

Interviewing Former 1- and 2-Year Olds About Medical Emergencies 5 Years Later

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Five years earlier, 1- and 2-year-old children who had been injured seriously enough to require hospital ER treatment had been recruited from the ER. For this study, as many of these children as could be found participated. The majority of former 1-year olds recalled nothing about these highly stressful events, whereas most former 2-year olds recalled a great deal. For those former 1-year olds who did recall the target events, quality of recall was problematic. In particular, they made considerable source confusions or intrusions into their accounts of details from other related events, producing an account that amalgamated various events into one recollection. Forensic implications are discussed.

KEY WORDS: long-term memory; stressful events; source errors; source monitoring.

This study explores the recollections of 6- and 7-year olds for highly salient and emotional events that occurred 5 years previously, when they were 1 or 2 years of age. The questions we address are the following: Do children claim to recall these events? If so, what is the nature of their recall? Specifically, how much do they recall and how accurate is that recollection when compared to records of the events that were collected at the time they occurred? Two major ways of assessing the children's recollections are used: the amount of information they supply about the target events, and the number of probable intrusions from other similar events that are woven into their accounts.

The questions of whether and how well children recall events from their very early years has pragmatic relevance in forensic situations. Since children are increasingly appearing in court as witnesses, the accuracy of their long-term recall is of considerable interest to police, lawyers, and judges, and there are numerous judicial cases in which the target forensic events took place when children were very young. For example, courts have dealt with a number of cases of alleged child sexual abuse

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that took place when children were 1 or 2 years old, and these cases have often not come to light until some years later (Ceci & Bruck, 1995).

In Canada, the Canadian Criminal Code and the Canada Evidence Act were amended by Parliament by Bill C-15 (in 1989) and Bill C-126 (in 1993), such that corroborating evidence was not required in trials involving children, and moreover, judges were directed not to warn juries that children's testimonies are unreliable or should be viewed with skepticism (Sas, Wolfe, & Gowdey, 1996). Rather, in several recent decisions the Supreme Court of Canada has favored the view that juries were to assess evidence based on their view of the person's mental development, understanding, and ability to communicate. As a consequence of these changes, increasingly younger children are becoming involved with the court system. On a personal note, one of the authors was contacted by a RCMP officer about an alleged incident involving a child who had been 29 months of age at the time of the incident, and she had come forward several years later. The officer wanted to know whether he should even begin an investigation, based on research about the reliability of young children's memory.

Although the events that children are asked to recall in the present study do not fall under the rubric of abuse or entail court involvement, they are nonetheless highly salient events that evoked considerable emotion at the time, according to adult witness reports. Specifically, the children suffered injuries serious enough to require hospital emergency room treatment, injuries such as broken bones, lacerations requiring suturing, burns, or dog attacks. Adult witnesses were interviewed at the time about circumstances surrounding the children's injuries and medical treatment and rated the children's degree of emotional distress. Although children get hurt at various times over the years, the target injuries were relatively unique events since it is not common to have injuries serious enough to break bones or require suturing.

There is no doubt that the child's age during a target experience is a key factor affecting whether that experience will be recalled years later, and long-term memories seem to be particularly rare for experiences occurring when a child was less than 2 years of age (Peterson, 2002; Rubin, 2000). For example, Terr (1988) studied the long-term memory of children who had documented experiences of severe trauma and she found that children who had been under 2 years when they occurred did not readily recall them. In an investigation of children's memory for injuries that had occurred 2 years previously, Peterson (Peterson, 1999; Peterson & Rideout, 1998) found that children who had been at least 2 years 3 months old at the time of event occurrence readily recalled their experiences whereas children who had been younger were more likely to have minimal if any memory of target events (Peterson & Rideout, 1998). Although these studies looked at medical emergencies, findings may well be applicable to other types of events, for example early abuse allegations that people talked about at the time.

Intrusions in Recall

How common intrusions are in children's recall is a question of considerable forensic relevance. By intrusions we mean that the child includes into a recounting

of one event some aspects of a different but similar event. (In the literature, these are also termed confusions in source monitoring.) Intrusions or source monitoring errors are particularly important because although some jurisdictions allow prosecution in cases where alleged child victims of multiple instances of sexual abuse can only provide general accounts of multiple abuse (Poole & Lamb, 1998), children in most jurisdictions are required to provide details of each incident individually (e.g., S. vs. R., 1989; Roberts & Powell, 2001). In these jurisdictions intrusions of details from one episode into another episode are serious threats to credibility (Ceci & Bruck, 1995). Thus, the ability of children to differentiate various experiences is an important forensic concern.

