



Mixing memories: The effects of rumors that conflict with children's experiences

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Abstract

This study examined age differences in children's vulnerability to be misled by two types of false overheard rumors, namely a rumor that suggested a reasonable explanation for an earlier unresolved experience and a rumor that suggested an explanation that conflicted with information already in memory. Results indicated that all of the children were highly susceptible to wrongly report the rumor as an actual experience when it merely filled a gap in memory. However, the 5- and 6-year-olds were better able than the 3- and 4-year-olds to resist the rumor when it suggested a conflicting explanation for a past event. Developmental changes in children's understanding of conflicting mental representations were linked to their ability to resist being misled by the conflicting rumor. © 2007 Elsevier Inc. All rights reserved.

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Introduction

During recent years, there has been a surge of interest in examining factors that can induce errors in children's reports of their experiences. This increased attention has been motivated largely by the unprecedented involvement of young witnesses in the legal system. Because children's testimony is elicited in interviews, this literature has focused on suggestive interviewing techniques. This body of work has revealed, for example, that children's accounts can be hindered seriously by the types of questions that interviewers ask

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(e.g., Bruck, Ceci, & Hembrooke, 2002), the sorts of ancillary aids that are used (e.g., Bruck, Ceci, & Francoeur, 2000), and the characteristics of the interviewer (e.g., Bjorklund et al., 2000). Despite the significance of this line of research for developing effective interviewing protocols, investigators have become increasingly concerned with exploring suggestive factors outside of the formal interview context that also can contaminate children's reports.

One factor that can lead to errors in remembering is rumor. In their seminal study on rumors, Principe, Kanaya, Ceci, and Singh (2006) found that children who overheard a false rumor that provided a reasonable explanation for an earlier ambiguous occurrence later reported experiencing the event suggested by the rumor. In this investigation, a magician failed to pull a rabbit out of his hat during a magic show performed in children's classrooms. After the show, some of the children overheard a rumor in which an adult alleged that the trick had failed because the rabbit had gotten loose in the school. Other children, who were not exposed to the rumor, actually experienced the event suggested by the rumor, namely a loose rabbit in their school. Later, the subset of children who overheard the rumor, either directly from the adult or indirectly through natural interactions with their classmates who heard the adult, were as likely to report experiencing the rumored event as were those who actually experienced it. Demonstrating the potency of rumor, most of the erroneous reports were in children's free recall and were quite elaborate.

The relevance of Principe and colleagues' (2006) study to both basic research on memory and applied concerns regarding children's testimony notwithstanding, the interfering effects of rumor might be less powerful in situations where the rumored information conflicts with the past rather than helps to explain an ambiguous event. The major purpose of the current investigation, therefore, was to extend Principe and colleagues' demonstration of the impact of rumors by exploring whether a rumor that conflicts with children's experiences, rather than merely fills a gap, also can induce errors. This contrast is of interest because when rumors fill a gap, overheard details can be imported into memory without superseding any actually experienced details. In contrast, when rumors conflict with the past, children must figure out how to resolve the contradiction. Thus, unlike gap-filling rumors, contradictory rumors cannot be imported into memory without displacing or otherwise updating the original information. Admittedly, there is some evidence showing that children do not automatically reject any heard information that contradicts their own experiences. For instance, most children believe that the earth is round despite their own experience suggesting that it is flat (Siegal, Butterworth, & Newcombe, 2004). Likewise, children generally believe in the existence of germs despite not being able to observe them for themselves (Harris, Pasquini, Duke, Asscher, & Pons, 2006). However, given that children tend to believe what they have seen with their own eyes in preference to conflicting information that they have heard about from someone else (Robinson, Mitchell, & Nye, 1995), it seems likely that they might be less affected by a contradictory rumor than by a gap-filling rumor.

The higher expected resistance to contradicting rumors versus consistent rumors notwithstanding, children's understanding of the mind as representational may moderate their degree of resistance to contradicting rumors. Specifically, as children develop the ability to reason about conflicting mental representations with age (Perner, 1991; Wellman, 1990), they may become better able to handle rumors that contradict their experiences. This prediction comes from numerous researchers in the theory of mind tradition

who propose that there is a major transition in children's understanding of representational processes between 3 and 6 years of age. Younger preschoolers are thought to possess a copy theory of mind and to believe that the mind directly represents or copies the world (Chandler & Boyes, 1982; Flavell, 1988). Consequently, they assume that there is only one objective way to represent the world and that everyone has the same beliefs about it. In contrast, older preschoolers develop an interpretive theory of mind and recognize that mental representation is an active, subjective process based on the particular information that people have available to them as well as prior beliefs, expectations, goals, and so on (Flavell, 1988; Perner, 1991; Wellman, 1990). Thus, older preschoolers understand that the world can be represented differently from the way it really is and that different people can have different, even contradictory, representations of the same circumstance.

