

# Source-Monitoring Training Facilitates Preschoolers' Eyewitness Memory Performance

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Preschool children are more susceptible to misleading postevent information than are older children and adults. One reason for young children's suggestibility is their failure to monitor the source of their memories, as in, for example, discriminating whether an event was seen live versus on television. The authors investigated whether source-monitoring training would decrease preschoolers' suggestibility. Thirty-six 3–4-year-olds observed target live and video events and were then given source-monitoring or recognition (control) training on nontarget events. Following training, all children answered 24 misleading and nonmisleading target-event questions. Children given source-monitoring training were more accurate than control group children in response to misleading and nonmisleading yes–no questions and in response to nonmisleading, open-ended questions. Implications for strategy development, dual representation, and child witness interviewing are discussed.

Young children are more susceptible to misleading postevent information than are older children and adults, which is a contributing factor to young children's greater degree of suggestibility (Cassel & Bjorklund, 1995; Cassel, Roebbers, & Bjorklund, 1996; Ceci, Ross, & Toglia, 1987; Leichtman & Ceci, 1995; Ornstein, Gordon, & Larus, 1992). Preschoolers (3–5-year-olds) are less adept than older children and adults at correcting interviewers' false statements or questions about witnessed events. One reason that preschoolers more often acquiesce to interviewers' false suggestions is that children confuse the sources, or origins, of events (Ackil & Zaragoza, 1995; Poole & Lindsay, 1995).

Monitoring the sources of events involves an attribution process in which decisions are made about how information was acquired; it includes, for example, distinguishing between whether an event really happened or was merely imagined or suggested (Johnson, Hashtroudi, & Lindsay, 1993). Studies indicate developmental differences in source-monitoring ability (Foley & Johnson, 1985; Foley, Johnson, & Raye, 1983; Lindsay, Johnson, & Kwon, 1991). For instance, 6-year-olds were more likely than 8- and 10-year-olds and adults to misattribute an event that was only heard about

to a memory of a real-life experience (Ackil & Zaragoza, 1995). The purpose of the research presented in this article was to investigate whether training children to monitor the sources of events would increase their tendency to reject misinformation about the sources of witnessed events.

In addition to problems discriminating real-life events from heard-about or imagined events, young children also have difficulty distinguishing between real-life events and television events (Roberts & Blades, 1996, 1998). The amount of television watched by children in the United States averaged 11 to 28 hours per week in the 1990s; more time was spent watching television than in all other activities except sleeping (Sanrock, 1999). Given that children spend so much time watching television, it is important to investigate their tendency to confuse real-life and television events. It is possible that children might obtain knowledge about certain events from television (e.g., sexual behavior) and incorporate this information into their memories of real-life experiences (e.g., allegations of sexual abuse). Investigating children's ability to monitor real-life and television events thus has practical significance.

The source-monitoring framework (Johnson et al., 1993) might predict that distinguishing between live and video events would be a more difficult task than distinguishing between live and heard-about (suggested) events (though this issue remains an empirical question). Attributing the source of knowledge and memories entails evaluating average differences between characteristics of memories acquired from different sources (Johnson et al., 1993). Memories that have overlapping features should be harder to distinguish than memories that do not have overlapping features. For instance, sources that are similar in perceptual (e.g., two women) and semantic content are more often confused than sources that differ in perceptual (e.g., a man and a woman) and semantic content (Lindsay, 1990; Lindsay et al., 1991). Developmental differences arise when similar sources of information must be distinguished. For example, 4-year-olds were worse at discriminating stories told by two similar women than were older children and adults (Lindsay et al., 1991). However, 4-year-olds were just

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as good as older children and adults at distinguishing between stories told by two dissimilar people (i.e., a man and a woman). Unlike seen and heard-about events, real-life and television events share both visual and auditory features, which increases the likelihood of confusions between live and television events (Johnson et al., 1993), especially among younger children. Roberts and Blades (1998) required 4-year-olds, 10-year-olds, and adults to watch a real-life event and a similar video event. One week later, the children and adults answered misleading questions about the events. For example, they were asked by the female experimenter, "Did I eat a Rice Krispie cake in real life?" when, in fact, the experimenter had eaten a sandwich in real life and a Rice Krispie cake in the video. The results indicated that 4-year-olds produced more incorrect responses to these questions than did 10-year-olds and adults. There was no difference in the numbers of incorrect responses produced by 10-year-olds and adults. In this study, the younger children misattributed what they saw on the video to their memory of the real-life event.

Given that children have difficulty making correct source attributions when presented with misleading questions (Roberts & Blades, 1998), Thierry, Spence, and Memon (2001) tested whether a source-monitoring task administered prior to misleading questions would make 3–4-year-old and 5–6-year-old children less suggestible than a control group that was given only a yes–no recognition task without source cues. Children watched a target live event and a similar target video event. Immediately afterward, half of the children, the source-monitoring group, were required to answer questions that asked whether they watched the target events in real life or on video. The other half of the children, the control group, were asked questions requiring only recognition of target events, not source information. Following source-monitoring or recognition questioning, all children were asked questions that misled them about details that occurred in the live and video events. For example, in a question referring to the real-life event, details that occurred only in the video event were imported into the question (e.g., "How big were the fish that Mrs. Science picked up [real-life event] with her *red magnet* [video event]?"). Responses to these misleading questions were used to measure the effect of the source-monitoring manipulation on memory accuracy and suggestibility. Correct responses pinpointed the false information embedded in misleading questions, whereas incorrect responses assented to the misinformation. Children were also given the option of responding to the misleading questions with "I don't know."

