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Providing misleading and reinstatement information a year after it happened: Effects on long-term memory

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The question addressed here is whether misleading suggestions made to children a year after target events had occurred will alter long-term recall. One group (3–13 years old when injured and treated in a hospital Emergency Room) were given both misleading and accurate reinstating information a year later, and recall of target events assessed both 1 week and another year later (i.e., 2 years post-injury). A control group had recall assessed both 1 and 2 years post-injury. Misleading had little effect on children's recall 1 week later, although a few misled details were reported. However, a year later virtually none of the misleading information was incorporated into long-term recall. Rather, children were *more*, not less, accurate when recalling details about which they had been misled. Results were attributed to target events having been highly memorable and well rehearsed via previous recalls, and detection of discrepancies between memory and misleading information focusing attention on targeted details.

One important concern of professionals who deal with children in forensic situations is the degree to which misleading information and questions by interviewers can distort children's later reports about what happened (Moston, 1990). There is a large literature showing that misleading information or questions can affect children's responses (see reviews in Ceci & Bruck, 1993, 1995). This report considers an issue that has received very little attention, namely the degree to which misleading information that is presented long after target events occur is incorporated into memory and subsequently distorts children's recall of those events when recall occurs after an additional extremely long delay. This issue is of concern because children are often interviewed in potentially misleading ways in investigative situations, sometimes long after the occurrence of relevant events (e.g., by police and attorneys), and then there is often another considerable delay before the child actually appears in court (Bjorklund, Bjorklund, Brown, & Cassel, 1998).

There is no question that children can recall salient events long after they have occurred, even after the passage of many years, although the amount recalled is generally quite sparse (Gold & Neisser, 1980; Hudson & Fivush, 1991; Pillemer, Picariello, & Pruett, 1994; Sheingold & Tenney, 1982). Recently, several researchers have compared children's recall of real-life events after a delay of 1 or 2 years to their recall shortly after the events occurred (Fivush & Hamond, 1990; Fivush & Shukat, 1995; Goodman, Hirschman, Hepps, & Rudy, 1991; Peterson, 1999; Pipe, Gee, Wilson, & Egerton, 1999; Poole & White, 1993; Salmon & Pipe, 1997; Warren & Swartwood, 1992). Considerable forgetting was shown by the children in most of these studies, although Peterson (1999),

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when interviewing children about their recall of injury incidents that were serious enough to require hospital emergency room treatment, found surprisingly little forgetting after 2 years, especially of the central injury details.

The decreased memory of events over time found by most researchers is consistent with both constructive theories of memory and fuzzy trace theory, although fuzzy trace theory would posit much steeper forgetting slopes for verbatim traces than for gist representations (which may in fact exhibit little forgetting). However, reinstating the target event by means of intervening interviews prior to the final interview has been shown to be an effective way of attenuating forgetting. The authors of three recent reviews concluded that reminding children via these intervening interviews was effective at helping children recall target events (Fivush, Peterson, & Schwarzmueller, 2002; Fivush & Schwarzmueller, 1995; Poole & White, 1995). In fact, an intervening interview conducted a full year after the target events had occurred has been found to help younger children's recall of less memorable events after yet another additional year had passed (Peterson, 1999).

But what if these intervening interviews include misinformation and are misleading? An important question is whether the passage of time makes it more likely that children will incorporate such misleading information into their long-term recalls. The issue addressed by the current study is whether this misinformation distorts children's subsequent recall if that recall takes place a year later.

Children have been shown to be vulnerable to misleading questions and misinformation (see reviews in Ceci & Bruck, 1993, 1995). Younger children seem particularly vulnerable to suggestive or misleading questions, although there is some question about whether the format of the typical questions used (specifically yes/no format questions) may have especially jeopardised the performance of preschool-aged children (Fivush et al., 2002, Peterson & Biggs, 1997; Peterson, Dowden, & Tobin, 1999). There is a paucity of research on the effects of misleading information that is given months or even years after the event occurred, but according to Loftus, Miller, and Burns (1978) and Reyna and Brainerd (1995), the effects of such misinformation may be more pronounced after long delays because the original memory trace has faded over time. This would especially be true if the misinformation impacted verbatim rather than gist representations, which is usually the case with misleading suggestions according to Reyna and Brainerd (1995). Indeed, greater suggestibility has been found when the misleading information has been presented after a delay (Ceci, Ross, & Toglia, 1987; Loftus, 1992; Warren & Lane, 1994).

