

A Real-life Event Enhances the Accuracy of Preschoolers' Recall

KAREN L. THIERRY^{1*} and MELANIE J. SPENCE²

¹*National Institute of Child Health and Human Development,
Section on Social and Emotional Development, Bethesda, MD, USA*

²*The University of Texas at Dallas, School of Behavioral and Brain Sciences, Richardson, TX, USA*

SUMMARY

Children's memory and susceptibility to misinformation about a real-life and video event were examined. Eighty-six three- to four-year-olds and five- to six-year-olds observed an event either in real life or on video. Immediately afterward, they freely recalled the event and answered misleading questions about central and descriptive information. Three- to four-year-olds in the video condition were less likely to accurately recall descriptive information than three- to four-year-olds in the live condition and five- to six-year-olds in either condition. Children in the video condition were less accurate in response to misleading questions than those in the live condition. When video condition three- to four-year-olds in Experiment 2 were asked nonmisleading questions that prompted them for descriptive information, they recalled descriptors less accurately than those in the live condition. These results have particularly important implications for studies that utilize video events when investigating children's eyewitness memory. Copyright © 2004 John Wiley & Sons, Ltd.

Children are frequently required to testify about events that they either observed or in which they directly participated. Many studies have investigated children's memory for staged events in the laboratory in order to understand children's eyewitness capabilities. Some of these studies examined children's memories of target events performed in real life (Rudy & Goodman, 1991), while other studies consisted of events that were merely read to children via a storybook (Ceci, Ross, & Toglia, 1987) or that they watched on a video (Ackil & Zaragoza, 1995). Thus, researchers studying eyewitness memory and issues related to memory development may utilize target events that are presented to children from various media. The study presented in this paper examined whether children differentially recall events acquired from two presentation media: real life versus video.

Studies examining infants' and young children's behavioral reenactment of events modelled live and on video reveal a developmental progression in how well children learn from video presentations. When a one-step action using a novel toy was modelled on a video, 14-month-olds could imitate the action immediately and 24 h later (Meltzoff, 1988) and did so as well as 14-month-olds who were modelled the same action live in another study (Meltzoff, 1985). However, the complexity of action sequences seems to affect

*Correspondence to: K. L. Thierry, Section on Social and Emotional Development, National Institute of Child Health and Human Development, Rockledge One Center, 6705 Rockledge Drive, Suite 8048, Bethesda, MD 20892, USA. E-mail: thierryk@mail.nih.gov

imitation from live and video sources. Barr and Hayne (1999) modelled three-step action sequences (i.e. removing a mitten from a puppet's hand, shaking it, and replacing it on the puppet's hand) that were presented to 12-, 15- and 18-month-olds either live or on a video. They found that although 12- and 15-month-olds in the live condition imitated the actions, those in the video condition did not. Eighteen-month-olds were able to imitate from the video; however, imitation was facilitated by seeing the actions presented live.

By three years of age, children can imitate video actions as well as they imitate live actions. McCall, Parke, and Kavanaugh (1977) examined three-year-olds' ability to imitate multi-step action sequences and found that children who watched the actions modelled on a video imitated the actions equally as often as those who watched live models of the actions. A question that stems from this research concerns how well preschool-aged (three- to five-year-olds) children remember and verbally report information about events seen on video, particularly if they are confronted with misleading questions about those events.

Researchers investigating children's eyewitness memory of events seen in real life and on video have found differences in children's recall of events acquired from the two sources. For instance, Roberts and Blades (1999) examined four- and 10-year-olds' memories of similar events seen in real life and on video and found that the four-year-olds recalled the video event less accurately than they recalled the live event. It is not clear whether children were less accurate about the video event because of distortions of central or descriptive features or intrusions of live event information, as these analyses were not included. There was no difference in the 10-year-olds' recall of the live and video events. Because the children saw different (though similar) live and video events, however, it is difficult to draw any conclusions about the effect of the medium of event presentation on children's memories. Particular features associated with the real-life event could have made it more memorable than the video event.

Tobey and Goodman (1992) compared four-year-old children's recall accuracy and suggestibility for an event in which they either participated in real life or observed on a video. They found that children who participated in the real-life event were more accurate in their free recall about central actions and less susceptible to misleading information than children who merely observed the same event on video. In their study, however, memories of real-life participatory events were compared to memories of video observed events. It is unclear whether the free recall and suggestibility differences found were a result of participation or a result of the medium (i.e. real life versus video) of event presentation.

