MEMORY AND SUGGESTIBILITY IN THE FORENSIC INTERVIEW

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Memory for Traumatic Events in Children and Adults

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If we stop remembering, we stop being. — Elie Wiesel (1985)

One of the major tenets of psychotherapy is the principle that traumatic experiences have long-term effects on individuals (Freud, 1915/1957). Few clinical psychologists, trauma researchers, or victims of trauma question this principle. As an impressive example of this, Elie Wiesel, Nobel Laureate and holocaust survivor of Auschwitz and Buchenwald, has devoted his life to the importance of preserving the traumatic memories of human history. Recently, however, cognitive psychologists have begun to explore a different aspect of the trauma, that is, the accuracy of memories for traumatic events. Without doubting that traumatic events have long-term effects, these researchers seek to understand if memory for traumatic events functions similarly to memory for nontraumatic events, and if these two types of memories have similar characteristics. Understanding the nature of memory for traumatic events is important because it provides a basis from which to evaluate the veracity of individuals’ traumatic recollections. This intriguing notion, that although traumatic events might have a significant long-term effect on an individual, the individual may not retain an extensive veridical memory for the original traumatic event, is the focus of this chapter.

Researchers have addressed a different situation involving memory for traumatic events. This occurs when an individual has no access to his or her memory following a traumatic event. This phenomenon is known as dissociative or retrograde amnesia (two forms of psychogenic amnesia) and is associated with the recent debates regarding the repression and subse-
quent recovery of traumatic memories (for summaries of this issue, see Loftus, 1993; Pezdek, 1994; Pezdek & Banks, 1996). In a recent discussion, Arrigo and Pezdek (1998) presented six classes of events (in addition to childhood sexual abuse) that have been documented as sources of psychogenic amnesia. However, in this chapter neither amnesia for traumatic events nor posttraumatic stress disorder (PTSD) symptoms are discussed.

This chapter addresses situations in which individuals do have at least some access to their memory for a traumatic event and can recall aspects of the event. Whether this memory is likely to be accurate and whether it shares features with memory for nontraumatic events are discussed. If similar processes operate on memory for traumatic and nontraumatic events, then the wealth of research currently available on everyday memory for nontraumatic events should apply to memory for traumatic events as well. If not, new memory models need to be developed to address memory for traumatic events.

In this chapter, research and case studies on memory for salient traumatic events are presented. This is not intended to be a comprehensive review of the literature on this topic. Rather, we present a representative sample of the more recent research on memory for salient traumatic events. The studies discussed concern incidents in which a traumatic event is remembered, and researchers have assessed characteristics of memory for the event. Although this chapter primarily addresses children's memories for traumatic events, several important studies that involve adults' memories are also included. The inclusion of adult studies as well as studies of children allows a broader treatment of the question, "Are memories for traumatic events similar to normal nontraumatic memories?"

The first set of studies discussed addresses memory for medical procedures. As a point of comparison, we begin with a discussion of several studies that involve memory for routine medical procedures that although anxiety arousing, do not qualify as truly traumatic. This is followed by a discussion of research on memory for traumatic medical procedures. Subsequent sections present research on memory for disasters, violent events, and childhood sexual abuse. We conclude with a discussion of the lessons that can be gleaned from the research on memory for such a wide range of salient traumatic events. These lessons focus on the question: Does memory for traumatic events follow the same cognitive principles as memory for distinctive nontraumatic events?

MEMORY FOR ROUTINE MEDICAL PROCEDURES

Motivated by an interest in studying children's memory for salient events that occur in the course of everyday lives, Baker-Ward, Gordon, Ornstein, Larus, and Clubb (1993) examined the recall of 3-, 5-, and 7-year-old chi-
dren for a well-child checkup. The children were tested either immediately after the procedure, or 1, 3, or 6 weeks later. The physicians and nurses completed a checklist for each child against which each child's subsequent memory was compared. Although recall accuracy was impressive in the initial interview (the percentage of the features of the physical examination recalled was 75.1% for 3-year-olds, 82.2% for 5-year-olds, and 92.2% for 7-year-olds), the recall differences between each age group were significant. Also, with increasing time delay, the expected forgetting of features from physical examination occurred, with the forgetting rate significantly higher for the 3-year-olds than for children in the two older groups. In terms of children's responses to questions about features that were not actually part of the physical exam, the overall false alarm rate was well below chance; however, the 3-year-olds were significantly more likely to false alarm to these features (probability of a false alarm in the initial test condition = .24) than were the 5-year-olds (.06) and 7-year-olds (.09).

