
REPRESENTATIONS OF TRAUMA IN INFANCY: CLINICAL AND THEORETICAL IMPLICATIONS FOR THE UNDERSTANDING OF EARLY MEMORY

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ABSTRACT: Understanding the nature of the infant's internal experience is a crucial prerequisite for delineating the developmental effects of an early trauma. In addition, to the extent that internal representations of a trauma can be traced over time, traumatic experiences present unique opportunities for the study of early memory. This article will describe case vignettes of children who experienced a trauma in the preverbal period and who evidenced forms of memory of their trauma at subsequent points in time. In conjunction with the clinical material, developmental research bearing on the types of early memories described will be discussed. The clinical data, reinforced by research findings, indicate that preverbal children, even in the first year of life, can establish and retain some form of internal representation of a traumatic event over significant periods of time. The specificity and enduring nature of the internal representations suggest that specific therapeutic interventions over and above general comforting will be required if an infant is to maximally recover from a trauma. The clinical findings have relevance for a number of issues currently under debate in the area of infant memory, including the role of reminders in memory retention, the nature of early memory systems, and the development of autobiographical memory.

RESUMEN: Comprender la naturaleza de la experiencia interna del infante es un requisito crucial para delinear los efectos del desarrollo sobre un trauma que haya aparecido tempranamente. Adicionalmente, hasta el punto de que el camino de las representaciones internas de un trauma puede seguirse con el tiempo, las experiencias traumáticas presentan oportunidades únicas para el estudio de la memoria al principio. Este estudio describirá casos de niños que experimentaron un trauma en el período preverbal y que dieron muestra de formas de memoria de su trauma en subsecuentes puntos temporales. Conjuntamente con el material clínico, se discutirá también la investigación sobre el desarrollo que parte de los tipos de primeras memorias descritos. La información clínica, reforzada por los resultados de la investigación, indica que los niños en el período preverbal, aun en el primer año de vida, pueden establecer y retener alguna forma de representación interna de un evento traumático durante significativos períodos de tiempo. La especificidad y la naturaleza de aguante de las representaciones internas sugieren que si un infante se va a recobrar al máximo de su trauma, se requerirán intervenciones terapéuticas específicas muy por encima del nivel general de ofrecerle un simple consuelo. Los resultados clínicos son relevantes en cuanto a un número de asuntos que actualmente se encuentra en debate en el área de la memoria infantil, incluyendo el papel de las advertencias recordatorias en la retención de la memoria, la naturaleza de los primeros sistemas de memoria, así como el desarrollo de la memoria autobiográfica.

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RÉSUMÉ: Comprendre la nature de l'expérience interne du nourrisson est crucial pour délimiter les effets d'un traumatisme précoce sur le développement. De plus, dans la mesure où les représentations internes d'un traumatisme peuvent être tracées au fil du temps, les expériences traumatiques présentent des opportunités uniques pour l'étude de la mémoire précoce. Cette étude décrit des vignettes de cas d'enfants qui ont vécu un traumatisme durant la période préverbale et qui, ultérieurement, ont présenté des évidences de formes de souvenirs de leur traumatisme. Conjointement avec la documentation clinique, les recherches en matière de développement portant sur les sortes de souvenirs précoces décrits seront discutés. Les données cliniques, renforcées par les résultats de recherche, indiquent que les enfants préverbaux, même durant leur première année, peuvent établir et retenir une forme de représentation interne d'un événement traumatique, et ceci pendant de grandes périodes. La spécificité et la nature durable des représentations internes suggèrent que des interventions thérapeutiques spécifiques allant bien au delà d'un simple réconfort seront nécessaires à la récupération maximale du nourrisson après un traumatisme. Les résultats cliniques sont importants pour certains problèmes faisant actuellement l'objet d'un débat dans le domaine de la mémoire du nourrisson, dont par exemple le rôle des rappels dans la rétention de la mémoire, la nature des systèmes de la mémoire précoce, et le développement de la mémoire autobiographique.

ZUSAMMENFASSUNG: Um die entwicklungspsychologischen Effekte eines frühen Traumas beschreiben zu können, ist es unerlässlich die inneren Erlebnisse des Kleinkinds zu kennen. Zusätzlich bieten traumatische Erlebnisse eine einmalige Gelegenheit, um die frühe Erinnerungsfähigkeit, jedenfalls so weit, als Spuren der inneren Repräsentationen eines Traumas gefunden werden können, zu studieren. Diese Arbeit beschreibt Falldarstellungen von Kindern, die ein Trauma in der präverbalen Periode ihres Lebens erlebt haben und die Zeichen von Erinnerung an ihr Trauma an mehreren späteren Zeitpunkten zeigten. Entwicklungspsychologische Forschung zu den Typen der frühen Erinnerung wird gemeinsam mit dem klinischen Material diskutiert. Unsere klinischen Beobachtungen, unterstützt durch die Forschungsergebnisse weisen darauf hin, dass vorsprachliche Kinder – sogar im ersten Lebensjahr – einige Formen von innerer Repräsentation eines traumatischen Ereignis über längere Zeit herstellen und bewahren können. Die Spezifität und die lange Dauer der inneren Repräsentationen weisen darauf hin, dass spezifische therapeutische Interventionen mehr und bedeutender, als allgemeine Wärme nötig sind, wenn ein Kleinkind sich von einem Trauma erholen soll. Diese klinischen Beobachtungen haben eine Bedeutung bei einer grossen Anzahl von Themen, die derzeit debattiert werden: kindliche Erinnerung, unter Einschluss der Rolle von Menschen, die die Erinnerung hervorrufen, die Natur des frühen Erinnerungssystems und die Entwicklung der autobiographischen Erinnerung.

