JOURNAL OF COGNITION AND DEVELOPMENT, 14(1):154–174

ISSN: 1524-8372 print/1532-7647 online
DOI: 10.1080/15248372.2011.638688

Routledge
Taylor & Francis Group

ARTICLE

Revisiting Narrative Elaboration Training With an Ecologically Relevant Event

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A problematic issue for forensic interviewers is that young children provide limited information in response to open-ended recall questions. Although quantity of information is greater if children are asked more focused prompts and closed question types such as yes/no or forced choice questions, the quality of their responses is potentially problematic for a number of reasons. Consequently, a key goal of forensic interviewers is to maximize how much information children provide in open-ended recall. In the current study, 52 3–7-year-old children (mean age 5;2) were interviewed about a highly stressful real-life event, specifically an injury requiring hospital emergency room treatment. Half were given Narrative Elaboration (NE) training prior to the interview. Such training involves cue cards that encourage information about participants, setting, actions, and conversations/cognitions/affective states—all of which is important in forensic interviews. NE-trained children not only provided more information in open-ended recall but they also provided longer, more emotionally evaluated, more descriptive and more coherent open-ended recall than did controls. This is the first study of NE when real life, emotionally charged events are used, as well as the first examining NE-facilitated improvements in the quality of memory reports in terms of coherence and credibility variables. Forensic implications are discussed.

Children are frequent participants in the legal system as witnesses, and although there are developmental deficiencies in a number of cognitive skills, appropriate interviewing can help to maximize children's potential as witnesses. Their greatest asset as witnesses is that they are able to recall considerable information about autobiographical events (Bauer, 2007; Nelson & Fivush, 2004; Peterson, 2002, 2012). It has also become clear that the properties of the particular events they recall make a difference. Mundane, everyday, or repeated events are not well recalled (Peterson, 2002), whereas children recall a lot of information about events that are highly salient,

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emotionally engaging, and unique. For example, children have excellent recall of negative events such as unexpected injuries serious enough to require medical attention (Peterson, 1999, 2010, 2011, 2012; Peterson & Bell, 1996; Peterson & Warren, 2009; Peterson & Whalen, 2001), destructive hurricanes (Bahrick, Parker, Fivush, & Levitt, 1998; Fivush, Sales, Goldberg, Bahrick, & Parker, 2004; Sales, Fivush, Parker, & Bahrick, 2005), or painful and invasive medical procedures (Goodman, Quas, Batterman-Faunce, Riddlesberger, & Kuhn, 1994, 1997; Merritt, Ornstein, & Spicker, 1994; Quas, Bauer, & Boyce, 2004; Quas et al., 1999). Children also have excellent recall of highly positive events such as visits to Disney World (Hamond & Fivush, 1991). As contrasting examples of children's recall of mundane versus stressful events, preschoolers recalled approximately 20% to 30% of the features of a living room camping trip when interviewed 1 day or 3 weeks later (Boland, Haden, & Ornstein, 2003; Haden, Ornstein, Eckerman, & Didow, 2001; Ornstein, Haden, & Hedrick, 2004), but recalled 75% of the features of facial surgery events (caused by injuries) when they were interviewed a full year later (Burgwyn-Bailes, Baker-Ward, Gordon, & Ornstein, 2001). Thus, the experiences that children recall particularly well are highly salient, emotional, and unique. These properties also characterize many forensic events.

Although children have demonstrated robust memory for salient emotional events, both the amount and quality of information that children provide is profoundly affected by how they are interviewed (Larsson & Lamb, 2009). There are a number of issues that affect the quantity and quality of children's recall, and a crucial one is the types of questions children are asked. Children typically provide little information in free (i.e., unstructured, open-ended) recall, for example (see Pipe, Thierry, & Lamb, 2006, and Powell, Fisher, & Wright, 2005, for reviews). Furthermore, the younger the child, the less information he/she provides in free recall (Lamb et al., 2003). Fortunately, the information children do provide in free recall is generally accurate, which is more than we can say about information children provide in response to other forms of questions. Thus, free recall in young children elicits high-quality information, but unfortunately, the information is limited in quantity.

Given the impoverished nature of young children's free recall, they require more questioning by interviewers who are hoping to obtain the necessary information about an event. A range of question types are typically used by interviewers, some of which are open ended and some of which prompt additional free recall about specific things previously mentioned by the child (e.g., "Tell me what happened after you fell"). Other questions include *Wh-* questions to prompt children to provide particular sorts of information (e.g., "Where were you?"). These sorts of questions elicit *recall* (as opposed to *recognition*) processes in children (Larsson & Lamb, 2009). That is, the interviewer is not providing specific information for the child, but rather, children themselves are retrieving the information from their memories. Information provided by children in response to such open-ended prompts or cues is likely to be accurate (Lamb et al., 2003; Pipe et al., 2006; Powell et al., 2005).

As with free recall, children often have difficulty providing complete reports of an event when asked these *Wh-* or open-ended questions. As a consequence of this difficulty or in some cases a lack of patience on the part of the interviewer, more focused questions are frequently used. These questions often rely on *recognition* memory rather than recall and include option-posing questions such as yes/no questions, forced-choice questions that ask children about aspects of an event that they had not previously mentioned, as well as suggestive and leading questions (Lamb, Orbach, Hershkowitz, Horowitz, & Abbott, 2007; Larsson & Lamb, 2009).

These focused questions not only rely on recognition memory, but they also may exert pressure on children to agree with the interviewer regardless of the children's ability to answer the question or the accuracy of the interviewer's ideas regarding an event. They may also encourage children to respond even when unsure, or they may activate response biases (e.g., to say "yes" regardless of the question). These sorts of questions increase the risk for error and interviewer contamination (Lamb et al., 2007; Melnyk, Crossman, & Scullin, 2006). For example, in one study, some children said "yes" when asked by the interviewer, "Did the man touch your private parts?" when video records of the laboratory interaction show that touching was not done (Goodman, Hirschman, Hepps, & Rudy, 1991). They also agreed with nonsensical statements such as the color red is heavier than yellow (Hughes & Grieve, 1980). Thus, these sorts of focused probes result in a considerably larger quantity of information from children, but the quality of that information is likely to be lower.