The results demonstrated that both age groups' susceptibility to misleading source questions could be decreased by explicitly requiring them to monitor details in the live and video events. Children given the source-monitoring task were less likely to acquiesce to misleading source information than were children given the yes–no recognition task (i.e., they produced fewer incorrect responses than the control group). In addition, 5–6-year-olds in the source-monitoring group produced more correct responses to the misleading questions than did 5–6-year-olds in the control group, which suggests that the source-monitoring task did improve their memory for source information. However, 3–4-year-olds in the source-monitoring group were not more likely than their control group age-mates to detect and reject the misleading source information. Their failure to recognize the inaccurate information within the misleading questions (defined as cor-

rect responses) suggests that the source-monitoring task may not have enhanced the memories of the younger children. Instead, these younger children in the source-monitoring condition tended to respond "I don't know" more than did their control group age-mates.

The pattern of results of the 3–4-year-old children in the source-monitoring group is actually consistent with Miller's (1990) idea of utilization deficiencies that occur in the development of strategy use. Much evidence exists that preschool children are less likely than older children to spontaneously use strategies that improve their performance on information-processing tasks (Bjorklund & Douglas, 1997; Justice, 1989; Schneider & Pressley, 1997). Miller has argued that when children begin using specific strategies, they may be capable of using a given strategy when instructed in it even though they do not use it spontaneously. However, they may experience no benefits from its use in terms of memory performance. In the study by Thierry et al. (2001), 3–4-year-old children in the source-monitoring condition were less likely to accept the misinformation because they tended to say "I don't know" more often than their control group age-mates. There was thus no evidence that the 3–4-year-olds' memories were enhanced by the source-monitoring task, a finding consistent with the utilization deficiency literature (Bjorklund, Miller, Coyle, & Slawinski, 1997).

We undertook the present study to see if a source-monitoring training procedure would decrease 3–4-year-olds' suggestibility by enhancing their memory accuracy or their ability to detect and reject false information. In the study by Thierry et al. (2001), the children were required to answer source questions about live and video target events, but they were not given feedback regarding the accuracy of their responses. In addition, the children were not given training in rejecting misleading source information embedded in questions. These conditions (feedback and training with misleading information) constituted the source-monitoring training procedure used in the current study. However, to ensure that the children were learning a generalized ability to use a source-monitoring strategy, we trained them on *nontarget* live and video events. Transfer of training was tested by questioning children about a different set of events, the *target* live and video events. This procedure satisfied a primary condition for investigating children's transfer of training as discussed by Brown and Kane (1988), which is that the surface similarities of the training and transfer tasks be minimized. Also, the children in the present study were not told that the training and transfer tasks were the same, which satisfied Brown and Kane's second condition for evaluating transfer of training.

In the study by Thierry et al. (2001), although the second condition was met, the first was not met. The training and transfer tasks contained a high degree of surface similarity in that the transfer task consisted of misleading questions about the same "Mrs. Science" live and video events that the children were previously required to source monitor in the training task. The present study therefore provided a more valid check on whether young children can learn to use a source-monitoring strategy that will decrease their suggestibility and enhance their memory accuracy.

The procedure was implemented over two sessions. In Session 1, 3–4-year-old children first observed target live and video events. In Session 2, the children were administered either source-monitoring training or control training on nontarget events. Fol-

lowing training, all children answered yes–no and open-ended misleading questions about the sources of target events as well as yes–no and open-ended nonmisleading questions. The yes–no questions were the same type of questions on which the children received training. Because the children did not receive training on open-ended questions, these questions were used to test whether training would transfer to a completely different type of question than the one used in training.

On the basis of studies such as Brown and Kane's (1988) that indicated young children's ability to learn from metacognitive training tasks, we predicted that children in the source-monitoring training condition would be more accurate in response to target yes–no questions than would children in the control condition. In addition, if children can acquire a general principle about the importance of considering source information that is flexible across question types, children in the source-monitoring training group should also be more accurate in response to open-ended questions than should those in the control group. When responding to the yes–no and open-ended questions, children who receive source-monitoring training should thus be less likely than those who receive control training to confuse the sources of event information.

## Method

### Participants

Thirty-six 3–4-year-old children (17 girls and 19 boys) were recruited from local child-care centers and served as participants. Consent forms were obtained from their parents. Children in each age group were randomly assigned to either a source-monitoring training condition ( $n = 16$ ) or a control condition ( $n = 20$ ), which are described below. The mean age of the children in the source-monitoring training group was 4.43 years (range = 3 years 3 months to 4 years 11 months), and the mean age of the control group children was 4.32 years (range = 3 years 2 months to 4 years 11 months). There were approximately equal numbers of boys and girls in each condition.

### Target Events and Design

The target events consisted of science demonstrations performed by "Mrs. Science" and were viewed in Session 1. One event was a live demonstration of three experiments (e.g., charging balloons with static electricity, 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.

The type of presentation of each set of events was counterbalanced so that the events seen live by half of the children were seen on video by the other half of the children. In addition, the order of presentation of live and video events was counterbalanced so that half of the children saw the live science experiments first and half saw the video experiments first.