抄録：乳児の内的な体験の性質を理解することは、早期の外傷の発達への影響を詳細に描写するための決定的な必要条件である。さらに、外傷の内的表象がある時間にわたって追跡されることができる範囲では、外傷的な体験は早期記憶の研究に、ユニークな機会をもたらす。この論文では、前言語期に外傷を経験し、その後の時点で彼らの外傷の記憶形態を明らかにした子どもたちの症例を描写するだろう。臨床素材に関連して、記述された早期記憶の形式についての発達研究の結果が議論されるだろう。研究結果により補強されて、臨床データから、前言語的な子どもは、最初の1年間でさえも、有意な時間にわたってなんらかの形の外傷的な出来事の内的表象を確立し、保持することができることが、示される。内的表象の特異性と持続する性質は、もし乳児が外傷から最大限に回復するとしたら、一般的ななぐさめの上に、さらに特異的な治療的介入が必要であろうことを、示唆する。臨床所見は、記憶保持における呼び起こすものの役割、早期記憶システムの性質、および自伝的記憶の発達を含む、乳児記憶の領域で現在論議されている多くの問題に関連する。

* * *

When exposed to a traumatic event, what does the infant understand about what is happening? Does he or she form an internal representation of the experience? Is the experience

retained in memory? If so, for how long and in what forms? Such questions have distinct clinical importance, because understanding the nature of the infant's internal experience is a crucial prerequisite for delineating the effects of an early trauma on children's subsequent development and for designing effective treatment approaches. They also have a larger developmental significance in that questions about infants' capacity for the registration and retention of experienced events apply not only to traumatic experiences but to environmental stimuli in general; they speak to the nature of the infant's inner world. Thus, clinical observations addressing these questions can contribute not only to issues of treatment, but to the advancement of understanding of infant memory functioning as well. To the extent that traumas can be represented internally, and to the extent that these representations can be traced over time, traumatic experiences represent a unique opportunity for the study of early memory.

This article brings together clinical observations of infants who experienced a trauma in the preverbal period and who evidenced forms of memory of their trauma at subsequent points of time. The clinical data, particularly when evaluated in light of burgeoning developmental research, indicate that preverbal children, even in the first year of life, can establish and retain some form of internal representation of a traumatic event over significant periods of time. The specificity and enduring nature of the internal representations and their influence on the child's affective responses to subsequent events suggest that specific therapeutic interventions over and above general comforting will be required if an infant is to maximally recover from a trauma. The clinical findings have relevance for a number of issues currently under debate in the area of infant memory, including the role of reminders in memory retention, the nature of early memory systems, and the development of autobiographical memory.

The case examples are drawn primarily from my own practice, with additional cases coming from discussions with colleagues and from the clinical literature. For reasons of space, the cases cannot be described in great detail. As is common with clinical data, the available information is variable and many questions about possible sources of contamination and alternative explanations for the children's memory manifestations will naturally arise. Further detail about the nature of the memories and the manner in which they emerged may be obtained by reviewing the cases that have been previously published. Given the rapid developmental changes occurring in the first two years, the case presentations will be grouped by age according to when the trauma occurred and organized around three periods of major developmental reorganization during infancy—two to three months, six to eight months, and 18 to 24 months (Emde, Gaensbauer, & Harmon, 1976). In each section, relevant developmental research will be cited to place the clinical vignettes in the context of what is currently known about infant memory functioning.

CLINICAL MATERIAL

Zero to Two Months

Given the large number of newborns who experience painful medical procedures, the question of whether a newborn infant can internally register a traumatic experience is an important one. Unfortunately, systematic research addressing this question is very sparse. Based on the data that is available, however, there is reason to believe that a newborn would be capable of such registration, albeit extremely rudimentary in nature. Newborn infants manifest all of the cardinal physiologic stress responses to pain (Anand & Hickey, 1987; Marshall, 1989). They are also capable of both instrumental and classical conditioning (Blass, Ganchrow, & Steiner, 1984; DeCasper & Fifer, 1980; Little, Lipsitt, & Rovee-Collier, 1984). Such capacities suggest that

in the first weeks of life an infant would have the ability to both experience a stress response and conditionally pair it with an accompanying stimulus such that subsequent behavior could be influenced. Sander's pioneering work demonstrated that newborns develop expectations, or "experiential-perceptual gestalts" (Sander, 1995), based on previous interactive encounters, and show affective and behavioral disturbances when these expectations are violated (see also Slater, 1995). Sander's study of the effects of mothers donning a ski mask when their infants were seven days of age offers a compelling example. As the infants were brought to the breast and looked into their mother's face, they startled and hesitated to begin feeding. In the transition to sleep following the feeding they showed increased restlessness, spitting up, and fussiness (Sander, 1991, cited in Nahum, 2000).

Even more relevant to the issue of the registration of traumatic experience, Gunther (1961) observed that newborn infants who experienced an anoxic airway obstruction during feeding would subsequently resist being put to the breast. When forced, they would cry and fight even more. In cases where such struggles persisted for even two or three feedings, merely positioning the infants in preparation for the feeding would cause them to "start crying from the expectation that they [would] be put on the breast" (p. 38). An anecdote reported to me by a mother was consistent with Gunther's observations. When her three-day-old infant was having difficulty nursing, a very aggressive nurse held the infant's head, forced open his jaw, and shoved the mother's breast into his mouth. The infant became upset, gagged, and arched his back away from the breast. At this moment, the nurse, who happened to be wearing a distinctive pink scrub suit with "neon pink" hearts, was paged and left the room. When the nurse returned 10 minutes later, the mother reported that the infant "saw who it was" and immediately arched his back and pushed against his mother's body with his legs with such force that he rolled over on the bed.

