which occur only in books and fairy tales. However, when children are placed in a conducive context they may *act* as if supernatural events are possible. For example, following the reading of a fairy tale, adult instruction about a supernatural event, or being shown some sort of "magical" apparatus, 4- and 5-year-old children acted as if they believed that pictures could be turned into three-dimensional objects, that inanimate objects could come alive, and that objects could be moved by words alone.

Two other investigations have examined in greater detail the extent to which children actually think about magic. In one of these investigations, Johnson and Harris (1994) presented 3–5-year-old children with various hypothetical object transformations, some possible and some impossible by normal means. Children consistently labeled the impossible occurrences "magic." Thus, preschool children seem to make a principled distinction between outcomes they consider magical and more ordinary outcomes. However, Johnson and Harris found that when 3–7-year-old children were asked to pretend that an attractive object was in a nearby box, approximately half of the children in each age group opened the pretend box and responded as if they wondered if the pretend entity was actually in the box. Johnson and Harris suggest that, although most children distinguish magical events from other types, children under the age of 7 vary in the extent that they take a credulous or skeptical stance toward magical occurrences.

A recent investigation (Chandler & Lalonde, 1994) examined the extent to which 3- and 4-year-old children are willing to label events as "magic." Rather than being presented with hypothetical or pretend transformations, in this study preschool children were presented with an apparatus adapted from one of Baillargeon's infant habituation studies (Baillargeon, 1991). The

apparatus included a screen which appeared to pass completely through a solid object in blatant violation of physical laws. Children's reactions to this impossible event were recorded. Two thirds of the children labeled this occurrence as "magic." However, after repeated viewings of the event, almost all of the children suggested that it involved a trick. Thus, when faced with a clear violation of physical law, children initially were willing to label the event as magic but abandoned this explanation when given the opportunity to consider alternative explanations.

Taken together these studies suggest that "magic" is indeed an active category in preschoolers' thinking. Children willingly label impossible or unexpected events as "magic." However, the robustness of children's tendency to invoke "magic" remains unclear. Specifically, it is not known what factors beyond physical impossibility may encourage children to invoke "magic" and whether children truly believe magic to be a real, supernatural force. Finally, it is not clear how children's magical beliefs change with age.

The primary purpose of this investigation was to examine when and to what extent preschool children resort to magical explanations. Specifically, we examined whether children reserve "magic" for unexpected or seemingly impossible events and the extent to which older and younger preschoolers use different mechanisms to account for such occurrences. To address these issues, we presented 4- and 5-year-old children with seemingly impossible object transformations, using a set of events typically included in magic shows. We chose to use prototypical magic tricks to see whether children view them as truly magical or whether they view these events as merely involving tricks or deception. In this first study, we contrasted children's explanations of these magical events with those of more commonplace occurrences (e.g., erasing a pencil drawing). In Study 2 we presented children with transformations of objects, which though possible without tricks or deception, involved mechanisms expected to be poorly understood by children (and many adults). In both studies we asked children to judge the possibility of potential mechanisms of change prior to seeing the actual transformations. This allowed us to examine children's explanations of both hypothetical and actual transformations, that is, to make a direct comparison of children's spontaneous reactions and their

explanations upon seeing the transformations. Finally, in order to examine the extent to which children actually believe that magic is a real, supernatural force we interviewed the children about their magical beliefs. In sum, by interviewing the children specifically about their magical beliefs, providing a wider range of magical items than in previous studies, and including actual as well as hypothetical transformations, we hoped to gain a clearer understanding of children's reasoning about magic.

Study 1

METHOD

Subjects

Forty-eight children participated in the study. There were 24 children in a younger age group ($M = 4-4$, range = 3-11 to 4-10; 9 males, 15 females) and 24 children in an older age group ($M = 5-5$, range = 5-0 to 5-10; 12 males, 12 females). In addition, 22 adults (9 males, 13 females) performed similarity, familiarity, and/or possibility ratings on the items used in the transformations. The children were from two university preschools and another local preschool, and the adults were recruited from undergraduate psychology classes. The sample consisted of primarily white, middle-class children and adults. All participants were native English speakers.

Materials

The items for Study 1 included eight objects whose appearance could undergo a transformation of one of four types: color, shape/size, part/whole, or appearance/disappearance. Four "magic" items were professional quality magic tricks which could undergo seemingly "impossible" transformations involving nonobvious causal mechanisms. The four "commonplace" items were everyday objects which could undergo "possible" transformations involving more obvious and familiar mechanisms. The possibility/impossibility and familiarity/unfamiliarity of the transformations were confirmed by ratings of two groups of 11 adults. "Magic" items were rated as significantly less familiar than the commonplace ones, $t(9) = 10.5$, $p < .001$, and magical transformations were rated as less possible than "commonplace" ones, $t(9) = 24.6$, $p < .001$. The items, transformations, and mean adult ratings appear in Table 1.

Procedure

Children were tested individually by one of two female experimenters in a private

TABLE 1

EXPERIMENTAL ITEMS USED IN STUDIES 1 AND 2, TRANSFORMATIONS, AND MEAN RATINGS OF FAMILIARITY AND POSSIBILITY BY ADULTS

Items	Transformation	Mean Familiarity Rating (<i>N</i> = 10) (Range = 0-10, Maximum = 10)	Mean Possibility Rating (<i>N</i> = 10) (Range = 0-10, Maximum = 10)
Magic:		4.6	.8
Dots	Color change	5.2	1.8
Coloring book	Color appearance	3.4	.9
Nickel	Size change	4.9	.1
Rope	Parts-whole	4.8	.4
Commonplace:			
Play-Doh ball	Shape change	9.0	10.0
String	Whole-parts	8.9	10.0
Balloon	Size/shape change	9.7	10.0
Pencil lead dot	Disappearance	9.7	10.0
Experiment 2:			
Glowstick	Appearance of light	5.5	7.9
Fickle foam	Color change	5.8	6.5
Color car	Color change	4.0	1.3
Invisible ink	Appearance of picture	5.7	9.4

room. To introduce the session, the experimenter explained the task as a game in which she would show some toys to the child and then do something with each toy to make it look different. In order to focus attention on the relevant aspect of each item, the experimenter presented each of the eight items (in a random order) and asked children to describe its initial appearance. For example, children were shown a ball of Play-Doh and asked, "What shape does this look like?" All but one child gave accurate descriptions of the items' initial states.

To obtain initial reactions regarding what sorts of mechanisms could be used to change each item's appearance, children were presented with a hypothetical transformation. That is, they were asked to think of ways to make the item look different (e.g., "How could I make this look a different shape? Can you think of some ways?"). Children were encouraged to suggest several mechanisms. Children's responses were coded as belonging to one of several categories: "mechanical" if they referred to workmanship (e.g., painting, hammering, cutting), "natural" if they invoked naturally occurring mechanisms of change (e.g., rusting, fading), "deception" if they mentioned trickery, "religious" if they referred to God or Jesus, or "magical" if they referred to magic words, wands, or people. Reliability of mechanism coding, assessed by two inde-

pendent coders on 18 children's responses, was 97%.

The majority of children spontaneously suggested some sort of mechanism to perform the hypothetical transformations. However, if children were unable to suggest any possible mechanisms for these transformations or did not give the one to be used in the actual transformation, the experimenter proposed a mechanism and asked whether it would succeed. For the commonplace items, the proposed mechanisms were the actual ones to be used in the transformations (e.g., "cutting the string," "blowing air into the balloon," "hitting the Play-Doh with my hand," "erasing the circle with an eraser"). For the "magic" items, the proposed mechanisms were the same "impossible"-appearing transformations to be performed by the experimenter (e.g., putting two pieces of rope together by "just pulling on them," making two colored dots change color by "pressing them together," making colors appear on pages of a blank coloring book by "flipping the pages with my fingers," making a nickel shrink in size by "by placing this [disk] on it").

Following this initial set of questions, the experimenter performed a transformation on each item. After each transformation, the experimenter asked the children to again describe the item's appearance (e.g., "What

shape does this look like now?”). All children correctly described the new appearance of the objects. The experimenter then asked children to explain how the transformation was performed (“How did I make this look [new appearance]?”). If children responded “I don’t know” or gave no response, the experimenter prompted them with three choices (given in random order): (1) the first mechanism suggested by the child to the initial question about the hypothetical transformation, (2) magic, and (3) trick. The actual question was phrased: “Did I do it by (child’s mechanism), or was it magic, or was it a trick?”¹ Agreement between coders, assessed on 18 children’s transformation explanations, was 96%. After seeing each transformation, if children asked to try the item, we allowed them to play with the item. For the magic items, however, we substituted an identical-appearing, non-working copy. We used nonworking copies of the magic items for a number of reasons. First, we wanted to make our task similar to situations where magic tricks are performed. Magicians rarely reveal the mechanisms involved in their tricks. Second, by providing the children with nonworking copies, we ensured that children who did ask to play with the items did not have the opportunity to discover more about the item than did children who did not ask to play with the item. Finally, when we purchased the items at the local magic store we agreed never to reveal the true mechanisms underlying the tricks. Nearly all children asked to try one or more of the commonplace items. Only eight of the younger children and five of the older children requested to try any of the magic items.