Interviewers thus face a problematic trade-off when questioning young children: Information elicited by free-recall or open-ended questions is likely to be more accurate, but the amount of information is generally sparse. In contrast, more information is elicited by specific probes, but error rates are increased. Such errors can have serious implications in forensic situations, and so professional groups have recommended that interviewers rely as much as possible on free-recall and open-ended questions and try to minimize or avoid the sorts of questions that are riskier in terms of accuracy (American Professional Society on the Abuse of Children, 1990, 1997; Home Office & Department of Health, 2002; Lamb et al., 2007). The issue then becomes: How can these goals be accomplished?

A variety of approaches have been developed with the intention of increasing the amount of accurate information that young children provide in response to open-ended questions or prompts. Three of these approaches are the National Institute of Child Health & Human Development (NICHD) Investigative Interview Protocol, the cognitive interview (CI), and the narrative elaboration training technique (NE). The NICHD Investigative Protocol was developed by Orbach et al. (2000) for the NICHD, and a number of studies have examined the use of this approach in the field with actual child witnesses (Lamb et al., 2003; Orbach et al., 2000; Orbach & Lamb, 2000; Sternberg, Lamb, Esplin, & Baradaran, 1999; Sternberg, Lamb, Orbach, Esplin, & Mitchell, 2001). Results from these studies have shown that even though there was little increase in the total amount of information gained by using the NICHD protocol as compared with a typical interview, more of the information was provided in response to open-ended questions and free recall.

However, accuracy of children's information was not directly assessed in these studies, although prior research on the relative accuracy of free and open-ended recall suggests that the information provided after these memory cues is more likely to be accurate (Lamb et al., 2003). Such accuracy assessment is difficult to do in actual forensic cases since there is seldom an independent record of what happened. Rather, adult witnesses are often those accused and consequently are likely to deny what children say. However, there have been two small studies of alleged child victims of sexual abuse in which there was either a video record or admission of abuse by alleged perpetrators. In these studies, information elicited by free or open-ended recall was more likely to be accurate than that elicited by focused prompts (Lamb et al., 2007; Orbach & Lamb, 2000). Because of limited research on the accuracy of information provided by children in actual forensic settings, laboratory and analog studies that share at least some similarities with forensic events, even though they differ in a number of important ways, can play an

important role in helping to understand the effectiveness of different types of interviews. The other two primary interview procedures that have been explored in analog or laboratory research are the CI and NE.

The CI was originally developed by Geiselman, Fisher, MacKinnon, and Holland (1986) for use with adults and was later modified for use with children (Geiselman & Padilla, 1988; Saywitz, Geiselman, & Bornstein, 1992). It involves using free recall followed by four mnemonic devices designed to aid recall: reporting everything no matter how seemingly trivial it is, mental reinstatement of context, retelling events in different orders, and retelling events from different perspectives. Studies assessing the use of the CI with children have shown conflicting results. A number of studies have found the CI to elicit a larger quantity of accurate information from children when they are interviewed about laboratory events (e.g., Akehurst, Milne, Köhnken, 2003; Köhnken, Milne, Memon, & Bull, 1999; Larsson, Granhag, & Spjut, 2003; Milne & Bull, 2003), but other studies have found an increase in incorrect and even confabulated information with the CI (Hayes & Delamothe, 1997; McCauley & Fisher, 1995; Memon, Cronin, Eaves, & Bull, 1993; Memon, Holley, Milne, Köhnken, & Bull, 1994; Memon, Wark, Bull, & Köhnken, 1997). Younger children especially seem to have difficulty with some aspects of the CI and have demonstrated problems with recalling events in a different order or from a different perspective (Geiselman & Padilla, 1988). A meta-analysis of the CI by Köhnken et al. (1999) found that there was a significant but inconsistent increase in the amount of correct information when the CI was used, with a corresponding increase in incorrect information. Thus, the CI may well lead to an increase in the quantity of information that children provide, but it needs to be used with caution, especially with younger children as it can negatively affect the quality of information children provide (Geiselman & Padilla, 1988; Larsson et al., 2003; Saywitz et al., 1992).

The focus of the NE technique is to optimize free recall. The NE involves preinterview training of children to use cue cards to encourage them to provide the sorts of information needed by interviewers (Saywitz & Snyder, 1996; Saywitz, Snyder, & Lamphear, 1996). During the preschool years, children are still developing autobiographical memory skills (Nelson & Fivush, 2004), and an important one is developing an understanding of how memory reports are organized and what sorts of information should be provided (Peterson & McCabe, 1983). Children also have limited knowledge of the legal system and therefore of the expectations of interviews in a forensic setting (Saywitz, 1989), such as knowing what sort of information is relevant and the amount of detail needed. As part of the NE technique, four cue cards are used: participants, setting, actions, and conversations/thoughts/affective states. These cue cards have line drawings on them that represent each category visually. Practice and modeling are used to help the child learn the meaning of the cue cards and how to use them. The NE technique offers children a framework through which to organize their memory and prompts them for the information that would be needed in a forensic setting. Importantly, it also provides them with an additional opportunity to provide unbiased nonleading recall between the free-recall part of the interview and probed recall. Thus, the NE procedure is not only a training/preparation task but also a format for interviewing children.

Several empirical studies have assessed the recall of staged laboratory events using the NE procedure for both elementary school-aged children (Brown & Pipe, 2003a, 2003b; Camparo, Wagner, & Saywitz, 2001; Nathanson, Crank, Saywitz, & Ruegg, 2007; Saywitz & Snyder, 1996; Saywitz et al., 1996) and preschool-aged children (Bowen & Howie, 2002; Dorado & Saywitz, 2001). All of these staged events consisted of an interactive learning activity in a classroom or a laboratory event. In the majority of these studies, a classroom activity was interrupted

by a planned disagreement between the invigilator of the activity and another confederate. All of the studies found that the NE procedure increased open-ended and free recall without a significant increase in erroneous information. In addition, the NE procedure has been tested on fictitious events (Camparo et al., 2001), and NE children did not provide more false event details than did control children. Furthermore, the NE has also been found to be effective when retention intervals up to 9 months are used (Brown & Pipe, 2003b). Researchers have also found that for older children (specifically, 7 to 8-year-olds), simply giving children verbal cues about the content prompted by each cue card was also effective, even though no prior training procedure was used (Brown & Pipe, 2003a).