Although we do not know whether or in what form such "experiential-perceptual gestalts" from this early period might be retained in the form of internal schemas, there is evidence for the persistence of somatic memories. For example, Fitzgerald, Millard, and McIntosh (1989) demonstrated persisting cutaneous hypersensitivity to pain following repeated heel pricks, while Liley (1972) reported that infants who experienced as few as 10 heel pricks in the first three days of life could show distress for many weeks thereafter when their heels were grasped. Consistent with these reports I have had two instances reported to me of persisting hypersensitivity in the heel region following repeated heel pricks in infancy. In one case, a young adult, unaware that he had experienced repeated heel pricks to the point of tissue maceration as a newborn, reported to his parents with puzzlement that whenever he was under stress his heels hurt. In a second instance, the parents of a four-year old girl with a similar newborn experience reported that she repeatedly pounded her heels against the mattress while in bed to relieve an irritable sensation. Interestingly, a recent research study with rats has provided parallel support for the hypothesis that somatic sensations from the newborn period can endure. Ruda, Ling, Hohmann, Peng, and Tachibana (2000) found that rat pups exposed to a painful stimulus to the paws in the first weeks of life showed hypersensitivity to pain as adults. The adult rats also showed excessive sprouting of nerve endings in the afferent sensory regions of the spinal cord that corresponded to the affected limb.

Circumcision is another commonly experienced painful experience from the newborn period worthy of attention in regard to potential carryover effects. Although a number of studies have shown only transient and mild behavioral effects (Emde, Harmon, Metcalf, Koenig, & Wagonfeld, 1971; Marshall, Porter, Rogers, Moore, Anderson, & Boxerman, 1982; Marshall, Stratton, Moore, & Baxerman, 1980), a recent study has raised interesting questions about longer lasting retention. In a group of four- and six-month-old infants undergoing routine vaccination, Taddio, Katz, Ilersich, & Koren (1997) found increased distress re-

sponses (assessed by facial expression and duration of crying) in infants who had been circumcised as newborns compared to uncircumcised infants. They questioned whether similarities in the subjective and/or physiological response to the two painful stimuli triggered a more intense distress response to the vaccination, akin to a posttraumatic stress reaction.

Three to Six Months

The period between two and three months is a period of major developmental change, as infants develop a new awareness of the world around them (Emde & Robinson, 1979). They begin to make reliable discriminations between caregivers and respond differentially based on their previous interactions with that caregiver (Robson & Moss, 1970). They are able to anticipate stimulus patterns and sequences as shown both by anticipatory gazing (Haith, Wentworth, & Canfield, 1993), and by negative emotional responses when social expectations are violated, for example when mothers maintain a “stone face” (Tronik, Als, Adamson, Wise, & Brazelton, 1975). At this age infants also learn to appreciate means-ends relationships involving their own actions, or what Piaget (1952) termed “procedures to make interesting spectacles last,” and are capable of remembering these “procedures” for extended periods of time. For example, by two months of age, infants are capable of retaining a learned action, such as moving their leg to make a mobile move. By three months they are able to retain that learning for as long as a week without reminders (Hill, Borovsky, & Rovee-Collier, 1988). By five months, infants are able to demonstrate memory for familiar stimuli for periods of weeks when exposed to visual paired comparisons (Fagan, 1990), a paradigm dependent on brain structures traditionally associated with declarative memory (McKee & Squire, 1993). An impressive study of memory retention from this period is that of Perris, Myers, & Clifton (1990). At 6.5 months a group of infants was exposed to a single laboratory experiment involving reaching in the dark for a sounding object. The children showed evidence of remembering, as demonstrated by increased successful reaching and increased tolerance of the experimental situation compared to inexperienced controls, when exposed to a similar stimulus situation two years later. Also around three months, discrete affective states such as pleasure, fear, anger, and sadness begin to emerge (Izard & Malatesta, 1987). Combined with the infant’s growing capacity to register environmental events, this emerging affect differentiation enables the infant to establish emotionally meaningful, situation-specific, internal representations. These “cognitive-affective schemata” allow the infant to recognize and respond in emotion-specific ways to ensuing events that have similar stimulus configurations (Gaensbauer, 1982).

Three cases that I was involved with have illustrated the capacity of three- to four-month-old infants to retain such “cognitive-affective schemata” for extended periods. One infant, repeatedly and severely abused by his biological father between the ages of three and 10 weeks before being placed in foster care, showed fearful reactions to men for many months. During his first month in foster care, when approached by his foster father or teenage foster brother, he would cry inconsolably. The foster mother also noted that he would often startle if she inadvertently made an abrupt gesture in his direction, such as during diaper changes. Although these reactions diminished within his foster family, at six months, when an adult male bearing a physical resemblance to the father attempted to pick him up, he immediately startled and began to scream. At eight months, during a medical exam, when the doctor made an affectionate gesture with the intention of stroking his head, the child startled so abruptly that the doctor was taken aback. Except for the occasional startles, none of these types of reactions were seen in interactions with adult women. I first saw him at nine months (a time when stranger distress is common). As I talked to him from a distance of five feet he appeared quite frightened. He had a very fearful expression, a frozen posture, marked hyperventilation, and began to cry

whenever I attempted to move closer. (It was not possible during this office visit to compare his reactions to the approach of a female stranger.)

Another instance of enduring recognition distress was reported by the foster parents of a boy removed from his psychotic mother at four months of age. Among other traumatic actions, his delusional mother would undress him and wrap his entire body and face in cold, wet towels, to the point of smothering. She also required him to hold his legs in an awkward, rigid position. When he entered foster care he was frequently distressed, and was especially sensitive to having his clothes changed. Over a period of several months this distress diminished. However, when he was nine months a supervised visit with his mother was arranged. The mother's first act was to begin to undress him. The child immediately began screaming and the visit was promptly stopped. This brief encounter with his mother appeared to trigger many of his old traumatic feelings and behaviors. For the next week he cried almost constantly and held his legs in the same rigid position he had held them when he first entered the foster home.

