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CHILDREN'S RECALL OF MEDICAL EXPERIENCES: THE IMPACT OF STRESS

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ABSTRACT

Objective: The study compared children's reports of two medical events, to assess the effects of the type of event on children's recall. Additionally, the study examined the effect of props on children's event reports.
Method: Twenty children between the ages of 37 and 67 months were interviewed following either a voiding cystourethrogram (VCUG) or a pediatric assessment (PA) at a hospital. Interviews were conducted between 6 and 8 days after the event and included a doll and prop items.
Results: Ratings of stress were significantly higher for children who underwent the VCUG than those who underwent the PA. Children who experienced the VCUG procedure reported more correct information than the children who experienced the PA. Age was correlated with the total amount of correct information reported. Stress levels were correlated with both errors and accuracy of information.
Conclusions: Children who experienced a stressful medical procedure remembered more than children who experienced a neutral medical event, although this increase in amount recalled was at the expense of accuracy. These findings suggest that stress impacts negatively on recall; however, the unique and structured nature of the VCUG procedure compared to the PA, and the familiarity of the PA prop items to the children who experienced the VCUG procedure, may also have contributed to differences in recall of the two events. © 1999 Elsevier Science Ltd

Key Words—Child witness, Testimony, Stress.

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INTRODUCTION

CHILDREN CALLED UPON to give evidence in clinical and legal contexts are frequently required to remember and recount experiences that have been stressful or traumatic. It is only relatively recently, however, that researchers have begun to examine children's memory for stressful events involving a degree of personal threat or harm. A number of these features occur when children undergo some medical procedures, and these have therefore become a focus of recent research (e.g., Baker-Ward, Gordon, Ornstein, Larus, & Clubb, 1993; Gordon et al., 1993; Howe, Courage, & Peterson, 1994, 1995; Peterson & Bell, 1996; Steward, 1993). In particular, several recent studies have investigated children's memory for a micturating cysto-urethrogram (MCU; known as the voiding cysto-urethrogram, VCUG, in the U.S.A.), which involves an x-ray of the child's kidneys (Goodman & Quas, 1997; Goodman, Quas, Batterman-Faunce, Riddlesberger, & Kuhn, 1994; Merritt, Ornstein, & Spicker, 1994; Quas, Goodman, Bidrose, Pipe, Craw, & Ablin, in press). This procedure has some of the features of an abusive experience in that it is likely to involve discomfort and, in many cases, stress for the child, and also involves genital touch.

To date, studies investigating children's memory for stressful medical events have failed to reveal a straightforward relationship between stress at the time of encoding and subsequent recall; some have reported a beneficial effect of stress on memory (e.g., Goodman, Aman, & Hirschman, 1987, Studies 2 and 3; Goodman, Hirschman, Hepps, & Rudy, 1991), others have reported a negative impact of stress on memory (Merritt et al., 1994; Peters, 1987, 1991; Vandermaas, Hess, & Baker-Ward, 1993), and still others have found no impact of stress on children's memory (Goodman et al., 1991, Study 1; Howe et al., 1994, 1995; Oates & Shrimpton, 1991; Peterson & Bell, 1996). Few studies have, however, directly compared recall of stressful and nonstressful events using the same interview procedures over identical delays.

Children's reports of events are clearly influenced by the extent to which the memory interview supports their strengths and compensates for their limitations (Saywitz, 1995). Within clinical contexts, recognition of young children's difficulties has resulted in the widespread use of props in interviews, including toys and dolls (Boat & Everson, 1994; Koocher et al., 1995; Vizard, 1991). Findings of a number of recent studies suggest that although dolls, models, and toys may increase recall of both correct items and errors in young children's accounts (DeLoache & Marzolf, 1995; Gordon et al., 1993; Salmon, Bidrose, & Pipe, 1995), errors are less likely to occur when there is a relatively high degree of similarity between the props and the items they represent (Priestley & Pipe, 1997; Salmon et al., 1995). Furthermore, props that were not present at the event have been found to introduce a disproportionate number of errors (Salmon et al., 1995).

In the present study, we compare children's reports of two medical events; the micturating cysto-urethrogram (the VCUG) and the pediatric assessment (PA), a relatively nonstressful event for many (though not all) children. In addition to a comparison of the impact of different types of events, the present study also investigated a related question concerning the effect of types of props on children's event reports, namely those relevant and those irrelevant to the event.