In all of the above studies, children were observers, and the experience could be described as only mildly distressing at best. What is needed is an investigation of the NE technique when children are personally involved and experience high levels of distress. As argued above, events that have high salience and are stressful are better remembered by children (see also Quas & Fivush, 2009), and thus, it is possible that the NE procedure is even more effective with such events than with the sorts of events more typically studied. A second important issue is that the accuracy of the children's recall needs to be explicitly assessed. Subjecting children to high-stress events cannot be done ethically in the laboratory, and so investigators of child memory skills have capitalized on real-life events that cause child distress such as painful medical procedures (e.g., Quas et al., 1999, 2004), natural disasters (e.g., Fivush et al., 2004; Sales et al., 2005), or injuries requiring emergency room treatment (e.g., Peterson, 2010, 2011; Peterson & Warren, 2009). However, such highly stressful real-life events have not heretofore been used for studying the NE procedure. At the present time, there is no way to know if the NE technique is differentially effective depending upon the nature of the event being recalled. What we do know is that high-stress events are more similar to the sorts of events that bring children in touch with police, judges, and social workers, and thus these events have more ecological validity than do mundane events.

The current study evaluates children who have been injured seriously enough to require hospital emergency room treatment. Most of their injuries involved broken bones or lacerations requiring suturing. The children were interviewed using the NE procedure followed by a standardized interview that is similar to NICHD protocol recommendations. This interview was developed by Peterson and Bell (1996) and has been used in a number of studies investigating children's memory for injury (Peterson, 1999, 2010, 2011; Peterson & Bell, 1996; Peterson & Warren, 2009; Peterson & Whalen, 2001). Because adult witnesses are cooperative, accuracy can be assessed for this real-life event by comparing adult and child interviews.

Types of Information Derived From Interviews

Most of the prior research in this field has looked at the amount of new information that children provide in their interviews. This has been often defined as the number of unique units of information (UUIs), which, in laboratory studies at least, can be classified as correct or incorrect. This type of data will be assessed here as well. However, children's interviews can provide other sorts of information too. Part of the interview is essentially structured by the children themselves in terms of the sorts of content they choose to provide, rather than being structured by the interviewer through the sorts of questions that the children are asked. Free recall (e.g., "Tell me what happened") and NE-cued recall (e.g., "Does this 'people' card remind you of anything else?")

elicit such child content-structured memory accounts at the beginning of the interview. These open-ended recall descriptions contain additional information that is not captured by a scoring system that only identifies unique information.

First, the sheer length of children's open-ended reports is important (Buckner & Fivush, 1998; Peterson, 1994; Peterson & Roberts, 2003). Children who provide long accounts, particularly accounts that are elaboratively detailed, are more likely to be believed as witnesses (Bala, Lee, & McNamara, 2001). Secondly, memory reports that provide more references to children's emotions and cognitions as well as reports that are more descriptively detailed are likely to be more compelling. If one only scores the number of UUIs, a child who mentions a particular piece of information such as an emotion or a descriptive detail has that piece of information tabulated once, because the focus of that scoring system is uniqueness. However, children may repeat some types of information for emphasis because they feel it is important. Such use of repetition as an evaluative device was first described by Labov and Waletzky (1967/1997), and narrative researchers since then have shown that repetition is often used to provide an evaluative framework for a narrative (i.e., to provide information about how a child emotionally evaluates a series of events; e.g., Fivush, 1991; Peterson & McCabe, 1983). For example, a child who stated, "I *screamed* and I *screamed* and I *screamed*" is conveying a stronger sense of her emotional reaction to an event that another child who does not provide such evaluative repetition. Likewise, a child describing a dog that bit him who says, "It was a *big* dog . . . it was really *big* . . . it was so *big* that . . ." leaves little doubt about his opinion about the dog's size. This kind of evaluative framework makes a child's account more coherent (Fivush, Haden, & Adam, 1995; Haden, Haine, & Fivush, 1997; McCabe & Peterson, 1984, 1990; Newcombe & Reese, 2004; Peterson & McCabe, 1983; Snow & Imbens-Bailey, 1997), which may well make it more likely to be believed.

Thirdly, narrative researchers have identified some linguistic properties of narratives that contribute to it being perceived as coherent. Children's linkages of the events they describe through the use of connectives are one such marker of coherence (Bennett-Kastor, 1986; Costermans & Fayol, 1997; Peterson & Dodsworth, 1991). The provision of contextual embedding of the events is another marker (Buckner & Fivush, 1998; Peterson & McCabe, 1994, 2004; Peterson & Roberts, 2003). Thus, in the current study, children's free and NE-cued recall will be assessed in terms of length, amount of new information, the use of evaluative repetition of emotions, cognitions, and descriptive details, and two markers of coherence, specifically connective use and contextual embedding.

Hypotheses

In this study, children who were interviewed using free-recall probes followed by the standardized interview developed by Peterson and Bell (1996) are compared to children trained with the NE technique and then interviewed with free-recall probes followed by the NE cue cards and then the same standardized interview. It was hypothesized that the NE condition would lead to an increase in the number of unique units of correct information in open-ended recall as compared with the control group, without a corresponding increase in the number of unique units of incorrect information. It was also hypothesized that open-ended recall by children in the NE group would be longer and more descriptively detailed than recall by control children. In addition, open-ended recall by NE children would contain more references to their emotions and cognitions and would be more coherent.

METHOD

Participants

The 52 children who served as participants had all sustained injuries requiring treatment at the emergency room of a children's hospital, the only children's hospital in the province of Newfoundland and Labrador, Canada. The children were mostly of European-Caucasian descent and represented a cross-section of the population because all children residing in this region receive medical treatment only at this hospital. There were 26 children in the NE condition (M_{age} = 5;2; SD = 15.6 months; range = 3;6–7;11; 19 boys) and 26 children in the control group (M_{age} = 5;2; SD = 12 months; range = 3;1–7;1; 16 boys). Mean delay between recruitment and interview was 6.1 days (range = 4–12) for the NE children and 6.5 days (range = 3–14 days) for the control children.