It is not the case, however, that being exposed to misinformation invariably results in a decrement of memory when any memory changes are found. On the contrary, if children initially have excellent recall of target information, misinformation may *facilitate* subsequent recall rather than jeopardise it (Brainerd & Reyna, 1988; Howe, Courage, & Bryant-Brown, 1993; Marche & Howe, 1995). For example, Lee and Bussey (1999), using a criterion-learning paradigm, provided some children with misinformation and others with inconsistent information (i.e., similar-but-different information that was explicitly labelled as inconsistent), and they found that children's later recall was better if exposed to misinformation. Such facilitative effects seem to occur only when children are aware of the contradictions in the misinformation. This occurred in Lee and Bussey's study because they had trained the children to criterion on their task, and furthermore the children provided evidence of being aware of the contradictions, because many objected or explicitly corrected the experimenter who provided the misinformation. Others have achieved similar facilitative effects by using blatantly contradictory post-event information (Loftus, 1979), or issuing warnings (Dodd & Bradshaw, 1980).

To our knowledge, only one study has looked at the long-term effect of misleading information where that information was planted after a very long delay that averaged a year. Bruck, Ceci, Francoeur, and Barr (1995) talked to 5-year-olds immediately following an inoculation and gave them pain-denying, pain-affirming, or neutral feedback, and a week later found that such post-event suggestions had no impact on the children's assessment of how much the injection had hurt or how much they had cried. Of more relevance to the present study, a year later they gave the children three more sessions extending over 2 weeks of either positive feedback about the injection (you were brave and didn't cry at all) or neutral feedback, as well as misleading or nonmisleading information about the pediatrician's (and the assistant's) actions. Five days later the children were interviewed about the original target

experience and the researchers found that children who had been given pain-denying feedback reported less crying and less pain; in addition, children who had been given misleading information about the actions of the medical personnel sometimes reported those false actions. Thus, false information that had been given to children a year after the target event's occurrence had distorted some of the children's reports of the original event.

A ubiquitous problem that confuses the interpretation of research on suggestibility is whether it is children's memory *representations* that are changed, or only their verbal *reports* (Bjorklund et al., 1998; Ceci et al., 1987; Loftus, 1992, McCloskey & Zaragoza, 1985). A number of investigators have found that it is the reporting, not the representations themselves, that is affected in many cases (Cassel & Bjorklund, 1995; Cassel, Roebers, & Bjorklund, 1996; Marche, 1999). This is especially true for younger children, and under social conditions that favour compliance. For example, Marche (1999) found that 3–5-year-olds became increasingly likely to comply with misleading suggestions the more times they were exposed to them, even though the misleading information had little if any effect on their memory representations (but see Bjorklund et al., 1998). According to Poole (1995), consideration of social processes such as conforming to perceived interviewer demands and being cooperative conversational partners is often more important in predicting children's reports than memory *per se*.

Returning to the only extant study in which misleading information was provided after a very long delay, Bruck et al. (1995) provided the misleading information immediately after the occurrence of target events and then again in three closely spaced sessions which occurred on average a year later. She found that although children's reports were unaffected by the immediate misleading session, they were distorted by the delayed misleading sessions. She interpreted her results as suggesting that misleading information that is presented after the passage of such a long delay can affect children's memory for target events, even for information that is central such as the amount of pain and crying experienced by the child.

However, it is unclear whether such an interpretation is warranted. The misleading sessions were all presented by the same interviewer who subsequently elicited the children's reports a few days later, and children are sensitive to the communicative situation in which they find themselves (see review in Warren & McCloskey, 1997). For example, children have been shown to be more vulnerable to misleading when the misleading information is presented by someone who appears to be knowledgeable about the event (Ceci et al., 1987; Toglia, Ross, Ceci & Hembrooke, 1992), and they may well be more likely to acquiesce to interviewers when it is these same interviewers who provide the misleading information.

A clearer test of whether children's memory representations, not just their reports, were affected is to assess their recall of the target events when a different person interviews them, and ideally under conditions where children perceive little relationship between the misleading sessions and later interviews. In the present study, children were provided with misinformation and interviewed shortly thereafter, but of more relevance, they were re-interviewed not only by a different interviewer but also after another year had passed. This allowed us to assess whether the misleading information had been incorporated into subsequent long-term recall.