Differences in children's recall of live and video events are predicted by theories of television learning that emphasize the role of visual perception in processing information from television. Schmitt and Anderson (2002) thus proposed that young children have more difficulty learning from television than from real life because their representations of information acquired from television are weaker than their representations based on live information. They argued that the two-dimensional representation of a television image is degraded in terms of cues to depth perception, such as texture, shadow gradients, and stereopsis. Television images thus contrast with live presentations in which rich representations of three-dimensional information is available. Because of the degraded nature of television representations, interpreting actions and objects seen on television may more heavily tax young children's information-processing resources. They may then fail to attend to more descriptive details of television stimuli, such as the colour or number of objects present.

By three years of age, children can remember the objects and actions associated with events seen on television equally as well as they remember these features of events seen in real life (McCall et al., 1977). As a result, children at this age should not have any difficulty recalling actions and objects seen on video. To test this hypothesis, in Experiment 1, three- to four-year-olds and five- to six-year-olds watched a science event either live or on video. Immediately afterward, they freely recalled the event and answered questions that misled them about central and descriptive features. We predicted that there would be no difference between the children in the live and video conditions in their recall and suggestibility with respect to central information (i.e. main actions and objects; for a similar definition of central information, see Cassel & Bjorklund, 1995; Roebbers & Schneider, 2000; Saywitz & Snyder, 1996).

When remembering real-life events, children are less likely to freely recall descriptive information than central actions and objects; in addition, they are more likely to be misled about descriptive details than about central aspects of a real-life event (Cassel & Bjorklund, 1995; Goodman, Aman, & Hirschman, 1987). Because children do not spontaneously recall descriptive information seen in real-life events, they should have even more difficulty recalling this type of information seen on video, if television events are associated with degraded representations. Furthermore, children who see an event on television may be more likely to be misled about descriptive details than central information in comparison to children who see the event live. These hypotheses were tested in the present study. Developmental differences in the effect of presentation medium on memory were also examined. Perhaps the medium of event presentation would affect younger children's (three- to four-year-olds) but not older children's (five- to six-year-olds) memory accuracy.

Experiment 2 was conducted in order to examine whether the difficulty exhibited by three- to four-year-olds in the video condition when freely recalling descriptors in Experiment 1 would be eliminated if they were probed for these details using focused, nonmisleading open-ended questions.

EXPERIMENT 1

Method

Participants and design

Eighty-six three- to four-year-olds ($n = 43$) and five- to six-year-olds ($n = 43$) participated in the study. Children were recruited from four child-care centres, were of middle- to high-socioeconomic status, and were primarily of Caucasian descent. Parents gave informed consent for their child's participation.

Children in each age group were randomly assigned to either the live or video condition described below, with approximately equal numbers of males and females in each age \times condition cell. The mean ages of three- to four-year-olds in the live condition ($n = 19$) and video condition ($n = 24$) were 4.51 years ($SD = 0.30$) and 4.31 years ($SD = 0.48$), respectively. The mean ages of five- to six-year-olds in the live ($n = 21$) and video conditions ($n = 22$) were 5.75 years ($SD = 0.31$) and 5.63 years ($SD = 0.42$), respectively.

Target event

The target event consisted of three science demonstrations (Wilkes, 1990) performed by an experimenter known as 'Mrs Science' (see Appendix for a description of the science

event).¹ The same experimenter was featured in the real-life and video show. Children in the live condition observed the target event in real life, while children in the video condition saw the event on a video played on a colour television monitor. The video event was pre-taped prior to entering the schools. The same videotape was shown to all children in the video condition. The videotape consisted of formal features, such as zooming in on objects and panning across the screen. To control for contextual differences between the real-life and video presentations, Mrs Science performed the live and video event while wearing a white lab coat and standing in front of a red and white checkerboard background. She adhered to a script for the live presentation that was identical to that used for the video presentation. Within the script, she narrated exactly what she was doing, labelling the objects, describing the objects (e.g. indicating the colour and number of objects present) and the actions being performed (e.g. 'Now I'm pouring blue water into the jar'). Children in the live and video conditions were instructed to watch quietly and wait until the end of the presentation to ask any questions. For each presentation, Mrs Science was present in the room to ensure that the children were attending to the event.

Procedure

Target event presentation. Mrs Science accompanied three to four children to a quiet room in the school and began her live or videotaped demonstration. The total presentation time of the event was about 7.5 min. After watching the event, a second experimenter, who was absent during presentation of the target event, escorted an individual child to a different room and engaged the child in conversation about topics unrelated to the science demonstration to control for short-term memory effects. Following this filler activity, the second experimenter administered a surprise interview consisting of free recall followed by misleading questions about the target event.