Children's memory for a physical examination that included a more stressful feature was examined in four experiments reported by Goodman, Hirschman, Hepps, and Rudy (1991). In this study, children were videotaped at a health clinic during a physical examination that included venipuncture or an inoculation. A control group participated in the same procedure at the same clinic, but without the venipuncture or inoculation. Children ranged in age from 3 to 7 years old. After delays as short as 2 to 3 days, or as long as 1 year later, free-recall and specific and misleading questions were used to assess children's memory for the person who administered the examination, the room where it was given, and the actions that were involved. The amount of information freely recalled was not voluminous (mean number of units recalled was about 3 to 4 across the four experiments); however recall output was accurate (recall of inaccurate details was rare at any age). Although the amount and accuracy of recall did not differ by age, older children answered specific and misleading questions more accurately than younger children. To examine the effect of stress on memory, research assistants observed the child during the exam and rated the child's stress levels at various time points. Overall, stress levels were not significantly correlated with memory performance, except for children who exhibited high levels of stress. These children recalled more information and resisted suggestive questions more frequently than children who were observed to have experienced lower levels of stress.

Saywitz, Goodman, Nicholas, and Moan (1991) conducted a similar investigation of children's memory for a medical examination, but in their study, for half of the 5- and 7-year-old children, the procedure included an embarrassing and salient feature, an external genital/anal exam. One week or 1 month later, the children's memories were tested. Surprisingly,
of the 36 children in the genital/anal condition, 28 (77.8%) did not mention the genital touching in an open-ended free recall test, and 30 children (83%) did not demonstrate genital/anal touching even when an anatomically detailed doll was provided to assist recall. Only when the interviewer pointed to the vaginal/anal area of the doll and asked, “Did the doctor touch you here?” did all but five of the children (86.1%) finally disclose the experience. A different group of 36 children received a physical examination for scoliosis that did not include anal/genital touching. Only three children in this condition (8%) falsely reported genital/anal touching, even when the leading question previously mentioned was asked.

The finding that 86% of the children in the anal/genital touching condition eventually responded “yes” to the leading question, compared to only 8% of the children in the comparison condition who made false reports, suggests that when a child’s physical examination included an embarrassing and salient feature (in this case, anal/genital touching), this feature was likely to be stored in memory. However, the finding that so few children spontaneously recalled this particular aspect of the physical examination even when an anatomically detailed doll was present suggests that this feature was not likely to be accessible to recall without prompting. Alternatively, perhaps children could access this information in memory but did not report the anal/genital touching because they were embarrassed to do so. Although it is not possible to differentiate between these two interpretations of the results, it is nonetheless clear that this salient feature of the medical examination was not omitted from memory.

While the results of Saywitz et al. (1991) may seem surprising, these findings are consistent with the schema-based notion of memory. For example, Brewer and Treyens (1981) asked participants to wait in a graduate student’s office that included some items that were strongly associated with an office (desk, chairs, typewriter—remember, it was 1981!) and some items that were weakly associated with an office (wine bottle, skull, picnic basket). When participants were later asked to recall everything they could remember from the office, the strongly associated items were more likely to be recalled; few participants recalled the weakly associated items. This is exactly what would be predicted if participants were using their “office schema” to guide subsequent recall. According to this framework, although anal/genital touching may be a relatively more anxiety arousing aspect of a physical exam, it is nonetheless a weakly associated feature of children’s schema for visiting a doctor’s office as it is not frequently included in a routine doctor’s visit. Thus, although this feature is likely to be retained in memory, it is less likely to be cued by children’s schema for a doctor’s visit, and is less likely to be recalled. This finding, along with relevant results from studies that follow, provides an argu-
ment for why unprompted recall would not be expected to be an effective memory assessment tool in real-world interviews of children.

The schema-based notion of memory can account for why unusual aspects of a routine event may not be recalled. However, what do we know about people’s memory for events about which they do not have a well-developed schema—events about which they have no previous knowledge? Although children develop schemas for the frequently experienced routine events in their life (Nelson, 1986) as well as for traumatic events to which they have repeated exposure, such as cancer treatments (Bearison & Pacifici, 1989), most traumatic events, such as medical emergencies, accidents, and natural disasters, occur infrequently.

