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Before Misinformation is Encountered: Source Monitoring Decreases Child Witness Suggestibility

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This research examines whether young children are less suggestible if they monitor the source of acquired information. Events from 2 sources—live and videotaped science demonstrations—were observed by 3- to 4-year-olds (n = 39) and 5- to 6-year-olds (n = 36) in Experiment 1. One half of the children in each age group were administered a source-monitoring (SM) test that required reporting the source of science events. Control group children received recognition questions without source cues. Afterward, all children freely recalled the events and were then asked misleading questions about the source of events. Control 3- to 4-year-olds were less accurate than all other groups in free recall and in response to misleading-detail questions, whereas SM 3- to 4-year-olds' performance was equivalent to that of both groups of 5- to 6-year-olds. Experiment 2 examined one possible reason for the apparent lack of effect of the SM manipulation among the 5- to 6-year-olds: namely, that free recall served as an SM opportunity for them. To test this hypothesis, 5- to 6-year-olds' (n = 38) responses to misleading questions were examined when the free-recall task was omitted from the procedure. The SM group was more accurate than the control group, suggest-

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ing that free recall served as an SM task for 5- to 6-year-olds in Experiment 1. These results implicate SM as one factor underlying young children's suggestibility.

Children, as well as adults, are susceptible to misleading information when questioned about eyewitnessed events (Loftus & Hoffman, 1989; Loftus, Miller, & Burns, 1978; Poole & Lindsay, 1995; Rudy & Goodman, 1991; Saywitz, Goodman, Nicholas, & Moan, 1991). However, studies indicate that young children (3- to 6-year-olds) have particular difficulty rejecting misinformation (Cassel & Bjorklund, 1995; Cassel, Roebers, & Bjorklund, 1996; Ceci, Ross, & Toglia, 1987; Leichtman & Ceci, 1995; Ornstein, Gordon, & Larus, 1992). A factor affecting children's eyewitness reports is suggestibility, which refers to "the degree to which children's encoding, storage, retrieval, and reporting of events can be influenced by a range of social and psychological factors" (Ceci & Bruck, 1993, p. 404). This definition of suggestibility encompasses the idea that inaccurate reports can be due to both social factors (e.g., assenting to false information because of demand characteristics) and cognitive factors (e.g., true memory impairment).

One cognitive explanation for suggestibility is that young children are poor at monitoring the sources of their memories. Source monitoring (SM), according to Johnson, Hashtroudi, and Lindsay (1993), refers to an attribution process through which one makes decisions about how memories, knowledge, and beliefs were acquired. SM attributions are made on "the basis of qualitative characteristics of activated memories, such as amount or type of perceptual detail" (Johnson et al., 1993, p. 4). For example, when trying to distinguish whether one actually saw an object in an event or whether one only heard about an object being in the event, one may decide that the object was in fact seen in the event because of perceptual information, such as remembering the color or texture, associated with memories of the object. Imagined items or events seem to lack such perceptual detail.

Although some SM judgments are made quickly and without awareness of decision-making processes, Johnson et al. (1993) asserted that other judgments can involve more deliberate strategic processes. For example, one might "correctly attribute a memory of a conversation to imagination on the basis of knowledge that one is not acquainted with that person" (p. 4). Here, one attributes source based on information associated or not associated with activated memories. In addition to the quality of memory characteristics, SM judgments are also influenced by metamemory (Johnson et al., 1993). For example, one's knowledge that experienced events are accompanied by clear memories with rich perceptual detail will prevent one from accepting imagined memories (which are not as clear and perceptually rich) as something that was actually experienced. Johnson et al. suggested that developmental differences in these various factors associated with the source attribution process may play a role in developmental differences in SM. The purpose of the research presented in this article is to examine whether SM reduces young children's suggestibility, defined as their acceptance of misleading information.

Young children are more likely than adults to confuse two similar external sources (Lindsay, Johnson, & Kwon, 1991). For example, 4-year-olds made more source misattributions concerning what two similar females said than did older children and adults (Lindsay et al., 1991). Four-year-olds were just as good at SM as older children and adults, however, when the actors involved were dissimilar (i.e., a male and a female). Other factors that have been found to influence SM include the similarity of items presented from two sources and the timing between presentation of information from two sources. Source confusions are more likely to occur the more similar items from two sources are in semantic content (Johnson, Raye, Foley, & Foley, 1981; Lindsay et al., 1991; Markham, 1991) and the closer in time information from two sources is presented (Roberts & Blades, 1997).

The assertion that young children's suggestibility is, in part, due to their tendency to make source misattributions has been supported in several studies (Ackil & Zaragoza, 1995; Lindsay, Gonzales, & Eso, 1995; Newcombe & Siegal, 1996; Poole & Lindsay, 1995). Ackil and Zaragoza (1995), for example, found that 6-year-olds, as compared to 8- and 10-year-olds and adults, were more likely to claim seeing suggested information in witnessed events.

Using another important source distinction, that between events witnessed in real life versus on video, Roberts and Blades (1996) examined children's tendency to confuse these two external sources. Four-year-olds, 10-year-olds, and adults watched an event performed live by an experimenter. In addition, the children and adults watched a similar event performed by the same experimenter, but on videotape. They then freely recalled the event (e.g., "tell me everything that happened in real life") and answered questions that misled them about the source (i.e., live vs. video) of events. For example, children were asked, "Did I (experimenter) eat a Rice Krispie cake in real life?" when, in fact, the experimenter ate a sandwich in real life and a Rice Krispie cake on video. Although Roberts and Blades (1996) found no age differences in the accuracy of free-recall reports, they did find age differences in responses to misleading questions. The 4-year-olds produced more incorrect responses to these questions than the 10-year-olds and adults. There was no difference between the number of incorrect responses produced by the 10-year-olds and adults. The younger children, thus, misattributed what they saw on video to their memories of the live event.

Distinguishing between live and video events is a much more difficult task than distinguishing between seen events and heard about (or suggested) events. The SM framework would predict that live and video event discriminations should be more difficult to make because both events share verbal and visual features. "Seen" versus "heard" distinctions should be easier to make, given that the seen event has more features (verbal plus visual) that would distinguish it from the heard-about event. It is important to investigate children's tendency to confuse live and video events, given that many children are exposed to television programs on a daily basis and young children are prone to confuse television events with memories of real life events.