Another variable highlighted by Bruck et al. is the centrality of the details being misled. Some researchers have suggested that children are less suggestible when the misleading questions target salient events that involve central details about things that happen to their own bodies (Goodman et al., 1991; Melton, 1992; Saywitz, Goodman, Nicholas, & Moan, 1991). Instead, children are more likely to be misled about actions or people that are more peripheral. In contrast, in Bruck et al.'s study the children were misled on central details such as how much the inoculation hurt and how much they cried. They also were misled about which medical person had performed which of several actions (all having been performed by one of them). However, Bruck et al. did not explicitly contrast central versus peripheral misleading information when they assessed the impact of post-event suggestions that took place a year after the target event. In addition, all of the target actions had been performed by medical personnel whom children often have trouble differentiating, so it might have been relatively easy to confuse which person had done what. That is, these might not be appropriately classified as central details. Regardless of how these particular action details are classified, children's recall of central details seems to be better than their recall of peripheral details (Goodman et al., 1991; Howe, Courage & Peterson, 1994; Peterson, 1999; Peterson & Bell,

1996; Vandermaas, Hess, & Baker-Ward, 1993). It may also be true that the effectiveness of long-delay suggestions depends on the centrality of the detail being misled. In the present research, misleading information is provided about both central and peripheral details.

An additional feature of the present study is an explicit comparison of misleading information versus reinstatement of accurate information. It has long been known that reminding someone about an event aids long-term recall (Brainerd & Ornstein, 1991). Such reinstatement has been shown to be effective for nonverbal memory of infants (e.g., Rovee-Collier & Shyi, 1992) as well as verbal memory of older children (Brainerd, Reyna, Howe, & Kingma, 1990; Howe et al., 1993; Kidorf & Cox, 1996). Indeed, several recent reviews have looked at the number of re-interviews given to children about target events; such re-interviews of course reinstate the events being asked about, and in general the reviewers conclude that more interviews lead to better long-term recall (Fivush et al., 2002; Fivush & Schwarzmueller, 1995; Poole & White, 1995). In the present study, children are given misleading information about some details while other details are reinstated accurately. Children's recall of both can then be contrasted. It might also be argued that any sessions in which children are reminded of prior events, whether through misleading information or reinstatement, are in effect a reinstatement of the prior event since they remind the child of it. Kidorf and Cox (1996) argue that one should have a control group that had neither. They contrasted the effect of providing preschoolers with misleading or reinstated information when assessing their recall of a story, and also had a control group of children who had received neither misleading information nor reinstatement. They found that children who had had reinstating reminders had more accurate memory for the story that they had been read 2 weeks earlier than did children in either the misled group or the control group.

Turning to the present study, there are two phases: in Phase 1, two groups of children (experimental and control) are given a standardised interview about an injury sustained a year earlier and its subsequent hospital treatment. However, a week prior to this interview, the experimental children are exposed to both misleading and reinstating information about the target events. Phase 2 of the study occurs a year later: children are interviewed again a year after the previous interview, namely after a delay of 2 years from the target event.

Our hypotheses were as follows: during the Phase 1 interview, experimental children who had just been reminded about target events the previous week would have better recall than would control children who had not been systematically reminded since a previous interview 6 months earlier. This would especially be true for peripheral details, since children have been shown to have excellent recall of central details about parallel injuries even 2 years after they occurred. Comparing misinformation versus reinstatement effects for the experimental children, there were two possible outcomes that could be predicted by prior research: a long delay between event occurrence and the misinformation session (and thus potential decay of memory traces), as well as the fact that the same experimenter who provided the misinformation conducted the Phase 1 interview, could negatively affect children's reports about misled details in comparison to reinstated details, especially for peripheral details. If the misinformation indeed affected children's memory representations, not just their reports, then the misled details would be recalled less accurately than the reinstated details during the Phase 2 interview conducted a year later, and misinformation incorporated into the children's long-term recalls. On the other hand, other research has suggested that children have extremely good recall of medical emergencies, which are the target events about which they are misled; consequently, if children rejected the misinformation, they may even have had enhanced recall of the details about which misinformation was provided.

METHOD

Participants

The children and their families had all been recruited from the Emergency Room (ER) of the only children's hospital in Newfoundland, Canada. They were mostly White, of mixed SES backgrounds. The children had experienced a trauma injury that was treated in an outpatient manner, such as breaking a bone, requiring sutures for a laceration, getting bitten by a dog, or crushing fingers in doors. In Phase 1 there were 26 3–4-year-olds (8 girls and 18 boys, mean age = 3.8 years, hereafter termed "preschoolers"), 30 5–6-year-olds (13 girls and 17 boys, mean age = 5.6

years, hereafter termed "kindergartners"), and 48 8–13-year-olds (22 girls and 26 boys, mean age = 9.1 years, hereafter termed "older children"). The children who could be located for Phase 2 included 22 preschoolers (15 boys and 7 girls, mean age = 3.9 years), 20 kindergartners (10 girls and 10 boys, mean age = 5.3 years), and 30 older children (16 girls and 14 boys, mean age 9.3 years).