Children were randomly assigned to one of two groups. These groups were defined as a function of the type of training presented to the children during Session 2. Session 2 took place 3–4 days after presentation of the target events. One group, the source-monitoring training (SMT) group, received a task designed to increase their awareness of the importance of distinguishing sources of information. The second group, the control group, received a yes–no recognition training task designed to increase their detection of distractor items. The control group was not given source-monitoring instructions. These tasks encompassed the first phase of Session 2.

The second phase of Session 2 was administered immediately after the first phase and consisted of a target interview composed of misleading and nonmisleading questions, which all participants received (see Table 1 for a summary of the experimental manipulations).

## Procedure

### Session 1

A child who had his or her parents' consent to participate was approached by an experimenter (Mrs. Science) and asked if he or she would like to watch some science experiments. If the child refused, he or she was approached at another time. After attaining assent from 3–4 children, Mrs. Science accompanied them 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. Mrs. Science introduced the live and video shows to the children by labeling each set of events at the start of each show as either "real life" or "TV." For example, just before starting the real-life show, Mrs. Science would say, "First, I'm going to do some science experiments for you *in real life*," and she would begin the real-life presentation. After the real-life presentation ended, she would say, "Next, I'm going to show you some science experiments *on TV*," and she would start the video presentation. Each set of events was thus referenced with the exact terminology ("real life" and "TV") that was later used to refer to the events during target-event testing in Session 2. Children watched the live and video demonstrations in the same room. The presentations of the live and videotaped events each lasted approximately 7.5 min for each group of children. The total presentation time was therefore about 15 min. After the children witnessed the target live and video presentations, a second experimenter, who was not present during the science show, escorted each child to a different room and engaged him or her in conversation about topics unrelated to the science demonstration (filler activity). The second experimenter then asked each child 18 nonmisleading open-ended questions regarding the target events in order to obtain a baseline assessment of the children's memory of the target live and video events. The 18 baseline questions consisted of 3 questions about each of the 6 target live and video experiments.

### Session 2

*Phase 1: Source-monitoring and recognition (control) training.* During the first phase of Session 2, groups of 3–4 children in the source-monitoring and control conditions watched a presentation of a live puppet show (approximately 4 min long) and another similar puppet show but on a video (also approximately 4 min long). One puppet named Billy was

Table 1  
Summary of Experimental Manipulations

Condition	Session 1	Session 2 <sup>a</sup>	
		Phase 1 <sup>b</sup>	Phase 2
Source-monitoring training	Target events and baseline assessment	Source training	Target questions
Control	Target events and baseline assessment	Recognition training	Target questions

<sup>a</sup> Session 2 was administered 3–4 days after Session 1.

<sup>b</sup> Phase 1 constitutes the only difference between the treatment of the source-monitoring training and control groups.

featured in the real-life and video presentations. A second puppet named Terry watched the real-life and video presentations featuring Billy with the children.

Following the puppet show training events, each child met individually with the second experimenter and was given either source-monitoring training or recognition (control) training. Children in the source-monitoring condition were told, "Terry [the second puppet] can never remember what Billy [the puppet in the training show] did in real life and what Billy only did on TV. Billy hates that. Let's show Billy that you can remember what he did for you and Terry in real life and what you and Terry only saw him doing on TV."

The experimenter then administered 12 trials of the following sequence of questioning. The order of presentation of the 12 trials was randomized for each participant. On each trial, children were first asked a set of source-monitoring questions, which consisted of a two-part sequence, followed by training on misleading questions. In the first part of the source-monitoring section of each trial, the child was asked a yes–no recognition question such as "Did you see Billy crown himself king?" After a "yes" response, children were asked where they saw Billy crown himself king (i.e., "In real life or on TV?"). Children were given positive reinforcement for correctly answering the source-monitoring questions. If children responded incorrectly to a source question, they were provided with the correct answer.

After the child correctly responded to the source question, the experimenter administered the second part of the trial. She told the child that she was going to ask a question that might be a trick, or misleading, question about an item in the live and video puppet shows. The source of this item had just been established in the first part of the trial. The child was instructed to tell the experimenter whether or not the question was a trick. A trick question was defined for the child as a "question that is really sneaky because it might ask about something that is not right," and the child was told that he or she must "listen really carefully to the question and think very hard about the answer." For example, the experimenter asked, "Did you see Billy crown himself king on TV?" when, in fact, Billy crowned himself king in real life. The child was then asked to say why the question was a trick question. If children did not spontaneously say that Billy crowned himself king in real life as opposed to on TV, they were prompted for this information (e.g., the experimenter said, "Did you really see Billy crown himself king on TV or did he do this in real life?"). Half of the questions following the source questions were misleading, and half were nonmisleading. To be considered successfully trained, all children were required to reach a criterion of producing four consecutive correct responses to misleading questions and four consecutive correct responses to nonmisleading questions. Training ended when this criterion was reached or when the child received the 12 training trials twice (for a total of 24 trials).

Following the puppet show presentation, children in the control group were presented the same set of yes–no recognition questions about Billy's actions that were presented to children in the SMT group. They were also provided training in recognizing trick questions. However, children in the control condition were not prompted to report source information or trained to detect misleading questions about source information.