MEMORY FOR INVASIVE MEDICAL PROCEDURES

A number of researchers have investigated children’s memory for an invasive medical procedure known as Voiding Cystourethrogram Fluoroscopy (VCUG). This procedure is used to identify “reflux,” a precursor to kidney failure and other urinary tract problems. The VCUG procedure is of particular interest to memory researchers because the procedure involves painful, forced genital contact, and thus presents a physical approximation to sexual assault of a child. In one study of children’s memory for the VCUG experience, Merritt, Ornstein, and Spicker (1994) assessed children 41 to 87 months of age. Although a small minority of the children had experienced the VCUG procedure before, none had experienced the VCUG within the previous year. Three major results of this study contrast with results of the parallel studies that have assessed children’s memory for routine medical procedures. First, recall of the 21 features of the VCUG was notably high. In an immediately memory test, children correctly recalled 65% of the features in response to open-ended questions, and an additional 23% in response to yes-no questions. The correct rejection rate for features not in the VCUG procedure was also high in both the immediate test ($p = .94$) and 6 weeks later ($p = .93$). Second, there was relatively little forgetting between the initial test session and a 6-week follow-up (60% correct recall in response to open-ended questions and an additional 23% in response to yes-no questions). Third, total recall was only modestly correlated with age ($r = .40$, $p < .06$); however, this may be a result of the restricted range in the recall output. Although it is difficult to compare the results of studies assessing memory for different events using different test items, nonetheless, these results suggest that children remembered the VCUG procedure better, and not worse, than routine medical procedures.
Goodman, Quas, Batterman-Faunce, Riddlesberger, and Kuhn (1996) specifically probed factors that relate to the accuracy of children’s recall for the VCUG procedure. Forty-six children, ranging in age from 3 to 10, were tested on their memory for the VCUG between 6 and 27 days after the procedure. Consistent with previous studies, age differences in memory resulted; 3- to 4-year-old children recalled less, answered fewer questions correctly, and made more commission and omission errors than the older children. Also consistent with previous research, in this case research concerning the social construction of autobiographical memory (see, e.g., Nelson, 1993; Tessler & Nelson, 1996), Goodman et al. reported significant relations between several aspects of mothers’ interactions with their child and children’s subsequent memory for the VCUG procedure. Children whose mothers did not sympathetically talk with them or physically comfort them after the procedure recalled significantly more incorrect information in free recall and made significantly more commission errors to misleading questions. Children whose mothers did not discuss or explain the VCUG procedure to their child also made more commission errors to misleading questions. These important findings suggest interpersonal factors that mediate the accuracy of memory for traumatic events.

In the sample studied by Goodman et al. (1996), 63% of the children (n = 29) had received only one VCUG procedure in their life, 17% (n = 8) had received two VCUGs and 20% (n = 9) had received more than two VCUGs. Given that repeated experience with an event increases schema development for the event, it is particularly interesting to examine memory accuracy as a function of previous experience. The main effect of number of VCUGs was not significant on any of the memory measures, including amount and accuracy of free recall and accuracy of responses to specific and misleading questions. However, it would not be expected that children would develop schematized memory for an event that had been experienced only once or twice, and few of the children, only 20%, had experienced the VCUG more than two previous times. Also, the VCUG procedure is not repeated on children within a short time interval, so perhaps the memory for this procedure is more gradually schematized than is memory for procedures that are repeated within shorter time intervals such as treatments for cancer (Bearison & Pacifi, 1989).

In a similar study by Pipe et al. (1997), memory for the VCUG procedure was assessed following longer delays. Children ranging in age at the time of the VCUG from 29 months to 95 months were interviewed at delay intervals ranging from 9 months to 69 months. Compared to the children who were 4 years of age or older when they underwent the VCUG, children who were younger than 4 at the time of the VCUG were less likely to remember the procedure and were less accurate in their recall. In addition,
the delay between the VCUG and the memory interview did not predict children’s memory. This is one of the few studies that has assessed children’s memory for a traumatic medical procedure over delay intervals of more than 6 weeks, and the results suggest that little additional information is lost from memory during the longer delay intervals.

Another study that compared children’s recall for a traumatic event over long delays is that of Howe, Courage, and Peterson (1996). In this program of research, children’s memory was assessed for accidents that led to emergency room treatment. These were naturally occurring traumatic events and as such, they occurred one time only and prior conversations with parents were precluded. Parents of 25 children brought to an emergency room for treatment were interviewed by the experimenter. The children ranged in age from 17 months to 66 months old. Immediately following treatment, children and their parents were interviewed about the events surrounding the incident. The interview consisted of free recall followed by a standardized cued-recall segment. Approximately 6 months later, the children were interviewed a second time using the same procedure.

