

**Final Version: May, 2002**

**Remembering Infancy: Accessing our Earliest Experiences**

Alan Fogel

Department of Psychology, University of Utah, USA

[alan.fogel@psych.utah.edu](mailto:alan.fogel@psych.utah.edu)

Chapter to appear in G. Bremner & A. Slater (Eds.), *Theories of Infant Development*. Cambridge: Blackwell.

This paper is based in part on an invited lecture presented at the Associazione Italiana di Psicologia, Sezione di Psicologia dello Sviluppo, Alghero, Sardegna, September 26 - 28, 2000. This work is supported in part by a grant from the United States National Institute of Mental Health (R01 MH57669). I am grateful to Gavin Bremner, Lynette Cofer, Lisa Diamond, Raymond Kesner, Ilse de Koeyer, Sarah Norgate, Monisha Pasupathi, and Allan Schore for their helpful comments on earlier drafts of this paper.

The oldest known written description of infant development is from St. Augustine (354-430 c.e.). In the *Confessions* (1991), Augustine gives a remarkably detailed and developmentally appropriate report of his own infancy, describing how he sucked from the breast and his patterns of quieting and crying. He reports that his first smiles occurred during sleep, which can be observed in infants today. Augustine established the source of his data in the following way: "This at least is what I was told, and I believed it since that is what we see other infants doing. I do not actually remember what I then did" (Augustine, 1991, p. 8).

Augustine's description reveals that infantile amnesia, the apparent loss of memory about one's own infancy, has been accepted as fact for at least a few thousand years. Events in one's life that occur before the age of 3 or 4 years cannot be explicitly named, cannot be organized into a coherent narrative structure, and appear to be lost to the self (Rubin, 2000). Infantile amnesia has been explained by the onset of *autobiographical memory*, sometime during the third year of life (Fivush, 1994; Harley & Reese, 1999). In this view, children need to acquire conventional and symbolic language, and its cognitive prerequisites, in order to describe themselves to other members of their linguistic community and in so doing, to remember themselves.

In this paper, I shall review research – on infant and adult memory, infant neurobehavioral development, working models of attachment, recollections of documented early childhood trauma, and clinical work with adults and children – suggesting that children and adults may in fact remember some aspects of their first few years of life. In addition to the distinction typically made between implicit and explicit memory systems, I suggest that there is a third type of memory, which I call participatory memory – the experience of re-living or re-enacting the past – that can help to explain both contemporaneous infant memory and child and adult memories for infancy. I describe some of the conditions under which individuals may access participatory memories of infancy. I argue that this is a necessary pathway bridging unconscious and conscious processes and one pathway for therapeutic processes aimed at resolving trauma from early childhood. I conclude by discussing the research and clinical implications of accessing infantile memories.

## VARIETIES OF MEMORY

Memory researchers distinguish two memory systems. *Explicit memories* (also called conceptual or declarative memories) are composed of specific categories for types of event, times, and places. Explicit memory is recall *about* an event. *Implicit memory* (also called procedural or nondeclarative) “is concerned with unique, concrete personal experiences dated in the rememberer’s past” (Tulving, 1983, p. 1). Implicit memory is self-relevant, context specific, and “concrete.” These two types of memory are believed to be centered in different neurological structures located in different hemispheres of the brain (Schachter, 1992; Squire & Knowlton, 1995; Wheeler et al., 1997).

The differences between explicit and implicit memory can be extended to distinguish between two types of cognitive system: a rational system and an experiential system. The rational system is analytical, marked by conscious appraisal processes, encoded in symbols, and it operates in the realm of conscious control. The experiential system, on the other hand, is emotional, concrete, experienced passively, and mediated by “vibes” from past experiences rather than by explicit judgements and appraisals (Epstein, 1991). This is similar to William James’s distinction between knowledge by description (explicit) and knowledge by acquaintance (implicit).

Implicit memories have been used to explain skill learning, such as driving a car or playing a musical instrument. In this case, the memories are specific to the context (sitting behind a steering wheel or at a piano keyboard) and they are embodied, requiring the activation of specific sensory and motor systems. These memories are not memories “about” driving an automobile or performing music. Rather, the memory is constituted in the performance itself, not separate from it. A conceptual memory of driving is an arm-chair experience, thinking back on a specific incident. The conceptual memory requires a verbal narrative and does not necessarily require nonverbal actions. Implicit memories are from the past but may not correspond to a specific source event, time, or location (Schacter, 1996).

Both explicit and implicit memories are relational in the sense that not all the information required to remember is “in the head” (Fogel, 1993; Pasupathi, 2001). Compared to explicit memories which are relatively context-free, implicit memories require a specific type of context in order to be substantiated, a context similar to one in which the memory was acquired. In this case, the memory occurs spontaneously when the relationship between the subject and context is reconstituted. Some implicit

memories are social relational because the contexts in which they were acquired and those in which the memory recurs are interpersonal situations, a process called *implicit relational knowing* (Beebe, 1998; Lyons-Ruth, 1998; Siegel, 2001).

All explicit memories are intrinsically relational because they are substantiated via socially shared cultural conventions such as words and images. This is true even for memories that occur when a person is alone because solitary thought takes the form of these same cultural words and images (Fogel, 1993; Vygotsky, 1978). Explicit memories are told and re-told in social narratives. Evidence suggests that the explicit memories people retain are those which have been told to other people, making the process of memory formation and development inherently social (Pasupathi, 2001).

Research on infant memory suggests that, probably from birth, infants have both implicit and explicit forms of relational memories. Explicit memory, for example, is shown when infants recognize their mother's face or voice without necessarily demonstrating any enactive behavior (Howe, 2000). On the other hand, both types of memory have a different developmental course. Implicit memories are more prevalent and salient in early infancy. Explicit memory grows with increasing cognitive sophistication and with the ability to share autobiographical experiences with others via language (Fivush, 1993; Howe & Courage, 1993; M. Lewis, 1991).

Underlying verbal autobiographical memory, however, there is a memory for a pre-verbal sense of self, a "primary consciousness" or "ecological self" or "core self" consisting of sensing, feeling, and acting (Damasio, 1999; Rochat, 1995; Stern, 1985). Recent research on infant behavioral and neurophysiological development suggests that from the late fetal period, long before infants can recognize themselves in a mirror, infants have direct access to and implicit memories for their bodily states. Infants and late-term fetuses can experience their body's movements and senses. They also have access to the direct neural monitoring of the internal milieu of the body: the bowel and bladder, the heart beat, the breath, and other bodily functions that are linked to psychophysiological well-being (Butterworth, 1995; Damasio, 1999; Fifer, Monk, & Grose-Fifer, 2001; Rochat, 1995; Stern, 1985; 2000).