These descriptions are based on children's performance on a variety of tasks in the theory of mind literature that reveal age-related improvements in their understanding of conflicting representations. To illustrate, in Gopnik and Astington's (1988) representational change task, children are shown a crayon box. After stating that they believe crayons are in the box, children discover that the box contains candles. Then they are asked what they previously thought was inside when they had seen the closed box. To respond correctly, children must be able to resolve two conflicting representations of the box's contents, one based on its apparent contents (crayons) and the other based on its real contents (candles). Most 3-year-olds claim that they originally thought candles were inside. Not until around 5 years of age do most children say that they believed crayons were in the box. A similar developmental shift in reasoning is shown on related tasks such as the appearance–reality task (e.g., Flavell, Flavell, & Green, 1986), in which children must reason about objects whose appearance does not match their real identity, and the false belief task (e.g., Wimmer & Perner, 1983), in which children must deal with different individuals who have different representations of a single event. Importantly, children's difficulty with these tasks does not stem from a general inability to consider two representations simultaneously. DeLoache (2000), for instance, demonstrated that children as young as 3 years can hold dual representations of a single symbolic entity. Furthermore, by 3 years of age, children can reason about conflicting imaginary representations (Woolley, 1995) and conflicting desires (Wellman, 1990). Thus, young children's primary difficulty appears to be with conflicting representations that supposedly reflect reality (Flavell, 1988; Perner, 1991).

Interestingly, younger children's errors on theory of mind tasks bear a close similarity to their mistaken reports of misleading information in studies of suggestibility where suggestions that conflict with a past experience are heard (e.g., Connolly & Price, 2006; Ellis, Powell, Thomson, & Jones, 2003; Gobbo, Mega, & Pipe, 2002). Numerous studies in this tradition have shown that younger children are more likely than older children to wrongly recall what had been suggested (for reviews, see Ceci & Bruck, 1995; Westcott, Davies, & Bull, 2002). Although the exact mechanism responsible for this age pattern is unclear, it seems likely that younger children's belief that the world can be represented in only one way may prohibit them from simultaneously reasoning about their original representation and the one derived from the suggestions. In contrast, older children who realize that the same event can be represented differently by different people may be better able to correctly resolve the contradiction created by the suggestions.

Several studies using the misinformation paradigm support the notion that reasoning about conflicting representations is associated with a corresponding reduction in

suggestibility. Briefly, in the misinformation paradigm, developed by Loftus (1975), participants are exposed to an event and then are read a narrative or asked questions suggesting information that somehow conflicts with the original event. Then memory is assessed using a recognition test containing items from both the original event and the conflicting post-event information. For instance, Welch-Ross, Diecidue, and Miller (1997) asked 3- to 5-year-olds misleading questions (e.g., “Sally ate cereal for breakfast, didn’t she?” when in fact she had eaten eggs in the story) about a previously heard story. When tested later, children’s performance on theory of mind tasks indexing conflicting representation understanding predicted their ability to reject yes/no questions relating to the suggestions (e.g., “Did Sally eat cereal for breakfast?”). In a follow-up study using a two-choice recognition task containing both original and suggested details of a story, Welch-Ross (1999) found that children who could reason about conflicting representations evidenced longer response times when they made incorrect choices compared with those who could not deal with conflicting representations. One interpretation of this finding is that children who understood conflicting representations responded more slowly on the recognition test because they were comparing the two contradictory representations, in contrast to other children who responded more quickly because they considered only the representation of the suggested information. Similarly, Templeton and Wilcox (2000) had 4- to 6-year-olds watch a segment of *Sesame Street* and then listen to a narrative containing suggestions that conflicted with the segment. A two-choice recognition test revealed that those children who had passed a standard false belief task displayed more accurate memory than did those who had failed the task. Taken together, these findings show that conflicting representation understanding is an important determinant in children’s ability to resist contradictory suggestions. This relation, however, has been studied only in the context of the misinformation paradigm. Thus, an important next step is to explore whether the ability to deal with conflicting representations affects vulnerability to suggestions in other more naturalistic contexts that are known to produce memory errors such as when children overhear false rumors.

The current study

A first goal of the current research was to investigate whether the interfering effects of rumor on memory might be less potent when the rumor conflicts with the past rather than fills a gap. On the basis of age-related improvements in children’s ability to reason about conflicting representations evidenced on theory of mind tasks, younger preschoolers were expected to be more vulnerable than older preschoolers to a contradictory rumor. Given younger preschoolers’ belief that the mind directly copies or represents the world, they may fail to consider simultaneously their original representation and the representation created by the rumor. In contrast, older children’s more mature conception of the mind and developing ability to handle conflicting representations may enable them to make correct decisions about which of the two conflicting representations depicts the past accurately.

Following Principe and colleagues’ (2006) procedure, children experienced a scripted event and then overheard a false rumor suggesting that a fictitious activity had occurred during the event. For some children, the rumor was inconsistent with the event and, thus, created a conflicting representation. For others, the rumor simply filled a gap. Later, children’s memory was tested, and those who mistakenly reported that the

rumored activity had occurred were asked whether they had seen it take place with their own eyes. Of interest was whether reports of seeing the rumored activity tended to be accompanied by high levels of elaborative detail. This prediction is in line with Principe and colleagues' findings and comes from the source-monitoring framework proposing that individuals make decisions about the source of a memory by evaluating its characteristics at retrieval (Johnson, Hashtroudi, & Lindsay, 1993; Johnson & Raye, 1981). Memories based on experience should contain more perceptual, contextual, and affective details than should memories originating in other sources because the latter were never directly experienced but only heard about, imagined, dreamt, and so on (Johnson, Suen-gas, Foley, & Raye, 1988). Thus, assuming that the makeup of verbal accounts reflects the content of the underlying memory, the source-monitoring framework would predict that more elaborate accounts of the rumored activity would lead to higher rates of false reports of seeing this activity.