When asked misleading questions about the source of live or video events, children have difficulty rejecting incorrect source information (Roberts & Blades, 1996). Because children do not detect the misinformation in the types of questions asked by Roberts and Blades, perhaps they would benefit from more explicit orientation to the source of events. If they are oriented to process the sources of events before exposure to misleading source information, then perhaps they will be more resistant to source misattributions.

This idea is consistent with studies investigating strategy development that indicate preschoolers do not spontaneously use strategies, such as organization and rehearsal (Bjorklund, 2000; Bjorklund & Douglas, 1997; Schneider & Pressley, 1997). With training, however, young children do show enhanced memory accuracy (DeMarie-Dreblow & Miller, 1988; Lange, Guttentag, & Nida, 1990; Lange & Pierce, 1992), with older children (e.g., 5- to 6-year-olds) evidencing greater memory benefits as a result of strategy training. SM is a strategy that can be used to enhance memory accuracy. Perhaps if children were given practice in monitoring the source of live and video events prior to being misled about these events, this practice might make them more likely to reject misleading source information.

This hypothesis was tested in two experiments. Experiment 1 examined whether an SM task, performed by children prior to hearing misleading questions, would prevent live and video source misattributions. Two age groups of children were compared to determine whether there were developmental differences in the tendency for the SM task to reduce children's suggestibility (decrease their acceptance of misinformation).

Three- to 4-year-olds and 5- to 6-year-olds viewed one female performing a set of similar science demonstrations from two different sources: live and video. Afterward, an SM task was administered to one half of the children, defined as the SM group. The other one half of the children, the control group, received only yes–no recognition questions that did not explicitly cue this group to the source. We used recognition questions to provide the control group with the same rehearsal of details associated with the events as the SM group, but without source cues. Following initial SM or recognition (control) questioning, all children were administered an interview consisting of free recall and a set of questions that misled children about the source of details in the experiments.

We predicted that the free-recall reports of the SM group should contain fewer source confusions concerning live–video events than the free-recall reports of the control group. In addition, if SM makes children less susceptible to misleading information, then the SM group should produce fewer incorrect and more correct responses to misleading questions than the control group. Also, based on findings from the eyewitness literature (Ceci et al., 1987; Leichtman & Ceci, 1995; Memon & Vartoukian, 1996; Poole & White, 1991, 1993) and strategy literature (Bjorklund, 2000), we predicted developmental differences in the effect of the SM task, such that 5- to 6-year-olds should produce more correct and fewer incorrect

responses to misleading questions than 3- to 4-year-olds. Experiment 2 was conducted to clarify results of the 5- to 6-year-olds in Experiment 1. Five- and 6-year-old children were presented with the procedure used in Experiment 1 but without the free-recall task.

EXPERIMENT 1

Method

Participants

A total of 75 children participated in the study. There were 39 children (17 girls and 22 boys) who were 3 or 4 years of age and 36 children (16 girls and 20 boys) who were 5 or 6 years of age. Children were recruited from four child-care centers, were of middle- to high-socioeconomic status, and were primarily White. Parents gave informed consent for each child's participation.

Children in each age group were randomly assigned to either the SM or the control condition described later. The mean age of 3- to 4-year-old children in the SM (n = 19) and control (n = 20) groups was 4.35 years (range = 3 years, 4 months to 4 years, 11 months) and 4.39 years (3 years, 9 months to 4 years, 9 months), respectively. The mean age of 5- to 6-year-old children in the SM (n = 17) and control (n = 19) groups was 5.73 years (5 years, 0 months to 6 years, 4 months) and 5.50 years (5 years, 0 months to 6 years, 2 months), respectively.

Target Events and Design

The target events consisted of science demonstrations (Wilkes, 1990) performed by "Mrs. Science" (similar to Poole & Lindsay, 1995). One event was a live demonstration of three experiments, such as charging balloons with static electricity and testing a magnet on different objects. A second event consisted of another set of three similar science demonstrations performed again by the same Mrs. Science, but on a video, which the children viewed immediately after the live demonstration. To control contextual cues, Mrs. Science performed both the live and video experiments while wearing a white lab coat and standing in front of a red and white checkerboard background. The medium of presentation of each set of science experiments was counterbalanced so that the experiments seen live by one half of the children were seen on video by the other one half of the children. Additionally, the presentation order of live and video events was counterbalanced, resulting in four stimulus presentation conditions.

Children were randomly assigned to one of two conditions (see Table 1). These conditions were defined as a function of the type of questions presented to the children during the first phase of the interview. One group, the SM group, was asked a

TABLE 1
Summary of Experimental Manipulations in Experiment 1

	Interview Session[a]			
Condition	*Target Events*	*Phase 1*[b]	*Phase 2*	*Phase 3*
Source monitoring	live–video	source questions	free recall	misleading questions
Control	live–video	recognition questions	free recall	misleading questions

[a]Interview session administered immediately after target events; [b]Phase 1 constitutes the only difference between treatment of source-monitoring and control groups.

set of 20 questions that required them to distinguish where, specifically (live, on video, or not at all), they saw Mrs. Science performing the named experiment. The second group, the control group, was asked a set of 20 yes–no recognition questions. Two randomized orders of the SM and recognition questions were constructed, and question order was counterbalanced. One half of the children in each condition received Order Version 1 and one half received Order Version 2. Children in the two conditions received the same free-recall and misleading-question protocols, which are described later.

Procedure

Target event presentation. Mrs. Science accompanied 3 to 4 children to a quiet room in the school and began her live or videotaped demonstrations (depending on the counterbalanced schedule for that group). Immediately following this activity, the children then viewed the video (or live) demonstration of Mrs. Science performing other similar science experiments. The total time required for presentation of the events was about 15 min. A second experimenter, who was not present during the science experiments, then escorted each child to a different room and engaged the child in conversation on topics unrelated to the science demonstration.