The remainder of this paper is an account of the types of memory that are likely to be retained

long-term from the pre-verbal period and the conditions under which that memory may be accessed. I also suggest that there is a third type of memory, participatory memory, that forms a bridge between implicit (unconscious) and explicit (conscious) experience, and may be one of the primary pathways for integrating infancy experience into the autobiographical self.

### **Implicit memory as regulatory memory**

Implicit memory is primarily *regulatory*, automatized, and unconscious (Bargh & Chartrand, 1999). Implicit memories do most of the work of mediating between perception and action, as when stimuli are unconsciously evaluated, approached or avoided. Implicit memories are operating all the time and account for the organization and regulation of most of our adaptive behavior. There is a growing amount of evidence from neurodevelopmental research suggesting that early experiences alter neural pathways and structures to create patterns of responding to everyday events. These patterns are primarily emotional (that is, evaluations regarding harms or benefits) and serve to regulate behavior at a preconscious level, one's "primary" or "core" self that begins to be established in early infancy (Damasio, 1999; Stern, 1985).

Because most infant experience occurs in interpersonal relationships, the infant brain is particularly attuned to faces, voices and social information. Multiple, repeated experiences of social interaction become embodied in neuromotor pathways to create implicit relational knowing, implicit memories of how to do things with intimate others (Beebe, 1998; Lyons-Ruth, 1998; Siegel, 2001). The brain of the infant is experience-dependent and learns, via social experience, to view the social environment as fundamentally threatening or fundamentally friendly (Panksepp, 2001).

Although we may never recall 'explicitly' what happened to us as infants, the experiences we had with our caregivers have a powerful and lasting impact on our implicit processes. These experiences . . . involve our emotions, our behaviors, our perceptions, and our mental models of the work of others and of ourselves. Implicit memories encode our earliest forms of learning about the world. Implicit memories directly shape our here-and-now experiences without clues to their origins from

past events (Siegel, 2001, p. 74).

One of the most salient organizing factors of regulatory implicit memory is the infant's history of communication and emotion with significant others (Schoore, 2001). A number of attachment theorists have re-conceptualized Bowlby's "internal working model" of attachment, which regulates communication with significant others, as a form of regulatory implicit relational memory. This memory is acquired through experience with separation, reunion, and mutual availability issues in relation to attachment figures from infancy and early childhood.

The experience-dependent maturation of the brain creates an intuitive, unconscious sense of one's ability to regulate flows of emotion, either alone or in interpersonal relationships. With a sense of security, infants are more likely to regulate their experiences of a variety of both positive and negative emotions because their social relational experience of these emotions has a history of effective resolution. The right hemisphere specifically provides the unconscious regulation one's emotional synchrony with others.

"This capacity involves the abilities to nonconsciously yet efficiently read faces and tones and therefore intentionalities...to empathically resonate with states of others, to communicate emotional states and regulate interpersonal affects, and thus to cope with the ambient interpersonal stressors of early childhood" (Shore, 2001a, p.45).

An example of a regulatory implicit memory comes from one of the most comprehensive chronicles of everyday memory, Marcel Proust's *Remembrance of Things Past*. The hero, Swann, is responding to the new coldness of his former lover, Odette.

This new manner, indifferent, offhand, irritable, which Odette now adopted with Swann, undoubtedly made him suffer; but he did not realize how much he suffered . . . this change was his deep, secret wound, which tormented him day and night, and whenever he felt that his thoughts were straying too near it, he would quickly turn them into another channel for fear of suffering too much. He might say to himself

in an abstract way: 'There was a time when Odette loved me more,' but he never formed any definite picture of that time (Proust, 1981, p. 350).

Regulatory implicit memories, then, seem to be composites of repeated early experiences rather than accurate records of single incidents (Stern, 1985; Epstein, 1991). These generalizations create an unconscious predisposition to act or feel in particular ways in particular situations. These memories serve to regulate the links between self and other by altering the possibility for emotional response before an emotion is ever experienced. They are unconscious and, under ordinary conditions, unable to be explicitly accessed.

### **Participatory memories**

In addition to regulatory implicit memories and explicit verbal memories, there is another type of memory. It is a form of memory that can enter into the conscious experience of the remembering individual (similar to explicit memory) but the memory is behavioral and emotional rather than verbal or conceptual (similar to implicit memory). *Participatory memories are lived re-enactments of personally significant experiences that have not yet become organized into a verbal or conceptual narrative.* Participatory memories are conscious experiences in the present that are not *about* a past experience, meaning that the past experience is not represented as an image or concept divorced from emotional significance. Rather, participatory memories are emotionally experienced as a *being with* or a *re-living of* past experiences (Bråten, 1998; Fogel, 1993; Fogel, 2001; Heshusius, 1994). When experiencing a participatory memory, one is not thinking about the past. One is directly involved in a past experience as if were occurring in the present.

I will argue in the following sections of this paper that participatory memories arise from unconscious implicit memories and under certain social relational conditions (during psychotherapy, for example) may become transformed into explicit verbal memories. In that process, implicit memories of unresolved and unconscious traumas from early childhood may become resolved and reintegrated into a more complex and expanded autobiographical sense of self through time.

Some contemporaneous memories of late term fetuses and young infants appear to be participatory. In one type of memory study, for example, three-month-old infants are taught to display a

series of limb movements or head turns in order to activate the movement of a mobile suspended over their crib. Infants as young as 2 months of age can remember for up to two weeks without reminders the specific actions they learned to initiate the movement of a mobile. When infants are given periodic reminders, however, they can remember the procedures indefinitely.

Infant participatory memory, therefore, is *embodied* because when *re-enacting* and probably *re-experiencing* a procedure, infants can be said to remember it (Fogel, 1993). The body, moving in relation to the context, is actively involved in the substantiation of the remembered experience.

. . . efforts at understanding the subjective world of the infant have focused primarily on mental representations as the building blocks of inner experience. The baby's body, with its pleasures and struggles, has largely been missing from this picture (Lieberman, 1996, p. 289).

Infant participatory remembering is also situated in the context where initial learning occurs. Forgetting occurs when babies are retested in different cribs, in the same cribs with different colored bumpers, with different mobiles, with different odors in the room, or with different music playing. In these situations, infants are less likely to show a participatory memory of activating the mobile (Butler & Rovee-Collier, 1989; Fagen et al., 1997; Rubin, Fagen, & Carroll, 1998). Participatory memories are also shown, after the age of 6 months, when infants re-enact something via deferred imitation after delays of hours or days (Howe, 2000). Implicit memory is shown if infants at any time activate a mobile or perform some other action, having learned to do so in the past. The memories shown in these experimental studies are embodied in a specific sequence in a specific context, thus re-creating the entirety of the prior experience.