METHOD

Participants

Children between the ages of 3 and 7 years (inclusive) referred to Dunedin Hospital Radiology Department for a VCUG or to the Pediatrics Department for assessment over a 22 month period were eligible for inclusion in the study. Twenty children were included in the final sample (M = 49.3 months, range = 37–67 months). Ten children had experienced a VCUG (M = 49.1 months, range = 38–67 months, and 10 had experienced a PA (M = 49.5 months, range = 37–67 months).

Of the VCUG children, seven were girls and three were boys, and of the PA children, six were girls and four were boys.

Materials

Prior to the medical procedure, the female pediatrician observer completed a modified version of the Pain Behavior Checklist (PBCL) (Lebaron & Zeltzer, 1984). This checklist consists of eight behaviors from muscle tension to screaming on which an observer rates each behavior from absent to extreme intensity on a 5-point scale. Over the course of the procedure, the observer again completed the PBCL, and also the VCUG and PA Checklists. The checklist for the VCUG comprised 28 actions judged by the pediatrician observer and the radiologist conducting the VCUG (also female) to be the essential actions that could occur during the procedure and nine items of equipment that could be used. Similarly, the checklist for the PA comprised 28 actions judged by the pediatrician observer to be the essential actions that could occur during the assessment and 11 items of equipment that could be used.

Procedure

Children in the VCUG condition experienced the procedure as follows: The child was required to undress and lie down in the bed wearing a gown and after the genital area was washed and lubricating jelly applied, a urinary catheter was then inserted up the urethra into the bladder. Dye was infused into the bladder and x-ray pictures were taken. The tape and catheter were then removed and a bottle or bedpan was given to the child to urinate into. During this procedure the radiologist explained to the child what was happening.

Pediatric examinations comprised various features that were selectively administered to the child. These included the child standing and walking, being weighed and measured, blood pressure was taken, and head, neck, chest, abdomen, and the upper and lower limbs were checked. In some instances, the child's genital and anal regions were examined.

Approximately 1 week after the procedure ($M = 7$ days, range = 5 to 9 days), parents brought the children to the Department of Psychology, a separate location from the hospital, for the interview. The child was seated on the floor and was shown the toys and models of the medical items from the PA and VCUG procedures (props items). Eight props represented items from the VCUG (for example, the x-ray camera, television monitor, fluid line and stand, bedpan or urine bottle), eight represented items from the PA (for example, tongue depressor, tape measure, stethoscope, and otoscope), and three were present at both (bed, sheet, soft doll of the same gender as the child; this was not an anatomically correct doll.). The child was reminded about the hospital visit and encouraged to use the props to show what had happened. Nondirective prompts were provided until it was clear that the child could provide no further information. Children were then asked specific questions concerning the presence or absence, during the PA or VCUG, of eight of the prop items (four of which were relevant to their experience and four of which were distractors in that they were relevant to the procedure the child had not experienced). If the child indicated that the item had been present, the child was asked to show the interviewer what had happened with it.

Correct information in children's verbal reports and demonstrations was coded in the three categories of actions, objects, and body parts. Substituted objects were coded if children used a different object than that which was used in the event to demonstrate an action (e.g., using the tape measure to measure the doll's height). Correct rejections were coded when a child clearly rejected an item that had not been part of their experience. Errors were coded as distortions of actions that had occurred or of descriptions of objects that had been present during the VCUG or PA, or as intrusions of actions that had not occurred during the event. Answers to specific questions about objects were coded as correct or incorrect, or don't know replies. Reliability based on independent

Table 1. Mean (*SD*) Number of Items of Information Reported by Event Type

Information Category	VCUG	Pediatric
Correct		
Action	6.70 (2.95)	4.10 (1.66)
Body Parts	1.80 (1.62)	1.60 (1.35)
Objects	6.60 (1.90)	4.30 (1.57)
Substituted objects	0.70 (0.95)	0.00 (0.00)
Correct rejections	1.00 (1.89)	0.20 (0.42)
Total Correct	16.80 (6.03)	10.20 (4.32)
Intrusions		
Relevant prop intrusions	1.70 (1.34)	0.20 (0.42)
Distractor prop intrusions	4.00 (2.91)	1.30 (2.06)
Pediatric prop intrusions	—	1.50 (3.14)
General intrusions	0.50 (0.97)	0.70 (0.67)
Total Intrusions	6.20 (4.04)	3.70 (3.59)
Distortions		
Distorted action	0.10 (0.32)	0.00 (0.00)
Distorted body part	0.60 (0.97)	0.20 (0.42)
Distorted object	0.10 (0.32)	0.10 (0.32)
Total Distortions	0.80 (1.14)	0.30 (0.48)

coding of the transcripts and videos was assessed as agreements/(agreements + disagreements) and was 83%.