Interview session. The interview session was divided into three phases:

• *Phase 1: SM or recognition questions.* The first phase of the interview began after the second experimenter had established conversational rapport with the child (see Table 1 for a summary of experimental manipulations). Each child was questioned individually by the second experimenter and asked either SM questions (SM condition) or recognition questions that did not cue the child to source (control condition) about the previously observed target events. The SM test consisted of 20 questions about target experiments as well as distractor items, experiments that

never occurred. Pilot testing revealed that children had difficulty remembering the different response options (live, video, or not at all). As a result, we showed children three pictures (10 cm × 15 cm) that corresponded to the three response options. One picture was a snapshot of Mrs. Science. Children were instructed to point to this picture if the experimenter named an item that Mrs. Science did "in real life." A second picture was a snapshot of the television on which the video experiments were viewed. Children pointed to this picture if the experimenter named an item that Mrs. Science did "on TV (or video)." The third picture was used to depict distractor items that Mrs. Science did not do at all. This picture was essentially a snapshot of white light, representing the idea that the distractor item was "nothing" Mrs. Science had done. All children were given practice questions to ensure they understood when they should point to each type of picture. Children were asked questions of the following form: "Where did Mrs. Science pour colored water into glass bottles? Did she do this in real life, on TV, or not at all?" SM questions were modeled after those used in other studies with young children (Foley, Aman, & Gutch, 1987; Foley, Santini, & Sopasakis, 1989; Lindsay et al., 1991; Parker, 1995).

The control group received 20 yes–no recognition questions. At the start of questioning for this group, the children were simply reminded that Mrs. Science had performed experiments in real life and on video. They were shown the pictures corresponding to the real life and video events. However, unlike the SM group, this group was not instructed to point to the pictures when answering the recognition questions. Children simply answered the questions with yes or no, or gestured by nodding their head for "yes" or shaking their head for "no." The content of the recognition questions was identical to the SM questions, except that the control group only had to reply whether they saw Mrs. Science performing the named experiment; for example, "Did Mrs. Science pour colored water into glass bottles?" Before beginning questioning, children practiced using the "no" response option. For example, they were told that items not witnessed may be mentioned and that they should be sure to respond "no" to these items. They were then given a practice question requiring a "no" response (e.g., "Did Mrs. Science look under a microscope?"). All control group children responded "no" to this question.

• *Phase 2: Free recall.* After receiving SM or recognition questions (Phase 1), each child was escorted to another room in the school in which a third experimenter, also absent during the target events, administered the free-recall task, the second phase of the interview. First, the children were asked to recall everything that Mrs. Science did from only one source, for example, in "real life." When the child completed recall of events from the live demonstrations, he or she was then asked to recall everything that Mrs. Science did "on TV." We ensured that all children understood what was meant by "real life" versus "on TV" by explicitly telling them that they should "tell about those tricks that Mrs. Science did while they were sitting around the table with her in real life" or to "tell about those tricks they only

watched her do on TV, when they were not sitting around the table with her." (One half of the children were asked to recall the live events first, and one half were asked to recall the video events first). If children provided minimal or no detail about the events, the experimenter prompted the child for information using open-ended questions, such as, "What else did she do in real life?"

The experimenter adhered to a protocol that ensured that each child received nonsuggestive prompts for additional information. The specific prompts depended on the children's reports, but they were all open-ended questions designed to elicit more detail from the children about an established topic. For example, if a child recalled that, "Mrs. Science had a balloon," the experimenter followed up this reply with an open-ended prompt, such as "What did Mrs. Science do with the balloon?" Whenever a child completed discussion of a particular topic, the experimenter prompted the child with statements, such as "Tell me more about the tricks she did on TV."

• *Phase 3: Misleading questions.* The free recall was followed by a set of 10 misleading questions concerning the target events. Prior to asking the misleading questions, the third experimenter warned children in both groups that some of the information in the questions might be incorrect, and they were encouraged to inform the experimenter of any incorrect information they detected. In addition, the experimenter gave all the children the option of saying "don't know" in response to the misleading questions.

There were two types of misleading questions. One question type, defined as *misleading-detail questions,* misled children about details that occurred in individual live and video experiments. These six questions assessed whether children would accept misleading source information suggested to them by the interviewer. The questions were misleading in that they incorporated video (or live) details into a question that actually referred to a live (or video) event. For example, one question was, "Mrs. Science tested a magnet to see if it would work through glass. What happened when she dropped a spoon into the glass?" The first part of the question is nonmisleading and refers to a live event, the magnet–glass experiment. However, the question becomes misleading when it suggests a detail, the "spoon," that actually occurred in the video event (see Figure 1).

A second type of misleading question, termed a *misleading-distractor question,* was included in this question set. These four questions probed children about distractor items in the SM and recognition tests, but referred to events that were not performed in either the live or video experiments. For example, one question asked, "How big was the fire Mrs. Science used to heat up the water?" when, in fact, no fire or heating of water was ever performed for the children. These questions were included to determine if children were likely to incorrectly accept information that had been previously suggested by the interviewer in the SM or recognition testing (Phase 1) but that the children had not actually witnessed. Re-

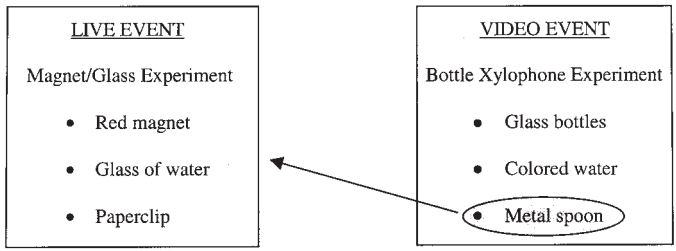

FIGURE 1 Structure of misleading-detail questions.

sponses that indicated rejection of the misleading information were scored as correct, whereas responses that indicated acceptance of misinformation were scored as incorrect. Children were also allowed to respond "don't know." Two randomized versions of the total set of 10 misleading questions were constructed and half of the children in each condition received each version. All interview sessions were audiotaped.

Results

Phase 1: SM Test

Baseline accuracy of SM and control groups' target-event memories. We calculated accuracy rates for each group to their respective initial questions (SM or recognition). Old–new recognition performance on the initial SM and recognition tests was used as the accuracy index. This measure afforded comparison of the groups' initial encoding of the target events before their memories were influenced by the misleading-question interview. This assessment of baseline accuracy was used because children provided different amounts of information in the free-recall task, preventing use of free recall as a baseline accuracy measure.