Proust gives many examples of participatory memories. The novel's narrator, as a young child, had become intrigued by the name "Swann." Whenever he later heard the name, he would not have an explicit memory of Swann as an image in the mind. The remembering was comprised of a re-enactment of relevant emotional experiences.

. . . I would be obliged to catch my breath, so suffocating was the pressure, upon that part of me where it was for ever inscribed, of that

name which, at the moment when I heard it, seemed to me fuller, more portentous than any other, because it was heavy with the weight of all the occasions on which I had secretly uttered it in my mind (Proust, 1981, p. 157).

In this passage, the writer describes the sensory and emotional manifestations in the present moment that form what he recognizes as a memory of his prior experiences. This memory is not conceptual or abstract, nor is it merely regulatory and unconscious. Rather, the memory is literally and realistically re-lived. Each time it recurs, the same feelings of portent create the experience of suffocation.

### **Participatory memory for trauma**

Post traumatic stress disorder (PTSD) in humans involves participatory memory experiences including strong and unexplained emotions, somatic sensations, and visual images such as nightmares and flashbacks, all of which are re-enactments of trauma-related responses. Traumatic participatory memories are behavioral re-enactments of earlier experiences and are associated with specific changes in the right limbic system, particularly the hippocampus and amygdala (Schoore, 2001; van der Kolk, 1996a).

Participatory memories associated with PTSD have a number of notable characteristics. First, they are not transformed as a result of subsequent experiences. Typically, people do not remember autobiographical events veridically. Rather, everyday memory is altered by the developmental and social processes that occur in the interim between the original experience and the remembering of the experience, usually with another person (Pasupathi, 2001). Trauma memories, however, are “timeless and unmodified by further experience” (van der Kolk, 1996a, p. 232). Individuals may have the same traumatic nightmares or re-experience the same recurrent flashbacks for many years, such as being suddenly intensely afraid and breaking into a cold sweat for no apparent reason (Smyth & Pennebaker, 1999; Terr, 1994; van der Kolk, 1996b).

One of the reasons why this may occur in PTSD is:

. . . that emotional memories can be established without any conscious evaluation of incoming information by the neocortex, and that a high

degree of activation of the amygdala and related structures can facilitate the generation of emotional responses and sensory impressions based on fragments of information, rather than full-blown perceptions of objects and events (van der Kolk, 1996a, p. 234).

Participatory memories for human infancy in older children and adults may be preserved in more-or-less complete experiential form because the infant limbic system is more developmentally mature than the neocortex. Thus, situations from infancy, especially if they are salient – which would certainly be the case for trauma – could become “timeless.”

A second characteristic of participatory memories is that they are primarily emotional and perceptual rather than explicit. Beside the apparent vividness of the participatory re-enactment is the common observation that trauma victims display a selective amnesia for the actual events of the trauma. They may not even be aware that their flashbacks have a specific origin in time and place (van der Kolk, 1996b). Pierre Janet (1904) reported cases in which patients experienced overwhelming emotions that were seemingly traumatic but for which they had no explicit memory. Freud and Breuer (1966) reported on patients who were troubled by emotional and behavioral symptoms, apparently participatory memories, that the patients could not explain.

This feature of traumatic participatory memories appears to be explained by the same neurological processes as the previous feature. Because traumatic events cannot be assimilated into a coherent verbal narrative, they are remembered primarily by the areas of the brain that process sensory, motor and iconic information. When traumatic memories are provoked in PTSD victims there is a decreased activation in Broca’s area (identified with some aspects of language processing) and right hemisphere activation in the amygdala and hippocampus (see van der Kolk, 1996b, for a review of this literature).

All autobiographical memories, both implicit and explicit, partake of cortical and limbic processes, as well as neural connections vertically into the body (Fink et al., 1996; Tucker, 2001). The emotional and perceptual aspects of traumatic memories, however, are dissociated from cortical processing and thus become split off from the narrative part of the autobiographical self. This again

suggests a similarity between memories for trauma and memories from infancy, where cortical and narrative processes are developmentally less available. While this lack of verbal memory for infancy has been the explanation for infantile amnesia, the trauma research suggests that the emotional and sensorimotor components of some infancy experiences may indeed be preserved and available for recall under certain conditions.

There are a growing number of well-documented studies showing that adults and young children retain an ability to re-enact some experiences of trauma that occurred during their own infancy, that is, to show participatory memory for trauma. Long-term memory for pain in infancy has been shown in rats who, as newborns, were given a painful injection on either their right or their left rear paws. When tested as adults, the injected paw was more sensitive to pain compared to the non-injected paw, and compared to non-treated control rats. In addition, there was a higher density of nerve endings in the injected paws of the adult rats. At least in rats, these memories of trauma are localized to specific regions of the body and may last until adulthood (Ruda, et al., 2000). This memory is participatory in the sense that the adult rat seems to contemporaneously re-experience the early pain in the same location that it was inflicted. This is not a memory about pain (not an explicit conceptual memory of having the pain inflicted to the paw during infancy), nor it is it an unconscious favoring of the affected paw without a contemporaneous psychological experience (not a regulatory implicit memory).

Early stress and deprivation in rats and monkeys can create long-term behavioral changes that could be considered participatory memories, such as fear and behavioral inhibition in novel contexts and higher levels of anxiety and stress reactivity. These apparent re-enactments of trauma-specific behavior are associated with neurological changes in the hypothalamic-pituitary-adrenocortical (HPA) axis (Gunnar, 2001; Posner, Rothbart, Farah & Bruer, 2001). In a potentially analogous way, human children who had been institutionalized in infancy because of parental death or absence are more likely than non-deprived children to show behaviors such as being resentful or aggressive when corrected, irritability, and fighting with peers (Ames, 1997; Hodges & Tizard, 1989). These behaviors are not explicit memories of being treated a certain way in early childhood. They are activated in the present, have emotional force, and probably replicate in the body the interpersonal conditions of early

experiences.

It may be theoretically useful to re-consider the concept of working models of attachment from the perspective of participatory memories as distinct from implicit memories. Children and adults with insecure attachment histories, for example, are more vigilant for signs of abandonment, gaining approval, and avoiding rejection (Goodman & Quas, 1997; Main, 1999). This vigilance is manifested in body postures of holding back, withdrawing and in lived emotional experiences of shame and anxiety. Anxious styles of attachment are seen in clinging, reaching, and a hunger for body contact, while avoidance is seen as pushing away and aversion to interpersonal closeness. These are probably participatory memories because they tend to be re-enacted with close friends, parent figures, romantic and sexual partners but not necessarily with other people, that is, in emotional and postural situations (e.g., lying down, close holding) in which the original experiences may have occurred (Lisa Diamond, personal communication).