A third case, previously reported (Gaensbauer, 1982), involved a child who suffered a skull fracture at the hands of her father at three months of age. During an evaluation three weeks later, the child showed fearfulness that was specific to men. When I approached her, she showed transient facial responses of fear (assessed by systematic analysis of her facial expression), became distressed, and arched backwards. She also made several batting motions toward me in what could easily be interpreted as (deferred?) imitation of what had been done to her. When approached by a female stranger, she showed none of these responses and allowed herself to be picked up and held. This fearful responding was prompted by auditory cues as well. The foster mother reported an incident where the child sat comfortably next to an adolescent male with long hair until he spoke, revealing a male voice, whereupon she immediately started to cry.

There are several additional reports in the clinical literature describing later manifestations of memory for a traumatic event occurring in the three to six month period. Perhaps the most dramatic is the description of Bernstein and Blacher (1967) of a precocious child who experienced a pneumoencephalogram at three months of age. At 28 months of age, prompted by cues from the environment associated with the earlier hospital experience (construction noises), she spontaneously reported memories of the medical examination ("Man stuck me in the tushie and knocked my head off," i.e., made her head hurt). Terr (1988) described a child sexually abused before six months of age who, at just under three years of age, carried out a variety of sexual enactments with dolls, including vaginal penetration, that were consistent with pornographic photos taken in the course of her sexual abuse. Recently, Roy and Russell (2000) reported on an infant diagnosed with cancer who experienced a series of painful surgeries and medical procedures beginning at two weeks of age. By five months the infant was showing behaviors characteristic of PTSD emotional reexperiencing, including fearfulness of hospital staff, excessive difficulty with soothing after even minor and painless procedures, and hypervigilance.

Seven to 18 Months

The second half of the first year initiates another period of dramatic change. Particularly relevant to the retention of traumatic memories and the ability to play them out in action are studies of infants' capacities for deferred imitation. This task requires that infants imitate specific actions that have been demonstrated to them at some earlier time. Because, generally, the infants are not allowed to actually touch the items used in the demonstration and thus are not afforded the benefit of procedural learning, deferred imitation has been considered a measure of declarative memory (McDonough, Mandler, McKee, & Squire, 1995; Meltzoff, 1995). Im-

itation of single actions with toys after a 24-hour lapse has been reported as early as six months of age (Barr, Dowden, & Hayne, 1996; Collie & Hayne, 1999). It is reliably seen in a majority of infants tested by nine months (Meltzoff, 1988). Beyond nine months there is a continuing expansion in the quantity of information that can be recalled and in the duration of retention. By 11 months, infants can demonstrate immediate recall of both familiar and novel two-step sequences (Bauer & Mandler, 1992), and can reproduce a familiar single object action (bottle feeding a teddy bear) up to one year later (McDonough & Mandler, 1994). By 12 to 13 months, infants are able to retain information about the temporal order of multistep action sequences after at least a week's delay (Bauer & Hertsgaard, 1993), with increasingly impressive evidence for long-term memory retention over the course of the second year. Meltzoff's (1995) demonstration of deferred imitation in 18-month-old infants exposed to single object-specific actions four months earlier and Bauer, Hertsgaard, and Dow's (1994) demonstration of retained learning in 21-month old children exposed to multistep event sequences eight months earlier provide representative examples.

The relationship between nonverbal memory capacity and language development is of particular interest during the second year, and has received considerable research attention. In a recent study examining deferred imitation and its relationship to verbal capacity in 13-, 16-, and 20-month-old infants observed at subsequent intervals ranging from one to 12 months, Bauer and Wewerka (1995) concluded that "the availability of a verbal code at the time of experience of an event is not necessary either for the event to be remembered over the long term, or for event memory later to be verbally expressed." Other investigators have also documented that language can be superimposed on previously registered preverbal memories (Nelson & Ross, 1980; Todd & Perlmutter, 1980). A dramatic example is the report of Myers, Clifton, and Clarkson (1987) of an almost three-year-old child who, during a follow-up lab visit, guessed what picture was behind a screen. She had last seen the picture two years earlier, at 40 weeks of age.

In a similar vein to the research findings on memory cited above, I have reported on four children who were between the ages of 7 and 13 months when they experienced discrete traumatic events (Gaensbauer, 1995). Provided with cues in the form of play settings that recreated the situational context in which the trauma occurred, the children spontaneously played out salient aspects of their traumas at intervals ranging from 13 months to 7 years after the actual events. In each case the children's enactments were accompanied by descriptive words or phrases not available at the time of the original trauma. An infant who had been involved in a serious auto accident at nine months of age was able at 23 months to play out the accident sequence with dolls and toys, including how the car was struck, rolled over, and landed. A second infant who was 13 months old when he was taken in an ambulance for emergency room treatment for a drug overdose, at 26 months played out several specific details of both the ambulance ride and his emergency treatment. The third case involved a boy who was severely physically and sexually abused by his father over a one-week period at seven months of age. At the age of eight years, in a therapy session with the therapist and his adoptive mother, the child suddenly entered a frenzied, dissociated state during which he dramatically reenacted with his own body the experience of being abused. This included screaming in fear, wiggling on the ground with his buttocks in the air, attempting to crawl under the couch to get away from the therapist (whom he was experiencing at that moment as his father), and using words to describe how he was being hurt. The fourth case was that of a 12-month-old infant who witnessed the death of her mother by a letter bomb. She played out both in action and with toys a number of important elements of that event during an evaluation at the age of four-and-one-half years. When asked how her mother had died, she suddenly dropped to the floor and thrashed about in a frenzied way. Later she abruptly brought her hand across a play scene

that recreated the situation immediately prior to the detonation, knocking dolls and furniture asunder in a gesture that captured essential qualities of the explosion. At the age of six years, in a therapy session with another therapist and in the presence of her adoptive parents, the child provided further verbal detail about the appearance of her mother after the bombing, information that had not been known by her parents but was subsequently confirmed by the police.