Interview session: free recall. In free recall, each child was asked to recall everything that happened in the target event. The interviewer started her questioning with the general prompt, 'Tell me everything that Mrs Science did,' and adhered to a protocol that ensured that each child received nonsuggestive prompts for additional information after each response provided by the child. The specific prompts depended on the children's responses, but they were all general open-ended questions designed to elicit more detail on an established topic. For example, if a child recalled that 'Mrs Science had a balloon,' the experimenter followed up this response with an open-ended prompt, such as 'Tell me about the balloon.' However, these prompts did not cue children for descriptive information, such as the colour or number of objects mentioned. When a child completed discussion of a particular topic, the experimenter prompted the child with statements, such as 'Tell me more about the science show,' until the child provided no additional information.

Interview session: misleading questions. The free recall was followed by a set of five misleading, open-ended questions about the target event. Prior to asking the misleading questions, the second 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

¹This event was quite salient for the children, as evidenced by their attention, in general, to the experiments. Science events have been used to study children's eyewitness memory in other studies (Poole & Lindsay, 1995, 2001, 2002; Thierry & Spence, 2002).

gave all of the children the option of saying 'I don't know' in response to the misleading questions.

All of the questions misled children about details that occurred in the science experiments, however, the questions varied with respect to the kind of misleading details included in the question. Three questions (misleading-central) misled children about central objects and actions that comprised the science experiments. Two questions (misleading-descriptive) misled them about descriptive features of objects, such as colour or number. Each question began with information about the event and then incorporated false information, either central or descriptive, about an object or action. For example, one misleading-central question asked, 'What happened when Mrs Science dropped a keychain into the bottles of colored water?' The misleading detail in this question is 'keychain' because it was not the object associated with this experiment; a 'spoon' was actually used in this experiment, and constituted one of the central objects used in the experiment. Two randomized orders of the set of questions were constructed and half of the children in each condition received each version. All interview sessions were audiotaped.

Results

Free recall

Free recall assessed children's spontaneous reports of the target events and represented a measure of their underlying representation or memory of the event. Free-recall responses were coded for three units of information: 1) central actions, 2) central objects and 3) descriptors, such as the colour or number of objects. For instance, the response, 'Mrs Science poured green water in a bottle' would consist of 1 unit of action information for 'poured,' 2 units of object information for 'water' and 'bottle,' and 1 unit of descriptive information for 'green.' Incorrect details involved responses that included actions and objects that were not used in the science experiments (e.g. saying that Mrs Science made a volcano when this never occurred) and descriptive information not related to the objects in the science experiments (e.g. attributing the wrong colour to an object). Each child's transcribed responses were coded by a trained rater. Twenty per cent of the cases from each age \times group cell were randomly selected and coded by a second rater. Inter-rater reliability using Cohen's kappa was 0.90.

Preliminary analyses indicated no difference between children in the live and video conditions for numbers and percentages (accuracy) of correct actions and objects. As a result, action and object measures were combined in the following analyses. In the following free-recall analyses, two children in the live condition (both three- to four-year-olds) and three children in the video condition (three- to four-year-olds: $n = 2$; five- to six-year-olds: $n = 1$) were excluded because of their failure to report any information. When numbers of correct actions and objects (see Table 1) were entered into an age (2) \times group (2) ANOVA, a main effect of age, $F(1, 77) = 11.46$, $p < 0.01$, was found. The five- to six-year-olds ($M = 10.19$, $SD = 4.33$) recalled more actions and objects than did the three- to four-year-olds ($M = 6.95$, $SD = 3.89$).

To assess accuracy of actions and objects, the numbers of correct actions and objects recalled was divided by the total number of correct and incorrect actions and objects recalled (see Table 1). This accuracy measure was entered into an age (2) \times group (2) ANOVA in which no significant effects were found. Three- to four-year-olds in the live and video conditions recalled actions and objects as accurately as five- to six-year-olds in the live and video conditions.

Table 1. Numbers and percentages of correct actions and objects and descriptors freely recalled in Experiment 1 (*SDs*)

	Number correct		Percentage correct	
	Live	Video	Live	Video
Actions and objects				
3- to 4-year-olds	8.24 (4.21)	5.95 (3.40)	83.91 (27.87)	83.83 (30.49)
5- to 6-year-olds	9.90 (4.39)	10.48 (4.35)	82.10 (25.24)	93.39 (23.02)
Descriptors				
3- to 4-year-olds	3.38 (2.72)	1.00 (1.15)	100.00 (0.00)	50.00 (57.74)
5- to 6-year-olds	4.14 (3.65)	3.91 (3.27)	96.43 (13.36)	100.00 (0.00)

The next free-recall measure was the number of correct details about descriptive information (e.g. colour, number of objects used). Numbers of correct descriptors (see Table 1) were entered into an age (2) \times group (2) ANOVA, in which no significant effects were found. Three- to four-year-olds and five- to six-year-olds in the live and video conditions produced equal numbers of correct descriptors. An age (2) \times group (2) ANOVA was not performed on the percentage of correct (accuracy) descriptors (see Table 1), because three- to four-year-olds in the live condition and five- to six-year-olds in the video condition exhibited perfect accuracy; five- to six-year-olds in the live condition showed near perfect accuracy. Three- to four-year-olds in the video condition exhibited the lowest accuracy ($M = 50.00$, $SD = 57.74$).

