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Suggestibility effects persist after one year in children who experienced a single or repeated event

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ABSTRACT

The study of long-term memory for repeated events has important implications for understanding autobiographical memory in a forensic context. Recall accuracy and suggestibility for details of an instance of a repeated event versus a single event were examined in children aged 5–6 and 7–8 years after a one-year delay. Children who reported an instance of a repeated event were more likely to report that a non-experienced detail had occurred and reported less correct information than did single-event children. After one year a significant suggestibility effect was still present. The present experiment provides further evidence for both the capabilities and limitations of children's long-term recall and reinforces the importance of non-suggestive interviews of children at all stages of investigation.

1. Introduction

Because much of what we encounter in life is repetition of similar events, the study of memory for repeated events has important implications for understanding autobiographical memory, both in the theoretical and applied domains. The recent focus on children's memory for repeated events (e.g., Connolly & Lindsay, 2001; Powell, Roberts, Ceci, & Hembrooke, 1999) is likely a result of the legal implications of predicting how children remember and report events that have occurred multiple times in similar ways (e.g., child abuse). Thus, there has been an emphasis on studying how such events are represented in memory, the malleability of memory for repeated events, and how memory for repeated events may differ from memory for unique events.

The extant research is clear: memory for repeated events differs substantially and in important ways from unique events (e.g., Connolly & Lindsay, 2001; Fivush & Hudson, 1990; Powell et al., 1999). This basic knowledge has been established from decades of research on developmental differences (Connolly & Price, 2006; Powell et al., 1999), suggestibility (Roberts & Powell, 2007), question type (Powell & Roberts, 2002; Price & Connolly, 2004), event construction (Connolly & Price, 2006), and emotional arousal (Price & Connolly, 2007a). In the present experiment, we sought to extend this work to an area of substantial applied interest that has received limited research attention: long-term recall for repeated events. Children's accuracy and suggestibility for details of an instance of a repeated event versus a single event were examined after a one-year delay. Children's long-term reports were also compared with an initial interview conducted shortly after their experience(s).

1.1. Memory for repeated events

Children's reports of unique events differ from their reports of repeated events. The way in which they differ is dependent upon at least two factors: type of detail and type of recall prompt. First, when an event recurs, details may be either fixed or variable. That is, details may occur exactly the same way across multiple events (fixed; e.g., the location of abuse is the same each time) or they may change across each instance of the repeated event (variable; e.g., different clothing is worn during each incident). Memory for details of unique events is generally weaker than memory for comparable fixed details of repeated events, but stronger than memory for variable details of repeated events (e.g., Connolly & Lindsay, 2001; Powell et al., 1999). Very few events recur in exactly the same way, and thus, the focus of the present experiment is on memory for variable details. Second, when eliciting recall of a repeated event, one may focus on memory of one particular instance of a repeated event or memory of the routine generally. Compared to memory of a unique event, memory for the general routine is stronger and memory for an instance of the routine is weaker. Most recent research has focused on children's memory for an instance, probably due to its forensic relevance: legally, children may be required to recall one particular instance of abuse in order to make the criminal allegation defensible (e.g., R. v. B. G., 1990).

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1.2. Suggestibility after a long delay

The empirical work to date on children's long-term memory clearly demonstrates that even young preschoolers are able to accurately recall details of unique autobiographical events after delays of months or years (see Peterson, 2002). However, much of the prior work has focused on issues such as related experiences occurring in the interim like conversations about the event (e.g., Peterson, Sales, Rees, & Fivush, 2007), rather than frequency. In the extant literature on children's memory for an instance of a repeated event, there is no published investigation that we are aware of in which children's recall after a long delay has been studied (the longest was three months; Roberts & Powell, 2005). This is particularly important for understanding children's evidence in the justice system; the time from initial disclosure of abuse to prosecution can be lengthy (see Pipe, Lamb, Orbach, & Cederborg, 2007), as can the delay between multiple investigative interviews.