Two major results followed from this research. First, because the age range of the children in this study was greater than that in previous studies, the results of this study can be used to assess the predictions of infantile amnesia. Howe et al. (1996) reported that children under 24 months of age at the time of the incident were not able to provide coherent accounts of what happened, using either free-recall or cued-recall techniques. These younger children remembered that they had been involved in an accident, and they could recall some of the global features of this accident. However, their narrative accounts were fragmented and incomplete. The researchers interpreted this result as evidence that the development of a concept of self is prerequisite to accurate autobiographical memory, and because a concept of self is not in place until approximately 24 months of age, this is the age at which accurate accounts of autobiographical memory begin to be evident.

The second major finding in the study by Howe et al. (1996) is that, for children older than 24 months of age, recall accuracy was quite high and commission errors were rare, even when prompts were used in open-ended cued recall. Further, although cued and free recall of peripheral details declined over the 6 month course of the study, memory for central details did not significantly decline over time.

In a separate report of the children just described, Howe, Courage, and Peterson (1995) examined changes in the rate of intrusion errors over time as a function of the children’s age at the time of the accident. This comparison is of interest because although it has been reported in other studies that intrusion errors increase with the length of the retention interval
(Flin, Boon, Knox, & Bull, 1992; Poole & White, 1993), this relationship has rarely been examined developmentally and has rarely included preschool age children. Further, it is important to examine the rate of spontaneous intrusion errors that occur in the absence of misleading or suggestive circumstances. Intrusion errors were defined in this study as recall of details from a different traumatic event, and thus reflect children's confusion between events that are semantically and affectively related. Overall, intrusion rates in this study were higher in the 6 month test than in the immediate test, but this difference was significant only for the youngest age group ($M = 30$ months), and not for the other two age groups ($M = 36$ months and 48 months). This finding suggests that children's tendency to confuse two traumatic events with the passage of time is of concern primarily for preschool children younger than 3 years of age.

MEMORY FOR DISASTERS

Memory for natural disasters was extensively studied after Hurricane Andrew, a devastating storm that struck the Florida coast on August 24, 1992. Bahrick, Parker, Fivush, and Levitt (in press) interviewed 3- and 4-year-old children about their experiences during the hurricane between 2 and 6 months after the event. Children's recall for the hurricane was detailed and highly accurate. By comparison, in a study conducted by Hamond and Fivush (1990), children recalled significantly more information about Hurricane Andrew (about 100 correct propositions) than comparable aged children who recalled a family visit to Disneyland (about 40 correct propositions). In addition, 4-year-olds recalled more correct information than 3-year-olds, and children's memory did not linearly vary as a function the retention interval; the children who were interviewed 6 months after the hurricane did not recall less than those interviewed 2 months after the hurricane. However, in this study, children who experienced more objective damage from the hurricane, in terms of damage to their home, recalled less than did children who experienced less severe damage.

Memory for the personal consequences of a natural disaster has also been studied by Neisser et al. (1996). In this study, adults' memory for the 1989 Loma Prieta earthquake was assessed immediately following the earthquake and 1½ years later. Of primary interest in this study was a comparison of recall by participants in San Francisco and Santa Cruz at the time of the earthquake (the direct experience groups) with those in Atlanta at the time of the earthquake (the observers). The California participants, who experienced the earthquake directly, remembered significantly more information 1½ years later than those who heard about the
earthquake indirectly. Further, within the San Francisco and Santa Cruz samples, memory was also tested for how participants learned about the collapse of the upper deck of the Bay Bridge, an event that was widely reported on the news, but not directly observed by any of the participants. Memory for the details of how they learned about the collapse of the bridge was more poorly retained after 1½ years delay than were similar details for directly experienced aspects of the earthquake.

A similar comparison was made in a study by Terr et al. (1996) of children's memory for the Challenger explosion on January 28, 1986. Memory for this disaster was assessed in two groups of children. The high involvement group included 8- and 15-year-old children from Concord, New Hampshire, where Christa McAuliffe had taught prior to joining the Challenger crew. The low involvement group included age-matched children from a control school in Porterville, California. In terms of both the quality of memory for the explosion itself, and memory for the personal experiences of the participant on hearing of the explosion, performance was significantly better in the high involvement group than in the low involvement group, both in 1986 and 1 year later.