An additional case recently brought to my attention by Dr. Irene Chatoor (personal communication) is consistent with these earlier cases. At 18 months of age, a child was brought to Dr. Chatoor for evaluation because of a severe eating disturbance. It was known that the child had been abused, with documented cuts and bruises over her face, prior to being placed in foster care at age 10 months. With enormous patience the foster mother had helped the child to become comfortable taking soft foods by hand or by spoon, but had been unable to alter what appeared to be a phobic reaction to bottles. Even from across the room, the sight of a feeding bottle would elicit distress in the child. During the evaluation at 18 months, when provided with various dolls and play items, the child immediately picked up a baby doll and a toy bottle and initiated a feeding episode by putting the bottle to the baby doll's mouth. After several seconds she began hitting the baby doll over the head with the bottle, making the source of her severe (traumatic) eating disturbance and her phobia of bottles dramatically evident. During a subsequent interview, the child's biological mother confirmed that she had frequently lost her temper during feedings and hit the child over the head with the bottle.

Looking at the second year of life, the expanding capacities for memory retention and verbal facility outlined above would lead one to expect not only increasingly complex memory traces, but increasingly elaborate verbal descriptors as well. In previous articles (Gaensbauer, 1995, 1997, 2000), I have reported on three infants traumatized in the second year of life who demonstrated enduring memories of their experiences. One infant at 15 months had suffered a broken leg and a series of traumatic hospital treatments. At 28 months, stimulated by a fall from a stool, she abruptly began to walk with a limp in the same way as she had immediately after her recovery and for the first time talked about her memories of being in the hospital. The other two cases involved two boys, a 15-month-old and a 22-month-old who was still speaking with single words, both of whom experienced tissue necrosis and painful medical treatments as a consequence of severe intravenous infiltrations. Treatment began at 18 and 13 months, respectively, following their hospitalizations. In therapy both children played out not only prominent aspects of their traumas, such as painful injections and debridements, but a number of minor details that their parents were certain had not been discussed in any form during the intervening period. An additional example of remarkable memory concerned a grief-stricken 30-month-old child whose mother had died suddenly a month earlier. Her current caregivers reported to me that a year earlier, when the child was 18 months of age (at a time when she was speaking multiple words but had not obtained verbal fluency in the form of phrases), they and the child's mother had been at the airport departing and returning from a vacation. After her mother's funeral the child had accompanied her caregivers to the airport to drop off a friend. As they pulled up to the departure point, the child recognized the building and called out, "My mommy is here. I want to see my mommy."

Other authors have also reported on children traumatized in the second year of life who have demonstrated impressive memory capacities. Terr (1988), for example, described a child who was sexually abused in a daycare home between 15 and 18 months of age. At the age of five, when asked during a psychiatric evaluation if anyone had ever frightened her she reported that someone had scared her once "with a finger part" as she pointed to her upper abdomen. Terr later obtained pornographic photos taken of the child at the time of her abuse showing an erect penis (the finger part) jabbing at the very spot on the child's upper abdomen that she had

pointed to in the office. Sugar (1992) reported on a 16-month-old child with early language proficiency who was involved in a plane crash, and was able at 26 months to provide a very accurate account of the accident both through detailed verbal description and play action.

Eighteen to 24 Months

Abundant research and clinical evidence have documented the ability of children between the ages of 18 months and two years, once they have achieved verbal fluency, to perceive, remember, and subsequently describe experienced events. Nelson, Fivush, and their colleagues have shown in multiple studies that the beginnings of autobiographical memory as it is traditionally conceptualized (i.e., the conscious verbal reporting of an event which occurred in the past) are seen around this age period (Nelson & Fivush, 2000). Many clinical reports have documented enduring memories for traumatic events in verbally fluent toddlers (Drell, Gaensbauer, Siegel, & Sugar, 1995; Gislason & Call, 1982; Gaensbauer, 1994; Hewitt, 1994; Osofsky, Cohen, & Drell, 1995; Pruett, 1979; Senior, Gladstone, & Nurcombe, 1982; Sugar, 1992; Terr, 1988; Wallick, 1979; Zeanah & Scheeringa, 1997). Usher and Neisser (1993) have demonstrated that certain affectively meaningful events occurring in the second year of life, such as the birth of a sibling or a hospitalization, can even be remembered into adulthood.

Two cases from my own practice illustrate the clinical significance of retained memories for traumas occurring around this period. A nine-year-old boy referred for treatment for depression was able to describe the events surrounding the death of his baby brother from SIDS seven years earlier, just prior to the patient's second birthday. His very detailed description, including the color of the clothes he and his mother were wearing, was confirmed by his parents who stated that he remembered the events better than they did. A second case involved a child with a chronic medical problem who underwent major surgery at the age of two. At age five she developed pneumonia, was taken to the hospital by ambulance and was immediately rushed to the intensive care unit on a gurney. Following her discharge, her mother found her in bed crying one night. When her mother asked her why she was crying she said, "The same thing happened this time that happened last time (i.e., when she was two). The nurses took me away on that [gurney] and no one was with me."

DISCUSSION

Clinical Implications

The clinical and research data indicate that possibly in the first weeks of life and certainly by two to three months of age infants are able to recognize stimulus cues associated with a traumatic experience and show expectable distress reactions and behavioral responses. By three to four months of age such recognition and distressed responding can persist for weeks to months. By the second half of the first year, and especially from nine months on, there is evidence for internal representation of traumatic events that can be expressed in the form of sequentially meaningful play reenactments at subsequent periods of time involving months and even years. Over the course of the second year, even before the onset of language fluency, memory capacity becomes all the more impressive.