Children in the recognition training group were given a cover story similar to the one told to children in the SMT group: "Terry can never remember what Billy did. Billy hates that. Let's show Billy that you can remember what he did for you and Terry." Twelve trials of recognition questions followed by misleading and nonmisleading questions were then administered to this group of children. First, recognition questions without source cues were asked (e.g., "Did Billy crown himself king?"). Children were given positive reinforcement for correctly answering each question. If a question was incorrectly answered, children were provided with the correct answer.

In the second part of the trial, children in the control group, like the children in the SMT group, were asked questions that might be trick

questions. Half of these questions were, in fact, trick, or misleading, questions, and half were nonmisleading questions. However, so as not to cue this group to source information, the trick questions misled children about a distractor item that occurred in neither the live nor the video puppet show. For example, after correctly answering the recognition question, the child was asked, "Did you see Billy crown himself queen?" when, in fact, Billy crowned himself king. The question was therefore similar in grammatical form to the question asked of the SMT group children; however, it did not mention source information. The child was then asked to tell the experimenter whether the question was a trick question and why it was or was not. If the child did not spontaneously provide the correct answer, he or she was prompted for the correct answer (e.g., "Did you really see Billy crown himself queen or did he crown himself something else?"). To be considered successfully trained, members of the control group (like the SMT group) had to reach a criterion of producing four consecutive correct responses to misleading questions and four consecutive correct responses to nonmisleading questions. Training ended when the criterion was reached or when the child received the 12 trials twice (for a total of 24 trials).

*Phase 2: Target-event questions.* After the children received source-monitoring training or recognition training (see Table 1), a third experimenter asked each child 24 questions about the target live and video events performed by Mrs. Science. These target questions consisted of two types: 12 yes–no questions and 12 open-ended questions. The 12 yes–no questions were similar to those used in training. Half of the yes–no questions were misleading, and half were nonmisleading. All of the yes–no questions asked about true central features of the target events; the questions were misleading in terms of the source of the events. These questions were posed in the following manner: First, the children were tested for recognition of the target events (e.g., "Did Mrs. Science catch fish?"). Following correct recognition of the event, children were asked yes–no source questions, half of which misled them about the source of the target event (e.g., children were asked, "In real life, did Mrs. Science catch fish?" when, in fact, the fishing experiment occurred on TV).

The other 12 target-event questions were open-ended questions. Half of the open-ended questions were misleading, as in the following example: "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 central detail, the spoon, that actually occurred in the video event. The other half of the open-ended questions were nonmisleading and probed children for central details about individual live and video experiments.

Administration of the 24 target yes–no and open-ended questions was blocked and counterbalanced such that half of the children in each condition received the yes–no questions first, and half received the open-ended questions first. Within each question type, the order of questions was randomized for each child. Before questioning began, all children were warned that the experimenter might ask questions that contained incorrect information. All children were also given the option of responding "I don't know" to the target questions.

## Results

### *Session 1*

#### *Baseline Assessment*

To ensure that the SMT and control groups' memories of the Mrs. Science live and video events were equally accurate before they were asked the misleading target-event questions, we had both groups answer 18 nonmisleading open-ended questions about the live and video events immediately after they witnessed these target events. These questions earned differing numbers of points depending on the number of items contained in a correct response.



For instance, one baseline question asked, “What did Mrs. Science’s magic balloons pick up?” The answer to this question was “paper and sugar,” so it was worth 2 points (1 point for paper and 1 point for sugar). The total possible score for the baseline assessment was 33 points. Children’s percentages of correct responses were entered into a one-way analysis of variance (ANOVA) with group (SMT vs. control) as the independent variable. No significant effects were found. The SMT group ( $M = 75.48\%$ ,  $SD = 11.77$ ) and the control group ( $M = 74.04\%$ ,  $SD = 10.51$ ) exhibited similar accuracy levels for the live and video events. Thus, any group differences found between the SMT and control groups’ subsequent responses to the target-event questions cannot be attributed to differences in their initial encoding and/or memory of the target events.

### Session 2

#### Performance on the Training Task

The performance of the SMT and control groups during the training phase of Session 2 is reported before the main findings on the effectiveness of training as measured by the target yes–no and open-ended questions (Phase 2 of Session 2). All children in the SMT and control groups reached the criterion of correctly responding to four consecutive misleading questions and four consecutive nonmisleading questions. During training on each type of question, misleading and nonmisleading, both groups were allowed 24 trials to reach the criterion. For the misleading questions, the SMT group required an average of 5.08 ( $SD = 1.57$ ) trials to reach criterion, whereas the control group reached criterion in an average of 5.40 ( $SD = 0.97$ ) trials. For the nonmisleading questions, the SMT group averaged 4.38 ( $SD = 0.51$ ) trials to reach criterion, and the control group averaged 4.60 ( $SD = 0.70$ ) trials to reach criterion. In sum, most SMT and control group children needed only one practice trial before they were able to correctly respond to four consecutive misleading questions. When responding to the nonmisleading questions, most SMT and control group children reached criterion after having no practice trials. These results indicate that the criterion used to define successful source-monitoring and recognition training was quickly acquired by most children.

#### Target Yes–No Questions

Four children in the control group and 2 children in the SMT group evidenced “yes” or “no” response biases in that over 80% of their responses to the yes–no misleading and nonmisleading questions were either “yes” or “no.” Specifically, in the control group, 3 children exhibited a “yes” response bias, and 1 child exhibited a “no” response bias. In the SMT group, 1 child displayed a “yes” response bias, and 1 child displayed a “no” response bias. When these 6 children were excluded from the following yes–no question analyses, the same pattern of results was found, so the children were included in the following analyses.