These results are similar to the findings reported by Yuille and Cutshall (1986) in a case study of eyewitness memory of an actual crime. In this study, 13 adults who were eyewitnesses to a shooting incident were interviewed shortly afterward by police officers and 4 to 5 months later by the researchers. Witness accounts showed little decline in accuracy over the 5-month delay interval, and witnesses more involved in the incident remembered more accurate information than those less involved. The 5 eyewitnesses with the highest involvement in the shooting had direct contact with either the thief, the storeowner who eventually shot the perpetrator, or a weapon used in the shooting.

Together, these results assessing memory for upsetting or traumatic events, along with similar findings by Rudy and Goodman (1991) assessing memory for a nontraumatic event, suggest that participation in an event produces better memory for the event than indirectly observing the event. One interpretation of this finding is that people have better constructed narratives for events that they directly experience than for events that they only learn about second hand, and memories are better preserved if they are coherent and well structured. Also, the recall of specific features of an event is more likely to cue related features of that event if the features are stored in a well-structured form in memory.

These results also highlight the need to differentiate the research between the personal salience of or involvement in an event and the extent to which the event is truly traumatic. Although Terr et al. (1996) and Neisser et al. (1996) reported that personally salient events were better remembered than less salient events, the results of Bahrick et al. (in press)
suggest that, for events that more closely approximate traumatic ones, memory correlates negatively with degree of trauma—the greater the destruction to a child’s own home, the less he or she recalled about Hurricane Andrew. Clearly additional research is necessary to clarify this issue by focusing on research that involves truly traumatic events and not simply upsetting events. In the next section, research is discussed that considers memory for traumatic events.

MEMORY FOR VIOLENT EVENTS

Several researchers interested in memory for personally salient events have studied memories for violent events. To begin with an extreme case, Wagenaar and Groeneweg (1990) studied memories of 78 survivors of a Nazi concentration camp. In this study, the researchers compared transcripts of interviews with the survivors at two points in time regarding their experiences in Camp Erika. The first interviews were collected between 1943 and 1948. The second interviews were collected between 1984 and 1987 in connection with the trial of Marinus De Rijke for Nazi war crimes. The survivors were in their mid-20s during their stay in Camp Erika and in their mid-60s when interviewed the second time.

The major results involved the quality of retention over the 40-year period of study. Although most of the survivors could recognize a picture of De Rijke taken in the camp, and they remembered the date on which they entered the camp, De Rijke’s name, and their camp registration number, there were many notable voids in memory. Three of the survivors who described in their early interview how they had been maltreated or tortured by De Rijke, could not remember his name 40 years later. Forty-two percent of the survivors (5 out of 12) who had not seen De Rijke’s picture on television during the intervening years since 1947 could not recognize a photograph of him taken in the camp. Some survivors forgot even denied ever having remembered observing other extreme incidents including being tortured and maltreated by De Rijke themselves and watching fellow prisoners being maltreated until they died by drowning, flogging, or beating.

The results of Wagenaar and Groeneweg (1990) make it clear that memories for extreme traumatic events are not impervious to forgetting, even forgetting of salient and disturbing aspects of the experience. Although these findings might be attributed to aging effects, as people at the time of the second interview were in their mid-60s, other interpretations of these results seem more compelling. For example, it is well established that active attempts to inhibit retrieval of information from memory can reduce access to that information (Anderson, Bjork, & Bjork, 1994). This phenom-
non is known as *retrieval induced forgetting*. Because it is likely that Nazi concentration camp survivors did not want to continue to think about their concentration camp experiences and relive these events in their memory, they may have actively attempted to inhibit retrieval of this information, and just "not go there" in their memory. This might explain why memory for even highly salient aspects of their concentration camp experience were not accessible to some survivors 40 years after their release from the camp.

But what about memory for a single, time-limited traumatic event that is violent or devastating? One such incident has been extensively studied by Lenore Terr. This is the kidnapping for 24 hours of 26 school children from their school bus on July 15, 1976 in Chowchilla, California. Terr compared the children’s memory for the event immediately after the incident in addition to 1 and 5 years later. The major finding was that the children retained accurate memory for the gist of the incident over the 1-year (Terr, 1979) and 5-year delays (Terr, 1983). There were some consistent patterns of memory inaccuracy, although these tended to involve peripheral information such as the date, time, and duration of the event. These results are consistent with findings reported by Howe, Courage, and Peterson (1996) and support the position that, as with memory for normal events, memory for the peripheral details of traumatic events is more likely to be forgotten over time than is the gist of these memories.