Procedure

All children had participated in two earlier interviews, at 1 week and 6 months after the injury. (For relevant data on children's recall during these interviews, see Peterson, 1996, and Peterson & Bell, 1996). The interview was standardised, asking about a prototypical injury and hospital treatment experience, and included questions about both central and peripheral details of the injury and the hospital treatment. Central details were defined as plot-relevant (Heuer & Reisberg, 1992; Peterson & Bell, 1996); furthermore, they were integral to the emotion-arousing experiences of either the injury itself or the hospital treatment rather than taking place either before or after these critical events (see Christianson, 1992; Peterson & Bell, 1996). These central details included what happened to cause the injury, the identity of the causal agent (person and/or object) of the injury, the injury itself (bone break, laceration, bleeding), the child's immediate response (crying or calling for help), the person who responded to that cry, the immediate first aid administered by that person (e.g., applying a cloth to stop the bleeding), going to the hospital, being examined by the doctor, the main treatment steps taken (x-ray, injections of local anaesthetic, sutures, casting broken bones), and crying in response to treatment. Peripheral details included the time and location of the injury, the other people who were present, what was happening prior to the injury, onlookers or secondary people who watched or played minor roles in home treatment (such as fetching an ice bag), people in the car who also went to the hospital, the time of the hospital visit, the hospital registration, what the child did while waiting in the waiting room and how long the wait was, who accompanied the child into the treatment room, minor procedural details of treatment, and what happened after leaving the hospital. Questions about all of these details were asked in a standardised interview (e.g., 'Where were you when you got hurt? Who was there with you? What happened right when you got hurt?'); a complete list of questions and examples can be found in Peterson and Bell (1996). The adult witnesses were also interviewed during the initial visit using the same interview questions in order to assess the accuracy of the child's recall.

Phase 1. Parents were contacted a year after their child's injury and the study explained. After parental approval, the children were randomly divided into experimental and control children. The children in the experimental group were visited in their homes and received a series of both misleading and reinstatement questions. (No free recall was elicited prior to these questions). For purposes of analysis there were four misleading and four reinstating questions, and both types of question were subdivided into two querying central details and two querying peripheral details. The four questions about central details were quasi-randomly assigned to either misleading or reinstating, with the limitation that there be two of each. The same was true of the four peripheral details. These details were taken from previous interviews with the children; thus, they were all details that children had recalled previously, and were also confirmed by adult witnesses. In addition, they were different for each child, since they were related to each child's specific experience. An equivalent "distance" between real and suggested details across children was controlled by substituting erroneous information into the same prototype component or frame as would be used for accurate reinstatement. (See Appendix for examples of the questions.).

The misleading/reinstatement questions consisted of two parts: the first part included the misled or reinstated information, while the second part of the sentence was a question relevant to the target event. During the questions, children performed one of two distractor tasks: 3–6-year-olds coloured pictures of "Barney" and 8–13-year-olds played a "Gameboy" game. The distractor tasks were used to decrease the extent to which the children focused on or confronted the experimenter about the misinformation; this was especially important for the older children. The order of questions was counterbalanced. If children corrected the interviewer at any time by saying, for example, "that's not the way it happened" the interviewer remained neutral and continued with the next question. One week later the children were again visited by the same individual and interviewed using the same standardised interview

as had been used in prior interviews. These standardised interviews began with free recall ("Remember that time when you [broke your arm]? Tell me about it. What happened?"), and were followed by probed recall about all of the central and peripheral details described above. The questions are listed in the Appendix of Peterson and Bell (1996), and interviewing procedures are described in detail in Peterson and Bell (1996) and Peterson (1999). The control children received only the standardised interview and were not visited during the previous week.

Phase 2. One year after the previous contact, families were again contacted and asked if they would be willing to participate. (This contact was unexpected by the families.) Preschoolers included 11 experimental and 10 control children, kindergartners included 10 experimental and 10 control children, and older children included 15 experimental and 16 control children. A researcher who was a stranger to the children visited them in their homes and interviewed the children, using the same standardised interview that had been used in each prior interview. All interactions with the children, whether in Phase 1 or 2, were audio-recorded on cassette tapes and later transcribed. All scoring was done from the transcripts.

Coding

For the experimental participants, both the 1 and 2 year interviews were searched for the details that had been either falsely supplied (i.e., misled) or accurately reinstated, and the presence and accuracy of these details were noted. For each control participant, details were identified that were matched in content to those given to an experimental subject for misleading or reinstating. For example, if an experimental participant was misled/reinstated about the identity of the object that had caused his or her injury, a matched injury-causing object was selected for a control participant of the same age and coded in terms of presence and accuracy. If the experimental participant had been misled/reinstated about who was present when he or she got hurt then a matched detail about who was there at the injury was selected for coding for a control participant. Thus, the control and experimental participants had similar central and peripheral details selected for coding. Approximately 12% of the scored interviews were checked against another trained scorer for reliability. Reliability was 98%, calculated by dividing the number of agreements between the scorers by the number of agreements plus disagreements.