For each group, the recognition score was found by adding the number of old responses (hits, defined as live or video [SM group] or yes [control group] responses to target items) plus the number of correct rejections of new distractor items. This sum was then divided by the total number of test items. An Age × Group (3- to 4-year-olds and 5- to 6-year-olds × SM and control) analysis of variance (ANOVA) was performed on these recognition scores. No significant effects of age or group or interactions between age and group were evidenced. Hence, after receiving the initial SM and recognition questions regarding details that occurred in the live and video events along with distractor items, the SM (3- to 4-year-olds: $M = 91.05$, $SD = 11.00$; 5- to 6-year-olds: $M = 95.88$, $SD = 10.79$) and

control group (3- to 4-year-olds: $M = 89.75$, $SD = 13.13$; 5- to 6-year-olds: $M = 91.84$, $SD = 11.21$) children were equally accurate.

Discrimination scores. To examine whether SM group children were correctly discriminating the live and video events, discrimination scores measuring this ability were computed. By computing this measure, we could better interpret this group's free-recall and misleading-question results.

For the live events, the discrimination score was calculated by dividing the number of live events called "live" by the number of live events called either "live" or "video." For the TV events, the discrimination score was found by dividing the number of video events called "video" by the number of video events called either "video" or "live." An Age × Source (3- to 4-year-olds and 5- to 6-year-olds × live and video) repeated measures ANOVA was performed on these discrimination scores. Results indicated a borderline main effect of source, $F(1, 34) = 3.96$, $p = .06$, such that children's discrimination scores for the live event ($M = 87.92$, $SD = 20.47$) tended to be higher than their discrimination scores for the video event ($M = 76.17$, $SD = 26.78$). No effect of age was evidenced. Despite the effect of source, 3- to 4-year-olds and 5- to 6-year-olds' discrimination of the live and video events was significantly greater than chance (50%), $ps < .05$.

In sum, following SM and recognition questions, all groups were equally accurate in their memories of the target events, as assessed with the old–new recognition measure. In addition, the 3- to 4-year-old and 5- to 6-year-old SM groups' discrimination of the live and video events was quite good, with both groups performing better than expected by chance.

Phase 2: Free Recall

Free recall assessed children's spontaneous reports of the target events. Free-recall response accuracy was computed using a technique modeled after the procedures employed by Poole and White (1991). The children's responses were scored based on the proportion of correct syntactic units (SUs) in each response. Examples of SUs included words describing actions (e.g., made and picked up) and objects (e.g., bottles and magnet). For instance, the response, "Mrs. Science *made music* with *bottles*," would include three correct SUs. As found in other studies (Memon & Vartoukian, 1996; Poole & White, 1991, 1993), this technique provides a good indicator of children's free-recall performance because of the fragmentary nature of preschoolers' responses. Each child's audiotaped responses were coded by a trained rater. Twenty percent of the responses (three from each Age × Group condition) were randomly selected and coded by a second rater. Interrater reliability using Cohen's kappa was .91. Eight of the 3- to 4-year-olds (4

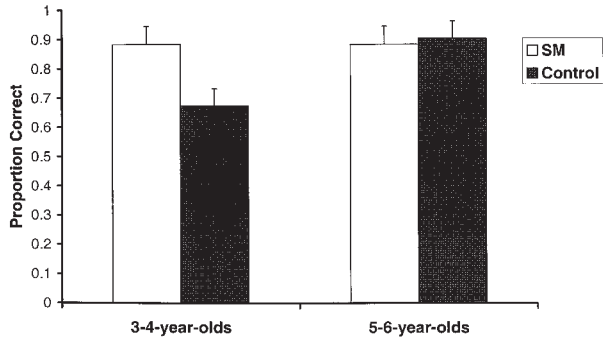

FIGURE 2 Proportion of correct syntactic units in free recall.

from the SM group and 4 from the control group) provided no verbal information in response to our prompts. All of the 5- to 6-year-olds provided responses in the free-recall task. Only those children who responded are included in the following free-recall analyses ($N = 67$).

The number of correct SUs that each child reported in free recall was entered into an Age × Group (2 × 2) ANOVA. A main effect of age was evidenced, $F(1, 63) = 21.24$, $p < .01$, indicating that both groups of 5- to 6-year-olds ($M = 19.86$, $SD = 7.40$) recalled a larger number of correct SUs than 3- to 4-year-olds ($M = 11.66$, $SD = 6.97$).

Because the two age groups reported different amounts of information, we performed an Age × Group (2 × 2) ANOVA on proportion of correct SUs (computed by dividing number of correct SUs by the total number of SUs recalled). A main effect of age, $F(1, 63) = 4.70$, $p < .05$, was revealed, but was qualified by an Age × Group interaction (see Figure 2), $F(1, 63) = 4.65$, $p < .05$. Simple effects analyses, $F(1, 30) = 5.95$, $p < .05$, revealed that 3- to 4-year-olds in the control group ($M = 0.67$, $SD = 0.25$) were less accurate than 3- to 4-year-olds in the SM group. In addition, 3- to 4-year-olds in the control group were less accurate than 5- to 6-year-olds in the control group, $F(1, 33) = 11.73$, $p < .01$. There was no difference in the accuracy of the 5- to 6-year-olds in the SM and control groups.

The 3- to 4-year-olds in the control group may have been less accurate in their free recall than the other groups due to one or a combination of the following factors: (a) source errors concerning the live and TV events (e.g., saying Mrs. Science made a bottle xylophone in real life when, in fact, she did this on video); (b) source errors concerning distractor items only suggested by the interviewer in the SM and recognition tests (e.g., saying Mrs. Science made a fire when, in fact, this was only heard about from the interviewer); or (c) confabulations, incorrect details about events that did not occur at all in the science demonstrations (e.g., "Mrs. Science blew up a building" or "did cartwheels").

Table 2
Mean Percentage and Standard Deviations of Free-Recall Errors Due to Live–Video Source Confusions

		Live–Video Source Errors			
		With Outlier		*Without Outlier*	
Age	*Group*	*M*	*SD*	*M*	*SD*
3- to 4-year-olds	SM	11.93	23.76	7.07	15.04
	Control	22.85	18.11	22.85	18.11
5- to 6-year-olds	SM	8.47	10.84	8.47	10.84
	Control	9.28	12.57	9.28	12.57

Note. SM = source monitoring.

Children's reports rarely contained the last two error types. Only 1% of children's free-recall errors were due to intrusions of suggested distractor items, whereas 3% of their free-recall errors were due to confabulations. Because most of the children's errors were confined to source errors confusing the live and video events, we analyzed group differences for this error type only. The percentage of children's incorrect responses due to live–video source errors was entered into an Age × Group (2 × 2) ANOVA. The percentage was computed by dividing the number of incorrect SUs for this error type by the total number of SUs reported.