Long-term memories of pain trauma in human infants also have been investigated in children who had a traumatic injury that brought them to the hospital emergency room some time during their first two years of life (Peterson, 1999; Peterson & Bell, 1996; Peterson & Rideout, 1998). If the injury occurred around the age of two years or after, children could recall the situation verbally up to two years later. One such child had burned his hand on a lawnmower exhaust pipe when he was just under two years-old. A year and a half later, he could state that he burned his hand, who was there, why it happened, and that he saw a doctor. These are explicit, conceptual, autobiographical memories.

Children who were injured before 18 months were different. At 16 months, a child fell and cut his forehead. His emergency room visit was traumatic for him, since he had to be tightly wrapped in a blanket to keep him from moving during the stitching of the cut. For the next few months, he showed sleep disturbances, fear of strangers, did not want to leave the house, and became hysterical when blankets were put on him. He was interviewed by the researchers when he was 22 months old. At that time he still did not have verbal skills sufficient to describe the situation but when he heard the word *hospital*, he pointed to the place on his forehead where he had received the stitches. When interviewed 18 months after the accident (at 34 months of age), he still had no verbal memory of it but his parents

said he still refused to be wrapped in a smock when getting his hair cut.

These memories are not explicit because there is no verbal memory and the child cannot stand outside the experience and reflect upon it. Nor are these memories simply regulatory, controlling the feelings before they occur by an unconscious avoidance of the situation. Rather, these memories are re-lived experiences in the present: they are participatory.

One of the most dramatic studies on participatory memories comes from clinical research on children who were under the age of five years at the time they were exposed to documented traumas such as sexual abuse, physical injuries, witnessing the death of a family member, or accidents (Terr, 1988). All children in the study had what Terr calls “behavioral memories” but only children older than 28 months at the time of the trauma were capable of retaining partial or full verbal memory for the trauma.

Of interest to this paper are the behavioral memories, some of which appear to satisfy the criteria for participatory memory. These include post-traumatic play or re-enactment and trauma-specific fears. In one play therapy episode, a child poked at her abdomen and talked about spears pointed at her during a visit to Disneyland. The spot she touched was exactly the place where videotapes of her sexual abuse (made by the perpetrators) revealed a man’s erect penis jabbing her and not, as might be presumed, in her genital area.

Terr also groups “personality changes,” such as persistent sadness or anger, under the category of behavior memories. These personality changes, however, appear to be regulatory implicit memories, confined to the background of psychological functioning. Under the cover of sad or angry moods, the potential for re-enacting the trauma remains in the unconscious background.

While accurate verbal memories of documented trauma are not surprising for children older than 3 years at the time of the incident,

The surprise comes when one looks at behavioral memories, at how early they appear, how long they continue, and how accurately they reflect what happened to the child. Behavioral memory appears to operate by different rules from those governing verbal remembrance.

For instance, behavioral recall allows for repetition of action in multiple, variable, and long-lasting abuses, even when the verbal descriptions of these abuses seem forever lost to consciousness (Terr, 1988, p. 103).

### **Participatory memories for non-traumatic experiences**

There seems to be a consistent clinical, neurological, and theoretical explanation for why some traumatic memories are participatory and relatively unmodified by later experience, even when those memories occur before the age of 18 months. Can non-traumatic events from infancy also be retained as participatory memories? Given that the infant brain tends to monitor primarily emotional and sensorimotor occurrences, and given that there is no verbal mediation of such experiences, highly salient positive experiences from infancy may be preserved in the emotional right hemisphere. Since such salient events would have occurred prior to language acquisition, they may become “timeless” in the same way that we have seen for traumatic memories.

Participatory memories have been documented for non-traumatic experiences but at the present time there is less convincing evidence than the evidence for traumatic memories. Compared to rat pups who received relatively little maternal attention, pups who received higher levels of licking and grooming from their mothers were less fearful and showed lower levels of stress both behaviorally and in the HPA axis response (Liu et al., 1997; Posner et al., 2001). Secure attachment behavior, the participatory re-enactment of approaching and comfort seeking in humans, is believed to be affected by infancy experience as mediated through the effective regulation of the HPA axis, the right limbic system, and the parasympathetic nervous system, especially vagal tone (Diamond, 2001; Schore, 2001). Preferences for food and other sensory pleasures may also be interpreted as participatory memories. These are rather general assertions, however, and research is lacking on the specificity of non-traumatic memories from infancy.

There are a few exceptions. In one study, children who were two and a half years old were retested in a procedure that had required them to reach for objects in the dark when they were six months of age. Compared to infants who did not have the six-month experience of reaching in the dark, the children who had the experience were better at the task at two and a half years even though they

had no verbal/conceptual memory of having done the task when they were younger (Perris, Myers, & Clifton, 1990). In this study, it is difficult to say whether the memory for reaching in the dark is implicit, i.e., a general automaticity, or participatory.

In another study, a sample of 8- to 10-year-old subjects were shown pictures of their preschool classmates, children who they knew when the subjects were 3 years-old. In comparison to pictures of 3-year-olds who the subjects did not know, the subjects had reliable skin conductance responses even though the subjects could not reliably identify verbally which of the pictures were of their former classmates (Newcombe & Fox, 1994). Although there were physiological effects, this memory did not appear to become part of the subject's conscious experience in the present. Thus, this study may show evidence for implicit regulatory memory rather than for participatory memory.

A clinical case study of non-traumatic participatory memory followed a group of singletons and twins from the late fetal period until the age of 3 years (Piontelli, 1992). Piontelli observed the fetuses in the company of the parents and physicians during ultrasound imaging of the fetus. She later conducted naturalistic observations of the children in their families. One set of dizygotic twins, for example, stroked each other between the walls of their separate amniotic sacs. After birth, they liked to touch and stroke each other, more so than the other twins in the study who did not show this behavior prenatally. At the age of one year, they developed a game of stroking each other from opposite sides of a silk curtain. Another set of fraternal twins was prone to hitting each other prenatally and continued to show violence and dislike toward each other for many years. A singleton who "wildly" licked her placenta and umbilical cord during the fetal period developed an eating disorder in infancy and an insatiable need for sensory pleasure.

Though suggestive of non-traumatic participatory memories from early infancy, the studies reviewed here are insufficient to make a strong case. There are, however, good theoretical reasons to suppose that such memories exist and can be revealed by future research. On the other hand, a much stronger case can be made at the present time for the preservation of participatory memories of infant trauma well into childhood and possibly for a lifetime.