There has been a great deal of empirical interest in the suggestibility of children's memories (see Bruck & Ceci, 1999). In addition to its forensic relevance, an advantage of using the suggestibility paradigm in children's memory research is that it may serve as a measure of memory strength. The *memory trace strength theory* proposes that weaker memories are more susceptible to suggestion than stronger memories (e.g., Pezdek & Roe, 1995). Thus, presentation of misleading information may have a bigger impact after a delay because the original memory trace has weakened. However, some research has indicated that the relationship between suggestibility and memory strength may be more complicated (e.g., Brainerd, Reyna, & Ceci, 2008). For example, if memory for the general content of an event is strong, erroneous suggestions that are consistent with the general event representation may be more likely to be accepted than if the same suggestions are consistent with a general event representation that is weak (see Connolly & Price, 2006; Roberts & Powell, 2006).

Relatively few studies have explored the persistence of suggestions in children's recall a long time after the event and introduction of suggestions. Poole and Lindsay (2001) in the classic "Mr. Science" experiments found that suggestibility, though reduced, was still present after one month. Melnyk and Bruck (2004) also found that previously suggested details were still reported after 6 weeks and again after 5 months. London, Bruck, and Melnyk (2009) conducted one of the few studies to examine children's suggestibility over a delay akin to those experienced in a forensic context. The authors found that suggestive information introduced shortly after a magic show impacted children's memories for the event close to one year later. London et al. (2009) examined recall after 15 months (Exp. 1) and 10 months (Exp. 2) and found significant suggestibility effects at the long term interviews across both experiments. Due to floor effects in free recall at such a long delay, their analyses were primarily conducted on recognition data. Nonetheless, given that closed questions are often posed to children in investigative interviews (e.g., Aldridge & Cameron, 1999; Davies, Westcott, & Horan, 2000; Phillips, Oxburgh, Gavin, & Myklebust, 2012), the presence of a suggestibility effect in recognition after such a long delay has implications for exploring past exposure to misinformation and interpreting children's testimony.

Whether a person will misidentify exogenous misinformation as experienced will depend, at least partially, on whether the specific or general information of the true event is activated by the retrieval cue (e.g., Brainerd & Reyna, 1995). If the specific information for the true event is accessed, rejection of misinformation is more likely. However, if general information is accessed and the misinformation is plausible, the misinformation is likely to be accepted as accurate. Since memory for specific information is said to decay more quickly than general information (e.g., Brainerd & Reyna, 1995; Fivush, 1997), if recall takes place after a delay (the precise length of which is not clear), general information is more likely to be accessed, leading to higher suggestibility. This may be more pronounced for repeated-event than single-event children in view of the stronger general representation in the former group. Given this theoretical prediction and the London et al. (2009) work evincing the persistence of suggestions after one year, we expected that after a one-year delay, repeated-event children would be more suggestible than single-event children in response to recognition questions. Further, we also anticipated that repeat-event children would report fewer correct target details than single event children, due to their greater reliance on more general memory.

1.3. The present experiment

We examined children's memory for an instance of a repeated event after a one-year delay. Children (4–5-years and 6–7-years at initial interview) who experienced a repeated event were compared to children who experienced the same target instance only once. We explored these age groups because differences in suggestibility are marked and especially pronounced in preschool children (e.g., Leichtman & Ceci, 1995).

2. Method

2.1. Participants

Connolly and Price (2006) interviewed 96 children aged 4–5- and 6–7-years-old. Seventy-one of these children returned to complete a one-year follow-up memory test for the present experiment (see Connolly & Price, 2006 for initial interview results and detailed methodology). Children who did and did not participate in the follow-up interview did not differ in average age or mean number of correct and suggested details (in each age group) reported at the initial interview (F's < 2.12, p's > .15).

2.2. Design and materials: time 1

The original experiment included a 2 (age: 4–5-years/6–7-years) × 2 (event frequency: 1/4) × 2 (detail: suggested/control) mixed-factorial design with age and frequency as between-subjects variables. Children participated in either one (single-event) or four (repeated-event) structured play sessions. Each play session involved 16 critical details. For children in the repeat-event condition, for each critical detail, a different option was presented during each of the four play days. Table 1 presents an example of experienced options and suggestions for one group of children. Suggestions were specific details the children did not experience during any session (e.g., "While you did the puzzle, you listened to *piano music*"). Control details were details that were not suggested but were presented at a general level (e.g., "While you did the puzzle, you listened to *music*"); naming the overall category without the specific detail. That is, for a control detail the specific detail the child experienced (e.g., *cat* puzzle) was not mentioned at all – only the overall activity (e.g., puzzle). Control details were included to measure the extent to which children would report a suggested detail by chance alone. Thus, for half of the children, a particular suggested detail (e.g., a *cat* puzzle) was suggested, and for the other half it was not suggested. For all children we recorded reports of suggested details (e.g., having completed a *cat* puzzle). This allowed us to control for a potentially higher than normal rate of guessing suggested details due to the strongly related nature of options associated with several critical details. Each suggestive detail was presented three times and was embedded within three separate questions or statements.