We found a main effect of age, $F(1, 63) = 4.30$, $p < .05$, suggesting that 3- to 4-year-olds produced more source errors confusing the live and TV events than 5- to 6-year-old children. However, the means for each age by group cell indicated this effect was largely due to the greater number of live–video source errors produced by the 3- to 4-year-old control group. However, the Age × Group interaction did not reach statistical significance, $F(1, 663) = 1.52$, $p = .22$. This result was likely due to an extreme score (3 standard deviations above the mean) in the 3- to 4-year-old SM group that greatly increased the average variation (see Table 2). Without this outlier in the analysis, the Age × Group interaction reached significance, $F(1, 62) = 4.46$, $p < .05$. Simple effects analyses, $F(1, 29) = 6.78$, $p < .05$, indicated that 3- to 4-year-olds in the control group produced more live–video source errors than the 3- to 4-year-old SM group and the 5- to 6-year-old control group, $F(1, 33) = 6.70$, $p < .05$. There was no difference between the live–video source errors recalled by 5- to 6-year-olds in the SM and control groups.

Phase 3: Misleading Questions

Children's responses to the misleading questions were coded as correct, incorrect, or don't know. Correct responses were defined as responses that pinpointed

the false information embedded in the misleading questions. For example, when responding to the misleading-detail question, "How big were the fish that Mrs. Science picked up with her red magnet?" a correct response would indicate that she did not pick up a fish with a red magnet. Incorrect responses were defined as those responses in which children assented to the misinformation (e.g., saying how big the fish were). Responses were coded as don't know when children responded with such phrases as "don't know" or "can't remember." Each question was worth 1 point, resulting in a total possible score of 6 for the misleading-detail questions and 4 for the misleading-distractor questions.

The percentages of correct, incorrect, and don't know responses to each type of misleading question, misleading-detail and misleading-distractor, were entered into separate Age × Group (2 × 2) ANOVAs. (A multivariate analysis of variance was not performed because the correct, incorrect, and don't know measures were interdependent.) For the misleading-detail questions, the percentages were computed by dividing the number of each response type by the total number of misleading-detail questions. The percentages were computed in the same way for the misleading-distractor questions. Percentages were computed because for some children (SM = 9 and control = 9), we could not code all of their responses to misleading questions due to unintelligibility of their tape-recorded responses or experimenter error, or both. However, the majority (89%) of these children (those producing some responses that could not be coded) received and intelligibly answered at least 8 out of the 10 misleading questions.

Misleading-detail questions. For correct responses to misleading-detail questions, a main effect of age, $F(1, 71) = 7.67$, $p < .01$, indicated that 5- to 6-year-old children ($M = 57.86$, $SD = 24.51$) produced more correct responses to the misleading-detail questions than the 3- to 4-year-olds ($M = 42.15$, $SD = 23.67$). For incorrect responses to misleading-detail questions, there was an Age × Group interaction, $F(1, 71) = 8.58$, $p < .01$ (see Figure 3). Simple effects analyses, $F(1, 37) = 5.05$, $p < .05$, indicated that 3- to 4-year-olds in the control group produced more incorrect responses to misleading-detail questions than 3- to 4-year-olds in the SM group. Three- to 4-year-old control group children also produced more incorrect responses to misleading-detail questions than 5- to 6-year-olds in the control group, $F(1, 37) = 10.22$, $p < .01$. There was no difference in the incorrect responses produced by 5- to 6-year-olds in the SM and control groups. For "don't know" responses to misleading-detail questions, no significant effects were found.

Misleading-distractor questions. No significant effects were found for this misleading-question type. Children rarely accepted distractor items as occurring in the target events.

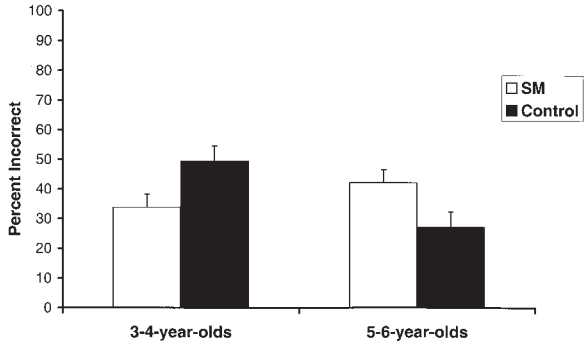

FIGURE 3 Percentage of incorrect responses to misleading-detail questions in Experiment 1.

Summary

To sum up the findings, there was evidence that SM decreased 3- to 4-year-olds' suggestibility (i.e., production of incorrect responses to misleading-detail questions). Although 3- to 4-year-olds in the SM group produced fewer incorrect responses than their peers in the control group, they did not produce more correct responses.

SM decreased 3- to 4-year-olds' suggestibility, but the pattern of means indicated that, as in free recall, SM did not significantly affect 5- to 6-year-olds' suggestibility. There was no difference between 5- to 6-year-olds in the SM and control groups in their correct and incorrect responses to the misleading-detail questions. Five- to 6-year-olds in the SM and control groups performed similarly well in responding to the misleading-detail questions.

Last, we found developmental differences in suggestibility, such that 5- to 6-year-olds in the SM and control groups produced fewer incorrect responses to misleading-detail questions than 3- to 4-year-olds in the control group. Five- to 6-year-olds also produced more correct responses to misleading-detail questions than 3- to 4-year-olds.

Discussion

The SM task did have a beneficial effect on 3- to 4-year-olds' free-recall and misleading-question performance. Children provided the SM task were more accurate in free recall and less likely to accept misleading-detail questions than children presented the recognition-question task. However, the SM task did not have an effect on either 5- to 6-year-olds' free-recall accuracy or their responses to misleading questions. Generally, the older children were highly accurate, producing more ac-

curate SUs during free recall as well as more correct responses to misleading-detail questions than the younger age group. However, for the 5- to 6-year-olds, the SM task did not improve performance over that of the control task. This finding is puzzling given that 3- to 4-year-olds benefited from the SM task, and it led us to question why there was no group difference for the 5- to 6-year-olds.