RESULTS

Phase 1

The transcripts of the experimental participants, who had been given both misleading and reinstating information about different central and peripheral details a week earlier, were scored in terms of whether target details were recalled accurately. The number of correct details provided by children in each category (out of a possible total of 2.0) is shown in the top half of Table 1. (Preliminary analyses that included the factor of gender were done on all data, for both Phase 1 and 2, but gender was never significant, alone or in interaction, so data are combined across gender in all analyses.) An ANOVA was calculated with age (three levels) the between-subjects factor and both truth of detail (misled versus reinstated) and information (central versus peripheral) as within-subject factors, and there were no significant effects. That is, it made no difference whether a detail was reinstated accurately or misled by substituting erroneous information—the detail was recalled just as accurately a week later. In other words, no short-term effects of misleading were evident when one analysed the overall accuracy of recall a week later.

Nevertheless, some of the misled information did get reported by children a week after the misleading/reinstating session. The frequency of misled details appearing in the children's recall the subsequent week is shown in Table 2. Considering how many details were misled, the frequency of such reporting is low although it occurs nevertheless, more so with peripheral details than central. Only 3 central details (one for each age group) about which children had been misled were incorporated, out of the more than 100 that they were given. These included a 3-year-old who had cut her head on a coffee table claiming erroneously that she had cut it on a chair, a 5-year-old who claimed that it was his dad who got to him first after he had hurt himself when it had actually been his mother, and an 8-year-old who erroneously claimed that it had been her teacher who had first responded to her after her injury. For

TABLE 1
Phase 1

Group	Treatment	Type of detail	Age in years at time of injury 3–4	5–6	8–13	All children
Experimental	Misled[1]	Central	1.85	1.82	1.82	1.83
		(SD)	*(0.17)*	*(0.15)*	*(0.14)*	*(0.15)*
		Peripheral	1.70	1.91	1.92	1.84
		(SD)	*(0.15)*	*(0.14)*	*(0.12)*	*(0.14)*
	Reinstated[1]	Central	1.93	1.82	2.00	1.92
		(SD)	*(0.13)*	*(0.15)*	*(0.00)*	*(0.12)*
		Peripheral	1.79	1.78	1.94	1.84
		(SD)	*(0.17)*	*(0.15)*	*(0.12)*	*(0.15)*
Experimental	Combined[2]	Central	3.75	3.64	3.82	3.75
		(SD)	*(0.20)*	*(0.18)*	*(0.17)*	*(0.18)*
		Peripheral	3.49	3.65	3.86	3.68
		(SD)	*(0.24)*	*(0.20)*	*(0.15)*	*(0.20)*
Control[2]		Central	3.68	3.88	3.86	3.81
		(SD)	*(0.20)*	*(0.12)*	*(0.11)*	*(0.15)*
		Peripheral	3.34	3.38	3.56	3.43
		(SD)	*(0.24)*	*(0.24)*	*(0.18)*	*(0.21)*

Means (and SDs) for the number of accurate central and peripheral details recalled by experimental children who had been misled or reinstated (as well as both combined*), and the number of central and peripheral details recalled by control children.

* The combined means for the experimental children are not necessarily the same as the sum of misled + reinstatement scores because a few children's data were dropped if there were missing values in either category.

[1] Range of possible scores is 0–2.00.

[2] Range of possible scores is 0–4.00.

misled peripheral details that were reported, three involved time (time of day of the injury or length of wait in the ER waiting room) and three involved what had happened after leaving the hospital. The remaining reported peripheral detail involved who was in the car when going to the ER.