A second goal of this research was to examine whether children's understanding of conflicting representations directly affects their resistance to a contradictory rumor. Although several investigations (Templeton & Wilcox, 2000; Welch-Ross, 1999; Welch-Ross et al., 1997) have provided evidence that performance on tasks indexing conflicting representation understanding is associated with children's resistance to false suggestions in the misinformation paradigm, it is not clear from extant data whether this link is particular to the misinformation paradigm or whether children's developing ability to deal with conflicting representations is associated with their ability to resist suggestions in other situations such as when a false rumor is overheard. To address this question, children were given a set of classic appearance–reality and false belief tasks.

Method

Participants

A total of 132 children participated in this study, divided into a younger group composed of 3- and 4-year-olds and an older group made up of 5- and 6-year-olds. There were 68 younger children (mean age = 51 months, range = 39–59, 37 girls and 31 boys) and 64 older children (mean age = 72 months, range = 60–81, 30 girls and 34 boys). The children were recruited from one of seven participating suburban preschools and summer day camps in southeastern Pennsylvania. Reflecting the population of these programs, 95% of the children were European American. An additional 30 children, 15 in each age group with a mean age and range comparable to the two groups described above, took part in a manipulation check. These children were drawn from two suburban preschools in the same region as the other children, and all of them were European American.

Experimental design

The 68 younger children and the 64 older children were assigned to one of three experimental groups that differed in terms of the type of exposure to the false rumor: conflicting representation versus nonconflicting representation versus control. The six groups formed by the combination of age and experimental group ranged in size from 20 to 24, with the number of girls in each group ranging from 11 to 14.

Procedure

The children were seen during two sessions, each of which took place in a room other than their assigned classrooms at their schools. The sessions were separated by approximately 1 week (mean = 7 days, range = 5–9), and the interviews were videotaped for subsequent coding.

The to-be-remembered event

Each classroom was visited by a magician named Magic Mumfry who performed a variety of magic tricks. Near the end of the show, Mumfry reached into his top hat to pull out a live rabbit. However, after several enthusiastic but failed efforts, Mumfry gave up and apologized to the children for failing to do the trick.

Then one third of the children, those in the conflicting representation condition, experienced an extra activity that provided a plausible explanation for Mumfry's failed trick but that conflicted with the rumor that they would later overhear. First, Mumfry wondered aloud whether the rabbit was still in its cage. Then he uncovered a previously unseen cage to find a live rabbit. After announcing that he had found the missing rabbit, Mumfry explained that the rabbit must be sick because when it is sick it will not leave its cage for any reason, not even to do its favorite hat trick. To encourage the children's belief in this explanation, Mumfry got out his "vet kit" and "checked" the rabbit with a stethoscope and then gave it some "medicine" to make it feel better. Finally, Mumfry covered the cage and left the school. Then, replicating [Principe and colleagues' \(2006\)](#) procedure, these children overheard a brief conversation between a teacher and an unfamiliar adult confederate in which the confederate alleged that Mumfry's trick failed because the rabbit had gotten loose in the school rather than appearing in the hat. The children's attention to the rumor was maximized by having them stand quietly in a line awaiting a sticker at the start of the planned conversation. Importantly, the rumor created a conflicting representation of Mumfry's failed trick for these children given their prior exposure to the sick rabbit activity. The teachers were instructed not to discuss the rabbit with the children.

A second third of the children, those in the nonconflicting representation condition, overheard the same rumor conversation as those in the conflicting representation condition but did not experience the extra sick rabbit activity. Thus, for these children, the rumor provided a plausible explanation for Mumfry's failed rabbit trick and, hence, did not create a conflicting representation. The remaining children in the control condition did not overhear the rumor and did not have any opportunities to interact with the children in the other two groups.

Manipulation check

A manipulation check was performed to verify that the children understood and could recall the sick rabbit explanation following the extra activity. The 30 children involved in the manipulation check were exposed to the magic show and then the extra sick rabbit activity in the same manner as those in the conflicting representation condition. However, following the extra activity, an unfamiliar examiner asked the children individually why Mumfry's hat trick had failed: "I heard that Magic Mumfry didn't pull his rabbit out of his hat. Do you know what happened?" The children were prompted with additional general probes if they did not immediately recall the extra activity.

Memory interview

One week after the magic show, all of the children (excluding those who took part in the manipulation check) were questioned by a condition-unaware interviewer. Following Principe and colleagues (2006), the interview followed a hierarchically structured format that began with an open-ended question: “I’d like you to tell me everything that you remember about the day that Magic Mumfry visited your school. I wasn’t there that day, so I don’t know what happened. Don’t guess or make anything up. Just tell me what you did or saw the time that Magic Mumfry came to your school.” After additional open-ended probing (e.g., “What else happened?”), a specific question was asked if the loose rabbit (hereafter referred to as the target activity) had not yet been mentioned: “Did anything happen to Mumfry’s rabbit?” The children who reported the target activity were prompted to elaborate (e.g., “Tell me more about that”) until their recall was exhausted. Finally, the children who reported the loose rabbit were given a “source question” that asked whether they merely heard about the target activity or actually saw it occur: “Did you see [action vis-à-vis the rabbit, as noted by the child, inserted here, e.g., ‘the rabbit eating carrots in your classroom’] with your own eyes, or did you hear about it from someone?”