The ability to distinguish between memories from multiple sources has recently been an active area of research (for a review, see Roberts, 2002), and an important factor that affects children's source monitoring is the similarity effect, i.e., the similarity of the events (or sources) being recalled. Children often report details from one event as if they occurred during a different event (Connally & Lindsay, 2001), although highly distinct episodes are less likely to be confused.

When children are exposed to multiple events that share some features, a factor that helps them recall the individual events is rehearsal. Repetition of the details of an experience through talking about it helps maintain those details in memory, as long as the repetition occurs in non-suggestive interactions (Roberts, Lamb, & Sternberg, 1999). Some researchers have suggested that such rehearsal, as long as it is accurate, strengthens memory traces of the incident (Brainerd, Reyna, Howe, & Kingma, 1990; Pezdek & Roe, 1995) or consolidates the memory (Poole & White, 1993). In the present study, some of the children were able to verbally rehearse the target events during family discussions and some were not. By necessity, this variable is confounded with age since the 1-year olds did not have the verbal skills to talk about their experiences shortly after they occurred. As well, the 2-year olds had an extensive interview, which may have consolidated their memory. However, other research has shown that 2-year olds who did not have such an interview right after parallel events transpired showed good recollection anyway, when assessed a year later (Tizzard-Drover & Peterson, 2004). Thus, whether children participated in an early interview or not is unlikely to have affected the results reported here.

Quality of Recall

One important issue we explore here is whether or not children think that they recall the target event, even if what they retrieve contradicts their belief. Because the events were the stuff of family discussions at the time (although most parents claimed at the 5-year follow-up that these events had not been discussed for several years since they were "old news"), it would not be surprising for the children to acknowledge that these events had occurred. But another important issue, and the key one forensically, is the degree to which their recall is an accurate reflection of what actually happened, versus tainted by other experiences that they may have had. In the present study we had a record of what occurred that was collected from adult eyewitnesses at the time of these events; in contrast, such a record seldom exists in forensic situations. Thus, it is informative to see the degree to which children's

accounts deviate from our record of what occurred. In the present study we are able to disentangle components that are part of the target events from components that are not, and thus can assess the quality of the information that the children provide. Unlike laboratory assessments of children's memory, we cannot with certainty identify where source errors came from; on the other hand, the target events are real-life events that elicited enormous distress at the time they occurred—the sorts of events that one cannot ethically replicate in a lab. Research conducted with older children using parallel events has found high accuracy rates in children's recall even 5 years later (Peterson & Whalen, 2001); this study will be able to provide information on the accuracy of accounts by very young children.

Hypotheses

In the present research, 6- and 7-year-old children are asked to recall a medical emergency that had occurred 5 years previously, when they had been only 1 or 2 years of age. Because prior research has found that individuals rarely recall events from when they were less than 2 years of age (Peterson, 2002), we predict that the children who had been injured at age 1 would be much less likely to have any recollection of the event than children injured at age 2. Furthermore, if they did have some recall, the amount of information would be considerably less. Because researchers investigating children's development of source monitoring skills have found that they improve with age (Roberts, 2002), we expect former 1-year olds to have more problems with intrusions or source confusions from other events than will former 2-year olds.

METHOD

Participants

All children were recruited from the ER of a children's hospital; they were mostly Caucasian and from mixed socioeconomic backgrounds. They had experienced medical trauma injuries (defined by ER personnel, mostly lacerations requiring suturing or bone fractures) that necessitated ER treatment. All were treated as outpatients and sent home. There were two groups of children: (a) Former 1-year olds included 25 children who had been between 13 and 23.5 months of age at injury (14 boys and 11 girls, Mean age = 19.4 months). (b) Former 2-year olds included 13 children who had been between 25 and 35 months of age when injured, (5 boys and 8 girls, Mean age = 29.5 months).³

Procedure

Five years earlier, parents and children were approached in the ER where the study was explained and initial consent given. The families were then visited at home a few days later (mean delay = 6 days, range = 2–12 days). Parents (and if necessary, other adult witnesses) were interviewed during home visits to document what had

³Data from memory interviews conducted with all but five of these children within the 2 years subsequent to their injury were presented in Peterson & Rideout, 1998.

happened at the time of injury. Such reports became the standard against which children's subsequent accounts were compared. Although parents may have made an occasional recall error, in such real-world cases there is often little alternative. If children themselves could be interviewed about their injury, they were. None of the 1-year olds could be interviewed although all but the youngest two 2-year olds could.