**Recognition of target events.** First, the SMT and control groups’ ability to correctly recognize the target events is reported. This measure is based on the initial yes–no questions that probed children’s memory of the target events (e.g., “Did Mrs. Science catch fish?”) just prior to probing for the source of the event.

Following half of the target-event recognition questions, the source of the event was misattributed by the interviewer in the misleading yes–no source questions. Following the other half of these questions, the source of the event was correctly attributed by the interviewer in the nonmisleading yes–no source questions. Children’s ability to recognize the target events was measured by dividing the number of correct recognitions of target events (possible 6) by the total number of target-event questions for which the interviewer misattributed the source in the following misleading question (6) or correctly attributed the source in the following nonmisleading question (6). This percentage of correct responses was entered into a Group (SMT vs. control)  $\times$  Event Type (source misattributed by interviewer vs. source correctly attributed by interviewer) mixed ANOVA. (No one utilized the “don’t know” response option for these initial recognition questions.) Results indicated no difference between the SMT group ( $M = 77.37\%$ ,  $SD = 26.59$ ) and the control group ( $M = 79.46\%$ ,  $SD = 23.44$ ) on recognition of target events. Thus, any difference in their recognition of source misattributions in the misleading questions or correct source attributions in the nonmisleading questions cannot be due to differences between the SMT and control groups’ memory of the individual experiment in question.

**Performance on yes–no misleading and nonmisleading source questions.** Because children rarely used the “don’t know” response option (about 2% of children’s responses in each group), those questions in which children used this option were excluded from these analyses. Percentages of correct responses to misleading and nonmisleading yes–no questions were entered into a Group (SMT vs. control)  $\times$  Yes–No Question Type (misleading vs. nonmisleading) mixed ANOVA. Results indicated a main effect of group,  $F(1, 34) = 15.93$ ,  $p < .01$  (see Figure 1), indicating that SMT group children ( $M = 67.63\%$ ,  $SD = 31.93$ ) produced more correct responses to the yes–no misleading and nonmisleading questions than did control group children ( $M = 41.38\%$ ,  $SD = 34.01$ ). Children in the SMT group also performed significantly better than chance (50%) in their correct responding to yes–no questions,  $t(15) = 3.33$ ,  $p < .01$ , whereas the control group’s correct responses did not differ from chance.

#### Target Open-Ended Questions

**Coding.** Children’s responses to each of the misleading and nonmisleading open-ended questions were coded as correct, incor-

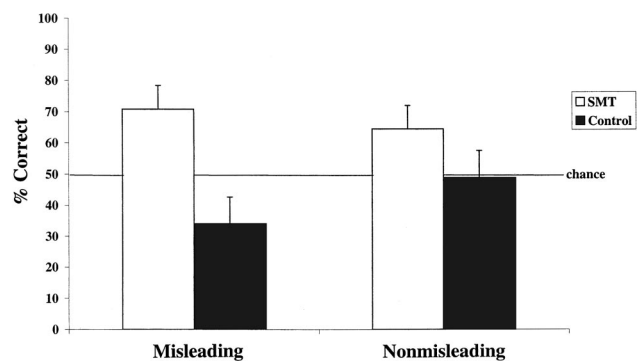


Figure 1. Percentage of correct responses to yes–no questions. Vertical lines depict standard errors.

rect, or don't know. For the misleading open-ended questions, a response was considered correct if the child rejected the false suggestion embedded in these questions. For example, in the misleading question "How big were the fish that Mrs. Science picked up with her big red magnet?" a correct answer indicated that Mrs. Science did not pick up fish with a *red magnet*. An incorrect response to this question would be failing to point out the false suggestion and responding affirmatively to the question by indicating the size of the fish. For the nonmisleading open-ended questions, a response was coded as correct if the child provided the correct item for which the question probed. For example, in the nonmisleading question "What did Mrs. Science pour into glass bottles?" the correct answer was "water." Incorrect responses to this question occurred when children said that Mrs. Science poured such items as honey or oil into glass bottles. Such items might have been used in other Mrs. Science experiments but were incorrect responses for this question.

Again, children rarely used the "I don't know" response option (average of 1 "don't know" response for each group), so these responses were excluded from the analyses. The percentages of correct responses to the misleading and nonmisleading open-ended questions were entered into a Group (SMT vs. control)  $\times$  Open-Ended Question Type (misleading vs. nonmisleading) mixed ANOVA. Results indicated main effects of group,  $F(1, 34) = 4.57$ ,  $p < .05$ , and of open-ended question type,  $F(1, 34) = 75.46$ ,  $p < .01$ , which were qualified by a Group  $\times$  Open-Ended Question Type interaction,  $F(1, 34) = 8.08$ ,  $p < .01$  (see Figure 2). Simple effects analyses,  $F(1, 34) = 8.66$ ,  $p < .01$ , indicated that children in the SMT group ( $M = 83.56\%$ ,  $SD = 17.17$ ) produced more correct responses to the nonmisleading open-ended questions than did children in the control group ( $M = 56.90\%$ ,  $SD = 32.76$ ). No difference between the SMT group ( $M = 24.88\%$ ,  $SD = 16.86$ ) and the control group ( $M = 27.15\%$ ,  $SD = 18.17$ ) in the production of correct responses to the misleading open-ended questions was evidenced. Both the SMT and control groups performed poorly when responding to these misleading questions.