RESULTS

The effects of the event type, degree of stress, and age on the numbers of items of correct information reported, numbers of errors made, and accuracy were assessed by comparing measures across event type (VCUG vs. PA) and by examining correlations between variables within and across event types.

Correct Information

Mean numbers of information correctly reported are shown in Table 1. To assess the effect of the nature of the event on the amount of correct information reported in response to the general prompt, the total numbers of correct items recalled were submitted to a one-way analysis of variance, with event type as the between-subjects factor. The analysis revealed a significant main effect of event type, $F(1, 18) = 7.92$, $p < .05$. Children who underwent the VCUG procedure recalled more correct information overall ($M = 16.8$) than those who underwent the PA ($M = 10.2$). Both the VCUG ($M = 6.70$) and the PA ($M = 4.10$) children reported only a relatively small number of the total number of actions that it was possible to report (28 for each event).

Errors

Mean numbers of errors in children's reports are shown in Table 1. Intrusion and distortion categories of errors were summed and submitted to a one-way analysis of variance, with event type as the between-subjects factor. The main effect of event type for total number of errors was not significant (for VCUG and PA, $M = 7.00$ and 4.00, respectively). Errors occurring in relation to the use of props (relevant and distractors) were examined. There was a main effect of event for intrusions made with relevant-prop items, $F(1, 18) = 11.44$, $p < .01$, with VCUG children making more intrusions than PA children ($M = 1.70$ and .20, respectively) and also for intrusions made

with distractor items, $F(1, 18) = 5.75$, $p < .05$, with VCUG children again making more errors ($M = 4.0$ vs. 1.3). None of these errors were of a nature that would suggest genital touch had occurred during the children's experience when it had not. Some, however, reflected scripted pediatric actions not performed by the radiologist or pediatrician (e.g., blood pressure taken, stethoscope used).

Accuracy

A measure of accuracy of recall was calculated as total correct items of information/(total correct + total errors). The accuracy of information reported was relatively low for both VCUG children ($M = .70$), and PA children ($M = .83$). Accuracy scores were submitted to a one-way ANOVA with event type as the between-subjects factor. The main effect of event type failed to reach significance ($p < .08$).

Stress

To establish whether there were any differences in stress ratings before and during the procedures for each of the two groups, a two-way ANOVA was conducted with event type as the between-subjects factor, and stress assessment (prior to and during the event) as a within-subjects factor. There were significant main effects of both event condition, $F(1, 18) = 8.94$, $p < .01$, and stress assessment, $F(1, 18) = 17.66$, $p < .01$, and a significant interaction between these two factors, $F(1, 18) = 9.62$, $p < .01$. To test this interaction further, a series of one-way ANOVAs were conducted. There was no difference between stress levels prior to the procedure ($M = .20$ for VCUG, $M = .00$ for PA), whereas stress levels during the procedure differed according to event type, $F(1, 19) = 11.58$, $p < .01$ ($M = 14.90$ for VCUG, $M = 3.00$ for PA). In other words, children who experienced the VCUG were rated as more stressed during the procedure than were children who experienced the PA. It is important to note, however, that the maximum score was 40 and even for the VCUG children, stress levels were not high.

To examine the effects of stress on recall, Pearson Product-Moment Correlations were conducted. Correlations between stress levels and correct information and errors, respectively, were not significant for children of either group. The correlation between stress levels and accuracy (correct items/[correct items + errors]) was significant for the VCUG children ($r = -.63$, $p < .05$), but not the PA children ($r = .05$). That is, higher scores were related to reduced accuracy for the VCUG children but not the PA children.

Age

Pearson Product-Moment Correlations were conducted between age and total recall, separately for VCUG and PA subjects. Age was significantly related to the total amount of correct information reported by the VCUG children ($r = .67$, $p < .05$), but not by the PA children ($r = .12$). Age was not correlated with total number of errors made for VCUG children, ($r = -.53$) or for PA children, ($r = -.20$).

Specific Questions

Children were asked eight questions concerning relevant and distractor props that had been used and their function. Correct answers to these questions were expressed as a proportion of the total number of questions asked. There was no significant difference in the accuracy of the VCUG children ($M = .70$) and the PA ($M = .70$) children in identifying whether the props had been present during their procedure at the hospital.