Conflicting representation tasks

After the interview, the children in the conflicting representation group were given standard appearance–reality and false belief tasks. First, a variation of Flavell and colleagues’ (1986) appearance–reality task required children to distinguish between the real and apparent identities of two common objects. This task was carried out with a sponge painted to look like a rock and a candle that looked like a crayon. The children first saw the object out of their reach and then were allowed to touch it. Then, while looking only at the object, the children were asked, “What does this look like to your eyes right now—does it look like a rock [candle], or does it look like a sponge [crayon]? What is this really? Is it really a rock [candle], or is it really a sponge [crayon]?” Then they were asked, “When you first saw this, before you touched it, what did you think it was, a rock [candle] or a sponge [crayon]?” For each object, the children were required to answer both questions correctly to receive 1 point. The total score for this task ranged from 0 to 2.

Second, the children completed two standard false belief tasks adapted from Hogrefe, Wimmer, and Perner’s (1986) procedure using a crayon box and a bag of M& Ms (i.e., assorted chocolate candy). The children first were shown the closed box or bag and asked, “What do you think is inside the box [bag]?” Once the children stated that they believed crayons (M& Ms) were in the box (bag), the box (bag) was opened, revealing small rubber balls (plastic tropical fish). Then the box (bag) was closed and the children were asked, “When you first saw the box [bag] all closed up like this, what did you think was inside the box [bag], crayons or balls [M& Ms or fish]?” and “Your teacher hasn’t seen inside this box [bag]. If he [or she] sees the box [bag] all closed up like this, what will he [or she] think is inside it?” The children were required to answer both questions correctly to be scored correct. The total score for this task ranged from 0 to 2.

The two sets of items within each task and the order of the two tasks were counterbalanced. The scores for the two tasks were combined into one conflicting representation index that ranged from 0 to 4.

Coding of the interviews

The videotaped interviews were transcribed verbatim and coded by condition-unaware raters. First, the transcriptions were scored for the type of probe needed to elicit the children's reports of the target activity (i.e., open-ended vs. specific) and their responses to the source question. Then the children's narrative responses to both open-ended and specific questions regarding the rabbit were broken down into propositions. Following Fivush, Haden, and Adam (1995), a proposition was defined as a clause containing a subject and a verb, either explicit or implied, that had not been mentioned previously by either the interviewer or the child. Examples of propositions included "He [the rabbit] was hopping around," "I tried to grab him like this," and "I saw him next to Anne." If two subjects were nominated, the clause was parsed into two propositions (e.g., "Me/and Madison heard the bunny munching"). If two action verbs were provided for one subject, the statement was scored as two propositions (e.g., "He hopped out the window/and hid in the tunnel").

Propositions then were parsed into one of three categories: Rumor, Conflicting Event, and Other. Statements that literally described the loose rabbit rumor or that went beyond the literal information provided in the rumor but nonetheless were consistent with events that reasonably could have happened if a rabbit were loose in the school were coded as Rumor (e.g., "The bunny was on my lap," "I saw paw prints on my playground"). Propositions were coded as Conflicting Event if they contained any information that was consistent with the notion of a sick rabbit as an explanation for Mumfry's foiled hat trick. Thus, Conflicting Event was scored for propositions that described the extra sick rabbit activity as well as for those that went beyond the exact details of this activity but nonetheless were consistent with the idea that Mumfry's rabbit was sick. Only children in the conflicting representation condition were expected to report Conflicting Event propositions (e.g., "He was in a little cage," "He had the biggest fever in the whole wide world") because they were the only children who experienced the extra activity. Descriptions of Mumfry's rabbit that were inconsistent with the loose rabbit in the school rumor or the sick rabbit activity or that likely could not have happened in reality were coded as Other (e.g., "The bunny went to DisneyWorld on vacation," "He drank a whole can of soda").

Of the 132 interviews coded, 10% ($n = 14$) were coded independently by two judges and checked for interrater reliability. Interrater agreement as measured by kappa was excellent, ranging from .93 to 1 for the level of recall of the target activity, the children's responses to the source question, and the number and type of propositions reported. The few coding discrepancies were mainly oversights that were resolved through discussion.

Results

Preliminary analyses

Preliminary analyses indicated no main effects of the dependent variables discussed below as a function of the confederate who played the role of Mumfry, the individual who served as the interviewer, the school, or gender.

Manipulation check

The manipulation check demonstrated that there were no discernable age differences in the children's memory for the extra activity. All 30 of the children involved in the manipulation check reported that Mumfry's trick had failed because his rabbit was too sick to leave its cage. Thus, because all of these children were able to access and report the explanation for Mumfry's failed trick that was generated by the extra activity immediately following its presentation, it is expected that all of the children in the conflicting representation condition also had access to this explanation when exposed to the rumor, thereby allowing the rumor to produce a second and conflicting explanation for the cause of Mumfry's failed trick.