As noted previously, with case material there are many unknown factors that can influence the clinical presentation and more than one possible explanation for any piece of clinical data. Validation of the observations and conclusions drawn here must thus await more systematic study. In most of the cases (both my own and those reported by others), the reliving and/or

reenactments were not totally spontaneous but were stimulated by contextual cues, either naturalistically in the home environment or through the use of dolls and toys in the playroom setting. The reenactments were often narrow in scope, in keeping with the children's immature perceptual abilities. They also were not veridical replicas of the events. Rather, they reflected the creative and synthetic use of crossmodal, expressive play vehicles that captured essential elements of the traumas, particularly the concrete, experience-near aspects that one might have expected to be most perceptually salient. The forms of memory expression and the range of cues triggering them indicated that the memories were registered not just visually but also in multiple sensory modalities (auditory, kinesthetic, tactile, and vestibular). They were not dependent on verbal learning, although, as described above, almost all of the children later superimposed verbal descriptors on their memories and play reenactments.

To what extent are the cases described here typical of infants' memory abilities? Certainly there will be enormous individual variation both in memory functioning and in the processing of a trauma. Nonetheless, the examples highlight the range of memory potential. Moreover, although traumatic memories are often more strongly imprinted than ordinary memories (Pitman, 1989; Terr, 1988), the memory capacities demonstrated in these clinical reports are not qualitatively different from those observed by developmental researchers in more affect-neutral laboratory situations. To the degree that these findings are characteristic of infants' capacities for event representation, they should heighten our awareness of the extent to which infants are registering not only traumatic events but everyday events as well. They reinforce our continuously expanding appreciation for the impressive abilities of these "scientists in the crib" (Gopnik, Meltzoff, & Kuhl, 1999) who are actively constructing their inner psychological worlds through the moment-to-moment perceiving and processing of environmental stimuli.

The long-term fate of early traumatic memories remains uncertain. Within the constraints of the infant's limited perceptual and cognitive abilities, they will in all probability undergo the distortion, loss of detail, merger with other memories, and other forms of alteration seen with the processing of any event memory. Over time they will presumably be forgotten, in keeping with the phenomena of infantile amnesia (although there are a number of case reports in the adult psychoanalytic literature in which remnants of traumas from the first and second years have manifested themselves in dreams and visual imagery, bodily sensations, affective states, and postural/behavioral enactments—see Share, 1994, and Gaensbauer, 1995, for references). Yet, even if their traumatic origins will eventually be lost to conscious awareness, the imagery, sensations, and affective states associated with a trauma will continue to reverberate in the child's mind. They will consequently influence, and potentially distort, the child's interpretation of subsequent environmental stimuli in both direct and subliminal ways for extended periods of time. Because little is known either about the mechanisms influencing the processing of traumatic memories beyond the infancy period or the manner in which they will be interwoven with other developmental issues over time, prospective studies are particularly needed.

In postulating that a traumatic event has been remembered, it is not necessary to hypothesize that it has been encoded at a particular point in time and then been retained without influence until the time of subsequent expression. Many studies have demonstrated that exposure to stimuli associated with the original experience enhances memory retention. A pertinent example would be the Rovee-Collier, Hartshorn, and DiRubbo (1999) report of two-month-old infants trained to make a mobile move. The infants received a three-minute reminder every three weeks up to age six and one-half months, and were able to show retention of their learning through seven and one-quarter months, at which point they became too old for the task. Because traumas in this early period are likely to have occurred in the context of daily

activities, it is equally likely that the traumatic neural circuitry will be cued on a frequent, if not daily basis. Bernstein and Blacher (1967), for example, in the case cited earlier, speculated that the 28-month-old's memory for the pneumoencephalograph she experienced at three months of age could have been periodically reinforced by the fact that her head circumference and neurological status were reevaluated every three months by the neurosurgeon at his hospital office. Given the effectiveness of exposure to reminders in two- to three-month-old infants, Rovee-Collier and Gerhardstein (1997) have hypothesized that "Repeated reactivations could theoretically eventuate in memories that are almost continuously accessible, achieving the status of 'semantic' or 'generic' memory." Similarly, Bauer (1997) and Meltzoff (1988) have suggested that by nine months of age there do not appear to be any underlying neurological or cognitive factors that would limit how long a memory might be retained, particularly if that memory were regularly reactivated.

One form of reactivation that is frequently mentioned as a possible explanation for children's reenactments is overheard parental conversation (in my cases the parents uniformly denied ever discussing the trauma directly with the child). Although I do not believe that overheard conversations can fully explain the detailed and affectively powerful reenactments that the children carried out in the cases cited, such conversations can certainly be evocative. For example, a 19-month-old child with only three expressive words but excellent receptive language had experienced a surgery and several painful, frightening emergency room visits between the ages of 16 and 17 months. Overhearing his mother mention the word "hospital" on the phone he immediately became frightened, pointed to the site of his surgery, and exclaimed "no-no-no!" as he shook his head. For more than a month following his treatments the child screamed whenever he was put in his car seat, fearing he was going to be taken back to the hospital.

Because physical and verbal reminders are likely to keep a traumatic memory alive and be potentially retraumatizing, it is important for therapists and parents to be aware of the extent to which traumatic memories and feelings are being rekindled by every day events. Lack of awareness can contribute not only to a perpetuation of symptoms but to the development of more generalized problems, particularly if a maladaptive interaction with caregivers is set in motion. In Dr. Chatoor's case, as gentle as the foster mother was in utilizing alternative methods of feeding the child, the mere presence of a bottle, even across the room, was probably sufficient to keep the traumatic memories alive and reinforce the child's fear. In the case of the child whose psychotic mother would undress him and smother him in wet towels, the extent of his traumatic feelings around being undressed were not fully appreciated and were not systematically dealt with when he entered foster care. Acrimonious conflicts around dressing and undressing were a source of difficulty for the next several years.