**Error types.** To determine why children in the SMT group were more accurate when responding to the nonmisleading open-ended questions than children in the control group were, we evaluated how children's incorrect responses to these questions were distributed by error type. Responses to the nonmisleading open-ended questions were coded according to the three types of

errors produced by the children. One type of error was a between-sources error, for example, importing items or actions from a video event into a question referring to a live event (e.g., saying that Mrs. Science dropped a spoon into a jar associated with the live event when a spoon was used only in the video event). A second type of error was a within-source error confusing items or actions that occurred in either of two live events or in either of two video events (e.g., saying that Mrs. Science went fishing for a keychain as part of a live experiment when a keychain was actually used in another live experiment). A third type of error consisted of confabulations in which children talked about items or actions that occurred in none of the experiments (e.g., saying that Mrs. Science made a volcano when this never occurred).

Percentages of incorrect responses (out of total responses) that were due to either between-sources errors, within-source errors, or confabulations were entered into separate one-way ANOVAs with group as the independent variable. No effect was found for confabulation errors, with children in both groups rarely producing this error type ( $M = 2.68$ ,  $SD = 10.71$ ). Children in the control group ( $M = 26.35$ ,  $SD = 30.74$ ) produced more between-sources errors than those in the SMT group ( $M = 4.94$ ,  $SD = 8.99$ ),  $F(1, 34) = 7.23$ ,  $p < .05$ . There was no difference between the numbers of within-source errors produced by children in the SMT ( $M = 10.48$ ,  $SD = 14.89$ ) and control ( $M = 12.78$ ,  $SD = 17.19$ ) groups. These results suggest that children in the control group were less accurate when responding to the nonmisleading open-ended questions because they were more likely than the SMT group to let between-sources errors intrude into their responses. Source-monitoring training might have made children in the SMT group more cautious about letting information from another source intrude into their responses, so fewer of their errors were of this type.

In sum, source-monitoring training decreased 3–4-year-olds' suggestibility, as indicated by their production of more accurate responses to yes–no misleading and nonmisleading questions than were produced by the control group. Children in the SMT group were more likely to reject source misattributions and to recognize correct source attributions than were children in the control group. Source-monitoring training did not have any effect on children's responses to the misleading open-ended questions. However, there was an effect of source-monitoring training on children's responses to the nonmisleading open-ended questions. Children in the SMT group were more accurate than their control group counterparts in response to the nonmisleading open-ended questions, because children in the control group were more likely than those in the SMT group to let video (or live) event information intrude into their responses to questions about live (or video) events.

## Discussion

In the present study, 3–4-year-olds who were given training in monitoring one set of live and video events were able to transfer this training to a different set of live and video events seen 3–4 days earlier. Children learned that source information is important to consider when recalling events and that this information should be attended to when responding to questions about events witnessed from different sources. Without source-monitoring instructions and training, 3–4-year-olds in the control group failed to

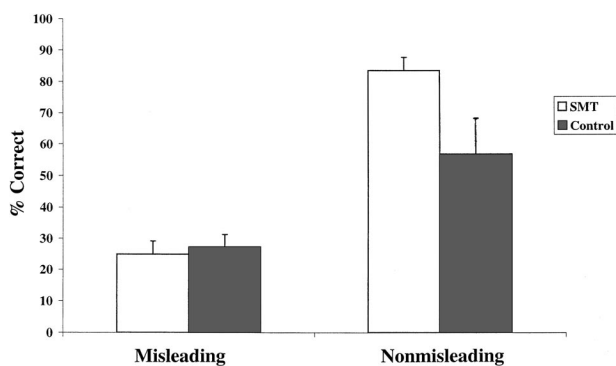


Figure 2. Percentage of correct responses to open-ended questions. Vertical lines depict standard errors.

recognize and correct source misattributions as accurately as children trained to attend to the source of events.

Previous research examining whether preschool children will transfer training from certain cognitive tasks to performance on similar tasks has often found that transfer of training is difficult to obtain with this age group. However, there are some studies that have found training effects showing that young children can learn to abstract general principles acquired through examples and can transfer this learning on the basis of properties other than appearance (Brown & Kane, 1988; Brown, Kane, & Echols, 1986; Lange & Pierce, 1992). In Brown and Kane's (1988) study, children as young as 3 years learned how to solve problems presented in a series of example stories and used that knowledge to solve similar problems presented in different transfer stories. Our task, which required that children learn to evaluate the accuracy of questions about the puppet show and use those same skills for evaluation of questions about the science experiments, was somewhat analogous to the task used by Brown and Kane. Our findings are consistent with their results and those of other such studies.

However, in these studies, as well as in the present study, training was very intensive, consisting of metacognitive feedback on the importance of using a given strategy. For example, a component of the training used in the present study required children to indicate why a question was misleading or not misleading. Because the questions were always misleading with regard to source, children in the source-monitoring condition might have realized the importance of considering source information when responding to questions about events.

The findings of the present study conflict with other researchers' efforts to reduce children's suggestibility with source-monitoring tasks. For instance, Leichtman, Morse, Dixon, and Spiegel (2000) reinforced the source of children's knowledge about a toy obtained either by watching a video about the toy, hearing about the toy through a story, or actually playing with the toy. Children in the source-reinforcement condition were told about how they learned about the toy and were required to repeat this source information back to the interviewer, whereas children in a memory-reinforcement condition were simply told descriptive, nonsource information about the toy. Leichtman et al. found no differences between 3-4-year-olds in the source-reinforcement condition, the memory-reinforcement condition, or a control condition that received no reinforcement of any kind. Children performed poorly in all conditions.