Separate chi-square tests comparing three to four- and five to six-year-olds who did or did not report descriptors as a function of live or video condition were conducted. For the three- to four-year-olds, there was a borderline effect of condition, $\chi^2(1) = 3.42$, $p = 0.06$, with 17% ($n = 4$) of the three- to four-year-olds in the video condition and 42% ($n = 8$) of three- to four-year-olds in the live condition reporting descriptors. Five- to six-year-olds in the live and video condition were equally as likely to report descriptors, with 67% ($n = 14$) of the five- to six-year-olds in the live condition and 50% ($n = 11$) of the five- to six-year-olds in the video condition recalling descriptive information. The three- to four-year-olds in the video condition were thus less likely than their age-mates in the live condition to recall descriptors and when they recalled this information, they did so less accurately than the children in the other conditions.

Misleading questions

Children's responses to the misleading-central and misleading-descriptive questions were coded as correct, incorrect, or don't know. Correct responses were defined as responses that pinpointed the false information embedded in the questions. For example, when responding to the misleading-descriptive 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 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 'I don't know' or 'I can't remember.'

The percentages of correct, incorrect, and don't know responses were entered into separate age (2) \times group (2) \times question type (central vs. descriptive) mixed ANOVAs. Percentages were computed by dividing the number of each response type by the total number of misleading-central and misleading-descriptive questions for which responses

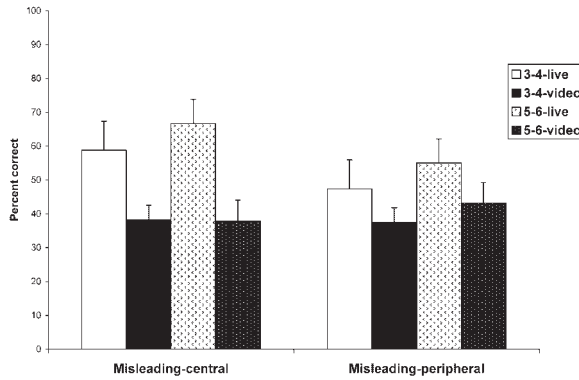


Figure 1. Percentage of correct responses to misleading-central and misleading-peripheral questions as a function of age and group in Experiment 1 (error bars represent SEs)

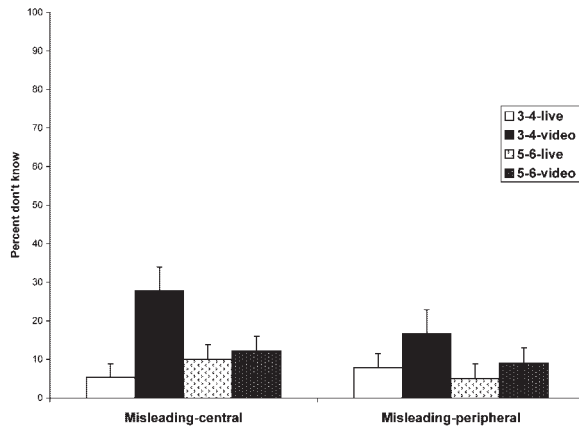


Figure 2. Percentage of don't know responses to misleading-central and misleading-peripheral questions as a function of age and group in Experiment 1 (error bars represent SEs)

were given. For correct responses, there was a main effect of group, $F(1, 81) = 10.79, p < 0.01$ (see Figure 1), indicating that children in the live condition ($M = 57.05, SD = 34.55$) were more accurate than those in the video condition ($M = 39.13, SD = 29.32$). For incorrect responses, there were no significant effects, although there was a trend, $F(1, 81) = 3.48, p = 0.07$, for children in both conditions to produce more incorrect responses to the misleading-descriptive ($M = 44.71, SD = 35.38$) than to the misleading-central ($M = 36.08, SD = 29.86$) questions.