The target event that children were recalling had occurred a year earlier, and since all experimental participants had been extensively reminded of that target event the previous week, the next analysis compares the recall of the experimental participants with control participants who did not get this prior visit. For experimental participants, both reinstated and misled details are combined resulting in a total possible score of 4.0 in each category of central or peripheral information. Likewise, there are four details that could potentially be recalled in each category for the control participants. The number of correct details recalled by the children in each

TABLE 2
Frequency of misled details being reported 1 week and 1 year after the misleading/reinstating session

		Age in years at time of injury 3–4	5–6	8–13	All children
1 week later	Central	1	1	1	3
	Peripheral	2	4	1	7
	Total	3	5	2	10
1 year later	Central	1	0	0	1
	Peripheral	1	0	0	1
	Total	2	0	0	2

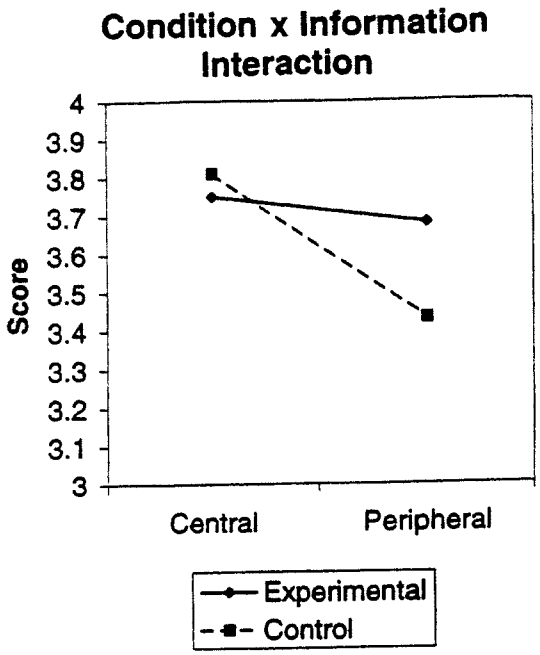

Figure 1. The interaction between condition (experimental versus control children) and information (central versus peripheral) in Phase 1.

category is shown in the bottom half of Table 1. An ANOVA was calculated with age (three levels) and condition (experimental versus control) the between-subjects factors and information (central versus peripheral) the within-subject factor. None of the main effects was significant, although age approached significance, $F(2, 98) = 2.95$, $p = .057$, with children tending to recall more with age. However, there was a significant condition × information interaction, $F(1, 98) = 6.91$, $p < .01$. This interaction is shown in Figure 1. Analyses of simple effects showed that for experimental children, there was no difference between their recall of central or peripheral information, whereas for control children, central information was recalled better than peripheral information ($p = .04$).

Phase 2

A year later the children were interviewed again, and the transcripts of the experimental children were searched for the central and peripheral details about which they had been misled or which had been reinstated a year earlier. The number of correct central and peripheral details in each category (out of a possible total of 2.0) is shown in the top half of Table 3. An ANOVA was calculated with age (three levels) the between-subjects factor and both truth of detail (misled versus reinstated) and information (central versus peripheral) as within-subject factors. The truth of the original details was the only significant factor, $F(1, 137) = 9.98$, $p = .002$. Children were more accurate in recalling details about which they had been misled a year earlier (mean = 1.86) than details that had been reinstated (mean = 1.60). There were no significant interactions. Thus, the centrality of the detail made no difference, and younger children recalled the details as well as older children did.

Children almost never reported the details about which they had been misled the year previously during their long-term recall a year later (and 2 years after the injury had occurred). Only two details about which children had been misled were reported during later recall (see Table 2). These were both by children who had been preschoolers at the time of their injury. One child who had been misled about what he had done while waiting in the ER waiting room recalled the misled activity rather than the correct one. The other child had been misled about the object that had caused her cut. In the interview that took place a year after the misleading session, just as she had during the interview taking place a week after being misled, she claimed that she had cut her head on a chair when in fact the coffee table had been the object of injury. This was the only instance of a child repeating the misled information that she or he had provided in the earlier interview.

Similar to our analysis of Phase 1, the misled and reinstated details were summed for the experimental children, and their recall of these details was compared to the recall of comparable details by the children in the control group (see the bottom half of Table 3). This was to see if the extra misleading/reinstating session differentially affected the long-term recall of the experimental children in comparison with control children who did not have this extra session. An ANOVA was calculated with age (three levels) and condition (experimental versus control) the between-subjects factors and information (central versus peripheral) the within-subject factor. There were no significant main effects or interactions.