Although repeated exposure is potentially retraumatizing, it is important to note that it can also serve the function of desensitization, modifying the child's negative expectations and reducing the intensity of affective responding with each exposure. Whether recurrent stimulus triggers are likely to be desensitizing or retraumatizing will depend on the many dynamic factors operating in each individual case. Parents will generally respond to their child's distress with intuitive empathy and comforting, hopefully ameliorating the intensity of the child's traumatic affects through a kind of naturalistic deconditioning. Without specific awareness of the child's traumatic reliving, however, a trauma's carryover effects may not be fully addressed. The case of the seven-month-old described above who had been severely physically and sexually abused by his biological father serves as an example of an effective naturalistic desensitization where specific traumatic effects were missed. After his placement in a foster/adopt home, his adoptive mother and sister held him almost constantly, despite his intense resistance and prolonged crying. It took three weeks before he settled down and could comfortably accept

being held. In light of his earlier experience, one could conceptualize what his mother and sister were doing as a form of implosion therapy. The holding very probably triggered traumatic memories and acute distress. However, with patience and perseverance these traumatic associations were eventually overridden by more positive associations. Unfortunately, the child's adoptive father did not participate in the holding, and no specific efforts were directed during this early period to overcoming specific associations to his having been traumatized by a man. His relationship with his adoptive father, a very warm and involved parent, remained distant and uncomfortable until he finally received therapy beginning at seven years of age (Gaensbauer, 1995).

Thus, although it is possible that traumatic reliving can be alleviated in the course of everyday caregiving and the opportunities for deconditioning which they present, a more rapid and integrated resolution will be obtained if direct efforts are made to ameliorate these traumatically imprinted internalized representations. The specificity and enduring nature of these trauma representations would suggest that treatment plans, even at these very young ages, need to move beyond general issues of nurturance, safety, and predictability. They need also to address the unique contexts of the child's posttraumatic responses through the use of trauma-specific measures designed to reduce the child's distress. In the first year of life desensitization efforts will usually be carried out in the context of caregiver–infant interaction and involve graduated exposure to the stimuli that are eliciting distress. Thus, in Dr. Chatoor's case, stepwise reintroduction of the bottle in stress-free, pleasurable contexts might have been helpful in reducing the child's fearful associations to bottle feeding (Chatoor, 1991). Over the course of the second year of life, toys, dolls, and other representative play materials become increasingly important as vehicles for the reenactment of traumas in play action. Such play both serves the purpose of desensitization and helps the child develop a more coherent narrative. It also provides opportunities for interpretive interventions on the part of therapists and parents that address the various personal meanings of the trauma for the child. Given the specificity of the representations, active structuring of the play on the therapist's part, such as recreating the traumatic situation with toys and dolls and allowing the child to play out "what happens next," can be particularly effective in gaining access to the child's memories and feelings. Therapeutic approaches to trauma in early childhood have been discussed in greater detail in a number of previous publications (Gaensbauer, 2000; Gaensbauer & Siegel, 1995; Osofsky et al., 1995; Scheeringa & Gaensbauer, 2000).

Theoretical Considerations

Although the exact nature of these internalized representations remains elusive, the manifestations of memory described here highlight some of the challenges in conceptualizing early memory functioning. Memory systems are typically categorized in dichotomous fashion—declarative/procedural, implicit/explicit, or early/late—although the question of how many memory systems there are is the subject of widespread discussion (Rovee-Collier, 1997). Moreover, these dichotomous systems are often discussed as if they function independently, based on the research demonstrating capacities for procedural learning out of conscious awareness in adult patients with bilateral medial temporal lobe impairment. The clinical data, however, do not easily lend themselves to these kinds of categorization. In real life, even at the earliest stages of development, memory functioning appears to be holistic and integrative, involving complex and reverberating interconnections between many regions of the brain. The multiple channels through which the traumatic representations were registered, encoded, and subsequently expressed in these young children (physiological, affective, multisensorial, behavioral, verbal, and symbolic) highlight how difficult it is in real life to encompass memory functioning

in any dichotomous fashion. Neither does there appear to be a sharp boundary between implicit and explicit memory processing. Even if one postulates that these early memories are initially encoded implicitly and out of conscious awareness (Siegel, 1995), the purposefulness of the children's reenactments and their ability to superimpose verbal descriptors on preverbal events suggest that explicit memory systems have access to the implicit memories.

Developmentally, implicit or procedural memory has generally been considered to precede explicit or declarative memory (Bachevalier, 1990; Nadel & Zola-Morgan, 1984; Nelson, 1995; Schacter & Moscovitch, 1984). Although, as Meltzoff (1995) has observed, it is difficult to apply terms derived from studies of adults to studies of early memory, the clinical examples support those infant memory researchers who have questioned the assumption that the procedural and declarative memory systems emerge independently and sequentially in early development. Meltzoff (1990, p. 20), for example, postulates that "There may never be a time that the human infant is confined to a purely habit/procedural mode." Similarly, Rovee-Collier (1997, p. 491) argues: "If there indeed are two memory systems, then they develop simultaneously and not sequentially from early in life." The memory capacities for specific events demonstrated in the case examples reported here raise the possibility that this postulated developmental sequence may also be reversed. To the extent that habits, learned skills, and unconscious scripts are the product of individually registered events which are aggregated over time into more automatically operating neural circuits, one could argue that in many cases explicit, episodic memory precedes implicit, procedural memory, i.e., that memories start out as declarative and become procedural. Stern's (1985) concept of RIGs (Representations of Interactions that have been Generalized), overarching schemata that grow out of individual episodes of interactive experience, is consistent with this formulation.