### **INFANT TO ADULT, ADULT TO INFANT**

The previous section suggested that there are situations in which previously unconscious implicit regulatory memories can be brought to life in the form of a participatory memory. The play therapy situation used by Terr is one such example. Can we say something general about the conditions under which participatory memories of infancy are likely to emerge?

Participatory memories are more likely to occur when the situation in the present has similarities to a salient situation in the past, one that is not explicitly remembered. A variety of studies on non-human animals show that fears conditioned during infancy can be reinstated when the older animals are placed under stress. Rats who were fear-conditioned at 21 days showed no retention 2 weeks later, a form of infantile amnesia. When given an injection of epinephrine or other stress hormones, the conditioned fears returned. The form of behavior shown by the stressed animals was infantile in appearance, involving stilling and freezing (Jacobs & Nadel, 1985; Nijenhuis, Vanderlinden, & Spinhoven, 1998). These findings suggest that under neurological conditions similar to the initial learning situation, the animals had a participatory memory of the conditioned stimulus.

In humans, emotional memories for abuse, trauma and stress related to infantile attachment history are linked to the relatively non-verbal right hemisphere (Brake, Sullivan, & Gratton, 2000; Fink et al., 1996; Schore, 2001). As in the case of fear-conditioned rats, these stressful and traumatic early experiences, because they are based in the right brain, lead to an inability to talk about emotions and internal states related to the trauma, that is, to dissociations of explicit memory (Schore, 2001). It seems reasonable to suspect that reinstatement of the neurobehavioral conditions of infancy – primarily sensory, motor, and emotional situations -- may create opportunities for the emergence of infantile participatory memories.

Similar to the research with rats, when humans with traumatic early histories are under physiological or psychosocial stress, their amnesia for early experiences becomes manifested as enactive “symptoms.” (Fox & Card, 1999). The majority of reported symptoms involve heightened sensory and motor states, such as inability to feel emotions or excessive emotionality, gastric and eating disorders, sensitivity to touch, and the like (Krueger, 1989). It may be clinically and theoretically useful to consider these symptoms as examples of participatory memories.

### **Therapeutic transformations from implicit to participatory to explicit memory**

Participatory memories that manifest as symptoms under stress do not necessarily become explicit because they lack an interpersonal context that facilitates integration into the autobiography of the self. These memories, though participatory, remain split off, dissociated from the conscious self. A number of therapeutic methods have been devised that evoke participatory memories and then facilitate their integration into the autobiographical self.

Freud, for example, was aware of the need to get adults out of their habitual and conceptual cognition in order to access childhood experiences for the purpose of treating symptomatic complaints. He experimented first with an early form of hypnosis and then later discovered a method that he called *free association*. Freud realized that thinking and reasoning about oneself is important for therapeutic integration, self-control, and appropriate social behavior. On the other hand, these ego functions — according to Freud — also serve to defend against awareness of the original trauma. One of the goals of psychotherapy is to free up the unconscious memories of emotionally laden experiences. In the company of an emotionally available therapist, these memories can be re-experienced and understood.

“The co-construction of a coherent narrative of the trauma may emerge in a relational contact which promotes a callosal transfer of affective information from the right to left orbitofrontal regions. This structural advance allows for left hemispheric retrieval and explicit semantic processing of right hemispheric emotional states encoded in implicit-procedural memory” (Schoore, 2001b, p. 245).

I suggest that one pathway from implicit to explicit remembering is the temporary manifestation of the implicit memories as participatory memories. These so-called regressions to earlier experiences that occur during psychotherapy, for example, provide a fertile ground for this process to occur.

“The vividness and immediacy of regressed states of experience become the core of an active reorganization of the interpersonal self, and one aspect of the analytic situation is the creation of a relational environment that permits, rather than induces, therapeutic regression.

This environment allows the individual partially to surrender the role of protecting ego stability because he feels safe enough to share the responsibility with the analyst. By doing so, the patient permits the emergence of regressed states of experience, along with intense reenactment in the transference of early and sometimes developmentally fragmented modes of thinking, feeling, and behaving” (Bromberg, 1991, p. 416).

The “vividness and immediacy” of regressed states seems to be a description of the lived experiential nature of participatory memories, awakened into being re-lived in conscious experience in the midst of a particular type of therapeutic relationship.

Bromberg (1991) suggests that language alone is inadequate to create such therapeutic opportunities: they cannot arise via interpretation, they are permitted rather than induced. Such opportunities occur when patient and therapist move into a play-like communication that is founded upon a history of trust built through the relationship. The participatory memories must be communicated to and witnessed by another person who is prepared to accept them and to help regulate the emotions as the client revises his or her autobiographical narrative to include not only the early experience, but the ability to cognitively regulate the emotions surrounding it.

Bromberg’s idea of permitting and allowing rather than inducing participatory memories is reminiscent of models of early mother-infant communication associated with secure attachments. Rather than inducing affective states in their infants, mothers match infant emotions and engage in moments of dynamic sharing of emotions. This has been called attunement, interpersonal affective resonance, dyadic states of consciousness, or co-regulation. These moments are typically associated with positive transformations of social and emotional behavior (Fogel, 1993; Schore, 1991; Stern, 1985; Tronick, 1998).

Similar moments have been observed during psychotherapeutic encounters. They have been called “now moments” (Sander, 1995; Stern, 1998). When they occur, clients experience novel insights and heightened emotions. These insights are fundamentally new forms of self experience. The sense of

the truth of the moment and its importance for the self is related to the fact that it can be *recognized as part of the self* (Beebe, 1998; Lyons-Ruth, 1998; Sander, 2000). A now moment is a “hot moment of truth” in which participants are caught “off guard,” requiring some unpredictable and ultimately creative act (Stern, 1998). This is also similar to Winnicott’s (1971) concept of the potential space between partners that arises when each is completely open to the possibilities that arise in relation to the other. Tronick’s (1998) concept of “dyadic states of consciousness” is similar. “Dyadic states of consciousness between the patient and therapist do not involve interpretation . . . they are purely emotional and procedural (implicit).” These descriptions from the therapy literature strongly suggest that what comes up during now moments are personally relevant, surprising, emotional, creative experiences. Because of their emotional aliveness, these experiences are very likely to be participatory memories from early childhood.

Another possible route into participatory memories of early childhood and infancy and their therapeutic transformation are somatic awareness therapies and somatic psychotherapies. These are forms of adult therapy that may use free associative talking and also body movement, body awareness, and touch as a way to access the memories of early childhood and re-integrate them into the self. Since infants experience their world via movement, touch, and embodied self-awareness, for many somatic awareness practitioners, this seems to be a more direct route to an adult’s infant experience than merely talking. Somatic awareness approaches may use soft music and low lighting. Awareness is enhanced as the practitioner helps the client to pay attention not only to their words but to their body movements, emotions, and sensations (Ogden & Minton, 2000; Schofield & Abbuhl, 1975).