Other single-occurrence violent traumatic events that have been studied include witnessing the homicide of a parent (Pynoos & Eth, 1984) and surviving a sniper attack at school (Pynoos & Nader, 1989). Children studied by Pynoos and Eth (1984) ranged from preschoolers to adolescents. The researchers initially interviewed each child within a few weeks of the murder and compared these accounts with the event as reported throughout the criminal proceedings. Although Pynoos and Eth (1984) reported little empirical data and primarily focused on children's affective reactions to having observed their parent’s death, some conclusions regarding memory were noted. The authors reported, "We believe that parental homicide leaves indelible, highly accurate, and detailed visual images" (p. 95). And further, "These children focus on the central action and disregard other details. For example, in one of his accounts, one 3-year-old boy repeated the phrase, 'Daddy squished mommy's neck.' " (p. 92).

Pynoos and Nader (1989) interviewed children who had survived a violent attack. A sniper shot repeated rounds of ammunition at children on a playground at their elementary school. Two people were killed and 14 were injured. The siege lasted for several hours. The major finding was that children who were most endangered during the incident later reported themselves as farther away from deceased or injured persons and somehow safer and more protected than they had actually been. On the
other hand, children who were least threatened later reported that they had been closer to the danger and at greater risk than they had been. This reconstructive nature of memory has been well documented in other arenas involving memory for nontraumatic events (see, e.g., the early work of Bartlett, 1932).

MEMORY FOR CHILDHOOD SEXUAL ABUSE

Although numerous studies have examined children’s memory for sexual abuse, in only a few of these studies has it been possible to compare memory for the abusive incident with corroborating evidence of what actually happened. However, two prospective studies on memory for sexual abuse have been conducted. In the first, Williams (1994) studied 129 women who in childhood had participated in a study on the immediate consequences of sexual abuse. Detailed medical records documented the abuse. Seventeen years after the abuse, when Williams interviewed them, 38% of these women reported no memory for the target sexually abusive event, despite the fact that more than half of these women reported details of other abusive incidents or other personal and embarrassing events. Further, there was no difference in the rate of not remembering the target abusive event between individuals who were 3 years old or younger as compared with those who were 4 to 6 years of age at the time of the abuse.

Similar findings were reported by Widom and Morris (1997) and Widom and Shepard (1996) from a prospective study of 726 people who had been physically abused, sexually abused, or neglected when they were less than 11 years old. Court records validated the abuse history in each case. A control group was also included. Twenty years later, the researchers interviewed the people regarding their memory for the target events. Only 63% of the individuals who had been sexually abused in childhood reported having had at least one sexual experience before the age of 12. Thus, 37% of the individuals did not appear to remember the target sexually abusive event. Regarding the individuals who had been severely physically abused in childhood, only 60% reported memory for physical abuse when assessed using the Very Severe Violence subscale and 92% reported memory for physical abuse when assessed using the Minor Violence subscale. Although neither Williams (1994), Widom and Morris (1997), nor Widom and Shepard (1996) assessed the accuracy of the specific details in the interview responses they gathered, it is clear that sexual abuse occurring before the age of 12, and to lesser extent physical abuse, is under-reported, at least in part due to the inaccessibility of the resulting memories.
A different experimental approach was utilized in a recent study by Bidrose and Goodman (2000) to study children's memory for documented incidents of sexual abuse. This study took advantage of police records that were available as a result of a situation that occurred in New Zealand. In this case, the police were informed that a man was prostituting young girls. The police located four of the girls; one was age 7, and three were age 12 when the incidents began. Following extensive police interviews of the girls, the police obtained a warrant and searched the alleged perpetrator's home. They located hundreds of photographs and several hundred audiotapes recording sexual acts between the girls and various men. The girl's allegations could then be compared with the photographic and audiotaped evidence.