Next, children were asked whether they themselves, a friend, each of their parents, a teacher, and a magician could perform each transformation. Children were always first asked whether they could perform the change but were asked about other agents in a random order.

Finally, children were asked a set of questions designed to determine whether they hold a set of coherent beliefs regarding magical phenomena. Children were asked whether magic is something real (as opposed to tricks) and whether people can find magic in the “real world” or only in books and movies. Specifically, we asked: “What is magic? Is it something real, or is it always

tricks?” Children were asked to explain their answers (e.g., we asked them to explain the meaning of “trick”). Children’s responses were coded as: 1 = magic involves real supernatural events, 2 = magic involves tricks or deception, 3 = magic is a combination of tricks and real supernatural events, 4 = magic is fantasy or it only occurs in books or movies, and 5 = unclear responses. We then asked the children: “Is magic only in stories and movies, or does it happen in the real world sometimes?” Depending on their responses, children were asked to describe magical events they had seen or to explain how they knew magic was not “real.” Children’s responses were coded as: 1 = magic occurs in the real world, 2 = magic occurs only in stories and movies, 3 = magic occurs in the real world as well as in books and movies, and 4 = unclear responses. Children were also asked questions about magicians, such as: “How does someone become a magician? Do magicians just know how to do magic or do they have to learn how?” These answers were coded as: 1 = magicians are born with special powers, 2 = magical powers are passed on by another individual with magic powers, 3 = magic is learned from books, 4 = magic is learned from a magician or in magic school. Finally, we asked: “Do magicians have special powers?” Responses to this question were coded as: 1 = magicians have special powers, 2 = magicians have special knowledge but not special powers, and 3 = magicians do not have special powers. Reliability on these questions, assessed on 18 children’s responses, was 93%.

On the basis of interview responses and explanations of the transformations, we rated the degree of each child’s belief in magic (i.e., as a possible causal mechanism distinct from tricks or deception). Two independent coders used a seven-point scale (1 = child clearly views magic as always involving tricks or deception to 7 = child believes magic is possible and real). Children given a score of 1 clearly stated that magic was not real and responded that magic involved tricks or deception, and these children stated that magic did not involve any type of special or supernatural powers. Children given a score of 7 mentioned that magic was real, that it involved special or supernatural powers, and these children did not use tricks

¹ Eighteen of the 48 children used the term “magic” prior to any mention of this term by the experimenter.

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or deception to explain any of the magic events. Children given a score in the mid-range responded to our questions in a mixed manner. These children typically used both "magic" and "tricks" to explain the events and were inconsistent in their responses to our questions concerning the reality status of magicians. Reliability for the belief ratings, assessed on 50% of the children's interviews, was 94% within one scale point (84% exact agreement).

RESULTS

Children made a sharp distinction between the commonplace and magical events. All of the subjects accepted the notion that the hypothetical transformations of the commonplace items could occur ($M = 3.9$ out of 4 events)² and rejected the notion that the hypothetical magical transformations could occur ($M = .3$, $SD = .7$ out of 4; $t(47) = 23$, $p < .001$).

Children provided a variety of causal mechanisms to explain the transformations. Since most of the responses (92%) were categorized as physical/natural, magic, or deception, only these explanation types were included in the analyses.³ To compare children's explanations prior to and after seeing the transformations, we conducted three separate, nonindependent 2 (age: 4, 5) \times 2 (time: before, after) \times 2 (item type: magic, commonplace) repeated-measures ANOVAs, each with frequency of a different explanation type (physical/natural, magic, deception) as the dependent measure.⁴ The results appear in Table 2. The "magic" and "trick" analyses revealed significant age differences, with 5-year-olds providing more "trick" responses ($M = .76$) than did 4-year-olds, $M = .17$, $F(1, 46) = 15.3$, $p < .001$, and 4-year-olds giving more "magic" responses ($M = .79$) than did the older children, $M = .37$, $F(1, 46) = 11.0$, $p < .005$. Four- and 5-year-olds were equally likely to give physical/natural explanations, $M = 2.60$, $M = 2.67$ respectively, $F(1, 46) = 0.3$, N.S. Each analysis revealed main effects of time and

item type. Children of both ages gave more physical/natural explanations prior to seeing the transformations than after seeing the events, $F(1, 46) = 36$, $p < .001$, but gave more trick and magic responses after seeing the transformations than before seeing them, $F_s(1, 46) > 50$, $p < .001$. More physical/natural explanations were provided for the commonplace events than for the magic events, $F(1, 46) = 445$, $p < .001$, but more magic and trick explanations were provided for the magic events than for the commonplace events, $F_s(1, 46) > 49$, $p < .001$. Significant time \times item type interactions were obtained for each of the three types of explanations, $F_s(1, 46) > 36$, $ps < .001$, and age \times time \times item type interactions, $F_s(1, 46) > 14$, $ps < .001$. Tukey HSD pairwise comparisons of the means ($p < .05$) were used to follow up the ANOVA results. Children of both ages gave significantly more physical/natural explanations prior to seeing the magic events than after they viewed these events (see Table 2). The younger children, however, provided significantly more physical/natural explanations for the events involving the commonplace items after viewing the events ($M = 4.0$) than before viewing the events ($M = 3.3$). There was no significant difference in the number of physical/natural explanations provided by the older children before and after viewing the commonplace events. Very few magic explanations were provided for the commonplace events before or after the viewing of the events; however, both groups of children provided significantly more magic explanations following the magic events than prior to these events. There was no difference between the two age groups in the number of magic explanations given prior to seeing the magic events; however, after viewing the magic events the 4-year-olds gave significantly more magic responses ($M = 2.96$) than the 5-year-olds did ($M = 1.09$). Similar to the results for the magic explanations, few trick responses were provided for the commonplace events before or after the viewing of the commonplace events. Both groups of children pro-

² One child did not accept one of the four transformations.

³ The exceptions included one religious response and the responses of two children who merely restated the items' appearance on the hypothetical, magical transformation.

⁴ We chose to conduct three separate analyses rather than including explanation type as another factor in a single repeated-measures ANOVA, since the frequencies with which children gave each of the three explanation types were not independent. The use of multiple-repeated measures ANOVAs offered the advantage of allowing for comparison of each explanation type across age, item types, and time. The additional nonparametric tests reported below allow for analysis of the relative frequency of the different explanation types.

TABLE 2

CHILDREN'S MEAN (SD) RESPONSES IN STUDY 1 AS A FUNCTION OF EXPLANATION TYPE, AGE, AND ITEM TYPE BEFORE AND AFTER SEEING THE TRANSFORMATION

	MAGICAL		COMMONPLACE	
	Before	After	Before	After
Physical/natural:				
4-year-olds	2.76 (1.2)	.36 (.7)	3.28 (.8)	4.00 (.0)
5-year-olds	2.52 (.9)	.70 (1.1)	3.52 (.7)	3.96 (.2)
Magic:				
4-year-olds .....	.16 (.4)	2.96 (1.4)	.04 (.2)	.00 (.0)
5-year-olds .....	.26 (.4)	1.09 (1.3)	.13 (.5)	.00 (.0)
Trick:				
4-year-olds .....	.00 (.0)	.68 (.6)	.00 (.0)	.00 (.0)
5-year-olds .....	.44 (.4)	2.17 (1.1)	.44 (.2)	.00 (.0)

NOTE.—Mean scores per category range from 0 to 4, *N* = 24 per age group.

vided significantly more trick responses for the magic events after viewing them than before viewing them; however, after viewing the magic events the older children provided significantly more trick responses (*M* = 2.17) than the younger children did (*M* = 0.68).

To compare more directly the relative frequencies with which children used the different explanation types, we examined individual children's dominant response patterns after seeing the magical transformations. Each child was scored as giving predominantly physical/natural (*p/n*), magic, or trick explanations to the four magical transformations (i.e., at least two responses in the same category, with no ties; ties were scored as "mixed"). A 2 (age) × 4 (pattern type) chi-square analysis confirmed that the modal response patterns in the two age groups differed, $\chi^2(3, N = 48) = 16.5, p < .001$, with 4-year-olds conforming to the "magic" response pattern more often than to other kinds (*N*_{magic} = 19, *N*_{*p/n*} = 1, *N*_{trick} = 3) and with 5-year-olds most often conforming to the "trick" pattern (*N*_{trick} = 12, *N*_{magic} = 5, *N*_{*p/n*} = 4).

To examine children's responses regarding whether different agents could perform each of the actual transformations, we gave each "yes" response a score of 1 and entered these data into a 2 (age) × 2 (item type) × 6 (agent) ANOVA. Overall, children of both ages believed that the various agents were more capable of performing commonplace (*M* = 3.7 out of 4) than magical transformations, *M* = 2.0; *F*(1, 46) = 143.9, *p* < .0001. Children believed that agents vary in their ability to perform the transformations,

F(5, 280) = 9.6, *p* < .0001, with magicians (*M* = 3.4) being more powerful than other agents, by Tukey HSD pairwise comparisons of the means, *p* < .01. For other agents, the mean number of "yes" responses per item type ranged from 2.5 (child) to 2.8 (teacher). Children believed magicians to be significantly more likely to cause magic events than the other agents, *M* = 3.2; *F*(5, 230) = 21.8, *p* < .0001, Tukey HSD pairwise comparisons, *p* < .01. On the magic items the mean number of "yes" responses for the remaining agents ranged from 1.5 (child) to 1.8 (teacher).