Some noteworthy differences between the study by Leichtman et al. (2000) and the present study might account for the discrepant findings between the two. Leichtman et al. did not use a training task that required children to actively monitor the sources of events. In our study, by contrast, children were required to monitor the sources of events in addition to being required to detect and reject misleading source information embedded in training questions. In addition, the children had to reach a criterion of correct responding before they were considered trained. This criterion provided reassurance that all children in the training condition were at the same level of source learning. In Leichtman et al.'s study, however, there did not seem to be a measure of children's ability to use recently monitored source information to reject misinformation embedded in questions. The present study, in conjunction with other training studies, indicates how extensive and supportive training must be in order for this young age group

to benefit from training (Brown & Kane, 1988; Brown et al., 1986; Crisafi & Brown, 1986).

The facilitative effect of source-monitoring training on children's memory performance indicates that for this particular process, children may be operating in the production deficiency phase, rather than in the utilization deficiency phase, which seemed to be the case in Thierry et al. (2001). Production deficiencies occur when children who do not spontaneously use a strategy can use one when trained to do so and experience facilitations in memory performance as a result of using the strategy (Flavell, 1970). When responding to the target questions, children in the SMT group used the source-monitoring strategy on which they were trained, and this resulted in their ability to reject misleading source information. In the study by Thierry et al. (2001), the source-monitoring task may not have been sufficient to allow children's memories to benefit from source monitoring, so the children in this previous study seemed utilization deficient.

Young children can thus benefit from source-monitoring training, as evidenced by their yes-no question performance; however, the transfer effect consistently occurred only when children were presented with identical question types during training and transfer sessions. When yes-no questions were presented in both training and transfer sessions (e.g., "In real life, did Mrs. Science catch fish?"), source-monitoring training improved performance over control group performance for both misleading and nonmisleading questions. When children were trained on yes-no questions but tested for transfer of source-monitoring training using open-ended questions, a different pattern of results occurred. Children in the SMT group were more accurate than children in the control group when tested with nonmisleading open-ended questions during the transfer test. This finding was due to the control group's tendency to let information from another source intrude into their responses. Source-monitoring training seemed to focus children's reports on the event in question, because their errors tended to be intra-event (within-source) confusions about items in experiments depicted in a real-life or video event rather than intrusions of extra-event (between-sources) details. No effect of training was apparent in children's responses to the misleading open-ended questions. Perhaps if older children, who are more proficient at source monitoring, were tested with this training task, their knowledge might have generalized to the different question type, because studies do indicate that older children more readily transfer training to analogous tasks than do younger children (Bjorklund & Jacobs, 1985; Miller, Woody-Ramsey, & Aloise, 1991).

An explanation for the failure of source-monitoring training to transfer to the misleading open-ended questions might involve the differential demand characteristics associated with each misleading question type. The misleading open-ended questions presupposed that the suggested information had occurred in a given target event (e.g., "What happened when Mrs. Science dropped a spoon into a glass?" was asked although she never did this). The misleading yes-no questions may have been less demanding because these questions did not presuppose the suggested information; the questions asked whether an event occurred from a given source (e.g., "In real life, did Mrs. Science make a song?"). The misleading open-ended questions were phrased so that false suggestions were more strongly imposed on the child and were thus more socially demanding. This demand-characteristics explanation is supported by the performance of children in the SMT group when

responding to the nonmisleading open-ended questions, which, like the misleading questions, probed children for target event details but, unlike the misleading questions, did not suggest false information (e.g., "What did Mrs. Science pour into glass bottles to make music?"). In response to the nonmisleading open-ended questions, children in the SMT group were more accurate than children in the control group.

This finding suggests that the failure of source-monitoring training to transfer to the misleading open-ended questions may not have been due to problems that the children were having in remembering the event details, because children in the SMT group were able to correctly recall event details when responding to the nonmisleading open-ended questions. Social demand characteristics associated with the misleading open-ended questions likely prevented source-monitoring training from transferring to these questions. The children might simply have agreed with the adult interviewer's suggestions despite their ability to accurately recall what actually occurred in a given event, which would be consistent with findings from eyewitness studies investigating the effects of social demands on children's suggestibility (Ceci et al., 1987; Davis & Bottoms, 2002; Schooler & Loftus, 1993; Zaragoza, Dahlgren, & Muench, 1992).

The results of the current study are also relevant for the issues surrounding children's development of dual representational abilities (DeLoache, 1987, 1991). Dual representation involves knowledge that the same entity can be represented in different ways. For example, children younger than 3 years of age have problems understanding that a model of a room is both an object in itself and a representation of an actual room (DeLoache, 1987, 1991; Flavell, 1988). In one type of task linked to dual representational ability, the representational change task (Gopnik & Astington, 1988), children are first shown an unopened candy box and are asked what they think is inside the box. After responding that they think candy is inside the box, the children are then shown that the contents of the box are actually pencils. When asked what they previously thought was inside the box, 3–4-year-olds claim that they always knew that pencils were indeed the contents of the box. Not until around 4–5 years of age are children able to correctly say that they previously thought candy was contained in the box.