Reporting the target activity

Total recall

The proportions and counts of children ($N = 132$) who "recalled" the target activity (i.e., that the rabbit was loose in school) during the interview are displayed in Table 1 by age, experimental group, and type of questioning needed to elicit the report of the target activity: open-ended, specific, and total (open-ended + specific). Consistent with Principe and colleagues' (2006) results, nearly all of the children in the nonconflicting representation condition reported the target activity. In the conflicting representation condition, however, reports of the target activity were depressed relative to the nonconflicting representation condition only among the older children. To examine this pattern statistically, a series of logistic regressions were conducted to predict the children's total recall of the target activity. In these analyses, experimental group and age group were placed as predictors. With the control group and the younger children coded as the baselines, results indicated that the children in the nonconflicting representation (93%) and conflicting representation (72%) conditions were more likely to report the target activity than were those in the control condition (12%), $\chi^2s(1, N = 132) \geq 17.78, p < .001, \text{Ods} \geq .45$. Furthermore, with the nonconflicting representation group coded as the baseline, there was a significant interaction with the conflicting representation group and age, $\chi^2(1, N = 132) = 5.43$,

Table 1

Proportions (and counts) of children who reported the target activity as a function of age, experimental group, and level of recall

	<i>n</i>	Open-ended	Specific	Total
3- and 4-year-olds				
Nonconflicting representation	24	.70 (17)	.21 (5)	.92 (22)
Conflicting representation	24	.79 (19)	.17 (4)	.96 (23)
Control	20	0 (0)	.10 (2)	.10 (2)
5- and 6-year-olds				
Nonconflicting representation	21	.76 (16)	.19 (4)	.95 (20)
Conflicting representation	22	.27 (6)	.18 (4)	.45 (10)
Control	21	0 (0)	.14 (3)	.14 (3)

Note. Counts are in parentheses.

$p < .05$, $\phi = .24$. To explore this interaction, separate follow-up analyses were carried out within each age group. The nonconflicting representation and conflicting representation conditions did not differ in the younger age group. However, among the older children, those in the nonconflicting representation condition were more likely than those in the conflicting representation condition to report the target activity, $\chi^2(1, N = 64) = 8.19$, $p < .05$, $\phi = .45$.

Open-ended recall

Because open-ended recall often is regarded as more accurate than probed recall (see, e.g., Fivush, 2002), it was of interest to examine the children's open-ended reports of the target activity. As can be inferred from the data presented in the second column of Table 1, the younger children (53%) were more likely than the older children (34%) to report the target activity during open-ended questioning, $\chi^2(1, N = 91) = 11.13$, $p < .001$, $\phi = .32$. This effect, however, was qualified by an Age \times Experimental Group interaction, $\chi^2(1, N = 91) = 7.10$, $p < .01$, $\phi = .28$. Replicating the results with total recall, among the older children but not the younger children, those in the nonconflicting representation group were more likely than those in the conflicting representation group to report the target activity in response to open-ended probes, $\chi^2(1, N = 43) = 9.32$, $p < .01$, $\phi = .47$. Note that the control group was excluded from this analysis because, as expected, none of these children reported the target activity at the open-ended level of questioning.

Seeing the target activity

The proportions and counts of children who reported actually seeing (as opposed to merely hearing about) the target activity when asked the source question are shown in Table 2. As expected, a substantial number of children who overheard the rumor recalled actually witnessing a loose rabbit in their school. To examine age and group differences, a series of logistic regressions were carried out to predict the likelihood of making a report of seeing the target activity. The children in the control condition were removed from this analysis because, as expected, none of them claimed to have seen the target activity. This analysis revealed a significant Age \times Experimental Group interaction, $\chi^2(1,$

Table 2

Proportions of children who reported actually seeing the target activity as a function of age and experimental group

	<i>n</i>	Proportion
3- and 4-year-olds		
Nonconflicting representation	10	.42
Conflicting representation	14	.58
Control	0	0
5- and 6-year-olds		
Nonconflicting representation	7	.33
Conflicting representation	2	.09
Control	0	0

$N = 91$) = 4.71, $p < .05$, $\emptyset = .20$. Follow-up analyses indicated no significant difference in performance between the nonconflicting representation and conflicting representation groups among the younger children. This difference, however, approached significance among the older children, $\chi^2(1, N = 43) = 3.39$, $p = .07$, $\emptyset = .28$.

Describing the target activity

The proposition coding scheme described above was used to characterize the children's narrative accounts of the target activity. Narratives were coded only for the subset of children who reported the target activity. Table 3 shows the average number of Rumor, Conflicting Event, Other, and Total (Rumor + Conflicting Event + Other) propositions by age and experimental group, accompanied by the n s on which each mean is based. As can be seen in the last column, the children in both rumor conditions provided a considerable amount of narrative detail in their descriptions of the target activity. To illustrate, consider the following excerpts: "I was trying to get it under the table because I saw white fur, and then I tried to grab it really quick but it was munching on my hand and it got away"; "The rabbit was white and I was trying to get it, and then I caught it and then I ran as fast as I can and then it just slipped out in my hands"; and "I saw it on my playground. I found it because it was hopping. He was running around from me, but I didn't catch him. He hopped around in the woods, and he came out of the woods."

To evaluate statistical age and experimental group differences in the total amount of detail, a 2 (Age: younger vs. older) \times 2 (Rumor Condition: nonconflicting representation vs. conflicting representation) analysis of variance (ANOVA) was carried out on the total number of propositions for the subset of children who reported the target activity. The control children were dropped from this analysis because of the small numbers of children in this condition who reported the target activity. There was an Age \times Rumor Condition interaction, $F(1, 74) = 3.95$, $p < .05$, $\emptyset = .05$. Follow-up tests revealed that among the younger children, those in the conflicting representation group provided a greater number of propositions than did those in the nonconflicting representation group, $F(1, 44) = 8.38$, $p < .01$, $\emptyset = .16$. The older children in the nonconflicting representation and conflicting representation conditions, however, did not differ significantly from one another in terms of the number of propositions reported. Furthermore, the subset of children in the nonconflicting representation and conflicting representation conditions who recalled actually