To determine why the 5- to 6-year-old control group performed as well as the SM group, two alternative explanations were examined. One hypothesis concerns older children's greater ability to use strategies without being explicitly cued to do so (Bjorklund & Douglas, 1997). Perhaps 5- to 6-year-olds in the control group, like their SM group peers, used SM when answering misleading questions about the target event. Actually, their performance during recognition testing suggests that this may have occurred. For example, during the recognition test, the control group was asked to simply say whether or not a given event occurred; however over one half of the 5- to 6-year-olds in the control group provided spontaneous overt reports that they monitored the source of their memories. For instance, when asked, "Did Mrs. Science make balloons pick up pieces of paper and sugar?" some 5- to 6-year-olds would respond, "Yes, she did that in real life." Specifically, 10 (53%) 5- to 6-year-olds in the control group spontaneously source monitored in response to some recognition questions, whereas only 5 (25%) of the 3- to 4-year-old control group spontaneously source monitored. This could explain the absence of a difference in the incorrect responses to misleading questions across the two groups of 5- to 6-year-olds. To test this hypothesis, those 5- to 6-year-olds (a total of 10) who spontaneously source monitored were dropped from the control group. The correct, incorrect, and don't know responses of the remaining children in the control group were then compared to the responses of the 5- to 6-year-olds in the SM group in separate one-way ANOVAs with Group as the independent variable. These analyses did not reveal any significant effects.

A second factor that could account for the similar performance of the SM and control groups is that an aspect of the procedure may have aided the 5- to 6-year-old control group's performance to a larger extent than the 3- to 4-year-old control group's performance. Just before the children were asked the misleading questions, they were asked to freely recall the live and video events. That is, they were first prompted to "tell everything that Mrs. Science did in real life." After the child could no longer recall the real life event, they were then prompted to recall the video event. This type of structured prompting essentially resulted in all children receiving a free-recall SM task. Because 5- to 6-year-olds benefit from strategy use more than younger children (Bjorklund, 2000; Bjorklund & Douglas, 1997; Schneider & Pressley, 1997), the 5- to 6-year-olds in this experiment may have benefited more from the free-recall task than the 3- to 4-year-olds. As reported earlier, both groups of 5- to 6-year-olds reported more correct details in free recall than the 3- to 4-year-old children. The 5- to 6-year-old control group might have used this recently recalled live–video event information when subsequently responding to the questions that attempted to mislead

them about details that occurred in the live and video events. Experiment 2 was designed to address this issue.

EXPERIMENT 2

To test the hypothesis that the free-recall task in Experiment 1 served as an SM strategy for 5- to 6-year-olds, the procedure administered in Experiment 1 was repeated with the exception that the free-recall task was omitted. If free recall was contributing to the heightened performance of control group 5- to 6-year-olds in Experiment 1, then without this recall portion of the interview, 5- to 6-year-olds in the SM group should produce a larger number of correct responses and fewer incorrect responses to misleading questions than 5- to 6-year-olds in the control group. No difference between the groups' production of "don't know" responses was predicted.

Method

Participants

Thirty-eight 5- to 6-year-olds (20 girls and 18 boys) were randomly assigned to the SM (n = 20) or control group (n = 18) with approximately equal numbers of boys and girls in each group. The mean age of children in the SM group was 5.65 years (range = 5 years, 0 months to 6 years, 5 months) and the mean age of the control group was 5.56 years (range = 5 years, 0 months to 6 years, 4 months). These children attended the same child-care centers as those in Experiment 1, and they were similar in socioeconomic status and ethnicity to the children in Experiment 1.

Target Events and Procedure

All children observed the live and video target events with Mrs. Science. After receiving the SM or recognition task (Experimenter A), children were immediately administered the set of 10 misleading questions concerning the target events, which consisted of 6 misleading-detail questions and 4 misleading-distractor questions (Experimenter B).

Results

Children's percentages of correct, incorrect, and don't know responses to misleading-detail and misleading-distractor questions were entered into separate one-way ANOVAs.

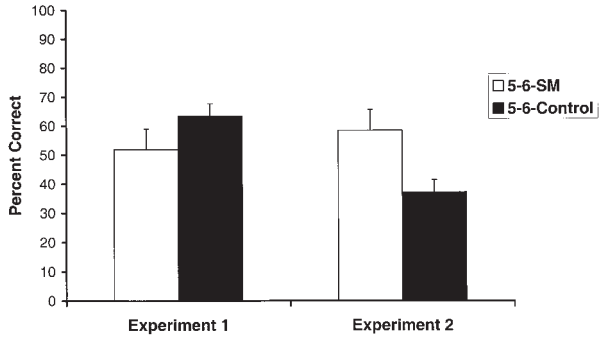

FIGURE 4 Percentage of correct responses to misleading-detail questions produced by 5- to 6-year-olds in Experiments 1 and 2.

Misleading-Detail Questions

For correct responses, a main effect of group was evidenced, $F(1, 36) = 8.98$, $p < .01$, such that the SM group ($M = 58.35$, $SD = 24.45$) produced more correct responses than the control group ($M = 37.06$, $SD = 18.57$). For incorrect and don't know responses to misleading-detail questions, no significant effects were evidenced.

Misleading-Distractor Questions

As found in Experiment 1, no significant effects emerged for children's responses to misleading-distractor questions. Children rarely assented to having witnessed the false events in these questions and were able to correct the interviewer.

Comparison of 5- to 6-Year-Olds in Experiments 1 and 2

If free recall was aiding the 5- to 6-year-old control group's performance in Experiment 1, then the 5- to 6-year-olds' correct responses to misleading-detail questions in Experiment 2 should be significantly lower than the 5- to 6-year-old control group's correct responses in Experiment 1. To test this hypothesis, separate Experiment × Group (1 and 2) ANOVAs were performed on children's correct and incorrect responses. For correct responses, there was an Experiment × Group interaction, $F(1, 70) = 9.39$, $p < .01$ (see Figure 4). Simple effects analyses, $F(1, 35) = 18.67$, $p < .001$, indicated that the control group in Experiment 1 produced more correct responses than the control group in Experiment 2. There was no difference between the correct responses produced by 5- to 6-year-old SM groups in Experiments 1 and 2. For incorrect responses, there was another Experiment ×

Group interaction, $F(1, 70) = 6.07$, $p < .05$. Simple effects analyses, $F(1, 35) = 6.61$, $p < .05$, revealed that the control group in Experiment 1 ($M = 27.11$, $SD = 19.58$) produced fewer incorrect responses than the control group in Experiment 2 ($M = 44.44$, $SD = 21.44$). There was no difference between the incorrect responses produced by the 5- to 6-year-old SM groups in Experiments 1 ($M = 42.12$, $SD = 27.31$) and 2 ($M = 33.40$, $SD = 22.31$).