Of the 246 allegations that were reported in hearings or police interviews, 194 (78.9%) were supported by available evidence and 52 (21.1%) were not supported. More specifically, of the 160 allegations that specifically involved sexual acts, 137 (85.6%) were supported by available evidence. The rate of unsupported allegations could reflect commission errors by the girls, or perhaps the absence of audiotapes or photographs of the encounters. In addition, the researchers reported that many of the audiotapes were difficult to code because they contained unidentifiable sexual activity and involved more than one of the girls. Computed differently, there was evidence for 318 different sexual acts involving the girls, and allegations were made for 194 of these (61%). The remaining 124 (39%) acts were omitted from the girls' reports of what happened. In addition, there were three events that were denied to have occurred, even though the evidence documented their occurrence. These findings suggest an impressive memory for the details of multiple incidents of childhood sexual abuse spanning as much as a 2-year period of time for one of the girls.

Together, these studies suggest that the details of sexual acts that are still part of one's current and ongoing life are likely to be accessible to memory with a high rate of accuracy. However, although adults' memories for childhood sexual abuse are often accurate, they are less likely to be accessible to conscious recollection than are memories for less traumatic events.

CONCLUSIONS: ARE MEMORIES FOR TRAUMATIC EVENTS SIMILAR TO MORE NORMAL MEMORIES?

Although some people portray memory for traumatic events as unusually accurate and highly detailed (see, e.g., Pynoos & Eth, 1984, & Terr, 1988), most of the research reviewed here characterizes memory for traumatic events as generally correct, although by no means perfect, and in many
ways similar to memory for more normal nontraumatic events. Based on the research on memory for traumatic events reviewed in this chapter, it is apparent that many characteristics of memory for nontraumatic events apply to memory for traumatic events as well. Thus, when individuals are interviewed about traumatic events, their reported memories are expected to exhibit many of the same qualities as memories for nontraumatic events, and many of the cognitive processes that operate on memory for more normal events apply as well. What are some of these processes?

First, in the research on memory for nontraumatic events, it is well documented that unique or distinctive events are better retained in memory than are nondistinct events. This effect was perhaps first cited by Koffka (1935), in reference to the dissertation results of von Restorff. The von Restorff effect refers to the finding that in a list of unrelated words, the distinctive items (i.e., those not semantically related to other words in the list) are learned faster and retained longer than the other items. Although an explanation of this effect has plagued cognitive psychologists (see, e.g., Hunt & McDaniel, 1993), nonetheless, the effect seems to be a robust one. Brewer (1988), for example, reported in an autobiographical memory study that infrequent events and those that occurred in infrequent locations were best recalled.

Disregarding the incidents for which some individuals exhibit amnesia for a highly traumatic event, the uniqueness effect would explain why events that are wholly unusual or distinctive, such as the traumatic events discussed in this chapter, are predicted to be more accurately retained in memory and subsequently more accessible than more normal nontraumatic events. However, this is a precarious finding because within the context of a particular event, the distinctive features are sometimes weakly associated with the event schema, and as such are less likely to be accessible. This is consistent with reports by Saywitz et al. (1989) regarding memory for the features of a medical examination that involved anal/genital touching and Brewer and Treyens (1981) regarding memory for consistent versus inconsistent items in an office.

A second principle that applies to memory for traumatic and nontraumatic events is the finding that memory for traumatic events is not impervious to the effects of temporal delay that characterize forgetting in normal memory. In most of the studies reported here, with the passage of time the accuracy of recall decreased and the tendency to false alarm to suggested items increased. However, although it is difficult to directly compare forgetting rates for traumatic and nontraumatic events, it appears that the rate of forgetting traumatic events is less steep than the rate of forgetting nontraumatic events. For example, Merritt et al. (1994) reported minimal forgetting of the 21 features of the VCUG procedure be-
tween the initial test session and a 6-week follow-up. Likewise, Pipe et al. (1997) tested memory for the VCUG procedure at delay intervals ranging from 9 to 69 months and reported similar low forgetting rates in the short and long delay conditions. One interpretation of this result is based on a finding known as Jost’s Law (Jost, 1897). According to Jost’s Law, the greater the strength of information in memory, the more slowly the memory will decline over time. Thus, because the memory strength for traumatic events is generally greater than the memory strength for nontraumatic events, traumatic events are expected to be forgotten more slowly.

This relationship can also be observed in the results reported by Neisser et al. (1996). When people were tested on their memory for the Loma Prieta earthquake, details of how they learned about the collapse of the Bay Bridge (an event not directly experienced by these individuals) were more likely to be forgotten after 1½ years than were similar details for directly experienced aspects of the earthquake. Because the memory strength for directly experienced events is greater than the memory strength for events not directly experienced, directly experienced events should be more resistant to forgetting over time.