Children's responses to the structured interview questions suggest that children have substantial knowledge about the category of magic, though their beliefs about the nature of magic vary. When asked what magic is, many of the 4-year-olds (*N* = 13) responded that magic was real and involved extraordinary or supernatural powers, while the majority of 5-year-olds (*N* = 14) said that magic involved trickery or deception. Several children (six 4-year-olds, five 5-year-olds) suggested that the nature of magic depends on the situation. For these children magic involved real supernatural powers in some situations and trickery in others. Two children (one of each age) gave "fantasy" responses, indicating that magic is something found only in books, movies, or stories. On the question asking whether magic can be found only in fantasy or also in the real world, children of both ages gave a variety of responses. Several children (four in each group) relegated magic to the realm of fantasy, whereas 15 children (eight 4-year-olds, seven 5-year-olds) believed in the possibil-

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ity of finding magic in the real world. The remaining children believed magic to be sometimes real and sometimes fantasy (three in each group), didn't know, or gave no response. Thus, children vary in their knowledge and beliefs about the boundaries of magic as a category.

When asked about magicians, the majority of both 4- and 5-year-olds agreed that magicians are "magic" people. However, while several 4-year-olds believed that people become magicians by being born one ($N = 5$) or by having powers passed on ($N = 3$), few older children gave such responses. The majority of 5-year-olds ($N = 17$) and several 4-year-olds ($N = 5$) responded that magicians learn magic from other magicians, or from books, or by going to "magic school." Overall, data from the structured interview suggest important individual differences in the extent to which children believe magic to entail supernatural or impossible occurrences, versus stagecraft and trickery, though as a group, 4-year-olds appear more willing than 5-year-olds to believe in the possibility of "real" magic and magical agents.

Finally, examination of the belief ratings revealed considerable age and individual differences in children's credulity toward magic. Overall, 4-year-olds were rated as more believing than 5-year-olds, $M = 5.6$ and 3.3 , respectively; $t(36) = 4.13$, $p < .001$. Although nearly two-thirds of 4-year-olds (63%) believed that magic was real (score of 6 or 7), only about a fifth of 5-year-olds (21%) held such strong beliefs (see Fig. 1). In contrast, 38% of 5-year-olds believed that magic was not real (score of 1 or 2), as compared to only 10% of 4-year-olds. In sum, although children of both ages did show some credulity toward the possibility of magic, a developmental trend emerged, with 4-year-olds appearing more believing than 5-year-olds.

DISCUSSION

These results suggest that 4- and 5-year-old children have a fairly clear notion about what events are possible versus impossible in the real world. In general, children used natural or physical mechanisms to explain commonplace transformations. When presented with events which they believed to be impossible a few children continued to provide natural, physical mechanisms to explain the phenomena. However, many children (primarily 4-year-olds) resorted to labeling these events as magic. Other

children, primarily 5-year-olds, suggested the "impossible" events were achieved by trickery. The interview results suggest that many of the younger children have specific notions about what sort of events should be labeled as magic, who can perform magic (typically magicians, and not themselves, other children, parents, or teachers) and how one becomes a magician (typically by being born a magician, by having the powers passed on, or by learning magic from magicians, books, or school). Thus, it seems that, for many of these younger children, magic is not simply a label used to categorize some phenomena as unusual but describes certain special powers or mechanisms which are beyond the ordinary. In contrast, these findings suggest that the majority of 5-year-olds view magic as little more than trickery.

Study 2

In Study 1 we found that children clearly distinguish between possible and impossible events. Children labeled magic tricks as impossible and explained their occurrence by appealing to magic or deception. However, the extent to which children give magical explanations for other sorts of transformations, that is, more everyday events not involving prototypical magic tricks or deception, remains to be explored. Children are often confronted with events which were historically thought to be impossible (airplanes flying) or extraordinary (electric light, television, remote controlled appliances). Today these events are seen as quite ordinary by adults, yet it is unlikely that most adults would be able to give a sophisticated or accurate description of how these events occur. In Study 2, we explored how children reason about this type of event by presenting a series of "extraordinary" events analogous to these more common but still dramatic events. These extraordinary events included chemical and physical transformations of objects which resembled items typically found in the home. These items included a glowstick (similar to a plastic tube), a "magic" car (similar to a toy car), an invisible ink pad (similar to a pen and paper), and a foam pad that changes color (similar to a sponge). These items could all be transformed by natural means (touching the foam pad, dipping the car in hot/cold water, bending the glowstick) to yield fairly dramatic results (a change of color or the emission of light). Additionally these transformations involved mechanisms which most adults do not understand very well. Al-

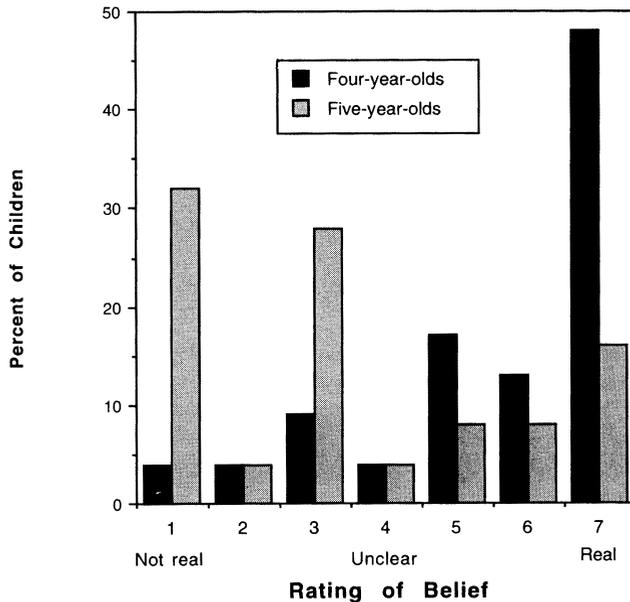


FIG. 1. Percent of 4- and 5-year-old children in Study 1 categorized by degree of magic belief. $N = 20$ per age group.

though we chose these items to be relatively unfamiliar to 4- and 5-year-old children, all could be purchased in toy stores, and all of the transformations could be performed by anyone provided they had some understanding of the underlying mechanism. As in Study 1, we presented both the commonplace and extraordinary transformations, in order to assess whether children rely on different causal mechanisms to explain their occurrence.

Previous researchers examining young children's causal reasoning have come to different conclusions regarding the extent to which children use nonnaturalistic or magical explanations when they are presented with unfamiliar phenomena or events which they do not understand. For example, Huang (1930) reported that children rarely used magical or supernatural causality to explain events. In this investigation, children between 4-10 and 10-3 were presented with a set of events with unexpected outcomes. These events included a few magic tricks and several perceptual illusions (e.g., the Muller-Lyer illusion), but the majority of the events involved physical phenomena with relatively unfamiliar mechanisms (e.g., a glass filled with water is covered with a piece of paper and the water remains in the glass when the glass is turned upside down). Fewer than 3% of the children's explanations of the events made reference to magi-

cal or supernatural causality. Rather, the majority of the children's explanations involved discussion of physical and natural mechanisms. Other researchers, however, have reported that it is common for children to use nonnaturalistic or magical explanations for unfamiliar events (Baldwin, 1955; Berzonsky, 1970, 1971; Nass, 1956; Russell, 1956). In this research, familiarity has been equated with knowledge of the underlying mechanism causing the event. Thus, an event was considered to be familiar if children could experience the process and outcome of the causal sequence (e.g., a boat sinking in a tub of water due to a hole in the bottom). Unfamiliar events were those where the underlying causal mechanism was "remote" or not readily observable (e.g., clouds moving, stars shining). Berzonsky (1971) found that 6- and 7-year-old children provided more nonnaturalistic explanations when asked to explain remote events or events where the children's expectations were violated (e.g., a scale failing to tilt to the heavier side when support was withdrawn) than when asked to explain familiar events. One of the primary goals of the present study was to sort out these disparate findings by examining more closely how young children reason about unexpected events with unfamiliar causal mechanisms.

The "extraordinary" transformations included in the present study allowed us to

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examine children's reactions to less remote, yet dramatic transformations that violate expectations and which are accomplished by mechanisms which are poorly understood by most adults. As in Study 1, we examined whether children might label these transformations as caused by "magic," "tricks," or natural means. Thus, in this study we examined whether children's magical responses were reserved for prototypical magic tricks involving deception, or whether children would use magic to explain the occurrence of events which both violated their expectations and for which they had little understanding of the underlying causal mechanisms. In addition, to determine whether previous experience with the objects might influence children's causal explanations, we asked children if they had played with or owned these objects prior to participating in the study. This last question allowed us to examine whether familiarity with any of the items influenced the manner in which the children explained the events. As in Study 1, we assessed children's beliefs about magic using a structured interview following the experimental session.

METHOD

Subjects

Forty children participated in Study 2. There were 20 children in a younger age group ($M = 4-5$, range = 3-11 to 4-11; 10 males, 10 females) and 20 children in an older age group ($M = 5-5$, range = 5-0 to 5-11; 10 males, 10 females). The same 20 adults who performed similarity, familiarity, and/or possibility ratings on the items in Study 1 performed similar ratings for this study. The children were from a university preschool or another local preschool, and the adults were recruited from undergraduate psychology classes. All of the subjects were native English speakers with predominantly white, middle-class backgrounds.