Discussion

When 5- to 6-year-olds were not required to free recall the events, the children receiving the SM task were less suggestible than the control group. This conclusion is supported by the findings that children in the SM group produced a higher percentage of correct responses to misleading-deteail questions than children in the control group. These results reveal that 5- to 6-year-old children do indeed benefit from an SM manipulation if performed before they are presented misleading source questions. These results also suggest that in Experiment 1, both the SM and control groups' memories of the live and video events were enhanced by the free-recall portion of the interview, supporting the hypothesis that the free-recall procedure functioned as an SM task for the 5- to 6-year-olds. This enhancement allowed both groups to perform similarly on the misleading-question interview. Without this free recall in Experiment 2, the control group produced fewer correct responses to misleading questions than the SM group, and the effect of the SM task was revealed.

GENERAL DISCUSSION

The experiments presented here provide evidence that an SM task can improve children's free-recall accuracy and reduce their susceptibility to misleading questions. Additionally, there were age differences in the effect of the SM task on children's responses to misleading-detail questions. For the older children only, the task improved their ability to reject misleading information.

Effect of SM on Free Recall

The free-recall reports of 3- to 4-year-olds in the control group were less accurate than both their peers in the SM group and 5- to 6-year-olds in the control group. The 3- to 4-year-old control group produced the lowest percentage of correct responses, that of 67% accuracy. The 3- to 4-year-olds in the SM group, evidencing 88% accuracy, performed similarly to 5- to 6-year-olds in the SM (88% accuracy) and control

(90% accuracy) groups. The finding that 3- to 4-year-olds in the control group were less accurate than older children in the control group is inconsistent with eyewitness studies that typically find no age differences in children's free-recall accuracy (Memon & Vartoukian, 1996; Rudy & Goodman, 1991; Saywitz et al., 1991). In addition, Roberts and Blades (1996, in press), who utilized live and video events, also found no age differences in free-recall accuracy. A likely explanation for our finding concerns the timing between presentation of the live and video events. According to the SM framework (Johnson et al., 1993), the closer together in time two events are presented, the more likely source confusions are to occur. In our research, the live and video events were presented immediately after each other and so represented a situation in which source confusions were highly likely to occur. In studies in which no age differences in free-recall accuracy were found (Roberts & Blades, 1996, 1998), the live and video events were separated by 24 hr and may have resulted in a less demanding SM situation for the children than that used in the research presented here. Our results, therefore, suggest that 3- to 4-year-olds who were given an SM task immediately after witnessing live and video events (sequentially presented) were more accurate in their reports of the events than 3- to 4-year-olds who were not given SM. This assertion is supported by the finding that the 3- to 4-year-old control group produced a higher percentage of live–video source confusions than the other groups.

Another noteworthy finding is that children did not incorporate information suggested by the interviewer into their free-recall reports. Children in both groups rarely reported suggested information. This finding is consistent with other eyewitness studies (Memon, Holley, Wark, Bull, & Kohnken, 1996; Saywitz et al., 1991) in which no intrusions of suggested information are indicated in free recall. Child witnesses are often questioned repeatedly prior to their courtroom testimony (Whitcomb, 1992). There is some evidence to suggest that under some conditions, repeated interviews can lead to the elaborate false reports that persist even after the children have been debriefed (Ceci, Crotteau-Huffman, Smith, & Loftus, 1994; Leichtman & Ceci, 1995). These repeated interviews often involve the presentation of misinformation over multiple sessions, such as once a week for a period of 4 weeks following the witnessed event (Leichtman & Ceci, 1995). When reporting the events as in the research presented here, the children had received only one occurrence of misinformation (immediately after the target events).

Effect of SM on Responses to Misleading Questions

Children's responses to misleading-detail questions, questions requiring discrimination of details in the live–video events, revealed that the 3- to 4-year-old control group produced more incorrect responses to these questions than both the 3- to 4-year-old SM group and the 5- to 6-year-old control group. The age differ-

ence in incorrect responses to questions that mislead children about details in live–video events is consistent with that found by Roberts and Blades (1996). The efficacy of the SM task in reducing 3- to 4-year-olds' acceptance of misinformation is also consistent with other studies indicating that orienting adults and children to source can decrease their suggestibility (Lindsay, 1990; Lindsay & Johnson, 1989; Newcombe & Siegal, 1996; Zaragoza & Koshmider, 1989). Previous research has shown that children are more accurate if they are oriented to source regarding the seen versus heard source distinction (Newcombe & Siegal, 1996). This study extends this effect, demonstrating that children's source misattributions can be decreased for a different type of source distinction. With the proper rehearsal of live and video events, 3- to 4-year-olds can resist misleading source questions.

Our results further indicate that an SM task erased developmental differences in children's incorrect responses, as evidenced by the lack of difference between 3- to 4-year-old SM group's and the 5- to 6-year-old control group's production of incorrect responses (in Experiment 1).

Another important finding from Experiment 1 was that correct responses to misleading-detail questions revealed age differences, such that 5- to 6-year-olds produced more correct responses than 3- to 4-year-olds. This finding is not consistent with our results from children's SM test performance (Phase 1). Here, we found no difference between the two age groups' discrimination of the live and video events. Given that both age groups exhibited similar levels of live–video discrimination, one would expect both to perform similarly well on the misleading-detail questions. However, this was not the case.

Two plausible explanations can be offered for this age effect. One explanation is that the 3- to 4-year-old SM group failed to correctly reject misinformation because of true memory impairment. This explanation is supported from the results analyzing children's number of correct details produced in their free-recall reports. Five- to 6-year-olds reported a larger number of correct SUs about the live and video events than the 3- to 4-year-olds. This older age group, thus, experienced more rehearsal of the target-event details than the younger age group. Perhaps this added rehearsal helped the 5- to 6-year-olds to more often recognize misinformation embedded in the misleading-detail questions.