Table 1
Sample details presented in RE condition (SE condition is day 4).

Activity	Day 1	Day 2	Day 3	Day 4	Suggested
Pretend	Baseball	Tennis	Soccer	Hockey	Bowling
Reach for	Circle	Red	Stream	Police	
Puzzle	Cow	Tiger	Pig	Mouse	
Mat	Blue	Waterfall	Fire	Big Bird	Magic wand
Sticker	Bicycle	Boat	Wagon	Bus	Train
Decorate	Ocean	Pirate	Ernie	Triangle	
Story	Wasp	Ladybug	Ant	Mosquito	Beetle
Wear special	Birthday	Elmo	Moon	Yellow	
Draw	House	Tent	Hut	Trailer	
Think about	Lemonade	Sunny	Don/Dawn	9	Tree
Look for	Pear	Peach	Cherry	Orange	
Look up	Cold	Alex	2	6:00	Cake
Build clay	Pot	Can opener	Bowl	Knife	Fork
Lucky	Jo	8	7:00	Hot chocolate	
Hide under cup	$20	$10,000	$1	$100	
Treasure	4	8:00	Ginger Ale	Hot	Cotton balls

2.3. Procedure: time 1

Children participated in one or four play sessions (about 30 min in length each), a biasing interview, and a final memory test. For children in the repeat-event condition, play sessions were scheduled twice a day (morning/afternoon) for two days. The target play session, the one about which memory would be tested, was the last play session which was identical to the only play session for children in the single-event condition.

Play sessions. Play sessions were conducted in groups of two to five children and activities were always presented in the same order. Activities are listed in the first column of Table 1. For the target play session the experimenter wore a special cape. The day was tagged as "Cape Day" to help children identify the target day during interviews.

Biasing interview. Two weeks after the target play session a female 'biaser' who was not present during any of the play sessions met with each child individually. After a few minutes of rapport building (casual conversation about the child's day), the biaser asked the child if he or she remembered 'Cape Day' and if the child could describe the cape. When the biaser was confident that the child was focused on 'Cape Day', she presented a scripted biasing interview containing 16 questions; eight suggestive (each presented three times within the biasing interview) and eight control. The biasing interview took about 5–10 min.

Initial memory test. One day after the biasing interview, a new female experimenter met with each child. After spending a few minutes establishing rapport, the interviewer asked the child to answer the questions based on what s/he remembered about 'Cape Day'. Free recall began with an open request for the child to report all that he or she could remember about 'Cape Day.' When the child stopped talking for approximately 10 seconds he or she was prompted with the names of each activity, presented one at a time. When the child appeared to have exhausted his or her free recall of the event, the cued recall test was administered. Children were asked one question about each critical detail, in the order they were presented (e.g., "On Cape Day, you put together a puzzle. What was the picture on the puzzle?"). To avoid the appearance of doubting the child's initial responses, the interviewer instructed the child that she had to ask all of the questions on her paper, even if she had already asked about it before. Finally, 'yes/no' recognition questions were asked for each critical detail not reported in free or cued recall (e.g., "Did you put together a puzzle of a *cat*?"). The memory test lasted about 20–30 min.

One year memory test: time 2. Within one month of the one-year anniversary of the initial memory test, children participated in a second memory test with a new female interviewer, lasting approximately 10 min. This memory test was identical to the first, with two exceptions: first, children were presented with a photograph of the play session leader wearing the special cape to assist with recollection of the target event. Second, all recognition questions were asked. In the first interview recognition questions were asked only if the child had not reported the information in free/cued recall; presumably, at the initial interview children had the weakest memory for the details elicited in recognition. As a result of this methodological limitation, we analyze only the recognition responses from the follow-up interviews to explore children's recognition memory after one year. Although this analysis limits our ability to draw conclusions about forgetting, it does inform us about recognition patterns after a long delay.