Finally, for don't know responses, there was a main effect of group, $F(1, 81) = 6.03, p < 0.05$ (see Figure 2), revealing that children in the video condition ($M = 16.67, SD = 25.78$) produced more don't know responses than those in the live condition ($M = 7.05, SD = 16.54$).

Conclusions

In sum, seeing the event on video decreased three- to four-year-olds', but not five- to six-year-olds', tendency to report descriptors in free recall. However, the video event reduced the accuracy of both three- to four- and five- to six-year-olds' responses to misleading

questions about central and descriptive event features. Thus, despite the ability to freely recall descriptors, five- to six-year-olds in the video condition had difficulty accurately responding to misleading questions about this information, a finding that parallels many eyewitness studies (Bjorklund, Bjorklund, Douglas, & Cassel, 1998; Roberts & Blades, 1999). However, children in the video condition were less accurate in response to the misleading questions than those in the live condition not because of a greater susceptibility to the misleading questions (i.e. more incorrect responding) but because of a greater tendency than children in the live condition to respond with 'don't know.'

Discussion

Because watching the event on video tended to affect only the three- to four-year-olds' free recall of descriptors and because three- to four-year-olds have difficulty spontaneously retrieving details from memory (Ornstein, Gordon, & Larus, 1992), perhaps if they were directly probed in a nonmisleading manner for descriptive information, they would recall these details as accurately as three- to four-year-olds in the live condition. Studies indicate that children are more accurate in response to nonmisleading questions than in response to misleading questions (Dale, Loftus, & Rathbun, 1978; Dent & Stephenson, 1979). As a result, investigative interview protocols encourage the use of nonmisleading, open-ended questions to elicit details from child witnesses (Poole & Lamb, 1998), particularly those aged three to four years who are the most susceptible to suggestion (Ceci & Bruck, 1993). It is thus important to examine children's memory abilities when they are asked focused, *nonmisleading* questions, as many eyewitness studies in fact do (Gee & Pipe, 1995; Pipe, Gee, Wilson, & Egerton, 1999). Perhaps three- to four-year-old children who see the event on video would provide as many correct responses to nonmisleading questions as those who see the event in real life. Experiment 2 examined this issue.

EXPERIMENT 2

Because Experiment 1 incorporated only free recall, in which spontaneous reports were assessed, and misleading questions, Experiment 2 examined whether the video event would continue to affect three- to four-year-olds' recall when they were directly probed for descriptive details using nonmisleading, open-ended questions. The finding that the five- to six-year-olds in the live and video conditions could spontaneously retrieve descriptive information suggests that if prompted nonsuggestively for this information, five- to six-year-olds would not have any difficulty retrieving it from memory. In Experiment 2, therefore, only three- to four-year-old children participated.

We administered the same target event presentation to another group of three- to four-year-olds who were randomly assigned to a live or video condition. After watching the live or video event, the children were asked nonmisleading questions that cued their memory for both central actions and objects and descriptive details. If children in the video condition produce as many correct responses to the descriptive-detail questions as children in the live condition, then this finding would suggest that the difficulty three- to four-year-olds in the video condition had in reporting descriptive information in free recall was a result of being required to spontaneously recall these details. Perhaps three- to four-year-olds in the video condition in Experiment 1 encoded the descriptive details of the event, but had difficulty spontaneously retrieving these details from memory and needed more

focused prompting. However, if they continue to show lower accuracy than their live condition agemates and failure to report this type of information after prompting, then processing descriptive information seen on television is problematic for this age group not only in free recall and in response to misleading questions but also in response to nonmisleading, open-ended questions.

Method

Participants

Twenty-eight three- to four-year-olds who did not participate in Experiment 1 were randomly assigned to a live ($n = 14$) or video condition ($n = 14$) with approximately equal numbers of males and females in each group. The mean ages of children in the live and video conditions were 4.40 years ($SD = 0.37$) and 4.49 years ($SD = 0.34$), respectively. These children attended the same child-care centres and were of similar socioeconomic status and ethnicity as the children in Experiment 1.

Target events and procedure

All children observed the same Mrs Science live or video target event used in Experiment 1. After presentation of the target event, a second experimenter escorted each child to a room where the science demonstration was not held and engaged the child in conversation about topics unrelated to the science demonstration (filler activity). The second experimenter then asked each child 12 nonmisleading, open-ended questions about the target event that cued memories for central actions and objects (e.g. 'What did Mrs Science use to go fishing?') in addition to descriptive details about the objects (e.g. 'What color was the balloon that Mrs Science blew up inside a cup?'). The questions were presented in random order for each child.