Embedded in the discussion of early memory systems is the question of whether infants are capable of evocative memory. If they were, how would they show it? Retrieval systems are obviously immature, and, in the cases cited above, the children's distressed "reexperiencing" and play reenactments were generally triggered by stimulus cues. Nonetheless, given the ready availability of the representations, it seems likely that any distributed, traumatically based, neural networks that can be "cued" by an external stimulus could also be triggered "spontaneously" by internal stimuli (including physiological and subjective states). Such stimuli could produce trauma-derived sensory and/or affective neural discharges that the infants would experience with whatever manner of consciousness they were capable of. In other words, there is reason to believe that, even in the first year of life, infants experience evocative memories that are not dependent on an external stimulus. The emerging clinical and research data, as I interpret them, suggest that differences between earlier and later memory functioning relate more to quantitative variables such as stimulus complexity, limited modes of expression, and duration of retention, than to qualitative differences in how memories are laid down and/or evoked.

The issue of memory for personal experience from the past is intimately tied to the question of "autobiographical memory." Nelson (1990) has questioned whether early memory phenomena such as deferred imitation (and presumably play enactments) can be considered "purposeful" in nature, i.e., the product of conscious awareness that this was a memory. She considers autobiographical memory to emerge at the point that children become capable of providing verbal narratives about events that they know have occurred to them in the past. Applying this criterion, the manifestations of memory for early trauma described here would not be considered autobiographical memory. The verbal descriptors superimposed on the nonverbal memories were generally quite limited in scope, and did not approach a coherent or complete narrative of what happened to the child. It remains a question, nevertheless, whether or not young children can have "autobiographical" memories that are not dependent on language.

Much of this debate, of course, hinges on questions of definition (Rovee-Collier, 1997). If verbalization is eliminated, what would qualify as an autobiographical memory? How do we define consciousness in a preverbal infant? What are appropriate criteria for declarative memory in early development? What would constitute a “purposeful” reenactment? Was the nine-month-old child who repeatedly held his legs in a fixed position for a week following the single brief encounter with his mother after a five-months separation doing this purposefully? Was he conscious of danger? Was he experiencing some form of internal visual or other sensory experience that signaled the nature of the danger?

We do not have answers to these questions at this point. However, the spontaneous and purposeful ways in which children reenact their traumas, once a vehicle for such expression is provided, strongly suggest that the children are aware they are communicating something that has happened to them. The upsurge in symptoms and various defensive operations that almost universally follow these play reenactments, especially initially, gives further evidence of the infant’s sense that these reenactments reflect intensely emotional personal experience. For example, in a therapy session at 26 months of age, the child who had been taken to the hospital at 13 months for an overdose repeatedly threw “pills” (pieces of chalk) in the wastebasket. His mother and I originally assumed this play related to his father’s hospitalization secondary to a medication reaction. However, the play was so purposeful and so unaltered by references to his father that it dawned on us that in getting rid of the “bad pills” he might be expressing feelings about his own experience. Operating on this assumption, I introduced a little boy doll and an ambulance. He confirmed that we were on the right track by immediately became engaged and animatedly playing out details of his ambulance ride and emergency room treatment. Looking back, his mother and I were both convinced that in his persistent pill play he was intentionally communicating to us about his own experience.

The degree to which infants can be aware of something having happened to them “in the past” is an intriguing and extremely difficult question. What is an infant’s sense of time? This question is too complicated to be addressed in any depth here. I would suggest, however, that the extent to which infants are programmed to perceive and anticipate sequences and to comprehend cause and effect would imply that temporal processing and a sense of time is intrinsic to neural functioning (Fitzgerald & Brackbill, 1976). Given such intrinsic aptitude, it would not be unreasonable to hypothesize that an infant could have an intuitive yet conscious sense that an internally represented event occurred “before” the present (Stern, 2000). At the same time, this sense, if present, is likely to be highly tenuous and primitive in nature, contributing to the young child’s tendency to experience any “reliving” emotions and/or sensations as being caused by whatever has triggered them in the present. Helping children to understand that their current reactions are overdetermined as a result of a past experience is, therefore, an important therapeutic task, although, because of their cognitive immaturity, a daunting one.

As Nelson and others have suggested, autobiographical memory, as we think of it from adult perspective, is predominantly verbally mediated and socially constructed in the course of early childhood. She eloquently describes how “the child is inducted into the shared forms of talking about shared experiences and comes to incorporate the adult values of talking about the experience” (Nelson, 1993). The onset of language fluency and the development of the capacity for symbolic thought occurring between 18 and 24 months open new worlds in regard to the infant’s sense of self and others, and mark a particularly important nodal point in early development. From this time forward into adulthood there will be a fundamental continuity in the way events are organized and communicated. At the same time, these advances constitute a significant disjuncture with previous modes of experiencing. Personal experiences that have been encoded globally and affectively during the preverbal period will not be easily assimilated into these new cognitive structures and much can be lost in the transition (Howe & Courage,

1993; Stern, 1985;). Parents and therapists, therefore, have a crucial role in helping the child to achieve verbally mediated understanding of a preverbal traumatic event. From a therapeutic standpoint, the establishment of a verbal narrative is a critical therapeutic accomplishment, not only to help children make sense of their experience but to deal with ongoing effects as they emerge in subsequent developmental periods (Gaensbauer, 2000). The knowledge that preverbal traumatic events are internally represented and that they do endure becomes a compelling reason for therapists and parents to develop a continuing verbal dialogue about such events. Children should not have to cope with the memories, whatever their form, on their own.

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