Materials

As in Study 1, the items were eight objects capable of undergoing appearance transformations. The four "commonplace" items were the same as those used in Study 1. However, the four "magic" items were replaced by objects which could undergo transformations considered by adults more "possible" than magic tricks, though involving unfamiliar mechanisms. Ratings provided by the same students who made ratings of the items for Study 1 confirmed that these "extraordinary" item transformations are more possible than those of the "magic"

items, $t(6) = 3.8$, $p < .01$, but less familiar than those of the "commonplace" items, $t(6) = 8.6$, $p < .001$, at least as viewed by naive adults. See Table 1 for a list of "extraordinary" items, transformations, and mean ratings.

Procedure

The experimental procedure was nearly identical to that in Study 1. Again, the experimenter asked the children to suggest mechanisms that might account for hypothetical transformations of each of the eight items. If the children did not suggest an appropriate mechanism on a particular item, the experimenter proposed a specific mechanism and asked whether it would succeed. For the extraordinary items, the proposed mechanisms were descriptions of the transformations to be performed (e.g., making a toy car change color by "putting it in a glass of water," making a picture appear "by just scribbling on the paper," making light appear "by bending this [tube] in half," coloring a piece of foam by "touching it with my hand").

After the assessment of the children's initial reactions to the items, the children viewed the actual transformations. As in Study 1, the experimenter asked the children to explain each transformation and, if necessary, prompted them with three specific choices: (1) magic, (2) trick, (3) the first mechanism suggested by the child to account for the hypothetical transformation. These choices were provided in a random order. As in Study 1, if children asked to try any of the items after seeing each transformation, we allowed them to play with the items. As in the procedure used in Study 1, we substituted nonworking copies of the extraordinary items. We used nonworking copies in this study for the same reasons as in Study 1 and to be consistent across the two studies. Once again, nearly all of the children asked to play with the commonplace items, but only seven of the younger children and six of the older children asked to play with the extraordinary items. Following each explanation, the experimenter asked the children to judge whether various causal agents could perform the same transformation. At the end of the experimental session, the experimenter asked the children whether they had seen or played with each item prior to the study. All coding categories were the same as those used in Study 1. Reliability was assessed on 10 children's responses by two independent coders. Agreement was 96% on coding of children's suggested mechanisms, 100% on explana-

TABLE 2

CHILDREN'S MEAN (SD) RESPONSES IN STUDY 1 AS A FUNCTION OF EXPLANATION TYPE, AGE, AND ITEM TYPE BEFORE AND AFTER SEEING THE TRANSFORMATION

	MAGICAL		COMMONPLACE	
	Before	After	Before	After
Physical/natural:				
4-year-olds	2.76 (1.2)	.36 (.7)	3.28 (.8)	4.00 (.0)
5-year-olds	2.52 (.9)	.70 (1.1)	3.52 (.7)	3.96 (.2)
Magic:				
4-year-olds .....	.16 (.4)	2.96 (1.4)	.04 (.2)	.00 (.0)
5-year-olds .....	.26 (.4)	1.09 (1.3)	.13 (.5)	.00 (.0)
Trick:				
4-year-olds .....	.00 (.0)	.68 (.6)	.00 (.0)	.00 (.0)
5-year-olds .....	.44 (.4)	2.17 (1.1)	.44 (.2)	.00 (.0)

NOTE.—Mean scores per category range from 0 to 4, $N = 24$ per age group.

tions of transformations, and 97% on the general questions about magic and magicians.

RESULTS

As in Study 1, children described the initial and end states of the items accurately (100% of the time). Upon hearing about the hypothetical transformations, all children accepted the commonplace transformations as possible ($M = 4.0$, $SD = 0.0$) but were less likely to accept the extraordinary transformations as possible ($M = 1.7$, $SD = 1.1$), $t(39) = 7.4$, $p < .0001$. The children were significantly less familiar with the extraordinary transformations ($M = 1.6$, $SD = 1.2$), $t(1, 39) = 12.5$, $p < .001$, compared to the commonplace ones ($M = 3.96$, $SD = 0.2$).

Overall, children provided fewer different causal explanations than in Study 1. To compare explanations of hypothetical and actual transformations of the different items, we conducted three nonindependent 2 (age) \times 2 (time) \times 2 (item type) ANOVAs, using each of the three most frequent response categories (physical/natural, magic, trick) as dependent variables. The results appear in Table 3. Of the three analyses, only the "magic" analysis revealed a main effect of age, $F(1, 38) = 6.2$, $p < .05$, with 4-year-olds providing significantly more magic responses than 5-year-olds. Each of the analyses revealed main effects of item type and time. Significantly more magic and trick responses were given to the extraordinary items than to the commonplace ones, $F_s(1, 38) = 15.1$, $p < .001$, but more physical/natural responses were provided for the commonplace items than the extraordinary ones, $F(1, 38) = 74.3$, $p < .001$. Children were

significantly more likely to provide physical/natural explanations before seeing the events than after seeing them, $F(1, 38) = 18.3$, $p < .001$, but were significantly more likely to provide both trick and magic responses after seeing the events than before seeing them, $F_s(1, 38) > 13.5$, $p < .001$. Significant item \times time interactions were obtained for each of the explanation types, $F_s(1, 38) > 17.6$, $p < .001$. Tukey HSD pairwise comparisons of means ($p < .05$) were used to examine these effects. Children were significantly more likely to provide physical/natural explanations for the extraordinary items prior to seeing the transformation ($M = 3.2$) than after seeing the transformation ($M = 1.8$). After witnessing the events, children were significantly less likely to provide physical/natural explanations for the extraordinary items compared to the commonplace ones ($M = 3.95$). While children rarely provided trick responses prior to seeing either event type ($M = .03$ for both types), after witnessing the events they provided significantly more trick responses to the extraordinary items ($M = .5$) than to the commonplace ones ($M = .00$). A similar result was obtained with the magic explanations. While children rarely used magic explanations prior to seeing the events for either item type ($M = .1$ for the extraordinary items, $M = .08$ for the commonplace ones), after seeing the events children gave significantly more magic explanations for the extraordinary items ($M = 1.7$) than to the commonplace ones ($M = .03$). No significant three-way interactions were obtained.

To compare the relative frequency with

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which children used each explanation type, we scored children's responses after seeing the four actual, extraordinary transformations as predominantly physical/natural, magic, or trick. A 2 (age) \times 4 (pattern type) chi-square analysis indicated that the distribution of children's responses did not depend on age, $\chi^2(3, N = 40) = 3.40, p < .4$. The majority of children ($N = 30$) gave predominantly physical/natural ($N = 15$) or magic ($N = 15$) responses. Four-year-olds' modal pattern was "magic" ($N = 10$), while 5-year-olds' modal pattern was "physical/natural" ($N = 10$). In contrast to Study 1, very few children (three 5-year-olds) gave predominantly "trick" responses. However, several children (five 4-year-olds, two 5-year-olds) provided an equal number of "magic" and "physical/natural" responses.

Many children were not consistent in their use of particular explanation types. Twelve children (eight 5-year-olds, four 4-year-olds) gave physical/natural responses for three or four of the extraordinary items, while eight (six 4-year-olds, two 5-year-olds) never did so. Eleven children (seven 4-year-olds and four 5-year-olds) gave magic responses for three of the four extraordinary items, while nine children (three 4-year-olds, six 5-year-olds) never gave magical explanations. Approximately half of the children (eleven 4-year-olds, twelve 5-year-olds) never gave trick explanations.

Since many children did not respond consistently across the extraordinary items, we examined children's responses on each item in more detail. Specifically, we investigated the relation between children's "possibility" judgments prior to seeing the transformations, their familiarity with each of the items, and their "magic" explanations after viewing the transformations. First, to investigate the relation between familiarity and possibility judgments, we conducted 2 (familiarity) \times 2 (possibility) chi-square analyses on children's responses for each item. The analyses confirmed that, for the most part, children unfamiliar with a particular transformation considered the change impossible (78.3% of the time, averaged across items), and, conversely, children familiar with a particular transformation generally considered it possible (59% of the time, averaged across items), $\chi^2s(1, N = 40) > 3.6, ps < .05$. Therefore, children's responses indicated a reliable, though not perfect, relation between familiarity ratings and possibility judgments.

To investigate the relation between possibility and familiarity judgments with children's explanations, we conducted possibility \times explanation type and familiarity \times explanation type chi-squares for each of the items. None of the four possibility \times explanation type chi-squares proved significant, $\chi^2s(2, N = 40) < .17, N.S.$ On each item, responses of children who judged the transformation to be impossible split primarily between "physical/natural" and "magic" explanations of the actual transformations. Few trick responses were given. Of the four familiarity \times explanation type chi-squares, only that for the invisible ink coloring book revealed a reliable relation between familiarity and explanation type, $\chi^2(2, N = 40) = 6.3, p < .05$, with the majority of "familiar" children ($N = 18$) giving "physical/natural" explanations ($N = 12$) and the majority of "unfamiliar" children ($N = 22$) giving "magic" explanations ($N = 14$). For each of the other three items, "unfamiliar" children gave "magic" and "physical/natural" explanations (44.6% and 39.2% of the time, respectively, averaged across the items) more often than "trick" responses (17.6%, on the average). Interestingly, on these three items, "familiar" children gave "magic" responses nearly as frequently (40.1% of the time, on the average) as did "unfamiliar" children. Apparently, children are sometimes willing to label as magic transformations which they have seen before.