2.4. Coding

Children's responses were transcribed and coded into one of three categories:

(i) Correct response – critical details associated with the correct activity on the target day;
(ii) Suggested response – critical details that had been suggested, but had not occurred on the target or any other day;
(iii) Internal intrusion – a detail that had been experienced during a non-target day.

3. Results

We examined children's correct and suggested responses one year after their participation in a single or repeated play session. Due to a relative lack of detail reported by children in free recall, children's responses in free and cued recall were combined (with any repeated responses removed) and analyzed together. Descriptive data for analyses of correct and suggested responses are presented in Tables 2 and 3. The design was a 2(detail) × 2(age) × 2(frequency).

3.1. Correct responses

To simplify analyses and because the detail variable was not of interest in correct responses,[1] analyses were collapsed across detail

[1] The detail variable allows for a comparison of details that were the subject of a suggestion to those that were not. Thus, for analyses of suggestibility it controls for the possibility of reporting a suggested detail by chance (i.e., without having actually received the suggestion). For correct responses, whether or not a given detail was previously the target of a suggestion (or not) was not of interest in the present study. When detail was included as a variable in the analysis, conclusions did not differ.

Table 2
Means (standard deviations) of correct responses in free/cued recall and recognition.

	Correct responses			
	Free/cued		Recognition	
	Initial/16	1 year/16	Initial[a]	1 year/16
SE, 4–5 years (N = 12)	7.58 (2.11)	0.75 (1.48)	3.27 (2.05)	7.42 (4.32)
SE, 6–7 years (N = 20)	7.75 (1.71)	3.20 (2.38)	4.20 (2.69)	8.75 (1.97)
RE, 4–5 years (N = 16)	2.06 (1.77)	0.44 (1.09)	6.00 (3.67)	9.19 (4.55)
RE, 6–7 years (N = 23)	2.78 (1.62)	0.57 (0.84)	3.78 (3.26)	8.65 (3.75)

[a] The total number of possible correct recognition responses at the initial interview was not equal across participants due to dependence on cued recall responses.

Table 3
Means (standard deviations) of suggested responses in free/cued recall and recognition.

		Suggested details			
		Free/cued		Recognition ('incorrect yes')	
		Initial/8	1 year/8	Initial[a]	1 year/8
SE, 4–5 years	Suggested	0.33 (0.65)	0.08 (0.29)	0.91 (0.70)	3.33 (2.46)
	Control	0.00 (0.00)	0.00 (0.00)	0.82 (0.87)	2.58 (2.61)
SE, 6–7 years	Suggested	0.50 (0.69)	0.10 (0.31)	1.30 (1.53)	2.35 (1.66)
	Control	0.00 (0.00)	0.05 (0.22)	0.95 (1.18)	2.20 (1.91)
RE, 4–5 years	Suggested	0.50 (0.73)	0.00 (0.00)	2.44 (1.86)	4.88 (1.86)
	Control	0.19 (0.40)	0.00 (0.00)	2.13 (2.39)	4.06 (3.02)
RE, 6–7 years	Suggested	2.13 (1.46)	0.22 (0.60)	1.52 (1.56)	3.78 (1.81)
	Control	0.13 (0.34)	0.26 (0.62)	0.87 (1.39)	2.78 (1.95)

[a] The total number of possible suggested recognition responses at the initial interview was not equal across participants due to dependence on cued recall responses.

(control/suggested). Thus, correct responses were analyzed with a 2(age) × 2(frequency) ANOVA.

Free/cued recall. Because single and repeated event children differed substantially in their reports of correct details in the initial interview, we conducted an analysis of covariance in which we entered initial interview scores as a covariate. A square root transformation was applied to the data prior to analysis to normalize the distribution. After controlling for initial interview scores, there was a main effect of Age, $F(1, 66) = 13.98$, $p < 0.011$, $\eta_p^2 = 0.18$, and an age × frequency interaction, $F(1, 66) = 10.25$, $p = 0.002$, $\eta_p^2 = 0.13$. For children who experienced a single event, older children reported more correct details at the follow-up interview than did younger children, $F(1, 31) = 16.20$, $p < 0.001$, $\eta_p^2 = 0.36$. For repeated event children, there was no age difference in reports of correct details, $F(1, 38) = 0.15$, $p = .71$, $\eta_p^2 = 0.004$.