Table 3

Mean numbers of propositions (and standard deviations) reported as a function of age and experimental group

	n	Rumor	Conflicting Event	Other	Total
3- and 4-year-olds					
Nonconflicting representation	22	4.04 (2.10)	0	1.73 (3.24)	5.77 (4.21)
Conflicting representation	23	5.17 (3.26)	2.78 (2.45)	2.22 (2.81)	10.17 (5.82)
Control	2	0.50 (0.71)	0	1.50 (2.12)	2.00 (1.41)
5- and 6-year-olds					
Nonconflicting representation	20	8.65 (4.32)	0	1.25 (2.88)	9.90 (5.58)
Conflicting representation	10	2.40 (2.84)	6.10 (5.47)	0.70 (1.34)	9.20 (5.27)
Control	3	1.00 (1.00)	0	1.00 (0.00)	2.00 (1.00)

Note. Standard deviations are in parentheses.

seeing the target activity with their own eyes ($n = 33$) provided a greater number of propositions ($M = 11.03$, $SD = 5.97$) than did those who reported merely hearing about it from someone else ($n = 42$, $M = 6.83$, $SD = 4.31$), $F(1, 74) = 13.60$, $p < .0001$, $\phi = .16$.

To explore the structure of the children's narrative accounts of the target activity in more depth, separate analyses were conducted on the mean numbers of propositions coded as Rumor, Conflicting Event, and Other. For Rumor propositions, there was a main effect of group, $F(1, 74) = 10.35$, $p < .01$, $\phi = .13$, such that the children in the non-conflicting representation group ($M = 6.24$) reported more Rumor propositions than did those in the conflicting representation group ($M = 4.33$). However, this main effect was qualified by a significant interaction, $F(1, 74) = 21.48$, $p < .0001$, $\phi = .23$. Follow-up analyses indicated that among the older children but not the younger children, those in the nonconflicting representation group provided more Rumor propositions than did those in the conflicting representation group, $F(1, 29) = 17.08$, $p < .0001$, $\phi = .39$.

Further inspection of Table 3 reveals that the children in the conflicting representation group included a good deal of Conflicting Event propositions in their accounts. The older children, however, included more details about the conflicting event in their reports than did the younger children, $F(1, 29) = 5.93$, $p < .05$, $\phi = .16$. Also of interest was whether more of the older children than the younger children blended the two representations of Mumfry's failed trick into their accounts. Indeed, many of the older children seemed to oscillate back and forth between the two representations. To illustrate, one child claimed, "It hopped out the cage and the girl opened the door, and it hopped out and the bunny just closed the door all by itself"; another said, "The bunny was hopping around in the cage because he was sick. . . . It couldn't get out because there were really small holes. . . . The bunny came out and got lost." To examine this issue, the numbers of children who reported at least one Conflicting Event proposition were compared. Although a higher percentage of older children (90%) than younger children (56%) who reported the target activity included at least one Conflicting Event proposition in their accounts, indicating that the older children were more likely than the younger children to blend both representations, this difference only neared significance, ($p = .06$, Fisher's exact test). The analysis of Other propositions indicated no age or experimental group differences.

Conflicting representation understanding

The next series of analyses explored the relation between children's performance on the conflicting representation tasks and their vulnerability to be misled by the rumor. As described above, the children's scores on the two conflicting representation tasks (i.e., the appearance–reality and false belief tasks) were combined into one index that ranged from 0 to 4. As expected, the older children had higher task scores ($M = 2.61$, $SD = 1.23$) than did the younger children ($M = 1.21$, $SD = 1.25$), $t(130) = -6.50$, $p < .001$. The children were split into two groups on the basis of whether or not they reported the target activity in response to either an open-ended or specific probe. The subset of children who reported the target activity ($n = 33$, $M = 1.39$, $SD = 1.35$) had lower conflicting representation scores than did those who did not report the target activity ($n = 13$, $M = 3.39$, $SD = 0.51$). An analysis of covariance (ANCOVA) with age in months as the covariate documented that conflicting representation task performance was associated with resistance to the rumor over and above any effect of age, $F(1, 45) = 4.94$, $p < .05$, $\phi = .12$. Furthermore, the subset of children who reported the target activity at the

open-ended level of questioning ($n = 24$, $M = 1.08$, $SD = 1.39$) had lower conflicting representation task scores than did those who did not report the target activity at the open-ended level ($n = 22$, $M = 2.91$, $SD = 1.19$), $F(1,45) = 4.60$, $p < .05$, $\phi = .10$. Although those who reported actually witnessing the target activity with their own eyes ($n = 16$, $M = 0.94$, $SD = 1.18$) had lower conflicting representation task scores than did those who said they did not see the target activity ($n = 30$, $M = 2.50$, $SD = 1.33$), this difference was not significant above the effects of age ($p = .12$).

Also of interest was the extent to which the children's performance on the conflicting representation tasks might be helpful in explaining some of the variation in their narrative descriptions of the nonoccurring target activity. The children's conflicting representation scores were negatively correlated (zero-order correlations) with the Total number of propositions ($r = -.52$, $p < .0001$) and the number of Rumor propositions ($r = -.67$, $p < .0001$), suggesting that lower levels of conflicting representation understanding were associated with higher levels of elaboration related to the loose rabbit rumor. The children's conflicting representation scores were not related to the number of Conflicting Event propositions. Next, because age was negatively correlated with the Total number of propositions ($r = -.52$, $p < .0001$) and the number of Rumor propositions ($r = -.68$, $p < .001$), partial correlations controlling for age in months were carried out. After controlling for age, the children's performance on the conflicting representation tasks was associated with the number of Rumor propositions ($r = -.37$, $p < .01$). However, the relationship was not significant for the Total number of propositions.