To investigate children's beliefs about which agents are capable of performing the extraordinary transformations versus more commonplace ones, we conducted a 2 (age) \times 2 (item type) \times 6 (agent) ANOVA on the number of "yes" responses children gave when asked whether a particular agent could perform each transformation. Overall, children believed the various agents to be capable of performing both commonplace and extraordinary transformations. However, children of both ages believed the agents to be somewhat more capable of performing commonplace ($M = 3.7, SD = 0.4$) than extraordinary transformations, $M = 3.1, SD = 0.9, F(1, 38) = 20.9, p < .0001$. Children also believed the agents to vary in their abilities to perform the extraordinary transformations, as indicated by a significant agent \times item type interaction, $F(5, 190) = 6.22, p < .0001$. Simple effects analysis revealed that only magicians were considered equally capable of performing both the extraordinary and commonplace transformations ($Ms = 3.5, SD = 1.1, SD = 1.0$, respectively, $F(1,$

38) = N.S). In spite of item type differences for each of the other agents, $F_s(1, 38) > 6.3$, $p_s < .05$, children generally believed other agents to be fairly capable of performing the "extraordinary" transformations. The mean number of "yes" responses on extraordinary items ranged from 2.8 (mom, $SD = 1.3$) to 3.2 (dad, $SD = 1.2$). Thus, whereas children in Study 1 believed magicians but not other agents to be capable of performing magical transformations, children in Study 2 believed all agents to be fairly capable of performing transformations of the extraordinary items.

As in Study 1, children's responses to the structured interview suggested varying knowledge and beliefs about magic. Again, 4-year-olds were likely to say that magic was something "real" ($N = 8$) or sometimes real and sometimes trick ($N = 8$). Five-year-olds ($N = 6$) were more likely than younger children ($N = 3$) to say that magic always involved tricks but were equally likely to respond that magic can be either real or trickery ($N = 8$), depending on the situation. In addition, 5-year-olds said magic was "real" nearly as often ($N = 6$) as did 4-year-olds. Only one child (a 4-year-old) placed magic in the realm of fantasy. When asked whether magic occurs in the real world or in stories only, children gave a variety of responses. Several children (seven in each group) believed that magic exists only in a fantasy context, while others (five 4-year-olds, seven 5-year-olds) believed it could occur in the real world. The remaining children believed magic to be sometimes fantastic and sometimes real (five 4-year-olds, four 5-year-olds), didn't know, or gave no response. These children, like those in Study 1, varied in their beliefs about the nature of magic.

On the questions about magicians, children of both ages tended to agree that magicians were real magic people. The majority of children in this study (fifteen 5-year-olds, eleven 4-year-olds) believed that people become magicians through learning rather than being born with special powers ($N = 3$) or having special powers passed on ($N = 3$). However, a majority of 4-year-olds agreed that magicians have real magic powers ($N = 12$), while the majority of 5-year-olds disagreed ($N = 12$). Overall, these data are consistent with those obtained in Study 1, confirming that 4-year-olds as a group are more willing than 5-year-olds to consider the possibility of "real" magical occurrences and agents.

DISCUSSION

The overall results of Study 2 are similar to those obtained in Study 1. Both 4- and 5-year-olds provided natural and physical mechanisms to explain hypothetical and actual commonplace transformations. In Study 2 children of both ages gave more "magic" and "trick" and fewer "physical/natural" responses after witnessing the extraordinary transformations than the other events. More younger than older children gave magical explanations after viewing the extraordinary transformations. In contrast, the majority of the older children continued to respond that these events were caused by natural or physical means.

Familiarity with the particular extraordinary items and their transformations did not account for children's patterns of magical explanations. For three of the four extraordinary items, children who were familiar with the item provided the same level of magical responses as children who said they were unfamiliar with the items. It seems that children are willing to label some transformations of items which they have seen before as "magical." Children generally suggested that the extraordinary events were not possible. Thus, although some children reported that they had seen the items before, they may not have seen the transformations we used before and may have been surprised by the transformations.

The results of Study 2 also suggest that 4-year-olds as a group are more willing than older children to consider the possibility of "real" magic events and people. However, it is clear from these results that individual children vary considerably with respect to their magical knowledge and beliefs.

Study 3

Studies 1 and 2 provide evidence that many 4-year-olds believe in the existence of magic. They use magic to explain the occurrence of seemingly impossible events and hold a rich set of beliefs regarding the nature of magical phenomena. How might these beliefs develop? One possibility is that parents might encourage the development of magical and fantasy beliefs. Rosengren et al. (1994) have found that parents report encouraging magical and fantasy beliefs to some extent. Belief in fantasy figures such as Santa Claus is also sanctioned by our culture, and previous research (Clark, 1991; Rosengren et al., 1994; Scheibe, 1989) suggests that children commonly believe in the real-

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ity of fairies, witches, Santa Claus, and other fantasy figures. In previous work the relation between parental support for these beliefs and children's magical beliefs has not been examined. The goal of Study 3 was to examine how parental encouragement of beliefs in magic and fantasy might relate to children's magical beliefs. In addition, we examined how parents' reports of their children's beliefs related to their children's magical responses in our two studies.

METHOD

Subjects

Parents of children participating in Studies 1 and 2 were asked to complete a questionnaire designed to gather basic information on how parents talk to preschool age children about magic and fantasy and how parents perceive and guide their children's fantasy beliefs.⁵ Parents of 37 of the 48 children who participated in Study 1 and parents of 26 of the 40 children who participated in Study 2 returned the questionnaire (72% response rate). Of the respondents, 32 were parents of 4-year-olds (17 females, 15 males), and 31 were parents of 5-year-olds (15 females, 16 males). All but four of the respondents were mothers.

Procedure

Study 1 survey.—The first of the survey's several sections included three questions about each of nine magical or fantasy characters. These characters included three figures associated with specific events (Santa Claus, Easter Bunny, and Tooth Fairy) and six supernatural fantasy figures (magicians, witches, fairies, ghosts, monsters, and dragons). We included both kinds of characters since we believed that responses might vary depending on whether the character is generally viewed as good or evil. To assess perceptions of children's fantasy figure beliefs,

we asked parents to indicate (yes, no, not sure) whether their children currently believed that each of the nine characters was real. We also asked parents to indicate (yes, no, neutral) which characters they currently encouraged their children to view as real, as well as which characters they themselves once believed were real.⁶ Together, these questions allowed us to examine the relations among parental encouragement of belief in fantasy characters, parents' perceptions of their children's beliefs, and children's magical beliefs as measured in the experimental setting.

In order to assess how parents might talk to their children about fantasy characters such as those listed above, we asked the parents how they would respond if their children asked whether certain fantasy characters are real. We asked these questions regarding magicians, Santa Claus, Easter Bunny, ghosts, and the Tooth Fairy. Responses were coded as "yes" if the parents said they would reply that the character was real, "no" if the parents said they would reply that the character was not real, or "avoidant" if the parents said they would not give a direct answer (i.e., respond by asking for the child's opinion). Since many parents indicated that they would not give a straightforward yes or no reply to these questions, we also coded the degree of certainty of information provided about the reality status of each character. Responses were coded as "definite" if the parents said they would give an informative response, "evasive" if the parents said they would not give definite information, or "alternative" if the parents said they would give a reply implying that the character was real in a metaphysical manner (e.g., Santa is the spirit of the season). Agreement between coders on these two coding dimensions was 83%, assessed for two independent coders on 15 surveys.

⁵ This survey was adapted from that reported in Rosengren et al. (1994) but is described in greater detail here.

⁶ It is possible that parents may have interpreted the questions concerning magicians in a manner different from those concerning the other figures. That is, parents may have interpreted our question about magicians as concerning whether there exist actual people who perform tricks and illusions and not (as we intended) whether there exist people called magicians who have extraordinary powers. We think that parents were unlikely to have interpreted our questions in the former manner for three reasons. First, our questions concerning magicians were embedded in a questionnaire asking about the reality of fantasy figures. It would seem unlikely in this context that the questions about magicians would be construed to be about the reality status of individuals who perform tricks. Second, it is doubtful that parents would interpret our questions about the encouragement of beliefs in magicians to be about individuals performing tricks and illusions. Rather, it is much simpler to treat this question as one about the reality of magic as a supernatural power. Finally, in informal discussions with parents, including participants in our research, they have never misinterpreted similar questions about magic and magicians.