Sylvan Tomkins, well known for his pioneering theoretical work on emotions, reported the reactivation of emotional memories from infancy and early childhood by means of creating a current situation that is similar to the physical and/or emotional conditions of early life.

If we place the adult in the milieu of the infant or child, bombard him with messages peculiar to the milieu, and permit, require, and urge him to emit the behaviors characteristic of infancy and childhood, we should be able to activate traces that have been dormant for most of the

individual's lifetime (Tomkins, 1992, p. 214).

Tomkins (1992) advocated creating oversize rooms, leaving the adult in darkness, being rocked, sucking on a pacifier, imitating the unstable walk of infants, hearing lullabies, and the like.

Clinicians practicing a variety of somatic awareness methods including somatic psychotherapy and Rosen Method Bodywork have written case reports documenting that participatory memories, self-relevant and immediate, can be part of a therapeutic transformational process. Rosen Method Bodywork uses gentle touch and words to help the client re-experience sensory and emotional states that had been held back since infancy and childhood (Wooten, 1995). Like Bromberg's approach to psychotherapy, The Rosen Method focuses on permitting and allowing clients to have participatory experiences in the context of a trusting therapeutic relationship. This is illustrated by one Rosen Method practitioner.

I was curious throughout my Rosen training as well as in my early-on private practice and teaching about the physical, emotional and attitudinal changes that occurred in my clients. I had experienced it myself time and time again. Often it seemed, my body remembered something which no words or images could convey, and the result was that my posture and the way I moved changed in significant ways: I stood up straighter without effort and with hips more relaxed, my stride became longer. I became more relaxed altogether and learned to notice the images that unexpectedly came to my mind, both as I was being worked on and after. Sometimes it was several days after a session when a significant memory would emerge from my unconscious (Wooten, 1995, p. 41).

I became personally convinced about the possibility for both traumatic and non-traumatic participatory memories of infancy in my own experience receiving and practicing Rosen Method Bodywork during the past 4 years. This clinical work,

coupled with 30 years of research expertise on the development of infant relational and embodied cognition and emotion, has opened new areas of research, clinical practice, and education in my career.

To take one example, participatory memories from infancy and childhood have been activated in college students who enroll in my infant development classes. With Mark Reese, a certified Feldenkrais Method practitioner and teacher, we developed infant-like self-awareness lessons that simulate such infant movements as sucking, smiling, rolling over, crawling, and balancing. These lessons, their theoretical background, links to infant development, and reports of student experiences doing them, can be found in one of my books (Fogel, 2001). Students are led first through relaxation exercises and then by step-by-step through infant movements, repeated slowly and deliberately, until the sensorimotor processes of primary consciousness predominate the students' awareness.

In the sucking lesson, for example, all the students who reported negative feelings or body tensions when sucking found out from their parents that they had problems with sucking or eating during infancy. One student who was especially distressed by her adult sucking experience learned that she had been fed through a tube as a baby. These students were unaware of having these early feeding difficulties until the participatory experience of the lesson led them to confirm their infancy experiences by interviewing their parents. Students who had a sense of peace, calm, and relaxation during the sucking – the most common participatory experience doing this lesson -- discovered that their early feeding had been normal (Fogel, 2001).

In methods such as these, access to participatory memory is aided by the creation of a deep state of relaxation that decreases sympathetic nervous system activity, which has the effect of creating a relaxation response and enhanced inner self-awareness. This state is similar to that produced during psychotherapy, bodywork, hypnosis, yoga, meditation, and prayer. It has parallels to artistic and scientific creativity, play, and dreaming, in which the individual breaks free from the ordinary boundaries

of implicit regulatory processes and awakens to an experience of direct participation (Rossi, 1993; Varela et al., 1991; Winnicott, 1971).

### CONCLUSION

This paper makes a case for the existence of at least two kinds of memory for early childhood prior to the acquisition of language: implicit memory and participatory memory. Implicit memory forms the core self, the unconscious processes that regulate our response to the sensory and motor aspects of the environment, the interpersonal world, and emotion. Participatory memory occurs when implicit memory comes alive in such a way that the person directly experiences something in the present that is recognized as being part of the self at some time in the distant past.

Participatory memories – at the moment when they are experienced -- are unexpected, non-rational, spontaneous, and emotional. We are not likely to experience them during ordinary conversation (explicit memory) or during everyday patterns of living (implicit memory). When participatory memories arise, they reveal the locations and processes in the body that were part of the formation of the original experience. Recent studies of the brain suggest that virtually all cognitive functions are organized vertically with connections in the mid-brain directly into the motor and regulatory systems of the body (Tucker, 2001; Seitz, 2000; Varela, Thompson, & Rosch, 1991). While conceptual systems serve to regulate narrative autobiographical memory, they do not act alone but rather with respect to the substrate of primary consciousness, the ongoing monitoring of embodied experience that forms the foundation of self awareness (Damasio, 1999; Tucker, 2001). Symptoms typically have some embodied link to the original event.

Participatory memories are likely to occur during periods of stress or during particular kinds of therapeutic situations. When they occur in therapy, they open the possibility for a healing change to occur. The participatory memory, recognized as part of the self but unconnected to particular times and places, can become transformed into a coherent narrative for the re-integrated autobiographical self. There is relatively little systematic data on therapeutic processes from the perspective of participatory memory. Nevertheless, a number of hypotheses may be suggested as grounds for further study.

*All moments of change – “now moments” in spiritual, meditative, somatic awareness or*

*psychotherapeutic practices -- involve participatory memories.* The clinical evidence suggests that now moments have the possibility to evoke participatory memories. I suggest that a closer examination of such moments will reveal that their particular salience for the participants can be accounted for by the sense of “truth” or “rightness” that occurs. This sense of truth occurs because the personal experience is immediately recognized as part of the self. The individual cannot pin down the exact location of the experience in time or space and at the same time feels a powerful sense of familiarity that is unusually compelling. If human change and transformation is connected to the re-experiencing of self-relevant memories from very early in one’s lifetime, the therapeutic moment is fundamentally a re-juvenation (Fogel, 2001). When the early past is brought to life in a participatory memory, it is like grafting a stem cell of the psyche into the adult mind-body system, yielding new pathways for growth.