Discussion

The results of the current study demonstrate that preschoolers' susceptibility to being misled by an overheard false rumor depends on a number of factors, including the nature of the rumored information and age-related changes in children's understanding of the representational process. Replicating Principe and colleagues' (2006) investigation, nearly all of the children who overheard a rumor that suggested a reasonable explanation for a past experience reported remembering events that never occurred but nonetheless were consistent with the rumor. Moreover, there were no effects of age, suggesting that increased resistance to gap-filling rumors might not develop during the preschool years. The current findings, however, qualify Principe and colleagues' study by revealing that younger preschoolers may be more vulnerable than older preschoolers to conflicting rumors. Whereas the 5- and 6-year-olds were more resistant to the rumor when it created a contradictory representation than when it filled a gap, the 3- and 4-year-olds were equally likely to be misled by both types of rumors. Furthermore, the children's performance on tasks indexing representational understanding supports the notion that children's ability to reason about conflicting representations is linked with resistance to contradictory rumors.

One interpretation of the increased resistance to the contradictory rumor with age is that children's developing ability to understand conflicting mental representations enabled their ability to consider both their original representation and the rumored representation. Supporting this interpretation is the finding that the younger children in the conflicting representation condition based the majority of their accounts on only one representation of the failed trick—the nonoccurring rumor. In contrast, the older children in this

condition embellished their reports mostly with details consistent with the explanation that they actually witnessed, reporting more than two times as many Conflicting Event details as Rumor details. Furthermore, the older children were more likely than the younger children to import at least one Conflicting Event proposition into their accounts, suggesting that the older children had more ready access to both representations and consequently drew from both in constructing their accounts.

Interestingly, the reduced suggestibility with age in the conflicting representation condition did not extend to the nonconflicting representation condition. More than 90% of the children at both age levels mistakenly reported experiencing the rumor, with more than 70% making this error at the open-ended level of questioning. This pattern of results might seem counterintuitive given that dozens of studies in the suggestibility literature have demonstrated that younger children generally are more prone than older children to make false reports following exposure to misleading information (for reviews, see Bruck & Ceci, 1999; Holliday, Reyna, & Hayes, 2002). However, the procedures in the nonconflicting representation condition were developed to promote the ready acceptance of the rumored explanation by creating uncertainty regarding the failed trick and then relieving this uncertainty by way of a rumor that provided a reasonable explanation. In the conflicting representation condition, in contrast, there was no uncertainty about why the trick had failed because every child witnessed it and presumably had a plausible explanation available when exposed to the rumor. Indeed, this line of reasoning is consistent with the literature on rumor transmission in adults demonstrating that rumors tend to flourish in situations where there is some degree of ambiguity or uncertainty about what happened but flounder in situations where the true facts are known (for a review, see Rosnow, 1991).

Supporting the explanation that the ability to reason about conflicting representations brought about the increased resistance to the contradictory rumor with age was the finding that those children who reported the target activity demonstrated poorer performance on the conflicting representation tasks than did those who resisted making this claim. Furthermore, poorer performance on the conflicting representation tasks was associated with increased levels of descriptive detail consistent with the overheard rumor. This relation remained significant after controlling for age, indicating that the children who had difficulty in reasoning about conflicting representations were more prone than others to fabricate elaborative details consistent with a conflicting rumor rather than to base their accounts on an earlier actual experience. These findings not only replicate but also extend those of Welch-Ross and colleagues (1997) and Templeton and Wilcox (2000) by demonstrating that the relation between conflicting representation understanding and susceptibility to suggestions is not limited to the misinformation paradigm; it also can occur in children's event reports following exposure to false rumors.

Given previous demonstrations of a link between memory performance and resistance to suggestions (e.g., Howe, 1991; Marche, 1999; Marche & Howe, 1995), it is important to point out that although the conflicting representation tasks used in the current study have a memory component, they measure a metacognitive ability that is not simply an epiphenomenon of memory skill (Flavell, 1986; Perner, 1991). To illustrate, on a classic appearance–reality task in which a white object is placed behind a red filter, many children can correctly recall the original color of the object even after wrongly reporting that the object really and truly is red (Flavell et al., 1986; Flavell, Flavell, & Green, 1987). Similarly, children's performance on control tasks in investigations of representational change reveal that children who fail these tasks often can remember the original contents of a container

after the contexts have been switched when the container does not suggest its contents (e.g., Gopnik & Astington, 1988; Gopnik & Slaughter, 1991).

An important issue to consider is the processes by which age-related changes in children's representational understanding mediated their proneness to contradictory rumors. Given young children's belief that the mind directly copies the world, they simply may have overwritten their original representation in line with the rumor. Similar to Loftus's (1975) memory impairment hypothesis, this overwriting process would serve to maintain a single version of the event in question. In contrast, older children's interpretive theory of mind may have enabled them to maintain distinct representations of their own experience and the conflicting rumor. Consistent with this interpretation is the negative correlation between performance on the conflicting representation tasks and the number of Rumor propositions that children included in their accounts. This finding could be interpreted as demonstrating that those children who showed better understanding of conflicting representations were less likely to overwrite components of the original sick rabbit representation with the loose rabbit representation. However, the frequent mixing of experienced and rumored details in the reports of the children in the conflicting representation condition provides evidence that the rumor did not always entirely overwrite the original representation of what happened to Mumfry's rabbit. Indeed, many of those in the conflicting representation group used details consistent with their original representation as fodder for their narrative descriptions of the rumored target activity.