In addition, to see whether parents used magic or appeals to fantasy as explanations in a more routine, everyday context, we asked parents how they would respond to their children's questions requiring complicated technical or scientific responses. For this question we presented the example of a garage door opener and asked: (1) how they would explain the operation of such a complex device and (2) whether they would provide a magical explanation in response to such a question. Responses were coded as "scientific" if parents said they would try to give an accurate explanation, "magic" if they said they would give fantastical information or invoke magic, "refer to authority" if they said they would refer their children to a more knowledgeable adult or reference book, or "don't know" if the parent would simply admit not knowing an answer. Since many parents indicated that their responses would change depending on their own knowledge of the topic at hand, responses were often coded as falling into more than one of the major categories. As a more general follow-up, we also asked parents whether they sometimes use magical explanations in response to difficult questions posed by their children. Once again, reliability was assessed for two independent coders, who reached 81% agreement on the 15 surveys assessed.

To examine parents' beliefs about the proper role of magic and fantasy in their children's lives, we asked several open-ended questions. First, we asked parents how important they thought it was for their children to learn to make a clear distinction between fantasy and reality and at what age making this distinction might be important. In a similar vein, we asked how important they thought it was for them to help their children make the fantasy-reality distinction. Responses were coded on a five-point scale, ranging from 1 (adult guidance is crucial) to 5 (children should definitely learn to distinguish fantasy from reality on their own). Reliability of coding of this general question was 88%, as assessed on 15 surveys.

Study 2 survey.—This survey included many of the same questions as the one given to parents of children in Study 1. Parents responded to the same three questions about event-related and supernatural fantasy figures, as well as to the same questions about the importance of fantasy in their children's lives. In the case of the latter set of questions, we changed the format to closed-response choices based on the coding cate-

gories developed from the responses obtained in the Study 1 survey.

The main departure of the modified survey was an expanded focus on how parents explain transformations involving complex or unknown mechanisms. Rather than giving the garage door example, we described the four "extraordinary" items used in Study 2 and asked parents how they would explain each transformation. This allowed for a comparison of parents' hypothetical explanations and their children's reactions to the actual transformations. The contents of parents' responses were coded according to the categories used for the Study 1 survey (scientific, magic, refer to authority, don't know). Reliability of coding was assessed on eight surveys, yielding intercoder agreement of 91%. As follow-up questions, we asked parents (yes, no) whether they would explain such transformations as magic, how often (ranging from "never" to "more than daily") their children asked questions requiring complex scientific responses, and in general how often they resorted to magical explanations in response to their children's questions (never, in teasing only, sometimes as fallback response, often as fallback).

RESULTS

General Level of Belief and Encouragement

The results of the first section of both surveys appear in Table 4. Overall, parents reported a substantial degree of belief among their children in both specific event-related and supernatural figures, ranging from 22% (dragons) to 79% (Santa). Approximately half of the parents (59%) reported that their children believed that magicians were real. These results suggest that parents do perceive their children as holding beliefs about a variety of fantasy figures. Parents reported general low levels of encouragement of beliefs for the supernatural figures, ranging from 3% for monsters to 28% for fairies and magicians.

To examine responses on the belief questions in more detail we conducted two separate 3 (question: parental belief, child belief, parental encouragement) \times 2 (age: 4, 5) repeated-measures ANOVAs on the number of yes responses for the supernatural and event-related figures. No main effect was found for age in either analysis, suggesting that parents of 4- and 5-year-old children encouraged beliefs to a similar extent and perceived equal levels of belief in their chil-

TABLE 4

PERCENT OF PARENTS REPORTING BELIEF IN VARIOUS FANTASY FIGURES AS CHILDREN, IN THEIR OWN CHILDREN, AND BELIEFS THEY ENCOURAGE IN THEIR OWN CHILDREN ($N = 63$)

Figure	Parents' Childhood Beliefs	Children's Current Beliefs	Encouraged Beliefs
Supernatural:			
Dragons	30	22	5
Witches	43	32	9
Ghosts	56	38	8
Monsters	41	30	3
Fairies	57	44	28
Magicians	54	59	28
Mean number of "yes" responses	2.8	2.2	.7
(SD)	(2.2)	(2.0)	(1.3)
Event-related:			
Santa	89	79	72
Easter Bunny	79	72	68
Tooth Fairy	76	64	63
Mean number of "yes" responses	2.4	2.2	2.0
(SD)	(1.0)	(1.3)	(1.3)

dren. The analyses did reveal main effects of question type, $F(2, 118) = 49.5, p < .001$, for the supernatural, $F(2, 118) = 5.3, p < .01$, for the event-related. Neuman-Keuls post hoc comparisons revealed that the level of parental encouragement of belief in supernatural figures ($M = 0.7$ out of 6, $SD = 1.3$) was significantly less than those reported for parents' childhood beliefs ($M = 2.9$ out of 6, $SD = 2.2$) and parents' reports of children's current beliefs ($M = 2.2$ out of 6, $SD = 2.0$).

For the event-related figures, parents reported that as children they had believed in significantly more figures ($M = 2.5$ out of 3, $SD = 0.9$) than they reported encouraging their children to believe in ($M = 2.0$ out of 3, $SD = 1.3$). The number of event-related figures that parents reported their children currently believing in ($M = 2.2$ out of 3, $SD = 1.3$) was not significantly different from either the number of figures the parents' reported believing in as children or the number of figures the parents' reported encouraging their children to believe in.

As far as parents' general beliefs about the role of fantasy in their children's lives are concerned, responses varied considerably. When asked in the Study 1 survey how much they encouraged beliefs in magic and fantasy, parents' responses were fairly evenly distributed, ranging from actively discourage ($N = 2$) to actively encourage ($N = 5$). On average, parents reported that they encouraged fantasy beliefs somewhat ($M = 3.3$ on a 0–5 scale). As far as their percep-

tions of the role of parents in guiding children's fantasy understanding are concerned, parents again gave a variety of responses, though the majority ($N = 22$) believed that children should learn the distinction mostly on their own or with occasional parental help. In general, these data suggest substantial individual differences in parental beliefs regarding encouragement of fantasy-reality understanding.

Relations between Parental Beliefs, Children's Beliefs and Parental Encouragement

In order to examine the relations among parental beliefs during childhood, perceptions of children's current beliefs, and parental encouragement, we performed several sets of correlations. Specifically, we examined the results obtained on the three questions across all characters, as well as separately for each of the two subtypes (i.e., event-related and supernatural). The total number of fantasy characters in which parents reported that they encouraged belief (range 0–9) was significantly related to the total number of characters parents reported that their children believed were real, $r(63) = .71, p < .01$. For the supernatural figures, parents' reports of their children's beliefs (range 0–6) were found to be significantly related to parents' reports of their own childhood beliefs, $r(63) = .73, p < .01$, and parental encouragement of the child's beliefs, $r(63) = .62, p < .01$. For the event-related figures, parents' reports of their children's beliefs (range 0–3) were significantly related

TABLE 5

PARENTS' RESPONSES TO QUESTIONS CONCERNING THE REALITY STATUS OF MAGICIANS, GHOSTS, SANTA, THE EASTER BUNNY, AND THE TOOTH FAIRY IN THE STUDY 1 SURVEY ($N = 37$)

FIGURE	REALITY STATUS?			CERTAINTY OF STATUS?			AGE DEPENDENCE?	
	Yes	No	Avoid	Definite	Evasive	Alternative	Yes	No
Magician	9	23	3	32	3	0	12	15
Ghost	3	24	8	24	10	1	8	18
Santa	21	7	7	24	7	4	23	5
Easter Bunny	19	9	6	25	5	3	20	6
Tooth Fairy	16	10	3	25	4	0	16	6

NOTE.—Because of missing data, rows within questions do not total 37.

to both reported parental encouragement, $r(63) = .75$, $p < .01$, and parents' reports of their own childhood beliefs, $r(63) = .59$, $p < .01$.

Parental Responses to Fantasy Questions

Table 5 shows the results for the Study 1 survey questions asking how parents would respond if their children asked about the reality of certain fantasy figures. Parents gave many more definite responses (78% of responses) than either evasive or alternative ones. The majority of parents responded that they would tell their children that ghosts and magicians were not real and that Santa, the Easter Bunny, and the Tooth Fairy were real. When asked about event-related figures, parents suggested that their responses would vary with the age of the child. However, parents were about evenly divided on magicians (12 responding yes, 15 responding no), and most parents (18 of 26 respondents) claimed that their responses concerning ghosts would not vary with the child's age.

Parents' Use of Magical Explanations

In our Study 1 survey, parents responded that they would not provide magical explanations to their children's questions very often. When asked how they would explain the operation of an automatic garage door opener, nearly all parents reported that they would give a scientific response ($N = 20$), refer to an authority (i.e., more knowledgeable adult, book, $N = 2$), or some combination thereof ($N = 7$). Only one parent reported that she might use magic as an explanation. Similarly, on the question asking directly whether they ever use "magic" as a response to children's questions, the majority of parents (73%) reported that they would never use magic as an explanation. Two parents reported using "magic" only in teasing, four sometimes as a fallback explanation, and two often as a fallback response.