DISCUSSION

Children who experienced the VCUG procedure reported more correct information than did the children who were interviewed about the pediatric examination. They also experienced greater levels of stress, raising the possibility that the difference in stress induced by the two procedures contributed to the differences in children's memory of them. However, when we examined the relationship between stress and recall within each group of children, for the VCUG children higher levels of stress were associated with decreased accuracy although not the amount of correct information reported. Therefore, although children recalled more about the stressful event, consistent with previous studies (e.g., Goodman et al., 1991) when levels of stress were related to accuracy, stress had a negative impact on the accuracy of children's recall of the event (see also Merritt et al., 1994).

In addition to stress, other factors may have contributed to the differential memorability of the two events in the present study. First, the VCUG is a relatively unique event and may therefore have been more memorable than the pediatric examination, a procedure likely to have been much more familiar to many children (Howe et al., 1994). Indeed, stressful events are in general likely to be more distinctive than neutral or pleasant events by their very nature, and in this sense it is doubtful that it is ever possible to strictly "match" stressful and nonstressful events.

A second point raised by Ornstein (1995) and Peterson and Bell (1996) is that medical procedures such as the VCUG involve causally-connected sequences of actions whereas the component actions and activities of the pediatric examination tended to be less strongly related. Even for very young children, causally-connected sequences are better remembered than those without causal connections between the component activities (Fivush, Kuebli, & Clubb, 1992; Fivush, Pipe, Murachver, & Reece, 1997; Murachver, Pipe, Gordon, Owens, & Fivush, 1996). This aspect may have been highlighted in the present study by the radiologist's narrative commentary about what was happening during the VCUG. As Tessler and Nelson (1994) have shown, talking about events highlights aspects that are later remembered, and may also provide an interpretive structure for the event (Fivush et al., 1997). Older children who experienced the VCUG reported more correct information than did younger children, although no relationship was found between age and errors. Older children may have been more able to take advantage of the highly structured and unique nature of the VCUG to report more features than were younger children.

Finally, the pattern of errors illustrates the potential difficulties in using prop items to aid children's accounts of a past event. Most of the errors that children made related to props, in particular, distractor items. This was particularly the case for the children who underwent the VCUG but who were, nonetheless, likely to have been familiar with the distractor props relating to the pediatric examination. Given the presence of these items, children did not restrict themselves to reporting the specific target event (the VCUG) but rather interacted with the other medical props also. We have argued elsewhere that the extent to which prop items lead to inaccuracies in children's recall is likely to depend on a number of variables, including whether or not children can interact with them, and the extent to which they are uniquely associated with the event (Salmon & Pipe, 1997). The use of toy props can constitute a double-edged sword, both increasing the amount of information that children report but potentially at the expense of accuracy.

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RÉSUMÉ

French abstract not available at time of publication.

RESUMEN

Objetivo: Con el objetivo de evaluar los efectos del tipo de acontecimiento en el recuerdo de los niños, el estudio comparó la exposición de recuerdos que realizaron los niños acerca de dos acontecimientos de tipo médico. Además, el estudio examinó el efecto de las cuestiones accesorias en la información que dan los niños del acontecimiento.
Método: Viente niños de edades comprendidas entre 37 y 67 meses fueron entrevistados después de haber participado en el hospital en una exploración pediátrica o en un cicto-uretrograma. Las entrevistas se llevaron a cabo entre 6 y 8 días después del acontecimiento e incluyeron ítems relativos a una muñeca y a los accesorios.
Resultados: Las puntuaciones de estrés fueron significativamente más altas para los niños que pasaron por el cisto-uretrograma que para los niños que recibieron la exploración pediátrica. Los niños que pasaron por el cisto-uretrograma proporcionaron en su exposición más información correcta que los niños que experimentaron la exploración pediátrica. La edad correlacionó con la cantidad total de información correcta proporcionada. Los niveles de estrés correlacionaron tanto con los errores como con la información precisa.
Conclusiones: Los niños que experimentaron un procedimiento médico estresante recordaron más que los niños que experimentaron un acontecimiento médico neutro, a pesar de que este aumento en la cantidad de recuerdo se hizo a expensas de la precisión del mismo. Estos resultados sugieren que el estrés impacta negativamente en el recuerdo. Sin embargo, la naturaleza única y estructurada del cisto-uretrograma en comparación con la exploración pediátrica normal, y la familiaridad de los ítems accesorios a la exploración pediátrica para los ninos que experimentaron el procedimiento de cisto-uretrograma puede haber contribuido a las diferencias en el recuerdo de los dos acontecimientos.