*Participatory memories do not need to be accurate to be therapeutic and transformational.* Whenever memory for early childhood is discussed, there is the tendency to ask about its accuracy. Did these things actually happen to the person? When the issue is brought into a legal case, such as recovered memories of child abuse, there is good reason to ask about accuracy. Although there are documented cases of both true and false recovered memories, from a young age children appear to have the ability to edit and reject false memories (Brainerd & Reyna, 2002). In therapeutic situations, however, accuracy is not an issue. Because participatory memories are not localized to a particular event, and because they are so personally compelling, individuals and cultures have devised many ways to make explicit sense out of them. They have been attributed to the prenatal or infancy periods, to past lives, or to a spiritual connection. Regardless of whether these narratives are correct or accurate, they are almost always transformational because of their emotional force for the individual. Since all memory is gist-like, there may be fragments of actual experience that coalesce with cultural and personal stories and myths to create a sense of participatory memory. Recognizing these kinds of experiences as participatory memories may facilitate research into their origins.

*Methods that heighten the possibility for experiencing participatory memories can be used for both therapeutic and scientific purposes.* When researchers of infancy and early childhood approach the subject from only a verbal/conceptual epistemological stance there is a profound barrier to

what can be understood about babies. Should we be satisfied with shaping our view of infancy according to our own adult conceptual framework? Is it reasonable to describe a non-conceptual being in conceptual terms? Or, shall we take steps to re-shape ourselves in the image of infants by using participatory and embodied epistemologies – such as somatic awareness practices -- in our research and our everyday life? At a minimum, by doing this we will become more self-aware, more relaxed, and healthier. In addition, as researchers dare to adopt such methods, especially in collaboration with psychotherapists and somatic awareness practitioners, we shall open windows of opportunity on our understanding of infancy and the contribution of infant experience to the adult psyche.

*The scientific study of participatory memory for infant experience can shed new light on therapeutic processes that seek to heal infant trauma and integrate the person into a cohesive sense of self across the life course.* Research problems include the conditions under which participatory memories may arise, how they are best transformed into autobiographical integration, and the plasticity of the brain to re-organize following such experiences. What is the relationship between mind and body, infant and adult, in the transformation of trauma into health? The theoretical plausibility of participatory memories from infancy and childhood may provide the impetus for new research.

#### REFERENCES

Ames, E. (1997). The Development of Romanian Orphanage Children Adopted to Canada. (Final Report to the National Welfare Grants Program: Human Resources Development Canada). Burnaby, British Columbia: Simon Fraser University.

Baddeley, A. (1994). The remembered self and the enacted self. In U. Neisser & R. Fivush (Eds.), The remembering self: Construction and accuracy in the self-narrative (pp. 236-242). New York: Cambridge University Press.

Bargh, J., & Chartrand, T. (1999). The unbearable automaticity of being. American Psychologist, *54*, (7), 462-479.

Beebe, B. (1998). A procedural theory of therapeutic action: Commentary of the symposium, "Interventions that effect change in psychotherapy". Infant Mental Health Journal, 19, (3), 333-340.

Brake, W., Sullivan, R., & Gratton, A. (2000). Perinatal distress leads to lateralized medial prefrontal cortical dopamine hypofunction in adult rats. The Journal of Neuroscience, 20, (14), 5538-5543.

Bråten, S. (1998). Infant learning by altercentric participation: The reverse of egocentric observation in autism. In S. Bråten (Ed.), Intersubjective communication and emotion in early ontogeny. Studies in emotion and social interaction, 2nd series (pp. 105-124). New York: Cambridge University Press

Bromberg, P. (1991). On knowing one's patient inside out: the aesthetics of unconscious communication. Psychoanalytic Dialogues, 1, (4), 399-422.

Butler, J., & Rovee-Collier, C. (1989). Contextual gating of memory retrieval. Developmental Psychobiology, 22, 533-552.

Butterworth, G. (1995). An ecological perspective on the origins of self. In J. L. Bermudez, A. Marcel, & N. Eilan (Eds.), The body and the self (pp.87-105). Cambridge. MA: Bradford.

Damasio, A. (1999). The feeling of what happens: Body and emotion in the making of consciousness. San Diego, CA: Harcourt, Inc.

Diamond, L. (2001). Contributions of psychophysiology to research on adult attachment: Review and recommendation. Personality and Social Psychology Review, 5 (4), 276-295.

Epstein, S. (1991). Cognitive-experiential self theory: Implications for developmental psychology. In M. R. Gunnar & L. A. Sroufe (Eds.), Self processes and development. The Minnesota symposium on child development, (Vol. 23, pp. 79-123). Hillsdale, NJ: Lawrence Erlbaum.

Fagen, J., Prigot, J., Carroll, M., Pioli, L., Stein, A., & Franco, A. (1997). Auditory context and memory retrieval in young infants. Child Development, 68 (6), 1057-1066.

Fifer, W., Monk, C., & Grose-Fifer, J. (2001). Prenatal development and risk. In G. Bremner and A. Fogel (Eds.), Blackwell Handbook of Infant Development (pp. 505-542). United Kingdom: Blackwell Publishers.

Fink, G., Markowitsch, H., Reinkemeier, M., Bruckbauer, T., Kessler, J., & Heiss, W. (1996). Cerebral representation of one's own past: neural networks involved in autobiographical memory. The Journal of Neuroscience, 16, (13), 4275-4282.

Fivush, R. (1993). Developmental perspectives on autobiographical recall. In G. S. Goodman & B. L. Bottoms (Eds.), Understanding and improving children's testimony (pp. 1-24). New York: Guilford Press.

Fivush, R. (1994). Constructing narrative, emotion, and self in parent-child conversations about the past. In U. Neisser & R. Fivush (Eds.), The remembering self: Construction and accuracy in the self-narrative. New York: Cambridge University Press

Fogel, A. (1993). Developing through relationships. Chicago: University of Chicago Press.

Fogel, A. (2001). Infancy: Infant, family and society (4<sup>th</sup> ed.). Belmont, CA: Wadsworth.

Fox, N., & Card, J. (1999). Psychological measures in the study of attachment. In J. Cassidy & P. Shaver (Eds.), Handbook of attachment theory, research and clinical applications. (pp. 226-245). New York: Guilford Press.

Freud, S., & Breuer, J. (1966). Studies on hysteria (J. Strachey, Trans.). New York: Avon.

Goodman, G., & Quas, J. (1997). Trauma and memory: Individual differences in children's recounting of a stressful experience. In N. Stein, P. Ornstein, B. Tversky, & C. Brainerd (Eds.), Memory for everyday and emotional events (pp. 267-294). New Jersey: Lawrence Erlbaum.

Gunnar, M. (2001). Effects of early deprivation: Findings from orphanage-reared infants and children. In C. A. Nelson, & M. Luciana (Eds.), Handbook of developmental cognitive neuroscience, (pp. 617-629). Cambridge, MA: The MIT Press.