Due to our a priori hypothesis that single event children would continue to report more correct details in free/cued recall at the one-year delay interview than repeated event children, we conducted a univariate ANOVA on the transformed data and indeed found that children who experienced a single event reported significantly more correct details ($M = 2.28$, $SD = 2.39$) than repeated-event children ($M = 0.51$, $SD = 0.94$) after a long delay $F(1, 69) = 18.47$, $p < 0.001$, $\eta_p^2 = 0.21$.

Recognition. Children's correct 'yes' responses to recognition questions at the one-year interview were analyzed. There were no statistically significant effects of age or frequency, though given our relatively low sample size, power may have been a factor.

3.2. Suggested responses

Due to the importance of a control measure in suggestibility analyses, the detail variable was included in these analyses. Thus, suggested responses were analyzed with a 2(detail) × 2(age) × 2(frequency) ANOVA. Note that to establish a suggestibility effect, there must be significantly more suggested than control details reported. That is, more suggestions are reported than could be expected by chance.

Free/cued recall. At the one-year interview, only 10 children reported a suggestion in free/cued recall (a total of 15 suggestions; 11 by repeated event children, 4 by single event children). Thus, due to extremely low cell frequencies and the likely resulting instability of any observed effects, these data are not analyzed.

Recognition. Children's incorrect 'yes' responses to suggested/control detail responses at the one-year interview were analyzed. There was a main effect of frequency, $F(1, 67) = 6.77$, $p = 0.01$, $\eta_p^2 = 0.09$; children who experienced repeated events were more likely to say 'yes' to a non-experienced detail ($M = 7.54$, $SD = 4.06$) than were children who experienced only one event ($M = 5.06$, $SD = 3.97$). There was also a significant suggestibility effect in children's reports after one year, $F(1, 67) = 15.37$, $p < 0.001$, $\eta_p^2 = 0.16$: children reported more incorrect 'yes' responses to suggested ($M = 3.55$, $SD = 2.08$) than control details ($M = 2.89$, $SD = 2.38$). The interaction between frequency and detail was not statistically significant, $F(1, 69) = 2.14$, $p = 0.15$, $\eta_p^2 = 0.03$.

3.3. Internal intrusion errors

Recall that internal intrusion errors occur when a child reports a detail that was experienced during a non-target instance.[2] Since the children were asked to recall only one particular instance of the repeated event, reporting details from any of the other three instances is, strictly speaking, incorrect. However, such details may be conceived of as correct in that they were actually experienced details. We were particularly interested in this pattern of errors at the one-year interview because we anticipated that repeated event children may be particularly likely to report a large number of internal intrusions (Connolly & Price, 2006; Powell & Roberts, 2002; Powell et al., 1999).

[2] Internal intrusions are observed only in free and cued recall. Recognition questions direct the child to answer "yes" or "no" to the target and suggested details. Reports of such details can also occur by chance in the single-event condition, particularly when details are linked thematically across experiences. Measuring internal intrusion errors in single-event conditions is critical because it corrects for such guessing.

Indeed, at the one-year delay interview, if internal intrusions and correct responses are combined to form an 'experienced details' score, single and repeated event children reported approximately the same mean number of total experienced details (single: $M = 2.31$ versus repeated: $M = 2.46$, $F(1, 70) = 0.07$, $p = 0.80$, $\eta_p^2 = 0.001$). However, repeated-event children's 'correct' responses were primarily internal intrusions (84%), whereas single-event children's 'correct' responses were primarily traditionally correct responses (i.e., target details; 99%).

4. Discussion

Consistent with our expectations, even after a year, children who experienced a repeated event recalled fewer correct details (in free/cued recall) than children who experienced a single-event. Older children maintained their expected higher correct recall rate in the single-event condition relative to younger children, but there was no difference in the repeated event condition. Further, after one year, children who experienced a repeated event reported more suggestions (in recognition) than children who experienced only one event. In recognition, there was also an overall significant suggestibility effect after one year when all recognition questions from the follow-up interview were analyzed. We discuss each of these findings in turn.