When telephoned to set up home visits, parents were asked to not rehearse the events with their child prior to our visit. During the visit, interviewers first established rapport and then attempted to elicit information about the injury. Interviewers were previously unknown to all children. Mean delay since the target events occurred was 63.6 months (range 56–72 months). A preliminary ANOVA showed that delay interval did not differ between groups.

During the interview, children were asked to think about a time a long time ago when they had been hurt and taken to the hospital; did they remember that? If necessary, children were subsequently given additional hints. (For example: "A long, long time ago you hurt your arm and had to go to the hospital—remember that?" "Remember when you broke your arm a long time ago? Tell me about it.") If children said they remembered the event, a standardized interview was administered. (See Peterson & Bell, 1996, for questions and examples of responses). If children recalled the wrong event (falling down last year and scraping her arm), the researcher gave another hint to help the child recall the target event ("No, I'm talking about the time long ago when you broke your arm. Remember that?") All interviews began with free-recall probes ("Tell me about what happened when you got hurt and went to the hospital") and then queried specific pieces of information, mostly by means of *wh-* (who, what, when, where) questions. Because of potential concerns about yes/no questions (Peterson & Biggs, 1997; Peterson, Dowden, & Tobin, 1999; Peterson & Grant, 2001), interviewers avoided using such questions, except in the few instances where a wh-question was not possible (e.g., "Did you cry?") If the child provided information relevant to any question during free recall or while expanding on an earlier question, it was not re-asked later, since there are concerns about asking children for the same information multiple times in the same interview (Fivush & Schwarzmueller, 1995). If children did not answer a particular question, it was repeated and if there was still no answer, the interviewer moved on to the next question. During the entire session the interviewer also incorporated play activities (coloring) as well as talk about the child's current activity, to make the interview more enjoyable and to optimize cooperation. The same prototype interview had been used for parental and witness interviews to ensure comparable data. All interviews were audiorecorded and later transcribed verbatim, and scoring was done from transcripts. All aspects of the research were approved by the University's Human Investigation Committee for ethical treatment of human participants.

Scoring of Recall Data

Amount of Information

Transcripts were searched for every new or unique unit of information provided by the child. Specifically, we searched for new units of information about persons,

objects, attributes, locations, activities, time, cognitions, and emotions. Such a scoring system has been used frequently in other reports (e.g., Fivush, 1991; Peterson & Roberts, 2003). Each new unit of information was coded as correct or not *vis à vis* the target events. To do this, adult witness reports were searched for information relevant to each of the children's information units, and the adult witness's report was used as the standard against which the children's reports were compared for accuracy.

Some units of new information seemed to be intrusions from different injuries (Howe, Courage, & Peterson, 1995), and the two events seemed to be combined in memory. Parents confirmed that the children had been to the hospital for other injuries although they often could not recall all the details of these other events. Because many of these details were described as probable but not confirmed with certainty, we have coded them as "probable intrusions." For our purposes, it is not relevant whether they are actually confirmed or not; they still have been inserted by children into their accounts of a different injury. New information that was neither accurate nor identified as a probable intrusion from another injury was scored as "other information." Data were coded for the number of accurate new units of information, probable intrusions, and other information, and a percentage accuracy score (*vis à vis* the target events) was derived by dividing the number of accurate units by the sum of all information units. Twenty-five percent of the transcripts were coded by two independent coders (a senior-level student and a highly experienced research assistant) who were blind to the age of the children. Percent agreement of the scoring categories (scored as number of agreements divided by the number of agreements + disagreements) was 92% ($\kappa = .80$).

Qualitative Analyses

Perusal of the children's transcripts suggested that there were four distinct patterns of recall, and the recollections were therefore categorized into these four patterns. Two raters independently classified all reports and they agreed in all but one instance. Classification of this one was resolved by discussion. The four patterns are: (a) *Good recall*. For these transcripts, children generated at least 10 correct units of information about the target events, and less than a third of their recall was a probable intrusion from other events. Overall, their recall was primarily accurate (defined as over 60% correct). (b) *Amalgamated recall*. Children generated at least 10 units of correct information about the target events, but also added at least half as many probable intrusions as accurate information, thus creating an amalgamation of at least two different experiences. Overall, less than half of the information they provided was correct, at least in terms of the targeted events. (c) *Minimal report*. For these transcripts, children provided only the bare essentials of the events, although the majority of the small amount of information that they did provide was accurate. (d) *No recall*. Children did not recall the target event. Some even maintained that the event never happened (e.g., "I never got stitches" or "I never broke no bones.")