TABLE 3
Phase 2

Group	Treatment	Type of detail	Age in years at time of injury 3–4	5–6	8–13	All children
Experimental	Misled[1]	Central	1.73	1.90	1.94	1.86
		(SD)	*(0.15)*	*(0.15)*	*(0.12)*	*(0.14)*
		Peripheral	1.80	1.89	1.89	1.86
		(SD)	*(0.15)*	*(0.16)*	*(0.11)*	*(0.14)*
	Reinstated[1]	Central	1.45	1.60	1.71	1.59
		(SD)	*(0.15)*	*(0.15)*	*(0.12)*	*(0.13)*
		Peripheral	1.63	1.60	1.61	1.61
		(SD)	*(0.17)*	*(0.15)*	*(0.11)*	*(0.14)*
Experimental	Combined[2]	Central	3.18	3.50	3.60	3.43
		(SD)	*(0.24)*	*(0.25)*	*(0.22)*	*(0.24)*
		Peripheral	3.44	3.44	3.50	3.46
		(SD)	*(0.28)*	*(0.26)*	*(0.20)*	*(0.24)*
Control[2]		Central	3.25	3.30	3.69	3.33
		(SD)	*(0.26)*	*(0.25)*	*(0.21)*	*(0.24)*
		Peripheral	3.25	3.11	3.08	3.15
		(SD)	*(0.26)*	*(0.26)*	*(0.20)*	*(0.23)*

Means (and SDs) for the number of accurate details (both central and peripheral) recalled by experimental children who had been either misled or reinstated (as well as both combined*), and the number of central and peripheral details recalled by control children.

*The combined means for the experimental children are not necessarily the same as the sum of misled + reinstatement scores because a few children's data were dropped if there were missing values in either category.

[1] Range of possible scores is 0–2.00.

[2] Range of possible scores is 0–4.00.

DISCUSSION

When children were provided with misleading details a year after the target events occurred and then interviewed about those events a week later (Phase 1), the misleading session had relatively little effect on the accuracy of their recall although some of the misled details (mostly peripheral information) did get reported. Although theoretical accounts of memory trace degradation over long delays would predict increasing vulnerability to suggestion with the passage of long time intervals, the fact that the misinformation had so little effect in this study is probably partly due to the fact that the children seemed to still have excellent recall of the target events. Other research about children's memory of similar target events has shown that children's recall of these sorts of events is excellent both 1 and 2 years after they occurred (Peterson, 1999). These events were highly salient, personally relevant, and emotionally involving, i.e., the type of events that are remembered particularly well by children (Goodman et al., 1991; Peterson & Bell, 1996; Saywitz et al., 1991), and thus may have been particularly resistant to misleading. For children in the present study, the original memory traces were probably firmly established, and furthermore, the children had rehearsed the details of these events during at least two prior interviews, which attenuates forgetting (Fivush et al., 2002; Fivush & Schwarzmueller, 1995; Poole & White, 1995).

Although providing misleading information had little effect, a few misled details did get reported by children 1 week after the misleading session, which in turn took place after a long delay. This is parallel to what Bruck et al. (1995) found. But in both studies the interviewer was the same person as the one who had originally provided the children with the misleading information, and the interview also took place within a week of the misleading sessions. Thus, social compliance issues probably played an important role and increased the likelihood of children's reports becoming contaminated by misinformation (Marche, 1999; Poole, 1995).

An important question, however, is whether the misinformation affected children's memory representations, or only their reports (Bjorklund et al., 1998; Cassel & Bjorklund, 1995; Cassel et

al., 1996; Ceci et al., 1987; Loftus, 1992; Marche, 1999; McCloskey & Zaragoza, 1985). As argued above, it is unclear in Bruck et al.'s study whether or not the children's memory representations were distorted by the misinformation since the social situation supported compliance. On the other hand, multiple presentations of the same misinformation may make it more likely to be incorporated into memory (Bjorklund et al., 1998; Lee & Bussey, 1999; but see Marche, 1999). In the present study, whether or not misinformation was incorporated into children's memory was assessed by looking at their recall a full year later, and furthermore having a stranger interview them. And in contrast to some children's performance in Phase 1, in Phase 2 the details about which they had been misled almost never got incorporated into their recall when they were interviewed a year after being misled. Only two misled details appeared in children's recall a year after the misleading session, and these two errors were both by children who had been 3 years of age at the time of the original events.

But even though the children did not incorporate misled details into later recall, it is not the case that the misleading session had no effect. Rather, details about which children had been misled were recalled *better* a year later than were details that had been reinstated. Such a finding is consistent with research suggesting that if children initially have excellent recall of target information, misinformation may facilitate subsequent recall rather than jeopardise it (Howe et al., 1993; Lee & Bussey, 1999; Loftus, 1979; Marche & Howe, 1995). A possible explanation for this facilitation may be that the children interpreted the misled details as "mistakes", and consequently focused their attention on them in a way that was not required by details being accurately restated. Or, the attention paid to the comparisons between misinformation and accurate information could itself have served as an additional reinstatement (Lee & Bussey, 1999). A quote from one 10-year-old when the experimenter visited her a week after the misleading session is relevant:

E: There's something you want to say first before I start this interview?
C: Yeah. Last time you came you said the things that were wrong. 'Cause I had four stitches and you only said three.
E: Right. Yeah.
C: And after [leaving the hospital] I went to McDonald's, not Burger King.
E: OK. My mistake. I'm very sorry. Is that all you remember?
C: I can't remember the other things.