Results

Each question earned differing numbers of points depending on the number of units of information for which the questions probed (i.e. number of objects, actions, descriptors cued). For the six questions about central actions and objects, the maximum score was 7 (one question could give a maximum of 2 units and five questions 1 unit each), and for the questions about descriptive details, the maximum score was 9 (one question could give a maximum of 4 units and five questions 1 unit each). First, numbers of correct central actions and objects were entered into a one-way ANOVA with group as the independent variable. No significant effect was found; children in the live ($M = 6.21$ [89%], $SD = 1.05$) and video ($M = 5.64$ [81%], $SD = 1.28$) condition produced similarly high numbers of correct responses about central actions and objects. Next, number of correct responses to descriptor-cue questions was entered into a one-way ANOVA and a main effect of group, $F(1, 26) = 5.49$, $p < 0.05$, was revealed. Children in the live condition ($M = 7.64$, $SD = 1.78$) produced more correct responses than those in the video condition ($M = 5.43$, $SD = 3.06$). The children in the live condition thus accurately recalled about 85% of the descriptors cued, while the children in the video condition accurately recalled about 60% of the descriptors.

These findings show that children who saw the event on video could accurately recall most of the descriptive details cued, but the accuracy of children in the video condition was still significantly lower than that of children in the live condition.

GENERAL DISCUSSION

The results indicated that the medium of event presentation affected children's accuracy and susceptibility to misinformation. The accuracy of three- to four-year-olds in the video condition was degraded both when freely recalling details and when responding to both misleading and nonmisleading questions. Five- to six-year-olds who watched the target event on video were less accurate in response to misleading questions than those who saw the presentation live.

This study adds to the literature examining qualitative differences in children's memories of events involving different media of presentation. Tobey and Goodman (1992) found that four-year-olds who participated in a real-life event recalled actions more accurately and with lower rates of suggestibility than those who watched the event on video. The present study indicated that simply observing a real-life event also resulted in higher free recall (for three- to four-year-olds) and misleading-question accuracy than observing the same event on video.

Researchers have also shown that events in which children participate in real life are associated with more accurate memory representations than real-life events which they merely observe as a bystander. For instance, in Rudy and Goodman (1991), four-year-olds who were direct participants in a real-life event were less susceptible to misleading questions than children who observed the real-life event. Likewise, Murachver, Pipe, Gordon, Owens, and Fivush (1996) found that children who participated in a real-life event were more accurate in free recall than children who only watched the event and children who heard a story about the event. The accuracy of children in the watch only and story conditions did not differ. However, when behaviourally reenacting the event, children in the participant and observe conditions were equally accurate, while children in both of these groups were more accurate than those in the story condition. Future studies should more systematically examine whether children's recall becomes increasingly accurate as the medium of presentation approximates a real-life experience in which direct participation is involved.

The free-recall performance of the five- to six-year-olds in both the live and video conditions suggests that their memories of the event should have been accessible, allowing them to respond accurately to the misleading questions. However, children in the video condition were less accurate in response to these questions than those in the live condition. Perhaps children in the video condition were susceptible to the heavy demand characteristics of the suppositional-type misleading questions asked, as children do show greater susceptibility to this form of misleading question than to yes-no misleading questions that do not presuppose misinformation (Thierry & Spence, 2002). Social demand characteristics of the misleading-question task cannot be the sole reason for the children's performance, however. Seeing the event on video should not have directly affected children's sensitivity to demand characteristics. A more likely interpretation of the findings is that an information-processing failure impacted the performance of children in the video condition.

The type of memory failure responsible for the performance of the three to four- and five to six-year-olds in the video condition is unclear. One type of memory failure could have been due to problems accessing or retrieving the memory traces. Studies indicate that younger children are less likely to spontaneously retrieve event details from memory and need more focused prompting than do older children (Fivush & Hamond, 1989; Hamond & Fivush, 1991). Although three- to four-year-olds in the video condition were less accurate than those in the live condition in Experiment 2, three- to four-year-olds in the

video condition recalled a significant portion of the descriptors (60%). This finding suggests that many of the descriptive details did get encoded into memory, and the children in the video condition in Experiment 1 needed more focused prompting for this information than was provided in free recall. Unlike the three- to four-year-olds, five- to six-year-olds in both the live and video conditions evidenced no retrieval difficulties when freely recalling the event, making the misleading-question performance of five- to six-year-olds in the video condition less likely to be attributable to inferior retrieval abilities.