Slightly different results were obtained in the Study 2 survey. When parents were asked how they would explain the mechanisms underlying each of the four "extraordinary" transformations, parents gave "scientific" responses most (68%) of the time. Parents sometimes responded that they would refer their children to an authoritative source (9% of the time) or gave mixed "scientific/authority" responses (11% of the time). Parents very rarely (3%) said they would give magical explanations. However, when asked more directly whether they would ever give magical explanations of these or similar "extraordinary" transformations, 11 parents (42%) admitted that they might provide a magical explanation sometimes ($N = 3$) or often ($N = 8$). Similarly, when asked if they generally use "magic" as a fallback response to their children's difficult questions about causal mechanisms, 11 parents admitted that they do (occasionally = 8, often = 3). Thus, although most parents normally give "scientific" responses to children's causal questions, some may occasionally resort to magical explanations of unusual events.

Relation between Parental Reports and Children's Magical Responses

To examine the relation between parental reports and children's magical responses we conducted a number of exploratory correlational and median split group analyses. Among the parent variables examined were number of fantasy figures in which parents encouraged belief (total, as well as supernatural and event-related figures separately), number of fantasy figures in which parents thought their children believed, reports of children's belief in magicians, number of figures in which parents once believed, content of information parents would give regarding figures' reality status (across all figures, as well as for magicians only), and each

TABLE 6

NUMBER OF CHILDREN BELIEVING IN MAGIC (Based on the Belief Rating) AS A FUNCTION OF PARENTAL VIEW OF CHILDREN'S BELIEF IN MAGIC AND PARENTAL ENCOURAGEMENT OF BELIEF IN MAGIC (N = 37)

	PARENTAL REPORT OF CHILD'S BELIEF IN MAGIC			PARENTAL REPORT OF ENCOURAGEMENT OF BELIEF IN MAGIC		
	Real	Not Real	Unsure	Real	Not Real	Unsure
Level of child's belief:						
Not real (0-3)	8	3	2	3	5	5
Real (5-7)	13	3	5	9	6	6

NOTE.—Three children's data are omitted from this table since they were coded at the midpoint of the belief rating.

of the general questions regarding the importance of fantasy beliefs and parental guidance in fantasy-reality understanding. We examined these parental variables in relation to children's belief in magic, measured by the belief rating obtained in Study 1, as well as by number of "magic" responses given in the experimental sessions in both Studies 1 and 2. Table 6 shows the pattern of results obtained when children's belief was assessed along with parental reports of their children's belief in magic and parental encouragement of these beliefs. Table 7 shows the pattern of results obtained when children's magical responses were compared with parents' hypothetical explanations of extraordinary events and parents' use of magical explanations. In the analyses, we collapsed across various categories to increase cell size, then performed chi-square analyses. These comparisons, as well as analyses examining other combinations of the variables described above, failed to yield significant correlations or group differences. Given these results, there appears to be no straightforward relation between parental

reports and children's behavior in our experiments. Rather, the relation between parents' perceptions and encouragement of social magical beliefs (i.e., beliefs in fantasy figures) and children's magical beliefs and explanations of causal events may be both subtle and complex.

DISCUSSION

Parents appear to view their 4- and 5-year-old children as having some trouble distinguishing fantasy from reality. In our survey, parents reported that their children believed that Santa Claus, the Easter Bunny, and the Tooth Fairy were real figures. Magicians and other fantasy figures were not reported as believed to be real to the same extent. It seems that parents primarily report encouraging belief in magical agents whom they sometimes portray. With respect to magicians, about half of the parents reported that their children believed magicians were real.

How might children come to label some events as "magic"? In this study we used a

TABLE 7

NUMBER OF CHILDREN PROVIDING MAGIC RESPONSES FOR 0 TO 4 OF THE EXTRAORDINARY EVENTS AS A FUNCTION OF PARENTAL REPORTS (N = 26)

	PARENTAL REPORT OF USE OF MAGIC FOR EXTRAORDINARY EVENTS			PARENTAL REPORT OF USE OF MAGIC IN GENERAL FOR DIFFICULT QUESTIONS		
	Never	Sometimes	Often	Never	Occasionally	Often
Number of magic responses:						
0	3	1	2	3	3	0
1	3	0	3	3	0	3
2	4	0	3	6	1	0
3	3	1	0	1	3	0
4	2	1	0	2	1	0

parent survey to determine the extent to which parents admit to encouraging beliefs in fantasy figures and magicians in their children. Only a third of the parents reported that they encouraged their children to believe that magicians were real, and the majority of the parents answered that, if explicitly asked, they would tell their children that magicians were not real. On the other hand, the majority of the parents responded that if explicitly asked, they would tell their children that Santa, the Easter Bunny, or the Tooth Fairy were real individuals. Many parents also reported encouraging belief in these figures. In general, parental encouragement of belief in fantasy figures was found to be positively related to perceptions of children's beliefs in the reality of fantasy figures.

The relation between parents' reports of belief in fantasy and magic and our assessment of children's willingness to accept "magical" changes was not as clear. We found no significant relations between survey responses and children's performance on either of our experimental tasks. Although this finding may at first seem surprising, there are a number of possible explanations. One possibility is that parents do not have a very good understanding of their children's beliefs. Parents do tend to underestimate children's beliefs (Singer & Singer, 1990; Taylor & Cartwright, 1991). In our surveys we found that parents of 4- and 5-year-olds reported similar levels of beliefs in their children and encouraged similar levels of belief in fantasy figures. However, in Studies 1 and 2 we found significant differences in the number of magical responses given by 4- and 5-year-olds. Taken together these findings suggest that parents may not have a very good understanding of their children's beliefs. It is also likely that parents' encouragement of belief in magic is subtle and infrequent and hence not easily captured in a parental report measure. Finally, while parents and the general culture do encourage belief in fantasy figures and magic to some extent, it is clear that children do not acquire these beliefs solely by these means. Harris (1994) has suggested that it is only when children have begun to understand the distinction between those events which are possible and those which are not that children can come to appreciate certain events as magical. At this point, children may learn to label as magic those events which violate normal causal principles. We suggest that parents may initially provide those labels.

In our surveys, we found that, although most parents report normally providing "scientific" responses to children's causal questions, some parents occasionally resort to magical explanations for unusual events. We surmise that, while these magical explanations may not be very common, they may be used to explain events that are particularly salient. That is, it is unlikely that parents use magical explanations at all to explain natural, commonplace events. However, parents may use magical explanations when presented with dramatic and perhaps novel events that violate expected causal sequences and of which they do not have a complete understanding.

General Discussion

Even though young children appear to understand certain principles which underlie various physical, biological, and mental phenomena (Wellman & Gelman, 1992), 4- and 5-year-old children do not rule out the existence of extraordinary, even supernatural events. Four-year-olds and, to a lesser extent, 5-year-olds labeled both prototypical magic tricks and extraordinary events as magic. Follow-up interviews revealed that many of the 4-year-olds view magic as a real phenomenon, controlled by magicians. Magic for many of these children is not something that is learned but something that involves special powers an individual is either born with or which are bestowed upon an individual by someone who possesses these powers. The majority of the 5-year-olds in these studies viewed magic as involving tricks and deception. These children viewed magic as a skill which could be learned through reading, other magicians, or at a special "magic" school.

The results of our first two studies contrast with those obtained by Chandler and Lalonde (1994), who found that 3- and 4-year-old children quickly shifted from magical to trick responses when allowed repeated viewing of an unusual event. The two investigations, however, differ in a number of important ways. First, we presented children with only a single viewing of each event rather than multiple viewings. It may be, as Chandler and Lalonde suggest, that children use magical explanations as temporary place holders while they search for some more familiar causal mechanisms to explain unusual events. In general, magicians perform a given trick only once per show, perhaps to keep the audience members from searching too far for nonmagical

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explanations. Clearly, the stability of children's magical explanations needs to be examined in more depth. Second, Chandler and Lalonde allowed their subjects to freely explore the apparatus involved in their unusual event, whereas we presented children with the opportunity to explore nonworking copies of the magic and extraordinary items. Few children, however, asked to play with the magic and extraordinary items. Thus, in our studies it was highly improbable that children would discover the actual mechanisms underlying the events. For this reason, children may have been less able to go beyond their initial magical explanations. Finally, we presented children with a series of unusual events rather than a single one. The cumulative impact of viewing a series of unexpected events may have increased children's willingness to use magical explanations. In a sense, we may have been better magicians by creating a more "magical" context than Chandler and Lalonde. Presenting unusual events in an unusual or "supernatural" context may shift children away from using more naturalistic explanations of phenomena. Likewise, had we performed our studies in a religious context, we might have induced children to provide more religious explanations. Subbotsky (1985, 1994) has begun to examine certain contextual issues leading to magical responses. The importance of contextual information in triggering various causal models or in causing children to shift from using one causal framework to another should be investigated in further research.

Children, however, do not use magic to explain all types of events, regardless of the context. In both of our first two studies, children did not use magic to label and explain a variety of commonplace events. One possibility that we explored in Study 2 is that children might reserve magical explanations for transformations of objects which were unfamiliar. Familiarity with the objects did not seem to determine whether a child will label it as magic. Even many of the children who reported having previous experience with some of our extraordinary items suggested that magic was involved in the transformations. Since many of the children reported that the hypothetical transformations of the extraordinary events could not occur, it may be that, while these objects were familiar to the children, the mechanisms themselves violated the children's expectations regarding what is a typical event for such items. This violation of familiar causal sequences may

underlie children's fascination for and desire to repeat events similar to the extraordinary events presented in Study 2. Further research should examine more closely how familiarity with the items and familiarity with the causal mechanisms relates to children's magical explanations.