Procedure

The families of all children were approached in the hospital emergency room and were given information about the study. If they were interested in participating, contact information was obtained. In accordance with ethics committee guidelines, families were then contacted a few days later and asked if they wished for more information and if they were still interested in participating. Those who were still willing to participate were then visited in their homes for the interview. Approximately 75% of families who were approached in the emergency room participated.

During the home visit, children in the NE condition were first given a tutorial on how to use the NE cards. They were read a brief story that contained all elements that are prompted by the NE cue cards (characters, events, context, and dialogue/thoughts/emotions) and then were shown the cue cards one by one. As each card was used to prompt story recall, children received both positive and corrective feedback. After children demonstrated a clear understanding of the cue cards, the researcher then placed all four NE cards in front of the children and asked for a free-recall account of their injury. They were told that they could use the NE cards to help them remember if they wished. After free recall, children were shown each card individually and asked: "What else does this card help you remember about when you got hurt?" Following this cued recall, children were questioned using the standardized interview. The standardized interview uses open-ended questions to ask about aspects of the child's experience and is found in the Appendix. Questions that were leading or suggestive as well as yes/no questions were avoided as much as possible. Occasionally a yes/no question was used if the child did not provide the relevant information in prior free or open-ended recall; examples of these types of questions include, "Did it bleed?"; "Did you cry?" Such questions were always followed by open-ended requests for elaboration.

Children in the control condition were asked for free recall about their injury and then were questioned using the standardized interview. These children had been recruited in an identical fashion to those in the NE condition, although they had been interviewed in previous years. Because it is a long, slow, and laborious process to obtain sufficient numbers of injured children as research participants (there must be a research assistant recruiter present in the hospital waiting room 7 days a week during summer months to be available whenever an injured child arrives for treatment), control children were not recruited simultaneously but rather were randomly selected from an age-matched sample of children who had been interviewed in prior years (M = 4.5 years

previously; range = 2–7 years). The authors acknowledge that differential recruitment presents confounds such as children injured in different years, variation in treatment personnel at hospital, different recruitment personnel, and different people scoring data. However, it was judged that such confounds did not pose a significant threat to the reliability and validity of results because interviewers were rigorously trained by the same person; in addition, the protocol for visiting families and for administering the standardized interview that all children received remained unchanged (see the Appendix for a summary of the standardized interview). Likewise, the interviews of the parents were identical whether their children were in the NE or control group. Importantly, because all adult interviews were identical, parents of NE children were not shown the cue cards and asked to provide information that was relevant to those cards but not queried in the standardized interview (e.g., the weather, what people were wearing). Parents were also not later shown the children's transcripts and asked to verify children's information item by item.

Children were interviewed alone first, without parental presence, and then parents (and if necessary, other witnesses) were interviewed. The interviewer elicited free recall about the child's injury followed by the same standardized interview that had been used for the children. The supervisor of recruitment and interviewing remained the same throughout the collection of data, and periodic and consistent testing of interviewers was a requirement of the interviewing process. In addition, the person who reads all the transcripts and trains people in scoring data also remained the same across the entire collection of children, and that person routinely compared earlier and later transcripts for scoring consistency. Furthermore, the emergency room is a training facility through which a large number of residents and physicians regularly rotate, and all of them were trained and supervised by the same supervisory staff. Finally, there have been no major changes across cohorts. The selection of children treated at the hospital as well as the catchment area of the hospital has remained the same throughout recruitment for all three groups. Socioeconomic status and racial composition of the sample were not deemed a significant problem because according to the 2001 census information provided by Statistics Canada, the area from which the sample was chosen is approximately 97% Caucasian and the hospital used in the research is the only tertiary-level care facility in the province and is publicly funded such that all children go there for this service.

Five interviewers (all female) were involved: Two interviewed the NE children, and three interviewed the control children. All interviewers were upper-level psychology undergraduates who were employed as part-time research assistants. Training involved accompanying an experienced interviewer on two home visits to observe procedures and subsequently conducting one or two interviews under the supervision of the experienced trainer. Additional interviews (typically two, sometimes more) were then listened to jointly with the research supervisor, and thereafter, spot checks of interviews were made. Additional training for the NE interviewers prior to home visits of study participants involved practicing the NE procedure with the research supervisor and then with a child volunteer who was not a study participant but had sustained an injury of some type at some point in the past.

All interviews were audio-taped and transcribed verbatim, and the adult eyewitness interviews were used to determine the accuracy of children's information. That is, for each item of information supplied by children, adult witness transcripts were searched to verify accuracy. Importantly, all adult witnesses were interviewed identically with the standard interview. Although adults too may occasionally make errors in recall, adult witness report is the best (and often the only) standard against which children's information can be assessed.

Data Scoring

The transcripts were first scored for the number of new units of information or UUIs provided by children. There were eight categories of unique information: persons (e.g., "*Nana* was there"), objects (e.g., "A *board* fell on me"), locations (e.g., "I was in the *backyard*"), activities (e.g., "I *fell* off my bike"), attributes (e.g., "It made a *big* cut"), time (e.g., "It was *lunchtime*"), cognitions (e.g., "I didn't *know* that there was glass there"), and emotions (e.g., "It really *hurt*"). These units of information were compared to the information provided by the adult eyewitnesses to assess accuracy. Each UUI was coded in one of three ways: confirmed as accurate, unconfirmed (the parent did not provide relevant information that would allow a judgment about accuracy), or incorrect. Thus, only errors of commission were counted as incorrect. The children's free-recall and NE-cued recall portions of their interviews were scored separately from their responses to the question probes of the standardized interview. In addition, scores for open-ended and total recall were derived: Open-ended recall included free recall plus NE-cued recall for children in the NE condition, and total recall was the sum of free recall, NE-cued recall for NE children, and probed recall. Thus, total recall provided an assessment of all unique information provided in the child's entire interview.