Another explanation for the type of memory failure responsible for the performance of children in the video condition involves differences in encoding the live and video event. Younger children do not encode and store information as effectively as older children do (Brainerd, Reyna, Howe, & Kingma, 1990). In addition, theories of memory development acknowledge the existence of a continuum of memory trace strength (Brainerd & Reyna, 1990; Ceci, Togliola, & Ross, 1988), such that stronger or weaker memory traces of target event information can be created. Perhaps watching the event on video resulted in weaker memory traces of descriptive information than watching the event live. This idea is consistent with Schmitt and Anderson (2002) who suggested that interpreting actions and objects on television may be more difficult for young children because of the degraded nature of the television representation. Because interpreting and attending to the actions and objects presented on television may more heavily tax young children's information-processing resources, they may not attend to more peripheral details of television stimuli, such as descriptive information. If the memory traces of the children in the video condition were not as strong as the memory traces of children in the live condition, then they may not have been able to correct the interviewer's false suggestions to the same degree that children in the live condition were, and thus tended to respond with 'don't know.' The presentation medium effects were observed when children were tested immediately after they witnessed the event. Perhaps these effects would be even more pronounced after long delays when memory traces of the video may be more degraded due to forgetting (Gobbo, Mega, & Pipe, 2002).

The results of the present study have important implications for researchers investigating children's eyewitness abilities. Those studies that present target events to children via a video may be overestimating children's susceptibility to misleading questions about central actions and objects and descriptive information experienced in real-life events. To gain better assessments of children's ability to accurately respond to misleading questions, researchers may want to utilize more salient events, such as real-life presentations. These events would likely enhance the accuracy of children's responses to misleading questions as well as the ecological validity of the study. Because eyewitness studies are meant to generalize to instances where children have witnessed some type of real-life event, it would be desirable to present live target events to children in laboratory studies. Furthermore, the results suggest that children who have really witnessed or experienced an event (e.g. victims of child sexual or physical abuse) may not be as susceptible to misinformation as some research would indicate (Ceci & Bruck, 1993). Future research might also examine whether the presentation medium affects older children and adults' eyewitness abilities. Perhaps these media effects are restricted to the young age groups examined in the present study.

ACKNOWLEDGEMENTS

These data were presented at the American Psychology-Law Society Conference, Austin, TX, March 2002. The authors wish to thank the children, teachers, staff, and parents at the

participating schools. Thanks are also extended to those who participated in data collection, especially Kelly Bentley, Leigh Brewer, Karen Gove, Chanta Khiev, Julie Kinsler, and Lucia Ramirez.

APPENDIX

Summary of target event

Balloon trick

1. Blow up yellow balloon
2. Pick up cup using stem of balloon
3. Show how balloon sticks to inside of cup

Magnetic fishing

1. Hold fishing pole over fishing pond
2. Pick up fish in pond
3. Throw fish in bucket

Bottle xylophone

1. Line four glass bottles in a row
2. Pour differing amounts of colored water into each bottle
3. Tap spoon on each bottle to make a song

REFERENCES

- Ackil, J. K., & Zaragoza, M. S. (1995). Developmental differences in eyewitness suggestibility and memory for source. *Journal of Experimental Child Psychology*, *60*, 57–83.
- Barr, R., & Hayne, H. (1999). Developmental changes in imitation from television during infancy. *Child Development*, *70*, 1067–1081.
- Bjorklund, D. F., Bjorklund, B. R., Douglas, R. B., & Cassel, W. S. (1998). Children's susceptibility to repeated questions: how misinformation changes children's answers and their minds. *Applied Developmental Science*, *2*, 101–113.
- Brainerd, C. J., & Reyna, V. F. (1990). Gist is the grist: fuzzy-trace theory and the new intuitionism. *Developmental Review*, *10*, 3–47.
- Brainerd, C. J., Reyna, V. F., Howe, M. L., & Kingma, J. (1990). The development of forgetting and reminiscence. *Monographs of the Society for Research in Child Development*, *55* (3–4, Serial No. 222).
- Cassel, W. S., & Bjorklund, D. F. (1995). Developmental patterns of eyewitness memory and suggestibility. *Law and Human Behavior*, *19*, 507–532.
- Ceci, S. J., & Bruck, M. (1993). Suggestibility of the child witness: a historical review and synthesis. *Psychological Bulletin*, *113*, 403–439.
- Ceci, S. J., Ross, D. F., & Toglia, M. P. (1987). Suggestibility of children's memory: psycholegal implications. *Journal of Experimental Psychology: General*, *116*, 38–49.
- Ceci, S. J., Toglia, M. P., & Ross, D. F. (1988). On remembering . . . more or less: a trace-strength interpretation of developmental differences in suggestibility. *Journal of Experimental Psychology: General*, *117*, 201–203.
- Dale, P. S., Loftus, E. F., & Rathbun, L. (1978). The influence of the form of the question on the eyewitness testimony of preschool children. *Journal of Psycholinguistic Research*, *7*, 269–277.