Table 1. Number (and Percent) of Children Recalling Something About the Target Event

Age	No recall	Some recall
1-Year olds	15 (60%)	10 (40%)
2-Year olds	3 (23%)	10 (77%)

RESULTS

The number of children who recalled the target injury is presented first, followed by analyses of the new or unique units of information that they provided. Finally, the qualitative ratings of the children's recalls are presented.

Number of Children Who Recalled the Target Events

A number of the children recalled nothing at all about the target events. In contrast, other children recalled some information and others a great deal. The children were first divided into those who recalled something versus those who recalled nothing, and these data are found in Table 1. It is apparent that the majority of 1-year olds recalled nothing, whereas all but three of the 2-year olds remembered their prior injury and hospital treatment. In fact, two of those children were only barely 2; they were the youngest in the 2-year-old sample, both being 25 months of age at the time of injury. A 2 (age) \times 2 (recall vs. no recall) χ^2 analysis was significant, $\chi^2(2, N = 38) = 4.68, p < .05$.

New Units of Information

Next we examined how much information children recalled about the target events. Only those children who recalled something about them are included; thus, there were 10 children at each age. Table 2 presents the number of units of information of various types provided by the children. Two derived scores are also presented: the percentage of all information units that were correct, and the ratio of probable intrusions to correct units. This latter score is derived by dividing the number of probable intrusions by the number of correct units of information, and is a measure of how much children seemed to combine different events into a report that purported to be about a single target injury event.

Table 2. Amount of Information Units (Correct, Intrusion, and Other) Provided by Children Who Recalled At Least Some Information

	1 Year Olds		2 Year Olds	
	Mean	SD	Mean	SD
# Correct	9.6	5.8	18.5	8.2
# Probable intrusions	8.3	9.9	3.4	3.7
Ratio Intrusions/correct info	0.86	1.00	0.18	0.16
# Other information	5.7	5.1	1.9	2.3
Correct (%)	40.7%	27.5	77.7%	12.9

The number of correct new units of information was analyzed in a one-way ANOVA, with age the between-subjects variable. The 2-year olds recalled more correct units of information about the injury event than did the 1-year olds ($M_s = 18.5$ vs. 9.6), $F(1, 18) = 7.90$, $p = .012$. The number of probable intrusions was analyzed in a parallel way, and there was no significant difference in the number intrusions produced by children in the two age groups. Next we compared the number of intrusions produced by children per accurate unit of information; Table 2 presents the average of the children's ratios of intrusions per correct information, and across children, the 1-year olds averaged almost one intrusion per correct unit of information whereas the 2-year olds averaged less than 0.2 intrusion per correct unit of information. An ANOVA showed a significant effect of age, $F(1, 18) = 4.38$, $p = .05$. The 1-year olds who remembered the target events at all were more likely than 2-year olds to combine information from multiple events into their accounts. Finally, we calculated the percentage of all information provided by the children that was correct. Two-year olds were significantly more accurate ($M = 77.7\%$) than were the 1-year olds ($M = 40.7\%$), $F(1, 18) = 12.00$, $p = .003$.

Qualitative Classifications of Recall

To reiterate, the children's interviews were classified qualitatively into good recall, amalgamated recall, minimal report, and no recall (see Table 3). The majority of 1-year olds did not recall the target event, and for those who did, most amalgamated their recall of target events with other events. Specifically, of the ten children who provided some accurate information about target events, seven provided an amalgamated report and only one child's recall was classified as good. In contrast, seven of the 2-year olds demonstrated good recall while only one produced an amalgamated report. Two children at each age gave only a minimal report. Fisher's exact probability test was calculated on the frequency of amalgamated reports vs. good recalls in each of the two age groups, and the probability of these results by chance is $p = .005$.

Table 3. Qualitative Classification of Children's Recall at 5 Years as Good Recall, Amalgamated Recall, Minimal Report, or No Recall

	Recall pattern			
	Good recall	Amalgamated recall	Minimal recall	No recall
Frequency of pattern				
1-Year olds	1	7	2	15
2-Year olds	7	1	2	3
Children who recalled something (%)				
1-Year olds	10%	70%	20%	—
2-Year olds	70%	10%	20%	—
All children (%)				
1-Year olds	4%	28%	8%	60%
2-Year olds	54%	8%	15%	23%

DISCUSSION

Do children recall highly salient and painful events that had occurred 5 years earlier, when they were 1 and 2 years of age? These were real-world events that elicited considerable distress at the time they occurred, and thus seem to be the sorts of events that are most likely to be retained over time (Quas, Qin, Schaaf, & Goodman, 1997). Indeed, most of the former 2-year olds did recall considerable (and mostly accurate) information about these events. In comparison, the majority of the former 1-year olds did not recall the target events; more disconcerting is the fact that most of the children who claimed to remember actually provided quite inaccurate accounts. Specifically, most seemed to amalgamate multiple events together in memory, producing what parents thought were intrusions from different experiences and thus providing numerous source errors. It is important to emphasize that the children thought they were recalling only one event; they did not think they were producing amalgamations that mixed together several events, and some of their accounts were convincingly cogent.