In addition, the free recall and NE-cued recall were scored for other types of information. These initial parts of the interview occur at the beginning, are essentially child-structured in terms of what content children choose to include, and contain additional information that is not captured by a scoring system that only identifies unique information. First, the sheer length of the children's reports was assessed: The number of words and the number of subject–predicate clauses in children's open-ended recall were tabulated to assess the amount of speech children provided in the initial open-ended part of their interviews, prior to probing by interviewers. Secondly, the following categories of potentially repeated information often function as evaluative emphasis and were scored each time they occurred rather than only the first time: emotions (e.g., "I was *scared*. . .. and I was so *scared*"), cognitions (e.g., "I *thought* Mom was home . . . I *thought* Mom was inside"), and attributes (e.g., "There was a *sharp* piece of glass . . . It was really *sharp*. . . It made a really big cut because it was so *sharp*"). Thirdly, two markers that contribute to the coherence of a memory account were scored. One of these markers is the use of connectives. Each instance of three types of connectives is tabulated: Causal connectives link together two events and explicit identify them as causally related (*because, if, so* when used as a connective); temporal connectives explicitly order two events chronologically (*first, next, later, before, after*); and other connectives join two clauses together but do not imply causation or temporal order (*and, but, or*). The second marker of coherence is contextual embedding. To score this, every specification of location (unique or repeated) was tabulated. Ten percent of the interviews were scored by a second researcher (Cohen's kappa = .96).

RESULTS

Unique Units of Information

Table 1 shows the mean number of correct, incorrect, and unconfirmed UUIs for children in the two conditions. These data are separately shown for free recall, NE-cued recall, and probed recall.

TABLE 1
Mean Number of Correct and Erroneous Unique Units of Information in the Different Interview Components for Children in the NE and Control Conditions

		Interview condition		
Interview component	*Information quality*	*NE M (SD)*	*Standard M (SD)*	*Significance p*
Free	Correct	17.5 (14.7)	15.5 (9.1)	*ns*
	Errors	0.3 (0.7)	1.1 (1.8)	.036
	Unconfirmed	5.6 (9.2)	0.9 (2.6)	.014
NE Cued	Correct	9.0 (6.2)	—	—
	Errors	0.5 (1.2)	—	—
	Unconfirmed	5.7 (6.7)	—	—
Open-Ended[1]	Correct	26.1 (18.1)	15.5 (9.1)	.010
	Errors	0.7 (1.4)	1.1 (1.8)	*ns*
	Unconfirmed	11.3 (12.1)	0.9 (2.6)	.000
Probed	Correct	48.4 (18.3)	54.4 (21.7)	*ns*
	Errors	6.4 (5.5)	3.4 (3.2)	.020
	Unconfirmed	18.8 (17.6)	6.3 (8.1)	.002
Total	Correct	74.5 (35.4)	69.9 (27.2)	*ns*
	Errors	7.1 (6.4)	4.4 (3.8)	*ns*
	Unconfirmed	30.1 (7.2)	7.2 (9.1)	.000

[1]Open-ended recall includes free recall + NE-cued recall for NE-group children and free recall only for control children.

In addition, two summarized categories are shown: the amount of open-ended recall (free recall for control children, but for NE-group children, the sum of free and NE-cued recall), and total recall (a sum of all of the above categories). Overall, a mean of 15.6% ($SD = 13.3$) of the UUIs provided by children were unconfirmed by parents, and thus, they could not be classified in terms of accuracy.

A series of one-way analyses of variance (ANOVAs) compared children in the NE group with those in the control group. (Preliminary analyses included the variables of gender and interviewer, but the Fs were always nonsignificant so data were summed across these variables.) In terms of children's free recall, there was no difference between the groups in the number of correct UUIs, although children in the control group provided more erroneous units of information, $F(1, 50) = 4.66$, $p = .036$, $\eta_p^2 = .08$, and children in the NE group provided more unconfirmed information, $F(1, 50) = 6.42$, $p = .014$, $\eta_p^2 = .11$. When one adds the information children in the NE condition supply in response to the cue cards (i.e., the amount of open-ended recall), there were significantly more correct UUIs provided by children in the NE condition, $F(1, 50) = 7.19$, $p = .010$, $\eta_p^2 = .13$, but there was no difference between groups in the number of errors. NE-cued children also continued to have more unconfirmed information, $F(1, 50) = 18.35$, $p < .001$, $\eta_p^2 = .27$. In terms of probed recall, the two groups did not differ in the amount of correct information they provided, but NE children provided more errors, $F(1, 50) = 5.74$, $p = .020$, $\eta_p^2 = .10$. And as usual, NE-cued children had more unconfirmed information, $F(1, 50) = 10.86$, $p = .002$, $\eta_p^2 = .18$. If one considers the total amount of information (i.e., probed plus open-ended information), there was no difference between groups in either the total number of correct UUIs or the total number of commission errors. However, children

in the NE condition provided more unconfirmed UUIs, $F(1, 50) = 19.26$, $p < .001$, $\eta_p^2 = .28$. Thus, children in the two groups were providing the same amount of both confirmed correct and erroneous details; the difference is that NE-cued children were providing considerably more information during open-ended recall, in response to the NE cue cards. For these children, 35% of their correct information was provided in open-ended recall. In comparison, proportionately more information had to be elicited from control children by question probes; only 22% of their correct information was elicited in open-ended recall. In addition, if one considers the percentage accuracy of children's open-ended recall for units of information that could be assessed for accuracy (i.e., correct UUIs divided by correct +incorrect UUIs), 97.4% of NE children's open-ended recall was accurate.

The unconfirmed information was classified for content, and approximately 32% of it was related to information prompted by the context or setting card. NE children described the weather and provided descriptive details of the scenery as well as of home and hospital objects. In terms of unconfirmed information prompted by the "people" card, children provided descriptions of people and listed exhaustively their friends who were present (21% of the unconfirmed information). In terms of information prompted by the "actions" card, 40% of the information related to activities that occurred well before those that were involved in their injury, parenthetical comments about prior similar events, or detailed descriptions of what they did while waiting in the hospital waiting room or in treatment rooms (40%). They also described thoughts of their friends or family members (2%), as prompted by the "conversation/thoughts/feeling" card. Only approximately 5% of the unconfirmed information was potentially related directly to the children's injury/hospital experience and was the sort of information that potentially could have been included by parents during the standard interview. Because it was not, it could not be assessed for accuracy.