4.1. Perseverance of suggestions after one year

One year after experiencing the event(s) and the presentation of suggestive information, there was still a significant suggestibility effect. Consistent with the findings of London et al. (2009), a suggestibility effect was observed only in response to recognition questions (free/cued recall means were too small for analyses). Given that the target event(s) (play session) was likely similar in salience to the London et al. target events (magic show), we propose that failure to observe a suggestibility effect in free/cued recall may be due to the relative lack of salience of both the event and suggestions. Consistent with this supposition, with a more salient event and more powerfully presented suggestions a suggestibility effect in free/cued recall after a very long delay has been observed in repeated event children (Price & Connolly, 2007b). Importantly the suggestive techniques used in the present study were not nearly as strong as those observed in highly publicized cases in which suggestive interviewing was a concern (see Bruck & Ceci, 1995), which likely results in an underestimation of the perseverance of suggestions with the present data.

4.2. Repeated-event children are still more suggestible after one year

Children who experienced a repeated event and were exposed to suggestions were still more likely to endorse incorrect information after one year than children who experienced a single event. Theoretically, we anticipated that after a long delay we would observe a larger suggestibility effect in repeated event, compared to single event children. Resistance to suggestions is heightened if specific information about the target event is accessed rather than general information. After such a long delay, general information is likely to be accessed by both single- and repeat-event children. However, we speculated that even after a year, repeat-event children would have stronger general event memory than single-event children (i.e., due to gist strength; Brainerd & Reyna, 1995). Though we did not observe a significant interaction between frequency and detail (suggested/control), our results pertaining to suggestibility are consistent with this possibility. That is, repeat-event children acquiesced to more suggestions than did single-event children. Greater access to particular information may have helped single-event children to reject incorrect information presented in the recognition questions, even after a one-year delay.

4.3. Repeated-event children report fewer correct details

After a long delay, children who experienced a repeated event still reported far fewer correct details in free/cued recall than did children who experienced a single event. Recalling an instance of a repeated event is typically more challenging than recalling a unique event (e.g., Connolly & Lindsay, 2001; Powell et al., 1999). That is, confusion among multiple related details makes recall of one of those particular instances more challenging. The present experiment extends that finding to two different age groups, after a long delay to recall.

To further understand the substantial difference in number of correct details reported by single- compared to repeated-event children we explored children's internal intrusion errors. When such responses are considered, it is clear that repeated event children are capable of reporting comparable numbers of details related to what they actually experienced. Those details, however, may not have come from the instance the child is questioned about. Thus, where practical, expanding the definition of a 'correct' response may be especially helpful for interpreting the testimony of children who have experienced repeated events.

4.4. Effects of age

We also examined age differences in children's recall after a long delay. Few main effects or interactions with age were observed, indicating that the effect of event repetition appears relatively consistent across the ranges in age examined. The typical age advantage in recall observed in older children was observed in the single event children, but not the repeated event children. These findings are consistent with the conclusions of Brainerd et al. (2008) that older children are more likely than younger children to identify patterns across stimuli (in this case, a repeated event) and so are more likely to be impacted by the patterns. Aside from these rather predictable effects, we can concur with La Rooy, Lamb, and Pipe's (2008) conclusion that there was limited evidence for developmental differences in the amount of information recalled across repeated interviews.

4.5. Caveats

We did not have a control condition of children who were not interviewed at the initial interview. As noted by several scholars (e.g., La Rooy, Katz, Malloy, & Lamb, 2010), this may be critical to determining the impact of delay, given an intervening interview's likely impact on subsequent recall (Pipe, Sutherland, Webster, Jones, & La Rooy, 2004). The data also suffered from general floor effects. Such low means limited our analyses in several places, and our conclusions in others. In future work, increasing the salience of the event should assist with prevention of floor effects.

5. Practical application

The present experiment provides evidence that children are capable of reporting correct information after a lengthy delay. There was, however, perseverance of a suggestibility effect that was particularly problematic for children who had experienced repeated events. Thus, even when suggestive techniques are not used in a subsequent interview, suggestions introduced previously may still influence children's responses after a long delay. These results provide further evidence for both the capabilities and limitations of children's long-term recall and reinforce the importance

of non-suggestive interviews at all stages of investigation. Further, the results underscore the need for investigative interviewers and those evaluating investigative interviews to be mindful of the special circumstances of children who have experienced repeated forensic events.

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