- Dent, H. R., & Stephenson, G. M. (1979). An experimental study of the effectiveness of different techniques of questioning child witnesses. *British Journal of Social & Clinical Psychology*, *18*, 41–51.
- Fivush, R., & Hamond, N. R. (1989). Time and again: effects of repetition and retention interval on 2-year-olds' event recall. *Journal of Experimental Child Psychology*, *47*, 259–273.
- Gee, S., & Pipe, M.-E. (1995). Helping children to remember: the influence of object cues on children's accounts of a real event. *Developmental Psychology*, *31*, 746–758.
- Gobbo, C., Mega, C., & Pipe, M.-E. (2002). Does the nature of the experience influence suggestibility?: a study of children's event memory. *Journal of Experimental Child Psychology*, *81*, 502–530.
- Goodman, G. S., Aman, C. J., & Hirschman, J. (1987). Child sexual and physical abuse: children's testimony. In S. J. Ceci, M. P. Toglia, & D. F. Ross (Eds.), *Children's eyewitness memory* (pp. 1–23). New York: Springer-Verlag.
- Hamond, N. R., & Fivush, R. (1991). Memories of Mickey Mouse: young children recount their trip to Disneyworld. *Cognitive Development*, *6*, 433–448.
- McCall, R. B., Parke, R. D., & Kavanaugh, R. D. (1977). Imitation of live and televised models by children one to three years of age. *Monographs of the Society for Research on Child Development*, *42* (5, Serial No. 173).
- Meltzoff, A. N. (1985). Immediate and deferred imitation in fourteen- and twenty-four month-old infants. *Child Development*, *56*, 62–72.
- Meltzoff, A. N. (1988). Imitation of televised models by infants. *Child Development*, *59*, 1221–1229.
- Murachver, T., Pipe, M.-E., Gordon, R., Owens, J. L., & Fivush, R. (1996). Do, show, and tell: children's event memories acquired through direct experience, observation, and stories. *Child Development*, *67*, 3029–3044.
- Ornstein, P. A., Gordon, B. N., & Larus, D. M. (1992). Children's memory for a personally experienced event: implications for testimony. *Applied Developmental Psychology*, *6*, 49–60.
- Pipe, M.-E., Gee, S., Wilson, J. C., & Egerton, J. M. (1999). Children's recall 1 or 2 years after an event. *Developmental Psychology*, *35*, 781–789.
- Poole, D. A., & Lindsay, D. S. (1995). Interviewing preschoolers: Effect of nonsuggestive techniques, parental coaching, and leading questions on reports of nonexperienced events. *Journal of Experimental Child Psychology*, *60*, 129–154.
- Poole, D. P., & Lamb, M. E. (1998). *Investigative interviews of children: A guide for helping professionals*. Washington, DC: American Psychological Association.
- Poole, D. A., & Lindsay, D. S. (2001). Children's eyewitness reports after exposure to misinformation from parents. *Journal of Experimental Psychology*, *7*, 27–50.
- Poole, D. A., & Lindsay, D. S. (2002). Reducing child witnesses' false reports of misinformation from parents. *Journal of Experimental Child Psychology*, *81*, 117–140.
- Roberts, K. P., & Blades, M. (1999). Children's memory and source monitoring for real-life and television events. *Journal of Applied Developmental Psychology*, *20*, 575–596.
- Roebbers, C. M., & Schneider, W. (2000). The impact of misleading questions on eyewitness memory in children and adults. *Applied Cognitive Psychology*, *14*, 509–526.
- Rudy, L., & Goodman, G. S. (1991). Effects of participation on children's reports: implications for children's testimony. *Developmental Psychology*, *27*, 527–538.
- Saywitz, K. J., & Snyder, L. (1996). Narrative elaboration: test of a new procedure for interviewing children. *Journal of Consulting and Clinical Psychology*, *64*, 1347–1357.
- Schmitt, K. L., & Anderson, D. R. (2002). Television and reality: Toddlers' use of visual information from video to guide behavior. *Media Psychology*, *4*, 51–76.
- Thierry, K. L., & Spence, M. J. (2002). Source-monitoring training facilitates preschoolers' eyewitness memory performance. *Developmental Psychology*, *38*, 428–437.
- Tobey, A. E., & Goodman, G. S. (1992). Children's eyewitness memory: effects of participation and forensic context. *Child Abuse and Neglect*, *16*, 779–796.
- Wilkes, A. (1990). *My first science book*. New York: Alfred A. Knopf.

Copyright of Applied Cognitive Psychology is the property of John Wiley & Sons Inc. and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.