Other Properties of Free and Open-Ended Recall

Free recall for both groups of children was analyzed in terms of other sorts of information, including length (number of both words and clauses), the number of evaluative devices (emotions, cognitions, and attributes), and indicators of coherence (causal connectives, temporal connectives, other connectives, and locations). Means are found in the top half of Table 2. Separate one-way ANOVAs compared the two groups on each property of free recall, and none of the analyses were significant.

Open-ended recall is child-structured rather than being directed by the nature of the interviewer's questions, and for control children, it includes only free recall, but for NE children, it includes free plus NE-cued recall. Open-ended recall was also analyzed in terms of other sorts of information, and means can be found in the bottom half of Table 2. In terms of the length of the children's open-ended recall, the number of words and the number of clauses provided by children in the NE condition were greater than those provided by control children, $F(1, 50) = 8.52$, $p = .005$, $\eta_p^2 = .15$, and $F(1, 50) = 19.12$, $p < .001$, $\eta_p^2 = .28$, respectively. In terms of the number of times particular types of evaluative information was mentioned—specifically, the number of emotions, cognitions, and attributes—NE-cued children provided more words to describe emotions, $F(1, 50) = 11.91$, $p = .001$, $\eta_p^2 = .19$, cognitions, $F(1, 50) = 4.09$, $p = .049$, $\eta_p^2 = .08$, and attributes, $F(1, 50) = 6.39$, $p = .015$, $\eta_p^2 = .11$. Thus, NE-cued children provided more instances of all three markers of evaluation. In terms of markers of coherence, there was no difference between groups in the number of causal or temporal connectives used, although

TABLE 2
Mean Length (in Words and Clauses) and Mean Number of Selected Evaluative Devices in Children's Free Recall and Open-Ended Recall[1] in the NE and Control Conditions

		Interview condition		
Aspect	*Specific category*	NE *M (SD)*	*Control M (SD)*	*Significance p*
Free Recall				
Length	Words	93.3 (125.5)	74.0 (68.6)	*ns*
	Clauses	15.1 (15.1)	12.3 (8.9)	*ns*
Evaluative Device	Emotions	0.4 (0.8)	0.6 (0.7)	*ns*
	Cognitions	0.3 (0.7)	0.2 (0.8)	*ns*
	Attributes	4.7 (6.3)	4.6 (4.8)	*ns*
Coherence	Causal Connectives	1.3 (4.1)	0.7 (1.4)	*ns*
	Temporal Connectives	2.5 (5.5)	2.5 (4.9)	*ns*
	Other Connectives	8.9 (10.7)	4.6 (4.1)	*ns*
	Locations	1.8 (2.6)	1.5 (2.0)	*ns*
Open-Ended Recall				
Length	Words	169.2 (151.4)	74.0 (68.6)	.005
	Clauses	30.0 (18.6)	12.3 (8.9)	.000
Evaluative Device	Emotions	2.2 (2.3)	0.6 (0.7)	.001
	Cognitions	0.7 (1.0)	0.2 (0.8)	.049
	Attributes	10.0 (9.8)	4.6 (4.8)	.015
Coherence	Causal Connectives	1.6 (4.5)	0.7 (1.4)	*ns*
	Temporal Connectives	3.9 (6.4)	2.5 (4.9)	*ns*
	Other Connectives	12.8 (11.1)	4.6 (4.1)	.001
	Locations	3.9 (3.8)	1.5 (2.0)	.007

[1]Open-ended recall includes free recall + NE-cued recall for NE children and free recall only for control children.

NE-cued children provided a greater quantity of other connectives, $F(1, 50) = 12.27$, $p = .001$, $\eta_p^2 = .20$. NE-cued children also provided more references to locations, $F(1, 50) = 7.81$, $p = .007$, $\eta_p^2 = .14$. Thus, NE children provided open-ended accounts that were longer, more evaluated, and more coherent compared with those of control children.

DISCUSSION

Our primary goal was to assess the usefulness of the NE procedure when the event used is a real-world stressful event, rather than the sorts of staged events used in prior laboratory studies. Thus, this study is the first test of the ecological validity of the NE memory enhancement procedure. Most prior studies had children witness an enacted altercation between two adults—events that involved children as witnesses rather than participants—and the events were at most minimally stressful. In comparison, the event used here was a personally experienced one that was highly salient; it was also stressful for children. They unexpectedly sustained injuries that were painful and often frightening and that required hospital emergency room treatment. Memory researchers have shown that such events are remarkably well remembered, even by 3- to 7-year-old children (see Peterson, 2002, for a review).

Although young children recall a considerable amount of information about highly salient and unique events, the act of communicating what they recall is more problematic (Larsson & Lamb, 2009). An important issue is that young children provide relatively little information in free or open-ended recall (Pipe et al., 2006, Powell et al., 2005), and thus, interviewers are forced to obtain the vast majority of the information they seek through the use of more directive questions. Option-posing questions that rely on recognition memory rather than recall are particularly problematic, and of course, more directive questions provide more opportunities for leading, misleading, or suggestive questions (Larsson & Lamb, 2009). The NE technique provides a mechanism for encouraging open-ended recall by children and thus capitalizes on one of their strengths, namely, the accuracy of such recall. It also encourages recall about important categories of information—specifically, information about people, context, actions, and emotions/thoughts/utterances.

Prior laboratory-based research showed that the NE procedure encouraged children to provide a proportionately larger amount of information in the initial open-ended part of the interview, and importantly, this increase in correct information was not accompanied by a concomitant increase in the number of commission errors (Bowen & Howie, 2002; Brown & Pipe, 2003a, 2003b; Camparo et al., 2001; Dorado & Saywitz, 2001; Nathanson et al., 2007; Saywitz & Snyder, 1996; Saywitz et al., 1996). The same pattern of results was found here with a naturally occurring stressful event. Overall, children in both the NE-cued and control condition provided the same number of correct as well as incorrect unique units of information during the course of their entire interview. However, more than a third (35.0%) of the correct unique units of information provided by NE-cued children was given during open-ended recall. During the initial free recall, they provided no more correct information than did control children, but they added considerably more when asked whether the NE cue cards reminded them of anything else. Thus, the NE cards were effective in eliciting more open-ended information. In comparison, only about a fifth of control children's correct information (22.2%) was provided in open-ended recall. A limitation in the use of NE cards suggested here is that the NE children provided more errors in probed recall than did control children, but when the entirety of the interview is considered, the two groups did not differ in the number of errors they made.