The better recall for experiences that occurred when the children had been 2 years of age is not surprising, given the excellent long-term recall for injury events that has been demonstrated in other parallel studies (Peterson, 1999; Peterson & Whalen, 2001). It is notable that two of the three 2-year olds who did not recall the relevant events were just barely 2, i.e., they were both 25 months of age at the time. When Eacott and Crawley (1998) investigated another highly salient event that seems to be recalled from a very early age, namely the birth of a sibling, they also found that 90% of children who were over 27 months of age recalled the target event whereas considerably fewer 2-year olds who were under that age did. And, of course, fewer yet recalled the target events if they had been under 2 years at the time.

It has been suggested that the ability to verbally rehearse events helps reinforce memory traces and consolidate them in memory (Brainerd et al., 1990; Pezdek & Roe, 1995; Poole & White, 1993); notably, the two former 25-month olds who did not recall the target events 5 years later were unable to participate in family discussions or be interviewed by a researcher in the days following their injuries. Nor were any of the former 1-year olds able to verbalize about the target events at that time. In contrast, the older 2-year olds were able to talk about the events right after they occurred. This may be an important contributor to the fact that 5 years later, all but one of these older children recalled something about the events, and most recalled a great deal. It is also possible that children are merely recalling what parents had said about these events rather than recalling the events themselves, either at the time they occurred or later, but it is hard to see why only former 2-year olds (especially only the older ones who were at least 27 months of age) and not children a few months younger would be influenced.

The most important finding of this study is the problematic quality of the 1-year olds' recollections. The high proportion of amalgamated reports from the 1-year olds is troubling. Courts and therapists sometimes encounter allegations of abuse that stem from events occurring when the individual was less than 2 years of age, and this report suggests that children's descriptions of events from this age all too

frequently seem to combine multiple experiences. This is often a serious problem for police investigation or judicial prosecution. In many jurisdictions, for a case to be successfully prosecuted it is crucial for children to be able to differentiate various experiences (S. vs. R., 1989). In fact, in most jurisdictions children must be able to specify the details of where, who, when, and what happened for each event, regardless of how often they are repeated (Roberts, 2002). However, the 1-year olds in our sample demonstrated numerous source confusions. Although the target events in this investigation were not abuse-related, they were nevertheless highly salient and emotional, and the fact that parents talked about these events around the children right after they happened should have helped the children's memory of them. Nevertheless, most recollections by these former 1-year olds (if they recalled the events at all) were rife with probable intrusions as well as other information for which neither we nor their parents could identify the source.

For the current study we had documented the circumstances of the children's injuries, but in forensic situations such documentation against which the child's account can be compared seldom exists. Thus, these amalgamated reports emphasize the difficulty of relying on the accounts of very young children, even if the children are convinced that they are recalling the events accurately. As shown elsewhere, such intrusions or source errors substantially decrease with age (Howe et al., 1995; Roberts, 2002), and indeed, such amalgamated reports for these stressful events were rare with our sample of children who were only 1 year older.

In summary, highly salient and emotional events are often not recalled years later by children who had been only 1 year of age at the time of event occurrence, and the memories that they do produce are rife with source confusions and event amalgamations. In comparison, former 2-year olds are considerably better at recalling these sorts of events. This study has a number of limitations: in terms of generalizability to forensic situations, the events were highly stressful but they were not abusive. Furthermore, casts and sutures probably were seen by children as things to show off, and the events certainly were talked about by parents as well as other people. In contrast, abusive events are seldom the stuff of family discussion. If children were old enough or linguistically capable of talking about these events right after they had occurred, this probably helped consolidate the events in their memory and in fact may be a major contributor to why the former 2-year olds' recall was so much better than that of former 1-year olds. If talking about the events is a contributor to long-term memory by children this young, then events about which children do not talk (or are enjoined against talking) may be even more poorly recalled. Nevertheless, children's recall of these particular salient and stressful events seems surprisingly robust, even though they had occurred when the children were only 2 years old. In contrast, the evidence presented here suggests that the recall of former 1-year olds, even if coherent, may be considerably more problematic.

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