A second explanation involves social demand characteristics associated with the misleading-question task. Studies indicate that children may fail to correct adult interviewers because they do not want to contradict an authoritative figure (Ceci et al., 1987; Davis & Bottoms, in press). We did attempt to minimize demand characteristics by warning children that the questions might contain incorrect information. Perhaps the 5- to 6-year-olds heeded the warnings more than the 3- to 4-year-olds because of a lessened sensitivity to demand characteristics. However, this explanation is not supported when the results from children's performance on the misleading-distractor questions are considered. When responding to mislead-

ing-distractor questions, both age groups in the SM and control condition performed quite well. They did not have any trouble correcting the interviewer's false suggestions embedded in these questions.

Hence, because one question type was not more socially demanding than the other, this second explanation can likely be ruled out. The 5- to 6-year-olds' greater ability to spontaneously recall more details of the live and video events may have been the reason for their greater production of correct responses to the misleading-detail questions, in comparison to the 3- to 4-year-old SM group. This hypothesis is also supported when the 5- to 6-year-old SM group in Experiment 2 is compared to the 3- to 4-year-old SM group in Experiment 1. Without free recall in Experiment 2, the 5- to 6-year-old SM group's responses to misleading-detail questions dropped down to the level of the 3- to 4-year-old SM group.

Free Recall as an SM Strategy

Similar to the pattern of findings with children's free-recall reports was our failure to find a difference between the 5- to 6-year-old SM and control group children's production of incorrect responses to misleading-detail questions in Experiment 1. Both of these groups were similarly correct and incorrect in their responses to misleading-detail questions. Consequently, SM only seemed to affect the younger age group's responses to misleading questions. One explanation for this finding concerns the development of retrieval strategies. Young preschoolers (3- to 4-year-olds) are less likely to spontaneously use strategies such as SM that might aid their memory of an event (Bjorklund & Douglas, 1997; Justice, 1989; Schneider & Pressley, 1997). Perhaps they lack the metacognitive awareness that would lead them to use SM to increase the accuracy of their memorial reports. However, our research suggests that when these younger children are given an SM task, they can benefit from the task when subsequently presented with free-recall and misleading questions. They are less likely to accept misinformation, as evidenced by their production of fewer incorrect responses. However, they are not more likely to correctly reject misinformation, as shown by the finding that there was no difference between the number of correct responses produced by the control and SM groups. This finding is actually consistent with Miller's (1990) idea of "utilization deficiencies," in which preschool-aged children who do not spontaneously use a strategy can use one when instructed but do not experience any benefits in terms of memory accuracy (Bjorklund & Douglas, 1997).

With increasing age, children begin to use strategies without being explicitly cued to do so (Bjorklund & Douglas, 1997). Experiment 2 suggested that the 5- to 6-year-old control group in Experiment 1 used free recall as an opportunity to rehearse the live and video events. This rehearsal of source information resulted in

the similar misleading-detail question performance of the 5- to 6-year-old SM and control groups in Experiment 1. When the 5- to 6-year-old SM and control groups were not given the opportunity to freely recall the target events, the effect of the SM manipulation was observed. In Experiment 2, the SM task enhanced the 5- to 6-year-olds' ability to correctly reject false information embedded in the misleading-detail questions.

Conclusions and Implications for Future Research

These findings provide additional evidence that SM influences children's suggestibility. The SM task may have led children to evaluate the characteristics of their memories of the live and video events when deciding whether the information in the misleading-detail questions was correct or incorrect. In discriminating memories of details that occurred in real life versus on video, children may have evaluated features associated with these memories. For example, they might have attributed the source of a particular event as a video event if they remembered features associated with the event memory that distinguished it as occurring on video, such as remembering the "zooming in" of particular objects in the event. The evaluative process may have resulted in the 5- to 6-year-olds' greater accuracy when responding to misleading questions and the 3- to 4-year-olds' lessened acceptance of misleading information.

Experiments 1 and 2 also highlight the impact that free recall can have on children's subsequent responses to specific misleading questions. Five- to 6-year-old children have the metacognitive ability to take advantage of free recall as a means to rehearse and organize their event memories. Younger preschool-aged children simply do not say much in free recall and so are not able to experience the beneficial rehearsal and organizational benefits associated with free recall. The studies, thus, suggest that preinterview training is particularly important for 3- to 4-year-olds. They need more support in the use of memory strategies, such as SM, to reduce their susceptibility to misinformation.

Three- to 4-year-olds who are required to monitor information from external sources (live and video) are less likely to acquiesce to questions that attempt to mislead them about the source of information. Though all children were warned before questioning that some of the questions might contain incorrect information, children given the SM task may have acquired a heightened sense of awareness of the incorrect information. That is, because the SM task required them to distinguish events that happened live and on video, children in the SM group may have been more sensitive to the misinformation and, thus, answered the misleading questions in a more cautious manner. Our data also revealed that the SM task actually eliminated age differences in the accuracy of children's free-recall reports and age differences in production of incorrect responses to misleading questions.

However, given that the SM task and misleading questions immediately followed the live and video events, it is important to investigate in future research whether a delay between presentation of the live and video events and misleading questions would alter the effectiveness of the SM task. Studies indicate that as the delay between presentation of target events and memory testing increases, children are more likely to accept misinformation (Bruck, Ceci, Francouer, & Barr, 1995; Leichtman & Ceci, 1995; Poole & Lindsay, 1995; White, Leichtman, & Ceci, 1997). One explanation for this finding is that children's memory representations, particularly source, may fade, leaving them more vulnerable to suggestion (Brainerd, Reyna, Howe, & Kingma, 1990; Parker, 1995). Perhaps immediate SM testing might inoculate children against misleading source questions at delayed testing by allowing their memories of the events to be more strongly associated with source.

Another avenue for future research involves examining the various skills that might underlie children's SM ability. Although developmental research within the SM framework (Johnson et al., 1993) reveals the kinds of SM that young children are capable of performing (i.e., external and reality monitoring), few studies have examined the specific cognitive skills required for successful SM. Individual differences in children's cognitive processing, such as their ability to use other retrieval strategies (e.g., organization and sorting) and their metacognitive abilities (Johnson et al., 1993), are likely to affect children's SM skills. In addition, Welch-Ross, Diecidue, and Miller (1997) suggested that 3- to 5-year-olds' developing theory of mind (i.e., their ability to reason about conflicting mental representations) may influence their ability to monitor sources. Therefore, more developmental research is needed to identify which of these specific processes or skills underlie SM as well as how they might interact so that children extract optimal benefits from SM. An investigation of such issues can have important theoretical and practical implications; for example, identifying child witnesses whose suggestibility might be decreased by SM.

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