In addition, NE-cued children provided more information that could not be classified as either correct or incorrect (i.e., accuracy was unconfirmed). This is probably due to the fact that parents were not shown the NE cue cards, and thus, they did not have the explicit opportunity to address the sorts of content that children were cued about through the use of those cards. If parents had been shown the NE cards, undoubtedly much of children's unconfirmed information could have been assessed for accuracy.

As examples of the sort of information that children provided in response to the cues provided by the NE cards that parents were unlikely to provide, children talked about the weather (e.g., "It was sunny out"), details of scenery (e.g., "There was a bench there and lots of grass and lots of trash and some tall weeds"), and descriptions of objects at home or the hospital (e.g., "a boy purse with a puppy on it," "I was lying on a thing like a piece of wood" [during an X-ray]). All of this descriptive detail is prompted by the context card. In terms of information prompted by the "people" card that was unlikely to be provided by parents, children described people (e.g., "Kallie is 8 and is taller than Hannah," "Mary had a green and blue shirt on") and provided exhaustive lists of friends present (e.g., "Kayla, Maggie, Tony, and Teddy the dog were there"). In terms of information prompted by the "actions" card that parents were unlikely to provide, children talked about activities that occurred well before the events leading to their injury (e.g.,

"We were swinging on the swings in my backyard before going to the park"), provided parenthetical comments about events (e.g., "Sean cut himself on that door three times"; "There was another kid there [in the ER] got his two front teeth hit with a golf club"), and talked about the details of what they did in the ER (e.g., "His head was hanging off in the game" [describing a video game played in the waiting room]). They also described the thoughts of others (e.g., "Rebecca moved back 'cause she thought it was going to fall on her"), as prompted by the "talking/thinking/feeling" card. Although a lot of this information may have been provided by parents (e.g., weather, descriptions of setting), if shown the NE prompt cards, some information (such as parenthetical comments about related events) would have required parents to have assessed the accuracy of each unit of information individually. Providing parents with transcripts of child interviews and asking them to do so is a suggested avenue for future research.

Of the open-ended information for which we could confirm accuracy, the NE-cued children had an accuracy rate of 97.4%. If, as one might expect, children's unconfirmed open-ended information is equivalently accurate, they might be providing an additional 11 correct units of information in their accounts over and above the accurate information that they currently provided in open-ended recall. If so, then they would probably provide more correct information overall in their entire interview than would children for whom NE cue cards were not used. However, even with so much information classified as unconfirmed, NE cuing encouraged children to provide more correct information in open-ended recall, and this increase was not accompanied by an increase in commission errors.

The NE procedure has been found to elicit more correct information without an increase in incorrect information in every study in which it has been used. In contrast, the investigators using the CI procedure with children have found more mixed results. Although an increase in information has been found in some studies (e.g., Akehurst et al., 2003; Köhnken et al., 1999; Larsson et al., 2003; Milne & Bull, 2003), other studies have found an increase in commission errors and even confabulations (Hayes & Delamothe, 1997; McCauley & Fisher, 1995; Memon et al., 1993, 1994, 1997). And younger children especially seem to have difficulty with some aspects of the CI procedure (Geiselman & Padilla, 1988; Saywitz et al., 1992). In contrast, the NE procedure has consistently been shown to work well with children, including difficult-to-interview younger children. Although the NICHD investigative protocol (Orbach et al., 2000) has been used successfully with actual child victims and eyewitnesses, little of the information provided by children has been able to be assessed for accuracy (for exceptions, see Lamb et al., 2007; Orbach & Lamb, 2000). Instead, information elicited by open-ended questions is assumed to be mostly accurate (Lamb et al., 2003). Use of this interviewing procedure in the field has been shown to help investigators provide a better-structured interview, but more research is needed, particularly in terms of accuracy.

Several investigators have found that simply providing very general verbal prompts may be enough (Bowen & Howie, 2002; Brown & Pipe, 2003a, 2003b). For example, Elischberger and Roebers (2001) asked children (after free recall) to tell about everything they remembered seeing and then about everything they remembered hearing. These additional prompts elicited more correct information from both kindergartners and second graders about a video they had watched without a concomitant increase in commission errors. So it is possible that general verbal prompts for the information cued by NE cue cards, without the physical presence of the cards, could work effectively. On the other hand, younger preschool-aged children may need the pretraining that the NE procedure provides. Future research is needed to clarify these issues.

The other aspect of children's interviews that was addressed in this study is the properties of their open-ended recall. This is the first study using the NE technique that extends the coding of children's responses beyond individual words, sentences, or propositions to capture aspects of children's evaluation of events as well as the coherence of their narrative accounts of their memory, and it suggests that use of the NE procedure can help overcome some of the expected developmental limitations of the memory reports from children this young. The memory assistance provided by the NE procedure does not help children's free recall, because none of the variables differed between groups when only their initial free recall was compared. Thus, the short training procedure that the NE children underwent was not internalized enough to alter their initial memory reports when they are simply encouraged to "tell everything that you can remember" at the beginning of the interview. (Of course, it remains to be seen if a more extended training [during several days and including lots of practice] would be effective. On the other hand, such extensive pretraining is not practical in most real-world situations.)