Children did, however, often believe that they could perform the transformations of the extraordinary events after witnessing them. In this regard children's responses for the extraordinary events were quite different from those for the magical ones, which they did not believe they could perform. At present, the cause of this difference is unclear. All of our magic and extraordinary events occurred relatively abruptly. Thus it does not seem likely that children used the timing of the event to determine whether they could perform it. It is possible that children noticed subtle differences in the types of actions used to produce the different types of events. We think that this explanation is unlikely, since we used events which contained similar types of discrete actions (e.g., pulling, pushing actions). In addition, to perform both of these events the agent needed to have some specific knowledge about the conditions which were necessary to produce the event. For the magic events, this knowledge constitutes the "trick." For the extraordinary events this knowledge involved some basic knowledge of the underlying mechanism. For example, in order to make the car change color in water, one needs to know (or realize) that the car was painted with heat sensitive paint and that the water must be a certain temperature. In this sense, our extraordinary events involved "tricks" as well. It is unlikely that the children in these two investigations were any more knowledgeable of the "tricks" involved in the extraordinary events than they were of those involved in the magic events.

Children do seem reluctant to use magical explanations unless faced with an extraordinary event (Subbotsky, 1994). This reluctance to label events as magical or to cite magical mechanisms may be due to some extent to perceived social costs (see Woolley & Phelps, 1994), but what seems truly to separate the magical from the commonplace is whether or not children believe the event to be possible. For both hypothetical magic and extraordinary events, children responded first that such transformations were impossible by the means we suggested and then proceeded to suggest physical mechanisms (e.g., color the magic coloring book

with a crayon). Only after witnessing the actual magic and extraordinary events did children resort to magic. Thus, in the first two studies presented here, magical explanations were reserved for those items which the majority of the children believed to be impossible. At present it is not clear whether children's magical explanations are more greatly influenced by violations of familiar causal sequences or by the occurrence of unexpected outcomes. It may be that young children view "magical" events in a principled fashion, reserving magical explanations for those events which violate expectations because the events are incompatible with known, familiar causal mechanisms.

Recent evidence has shown that children come to appreciate what events are possible and which are not by a relatively early age (Baillargeon, 1991; Rosengren, Kalish, & Gelman, 1992). This ability to classify events as possible or impossible indicates that children have a relatively good understanding of the causal principles which apply to events in the world. The ability to separate events into possible and impossible categories also means that children realize that causal principles provide one with the knowledge to predict what is possible and also to recognize those events that are not possible (Harris, 1994). Harris (1994) suggests that this ability to recognize certain extraordinary events opens up the possibility of a domain of magical events. According to Harris, classification of events as magic enables the child to cope emotionally and cognitively with cultural practices that support belief in the existence of supernatural beings (e.g., Santa Claus, God). From this perspective, it is only after children have developed an understanding of what is commonplace that children can come to appreciate certain events as magical or extraordinary.

The results of our surveys suggest that the relation between parental encouragement of beliefs and children's actual beliefs is quite complex. Clearly, cultural input is not the sole source of children's magical beliefs. It is unlikely, however, that children come to label events as magic completely on their own. Parents in our study reported that they encouraged their children to believe that certain fantasy figures are in fact real. Our assumption is that adults may use the term "magic" to highlight interesting events for children (e.g., in describing the "magic" of nature) or may even use magical explanations as a shortcut when asked to explain

complex events which appear to violate common causal sequences. Our survey results provide evidence that some parents on occasion resort to magical explanations. We have also found in our work in preschool classrooms that teachers sometimes label remarkable or extraordinary events as "magic." For example, in demonstrating how a magnet could make a row of paper clips hold together in a chain, one kindergarten teacher explained that the magnet was a "magic wand." On another occasion, a teacher showed a group of 4-year-olds a special kind of white paint which turned color upon contact with paper, and said, "What just happened? Who knows?!—maybe it's magic!" We believe that these magical markers may be provided to a greater extent than parents and other adults report, though we expect magical explanations to be reserved for certain special, extraordinary events, which are not easily explained by common causal mechanisms.

On the basis of our survey results, it seems that parents may actively support and encourage certain supernatural beliefs in young preschoolers. However, many parents responded that children should come to learn the distinction between fantasy and reality by age 5 or 6, suggesting at the same time that children should learn to make this distinction on their own. This implies that parents may shift from actively encouraging belief in certain supernatural figures to allowing children to figure things out on their own. Two types of parental responses to children's questions regarding the reality status of certain supernatural figures support this. First, some of our parents responded that if their children asked them if certain fantasy figures were real they would respond, "I don't know, what do you think?" Other parents responded to this type of question with vague metaphysical responses such as "Santa's real in the spirit." It appears that this shift in parental support may occur at the same time that children enter formal schooling and are provided with both more "scientific" causal mechanisms and peers with different belief systems. As children come into greater contact with peers with different beliefs, as well as an educational system which actively discourages magical beliefs, they may replace their magical explanations with more natural ones and begin to think that tricks and deception underlie the occurrence of seemingly impossible events. Likewise, as children come into greater contact with peers who have compet-

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ing interests and desires and gain a greater understanding of the differences between appearances and reality, children may begin to understand the deception involved in magic. By this account, parents and the culture at large may at first actively support magical beliefs while peers and schools are left to debunk these childhood myths.

References

- Baillargeon, R. (1991). Reasoning about the height and location of a hidden object in 4.5- and 6.5-month-old infants. *Cognition*, *38*, 13-42.
- Baldwin, A. L. (1955). *Behavior and development in childhood*. New York: Dryden.
- Berzonsky, M. D. (1970). Effects of probing children's phenomenistic explanations of cause and effect. *Developmental Psychology*, *3*, 407.
- Berzonsky, M. D. (1971). The role of familiarity in children's explanation of physical causality. *Child Development*, *42*, 705-716.
- Chandler, M. J., & Lalonde, C. E. (1994). Surprising, magical, and miraculous turns of events: Children's reactions to violations of their early theories of mind and matter. *British Journal of Developmental Psychology*, *12*, 83-95.
- Clark, C. D. (1991). *The cultural psychology of Christmas and Easter—with special reference to children*. Unpublished doctoral dissertation, University of Chicago.
- Harris, P. L. (1994). Unexpected, impossible and magical events: Children's reactions to causal violations. *British Journal of Developmental Psychology*, *12*, 1-7.
- Harris, P. L., Brown, E., Marriott, C., Whittall, S., & Harmer, S. (1991). Monsters, ghosts, and witches: Testing the limits of the fantasy-reality distinction in young children. *British Journal of Developmental Psychology*, *9*, 105-123.
- Huang, I. (1930). Children's explanations of strange phenomena. *Psychologische Forschung*, *14*, 63-182.
- Johnson, C., & Harris, P. L. (1994). Magic: Special but not excluded. *British Journal of Developmental Psychology*, *12*, 35-51.
- Luhrmann, T. M. (1986). Witchcraft, morality and magic in contemporary London. *International Journal of Moral and Social Studies*, *1*, 77-94.
- Nass, M. L. (1956). The effects of three variables on children's concepts of physical causality. *Journal of Abnormal and Social Psychology*, *53*, 191-196.
- Neusner, J. (1989). *Religion, science, and magic: In concert and in conflict*. New York: Oxford University Press.
- Piaget, J. (1929). *The child's conception of the world*. London: Kegan Paul.
- Piaget, J. (1930). *The child's conception of physical causality*. London: Kegan Paul.
- Rosengren, K. S., Kalish, C. W., & Gelman, S. A. (1992). *No way? Children's understanding of possible and impossible transformation of animals and artifacts*. Manuscript submitted for publication.
- Rosengren, K. S., Kalish, C. W., Hickling, A. G., & Gelman, S. A. (1994). Exploring the relation between preschool children's magical beliefs and causal thinking. *British Journal of Developmental Psychology*, *12*, 69-82.
- Russell, D. H. (1956). *Children's thinking*. New York: Ginn.
- Scheibe, C. (1989). *Developmental differences in children's reasoning about Santa Claus and other fantasy characters*. Unpublished doctoral dissertation, Cornell University.
- Singer, D. G., & Singer, J. L. (1990). *The house of make-believe: Children's play and developing imagination*. Cambridge, MA: Harvard University Press.
- Subbotsky, E. V. (1985). Preschool children's perception of unusual phenomena. *Soviet Psychology*, *23*, 91-114.
- Subbotsky, E. V. (1991). A life span approach to object permanence. *Human Development*, *34*, 125-137.
- Subbotsky, E. V. (1994). Early rationality and magical thinking in preschoolers: Space and time. *British Journal of Developmental Psychology*, *12*, 97-108.
- Taylor, M., & Cartwright, B. S. (1991). *The distinction between fantasy and reality: A comparison of children with and without imaginary companions*. Paper presented at the biennial meetings of the Society for Research in Child Development, Seattle.
- Wellman, H. M., & Gelman, S. A. (1992). Cognitive development: Foundational theories of core domains. *Annual Review of Psychology*, *43*, 337-375.
- Woolley, J. D., & Phelps, K. E. (1994). Young children's practical reasoning about imagination. *British Journal of Developmental Psychology*, *12*, 53-67.