The finding that traumatic events are ordinarily retained at higher levels of memory strength than are nontraumatic events has been related to the effects of adrenaline and related hormones (see McGaugh, 1992, for a review). However, although elevated levels of adrenaline enhance memory, the dose-response curve is an inverted U-shaped function predicted by the Yerkes-Dodson law (Gold, 1987). Accordingly, although moderate levels of adrenaline do enhance memory, when very high levels of adrenaline are released, such as by extreme levels of arousal, memory suffers relative to memory following more modest levels of activation.

A third principle that applies to memory for traumatic and nontraumatic events is the finding that memories for traumatic events show age-related patterns similar to those for memories for nontraumatic events. These age-related patterns show that generally the accuracy of memory and the amount of detail in memory increases with age during childhood. In addition, although the rate of false alarms and commission errors for features of traumatic events is generally low, preschool-age children are more likely to false alarm to information suggested by experimenters than are older children. However, in a number of the reported studies (see, e.g., Pipe et al., 1997) the accuracy of memory did not vary with age. Jost’s Law may also apply here. If the memory strength for traumatic events is generally greater than the memory strength for nontraumatic events, then memory for traumatic events should be less likely to decline with decreasing age, and age differences in memory for traumatic events would be less consistent.
A fourth principle that applies to memory for traumatic and non-traumatic events is the finding that the gist of an event is retained in memory more accurately than the peripheral details, and memory for the peripheral details is more likely to decline with the passage of time than is memory for gist. For example, in a study of survivors of a Nazi concentration camp, Wagenaar and Groeneweg (1990) reported that memory for the gist of daily life in the camps remained more accurate (although not flawless) over the 40-year period of the study than did memory for some of the peripheral details of the experience. Similarly, Terr reported accurate gist memory by the children kidnapped from Chowchilla despite less memory and less accurate memory for peripheral details after 1 year (Terr, 1979) and 5 years (Terr, 1983). Also, Howe et al. (1996) reported that, for the children in their study who were older than 24 months of age at the time of a medical emergency, although cued and free recall of peripheral details declined over 6 months, memory for central details did not significantly decline. These findings suggest that memory for both traumatic and nontraumatic events is hierarchically organized with features higher in the hierarchy more likely to resist forgetting with the passage of time.

There is another lesson to be learned from the review of the research on memory for traumatic events that has implications for forensic interviewing. Across several of the studies discussed, unprompted recall was not found to be an effective interview tool. For example, Saywitz et al. (1991) reported that of the 36 children interviewed regarding their memory for a medical examination that involved genital/anal touching, 28 did not mention the genital touching in an open-ended free recall test, and 30 children did not demonstrate genital/anal touching even when an anatomically detailed doll was provided. However, when the interviewer pointed to the genital/anal area of the doll and asked, “Did the doctor touch you here?” all but five of the children disclosed the experience. Although it is possible that the children simply did not report the genital/anal touching because they were embarrassed, an alternative interpretation of this finding is that the genital/anal touching was an unusual feature of a medical examination, and unusual features are not likely to be recalled without prompts or cues.

Further, it is important to note that prompts or cues were not reported to significantly increase the number of commission errors in the studies reviewed. Saywitz et al. (1989) reported that in a different group of 36 children who received a physical examination for scoliosis that did not include anal/genital touching, only three children falsely reported genital/anal touching, even when the leading question previously mentioned was asked. Also, Howe (1996), reported that the use of prompts in open-ended cued recall did not increase the number of commission errors in children interviewed about a medical emergency. The use of additional prompts,
however, needs to be differentiated from the use of props, such as dolls, to facilitate memory. These types of cues have been found to increase errors in children’s reports under some circumstances, such as those in which leading questions accompany the props’ presentation. For an extended discussion of the use of props, such as dolls, see Everson and Boat (chap. 16, this volume).

In conclusion, although some individuals can be amnesiac for some traumatic events, when traumatic events are remembered, these memories are generally accurate and exhibit many of the characteristics of memories for distinctive nontraumatic events. This suggests that special memory mechanisms may not be needed to account for memory for the traumatic events that are remembered. Thus, although traumatic events are likely to have a significant long-term effect on an individual, memory for traumatic events appears to follow the same cognitive principles as memory for distinctive nontraumatic events.

REFERENCES