A second possibility is that those younger children who held a copy theory of mind simply might not have represented both extra activity and the contradictory rumor as relating to the same event. These children may have remembered the sick rabbit explanation but relied on the loose rabbit rumor when questioned about the magic show. Consistent with this explanation is the finding that the older children were more likely than the younger children to blend details from both representations when they wrongly reported that Mumfry's rabbit had gotten loose. That is, although their reports were incorrect in the sense that they reported as true information that was merely overheard, this new information did not overwrite their original representation but rather commonly appeared in conjunction with details from the original representation in their accounts. Moreover, this blending of both experienced and rumored information is consistent with studies in the suggestibility literature demonstrating that children sometimes report both original and suggested details when tested for memory of the original event (Ackil & Zaragoza, 1995; Marche & Howe, 1995). Furthermore, this interpretation is consistent with the typical finding on standard appearance–reality and representational change tasks that even those children who err are able to remember the original attributes of the objects in question. Indeed, this interpretation does not imply that overwriting never occurs but rather points out the possibility that some portion of children's reports that appear to be due to overwriting may simply be due to the result of younger children's inability to entertain the idea that two representations could relate to the same event.

The results also demonstrate the importance of considering how children's understanding of conflicting representations affects other factors known to influence suggestibility. For instance, children's source monitoring may be prohibited to the extent that they cannot deal with multiple conflicting representations of the same event. Applied to this study, the children who could not hold and compare conflicting representations simultaneously would not have been expected to be able to engage in the process of distinguishing which of the two representations reflected reality. However, consistent with the notion that

source errors brought about at least some of the reports of the target activity is the finding that those children who reported actually seeing the loose rabbit generated more detailed narratives than did those who recalled only hearing about the rabbit (see also [Principe et al., 2006](#)). Although children tend to overattribute information in memory to their own sensory experiences (e.g., seeing) in a range of settings (e.g., [O'Neill & Gopnik, 1991](#); [Ratner, Foley, & Gimpert, 2002](#); [Robinson & Whitcombe, 2003](#)), these findings suggest that this bias may be driven in part by the elaborateness of the representation in memory.

Implications and conclusions

In [Rosnow's \(1991\)](#) description of the conditions that underlie the proliferation of false rumors, he emphasized that rumor depends on some degree of uncertainty about an event because of its capacity to help make sense of ambiguous events. In his view, "Where there is no free-floating doubt or uncertainty, there is no rumor" (p. 485). Although this description may characterize most situations in which rumors flourish, the results of the current study demonstrate that uncertainty is not yet a key factor in the acceptance of rumors among 3- and 4-year-olds. However, among older preschoolers, this description seems to effectively characterize the contrast between rumors that easily make their way into memory and those that are likely to be rejected. What factors mediate this age trend? The current findings suggest that the development of a conceptual understanding of the mind, particularly the ability to reason about conflicting mental representations, may be important for resisting false information transmitted via rumor that suggests a contradictory interpretation of an event about which children already have a feasible explanation.

Given younger children's proneness to be misled by rumor even under conflicting conditions, a fruitful direction for future work is to explore in a more fine-grained manner the on-line processes that make children with poorer representational skills more prone than others to mistakenly report conflicting rumors to the exclusion of their actual experiences. For instance, younger children's tendency to give more weight to contradictory information that is heard from a well-informed adult as opposed to an ill-informed adult ([Robinson, Champion, & Mitchell, 1999](#)) leads to the expectation that younger preschoolers might not always adopt contradictory rumors. They might do so only in situations where they believe the transmitter to be well informed. Given the confident manner in which the confederate transmitted the rumor, the children in the current study likely assumed that this adult was well informed. Also of interest is whether older children would show increased resistance under conditions of relative certainty to conflicting information from sources other than an unfamiliar adult. Perhaps discriminating among a trusted source such as a parent, a source imbued with much perceptual information such as television, and an internal source such as imagination from an actual conflicting experience would result in a task more difficult for older preschoolers than that in the current study.

In summary, these findings provide original evidence that the degree to which postevent suggestions conflict with the original experience might be an important factor in producing suggestibility effects, particularly in children over the age of 5 years or so. Indeed, this may be an important but generally overlooked contrast for the suggestibility literature because in some studies the suggested information conflicts with a past detail ([Connolly & Price,](#)

2006; Ellis et al., 2003; Gobbo et al., 2002), whereas in other studies an entirely false and nonconflicting event is suggested (Bruck et al., 2002; Ceci, Huffman, Smith, & Loftus, 1994; Leichtman & Ceci, 1995). Furthermore, although the task used in this work admittedly was very different from the sorts of events about which children typically are called on to testify, the findings underscore the potential of false rumors to influence children's reports of their experiences, particularly when rumors suggest an explanation that had been lacking. Because the offenses that usually bring children to court, such as physical and sexual abuse, tend to lack witnesses other than the young alleged victim or victims, there is often a high degree of uncertainty in the community about exactly what happened. Given that uncertainty is known to fuel rumor (Rosnow, 1991), the results of the current study point out several conditions under which legal professionals would be prudent to consider engaging in some form of rumor control or to interview young witnesses before false rumors develop.

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