However, matters were different when we looked at all of the children's open-ended recall. For the NE children, of course, this included both free and NE-cued recall, whereas for control children, it included only free recall. First, we found that NE children provided accounts that were longer. Specifically, they provided both more words and more subject–predicate clauses in their open-ended recall, and they provided more descriptively detailed accounts, as shown by the increase in attributes. In terms of social services and forensic implications, eyewitness reports that are rich in descriptive detail are more likely to be believed (Bala et al., 2001). Children also provided more information about both affect and cognitions. As an example of differences between the two groups of participants, children of this age seldom provide much information about affective states or cognitions in their recall, yet such information is often of great forensic relevance. During the preinterview training session, children were taught to use visual reminders to assist their recall and one of the cards (the "talking/thinking/feeling" card) specifically encourages children to talk about affective states and thoughts. Thus, the training procedure not only informs children that the interviewer wants a detailed report, but it also teaches them that the interviewer is interested in the particular sorts of information that are cued, including affective and cognition information. Further, when children are using the visual reminder cards when recounting the preinterview story that they were read, they not only are given practice using the cards, but they are given corrective feedback as well. Thus, during the target interview when they are recounting what happened at the time of their injury, they have already learned a great deal about the expectations of the interviewer and have had the opportunity to rehearse providing memory reports with the help of visual cue cards to remind them of various aspects of the event. As a result, NE children provided significantly more information about both affective states and their thoughts than did control children. Although previous studies with older children have shown increased recall of conversation/cognition/affective state information using the NE procedure (e.g., Saywitz & Snyder, 1996), researchers did not analyze the data for each aspect separately and thus could not comment on whether there was more mention of emotion or cognitions. In addition, they did not test preschoolers, as was done in the present study.

Specifying their emotions and cognitions as well as being descriptively detailed about objects embeds children's accounts in a more evaluative framework (Fivush, 1991; Fivush et al., 1995; Haden et al., 1997; Labov & Waletzky, 1967/1997; McCabe & Peterson, 1984, 1990; Newcombe & Reese, 2004; Peterson & McCabe, 1983; Snow & Imbens-Bailey, 1997). This makes the account more coherent and credible. In addition, there were other ways in which the accounts

of NE-cued children were more coherent. They used more connectives between their sentences, although not more connectives that specifically indicated causality or temporal sequence. Greater connectivity of sentences through the use of connectives affects how others rate the coherence of a child's memory report (Costermans & Fayol, 1997). Likewise, embedding a memory report in more contextual information such as location also increases people's judgment of coherence (Buckner & Fivush, 1998; Peterson & McCabe, 1994, 2004; Peterson & Roberts, 2003). Thus, open-ended recall of NE-cued children not only contained more unique information, but it also was more evaluative and coherent than that of children in the control condition. In other words, children were able to provide better narratives about the target event as a consequence of cuing.

Overall, the NE technique was successful in eliciting better memory reports about injury events from young children in comparison with reports elicited by a more traditional interviewing procedure. This suggests that the advantages of the NE procedure may generalize to legal situations that involve child injury (an all-too-common event), where children's reports often play an important role in decision making when social services professionals try to determine whether or not to take protective action or when law enforcement investigators and judges try to determine if legal action is appropriate. Thus, this study has implications for both practice and policy in psychology, social work, law enforcement, and the legal system.

In summary, using NE cards to elicit additional open-ended recall by children, prior to probing questions being used, is a successful way to improve the quality of children's recall. NE-cued children provided more information in open-ended recall than did other children, and almost all of this information was correct. In addition, NE-cued children provided open-ended recall that was longer, more descriptive, more emotionally evaluative, and more coherent. These properties can affect the believability of child witnesses (Bala et al., 2001). After all, not just the sheer amount of unique information affects people's judgments of children's memory accounts. Rather, evaluated and coherent accounts are more compelling (Fivush et al., 1995; Haden et al., 1997; Labov & Waletzky, 1967/1997; McCabe & Peterson, 1984, 1990). This is undoubtedly just as true for jurors as for other members of the lay public. In short, using NE training can potentially add considerably to the quality of children's eye-witness reports.

ACKNOWLEDGMENTS

Preparation of this article was primarily supported by Grant 513-02 from the Natural Sciences and Engineering Research Council of Canada to C. Peterson. Additional funding came from the Memorial University Undergraduate Career Experience Program, the Student Work and Service Program, and the Summer Career Placement Program.

We extend our thanks to the Janeway Hospital and their emergency room staff, and to all the recruiters, interviewers, transcribers, and data analyzers who participated. We also thank Penny Voutier for myriad helpfulness and Malcolm Grant for statistical consultation. And most of all, we thank the parents and children who allowed us into their homes and cooperated so helpfully.

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APPENDIX

I'm going to ask some questions to make sure I understand what happened
- What were you doing before it happened?
- How did it happen?
- Who was there?
- Who else? [who else, etc. until child says that was all]
- Who did it? [appropriate wording, and only if relevant]
- What [objects—use appropriate label] were involved? [clarification needed]
- What other [things—use appropriate label] were there when it happened?
- Where were you when it happened?
- When? What time of day? [If necessary: Was it before lunch, etc.?]
- How long ago did it happen?
- What did you do when it happened?
- How much did it hurt?
- Did you cry? [If so: How much? For how long?]
- Did it bleed? [If so: How much? For how long?]
- Who went for help?
- Who was the first person who came and got you?
- Who else came with [first person]? [encourage elaboration—who else, who else, etc.?]
- What did they do?
- Did you go anywhere else before you went to the hospital?
- [If so] Where?
- What happened there?
- Who else was there?
- What did they do?
- How long did you wait before going to the hospital?
- How did you get to the hospital?
- Who else came with you?
- What happened when you got there?
- Before you saw the doctor, what did a nurse do to you?
- What did you do while waiting?
- How long did you wait?
- When you saw the doctor, was it a boy or a girl?
- What else happened? [prompt for elaboration]
- Who was in the room with you?
- Did you have a needle? [If so: Where on your body?]
- How many needles did you get?
- Did that hurt? [If so: How much?]
- Did you cry? [If so: How much? For how long?]

If broken bone:
- *Tell me what happened when you got X-rays (pictures of your bones)?*
- Was the X-ray person a boy or a girl?
- Was it the same doctor or a different doctor?

Did the X-ray hurt? [If so: How much?]
Did you cry? [If so: How much, etc.?]
Who was in the room with you?
What happened after you got the X-rays?
Did you have to get a cast?
Who put the cast on?
Was it the same doctor or a different doctor?
How did they put it on? What did they do?

If lacerated:
Did someone give you stitches?
What happened? How?
How many?
Who gave you stitches?
Was it the same doctor or a different doctor?
Did you get a bandage?
What else did the doctor do?
Who was in the room with you?
Did that hurt? [If so: How much?]
Did you cry? [If so: How much?]
What else happened?
Did the doctor or nurse give you anything special before you left the hospital? [If so: What?]