It has been suggested that young children fail these tasks because in these situations, "they must consider two different beliefs or representations for one target" (Bjorklund, 1995, p. 210). Children's dual representation difficulties might also be related to the problems they have when responding to misleading questions about a witnessed event (Welch-Ross, Diecidue, & Miller, 1997). In eyewitness studies, children must consider what the interviewer suggests about a given event and compare that representation to what they actually know about the event. For example, when asked the misleading yes-no question "In real life, did Mrs. Science make a song?" (when, in fact, she made a song on TV), children had to compare what the interviewer suggested about the source of the event with what they actually remembered about the source of the event. They had to consider two conflicting representations about a single event: the representation that they acquired from the interviewer's suggestion and their past representation or memory about the true source of the event.

The results from the present study suggest that source-monitoring training helps children to better deal with conflicting representations. However, source-monitoring training did not only

affect children's responses to misleading yes-no questions; it also helped children's performance on nonmisleading yes-no questions. When asked the nonmisleading yes-no questions, children were confronted with nonconflicting representations about the sources of events. These questions should have been compatible with their memories about the sources of the events, so children should not have had much difficulty responding to these questions, especially if limitations in dealing with conflicting mental representations were the sole reason for their tendency to be misled. Despite this compatibility, children in the control group still performed less accurately when responding to the nonmisleading yes-no questions than did children in the SMT group. The control group's correct response rate was at chance, whereas the SMT group's correct response rate was well above chance.

These results indicate that children's suggestibility is not solely related to difficulties associated with dealing with conflicting mental representations but is also related to their difficulties associated with source monitoring. Without training in source monitoring, young children may have difficulties determining how event information was acquired, especially events that are similar in perceptual and semantic content (Johnson et al., 1993). Children may need practice in evaluating memory characteristics to correctly decipher the sources of witnessed events, especially after a delay, when memories for source information might not be as accessible as they would be at immediate testing (Brainerd, Reyna, Howe, & Kingma, 1990; Gopnik & Graf, 1988). With practice, children might learn to recognize distinguishing features of memories that can be used to attribute an event to real life or television, such as remembering the camera zooming in on certain objects and thus attributing a memory to an event that occurred on television. Future research might also examine how older children perform with this type of training. For instance, perhaps older children who are given source-monitoring and control training would be equally accurate in response to the nonmisleading yes-no questions given their tendency to monitor the sources of events more proficiently than younger children (Foley & Johnson, 1985; Foley et al., 1983; Lindsay et al., 1991; Roberts & Blades, 1998). Older children (e.g., 5–6-year-olds) may have more difficulty dealing with conflicting representations than dealing with nonconflicting representations, and source-monitoring training might be more important for them when responding to misleading questions.

The present findings are congruent with the growing body of studies linking children's source-monitoring ability to their suggestibility (Ackil & Zaragoza, 1995; Leichtman et al., 2000; Lindsay, Gonzales, & Eso, 1995; Mazzoni, 1998; Poole & Lindsay, 1995; Quas, Schaaf, Alexander, & Goodman, 2000). Young children who are better at source monitoring are less suggestible than children who are poorer at source monitoring (Leichtman et al., 2000; Mazzoni, 1998). These findings have important implications for interviewing child witnesses. Source-monitoring training procedures could perhaps be incorporated into interview protocols used to elicit more accurate information from child witnesses. For instance, Lamb and his colleagues developed the National Institute of Child Health and Human Development interview protocol that investigators are trained to use when questioning child witnesses about alleged sexual and physical abuse (Orbach et al., 2000; Sternberg, Lamb, Orbach, Esplin, & Mitchell, 2001). The protocol involves such presubstantive interview techniques as truth-lie discrimination, reminding children of the "don't know" response



option, and using primarily nonsuggestive open-ended questions, which have been shown to elicit more accurate information from young children than have closed question forms, such as yes-no questions (Dale, Loftus, & Rathbun, 1978; Dent & Stephenson, 1979; Peterson & Biggs, 1997). Source-monitoring training could be incorporated into these presubstantive techniques as a means to ensure that children are reporting about the event in question and not letting memories from other sources (e.g., television, suggested information) intrude into their reports. However, much more research needs to be conducted before implementing this kind of training into protocols. For instance, additional studies should examine how training on other source distinctions, such as real-life versus heard-about events, affects children's accuracy and suggestibility given that studies indicate a tendency for children to confuse heard-about events with events they have actually seen (Ackil & Zaragoza, 1995; Poole & Lindsay, 2001).

Another caveat regarding the practical implications of the present study concerns issues of ecological validity. For example, in many cases of sexual abuse, children are interviewed after delays of months or even years since the abuse occurred. Future work should examine whether children can benefit from source-monitoring training after such lengthy delays. In addition, though the "Mrs. Science" event was quite salient for the children, the event is not analogous to the kinds of emotionally charged events for which children must often testify, as in cases of sexual abuse. However, given that source-monitoring training was successful for the emotionally neutral yet salient events used in the present study, one might expect that training would also be successful for more personally significant, salient events. Studies suggest that events that involve an "optimal" degree of emotional significance seem more strongly represented in memory than events that involve less emotional significance (Bahrick, Parker, Fivush, & Levitt, 1998). In light of such findings, laboratory studies of source-monitoring training should have some applied validity, especially if they incorporate longer delays and training on other source distinctions.

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