During the misleading session itself, a number of children corrected a misled detail immediately after it was presented. Specifically, six preschoolers, five kindergartners, and seven older children corrected the experimenter about a total of 7, 12, and 16 details respectively. Corrections were equivalently distributed between central and peripheral information. Most misled details were not corrected; nevertheless, the children did point out to the experimenter at least some of the incorrect information in spite of answering the questions that formed the last part of each misleading stimulus. Some investigators (Lee & Bussey, 1999; Loftus, 1992) have suggested that memories are less likely to change if people immediately detect a discrepancy between post-event information and their recall of the original event, and the children in this study clearly detected discrepancies between at least some of the misinformation and their memories.

The conclusion reached by Bruck et al. (1995) was that a long delay makes children's memory more vulnerable to misleading suggestions, even for central information about memorable events. However, the results of this study suggest that the issue is still an open one that needs more research. Most importantly, children's reports are not the same as their memory. Even though a few children in this study reported the misinformation that the experimenter had given them a week later when interviewed by that same experimenter, this misinformation did not replace accurate information in memory, since a year later it was the accurate details, not the planted misinformation (with two exceptions), that the children reported to a new interviewer. On the other hand, there are two other factors that differentiated Bruck et al.'s study and this one which may have led to the different results: they used a stronger misleading manipulation (three misleading sessions rather than one, which may have increased the effect of suggestion on memory), and their final assessment was conducted by the same interviewer who gave the misleading sessions (thus increasing the likelihood of compliance in reporting but not necessarily changes in memory).

Did the misleading/reinstating session have a reinstating effect on the children's recall a week later? Yes, the session seems to have effectively reminded the children of the target event. Both

experimental and control children recalled central details quite well a year after the target events had occurred, but peripheral details were recalled better by the children who had had this earlier session than by control children who had not. Other research on the recall of these same children has shown that central details are recalled better than peripheral details, at 1 week and 6 months post-injury (Peterson & Bell, 1996) as well as 2 years post-injury (Peterson, 1999). In the present study, reminding the experimental children about the target event seems to have resulted in both central and peripheral information being equally well recalled. Thus, the expected memory advantage of central over peripheral information seems to have been negated by the reminders the children had been given 1 week earlier. In contrast, the control children showed the same superiority of central over peripheral information that was found in other research. Although ceiling effects may have played a role in children's recall of central details, the effectiveness of the intervening session at reminding children about peripheral details suggests that ceiling effects were less important for their recall of peripheral details. It is unclear why the children had no difference in their recall of central versus peripheral details in their final interview, 2 years after injury. Other interviews of same-aged children with parallel injuries have shown central details to be recalled better than peripheral details 2 years later, even with the same intervening interviews as experienced by the control group children (Peterson, 1999).

To summarise, misinformation that was provided after a long time delay did not distort the memory of children when their recall was assessed a year after the misinformation was provided. Possibly, as argued by Bruck et al. (1995), aggressive reiteration of misinformation such as sometimes occurs in forensic situations (Bruck et al., 1995; Ceci & Bruck, 1995) could lead to more incorporation of that information into memory than was the case here. Or children's memory for events that are less memorable (including filmclips or stories—frequent stimuli used in research) may well be more vulnerable. On the other hand, it could be only the children's reports to particular interviewers that are altered, not their memories. This is still an open question. There is evidence that totally fictitious events can be planted and then recalled long afterwards (Loftus & Coan, in press); in the present study, in contrast, the children were recalling events that were highly memorable. More research clearly is needed on the long-term effects of misinformation that is provided after a long delay.

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APPENDIX

Examples of misleading and reinstating questions

Misleading Examples (the incorrect information is in italics and always occurs in the first part of the sentence)

Central Details
You hurt yourself on *glass*, what did the doctor do to make you feel better?
A *bandage* was put on your cut, what time was it when you hurt yourself?

Peripheral Details
Your *mom* was with you when you hurt yourself, what did the hospital give you for a treat?
You stopped at *McDonald's* on the way home from the hospital, where did you go when you first hurt yourself?

Reinstatement (the first part of the sentence is correct information)

Central Details
Your mom and dad put ice on your cut at home when you hurt yourself, what did you do when you came home from the hospital?
You cut your hand, who called your mom from the school?

Peripheral Details
You were riding your bike before you hurt yourself, how long did you wait at the hospital before seeing the doctor?
Your mom was in the room when you got stitches, who was there when you first hurt yourself?