Harley, K., & Reese, E. (1999). Origins of autobiographical memory. Developmental Psychology, 35, (8), 1338-1348.

Heshusius, L. (1994). Freeing ourselves from objectivity: Managing subjectivity or turning toward a participatory mode of consciousness? Educational Researcher, 23, (3), 15-22.

Hodges, J., & Tizard, B. (1989). Social and family relationships of ex-institutional adolescents. Journal of Child Psychology & Psychiatry, 30, 77-97.

Howe, M. L. (2000). The fate of early memories: Developmental science and the retention of childhood experiences. Washington DC: American Psychological Association.

Howe, M. L., & Courage, M. L. (1993). On resolving the enigma of infantile amnesia.

Psychological Bulletin, 113, 305-326.

Jacobs, W., & Nadel, L. (1985). Stress-induced recovery of fears and phobias. Psychological Review, 92, (4), 512-531.

Janet, P. (1904). L'amnesie et la dissociation des souvenirs par l'emotion [Amnesia and the dissociation of memories by emotion]. Journal de Psychologie Normale et Pathologique, (1), 417-453.

Krueger, D. (1989). Body self and psychological self: A developmental and clinical integration of disorders of the self. New York: Brunner/Mazel.

Lewis, M. (1991). Ways of knowing: Objective self-awareness or consciousness. Developmental Review, 11, (3), 231-243.

Lieberman, A. (1996). Aggression and sexuality in relation to toddler attachment: Implications for the caregiving system. Infant Mental Health Journal, 17, (3), 276-292.

Liu, D., Dioro, J., Tannenbaum, B., Caldji, C., Francis, D., Freedman, A., et al. (1997). Maternal care, hippocampal gluco-corticoid receptors, and hypothalamic-pituitary-adrenal responses to stress. Science, 277, 1659-1661.

Lyons-Ruth, K. (1998). Implicit relational knowing: Its role in development and psychoanalytic treatment. Infant Mental Health Journal, 19, (3), 282-289.

Main, M. (1999). Attachment theory: Eighteen points with suggestions for future studies. In J. Cassidy & P. Shaver (Eds.), Handbook of attachment: Theory, research and clinical applications (pp. 845-887). New York: Guilford Press.

- Newcomb, N., & Fox, N. (1994). Infantile amnesia: Through a glass darkly. Child Development, 65, (1) 31-40.
- Nijenhuis, E., Vanderlinden, J., & Spinhoven, P. (1998). Animal defensive reactions as a model for trauma-induced dissociative reactions. Journal of Traumatic Stress, 11, (2), 243-260.
- Ogden, P., & Minton, K. (2000). Sensorimotor sequencing: One method for processing traumatic memory. Traumatology, 6, (3), article 3.
- Panksepp, J. (2001). The long-term psychobiological consequences of infant emotions: Prescriptions for the twenty-first century. Infant Mental Health Journal, 22, (1-2), 132-173.
- Pasupathi, M. (2001). The construction of the personal past and its implications for adult development. Psychological Bulletin, 127, (5), 651-672.
- Perris, E. E., Myers, N. A., & Clifton, R. K. (1990). Long-term memory for a single infancy experience. Child Development, 61, 1796-1807.
- Peterson, C. (1999). Children's memory for medical emergencies: 2 years later. Developmental Psychology, 35, (6), 1493-1506.
- Peterson, C., & Bell, M. (1996). Children's memory for traumatic injury. Child Development, 67, 3045-3070.
- Peterson, C., & Rideout, R. (1998). Memory for medical emergencies experienced by 1- and 2-year-olds. Developmental Psychology, 34 (5), 1059-1072.

- Piontelli, A. (1992). From fetus to child: An observational and psychoanalytic study. New York: Routledge.
- Posner, M., Rothbart, M., Farah, M., & Bauer, J. (2001, August). The developing human brain. [Special Issue]. Developmental Science, 4, (3).
- Proust, M. (1981). Remembrance of things past. Vol. 3. (S.K. Scott-Moncrieff & T. Kilmartin, Trans.). New York: Random House.
- Rochat, P. (1995). Early objectification of the self. In P. Rochat (Ed.), The self in early infancy: Theory and research. (pp.53-72). Amsterdam: Elsevier Science.
- Rossi, E. (1993). The psychobiology of mind-body healing: New concepts of therapeutic hypnosis. New York: W.W. Norton & Company.
- Rubin, D. (2000). The distribution of early childhood memories. Memory, 8, 265-269.
- Rubin, G. B., Fagen, J. W., & Carroll, M. H. (1998). Olfactory context and memory retrieval in 3-month-old infants. Infant Behavior and Development, 21, (4), 641-658.
- Ruda, M. A., et al. (2000). Altered nociceptive neuronal circuits after neonatal peripheral inflammation. Science, 289, 628-630.
- Saint Augustine (1991). Confessions. (H. Chadwick, Trans.). New York: Oxford University Press.

Sander, L. (1995). Identity and the experience of specificity in a process of recognition. Psychoanalytic Dialogues, 5, 579-593.

Sander, L. (2000). Where are we going in the field of infant mental health?. Infant Mental Health Journal, 21 (1-2) 5-20.

Schacter, D. (1992). Understanding implicit memory: A cognitive approach. American Psychologist, 47, (4), 559-569.

Schacter, D. (1996). Searching for memory: The brain, the mind, and the past. New York: Basic Books.

Schore, A. (1991). Early superego development: The emergence of shame and narcissistic affect regulation in the practicing period. Psychoanalysis and Contemporary Thought, 14, (2), 187-250.

Schore, A. (2000). Attachment and the regulation of the right brain. Attachment and Human Development, 2, (1), 23-47.

Schore, A. (2001a). Effects of a secure attachment on right brain development, affect regulation, and infant mental health. Infant Mental Health Journal, 22, (1-2), 7-66.

Schore, A. (2001b). The effects of early relational trauma on right brain development, affect regulation, and infant mental health. Infant Mental Health Journal, 22, (1-2), 201-269.

Seitz, J. (2000). The bodily basis of thought. New Ideas In Psychology, 18, (1), 23-40.

Siegel, D. (2001). Toward an interpersonal neurobiology of the developing mind: Attachment relationship, "mindsight," and neural integration. Infant Mental Health Journal, 22, (1-2), 67-94.

Smyth, J. M., & Pennebaker, J. W. (1999). Sharing one's story. In C. R. Snyder (Ed.), Coping: The psychology of what works, (pp. 70-89). United Kingdom: Oxford University Press.

Squire, L., & Knowlton, B. (1995). Memory, hippocampus, and brain systems. In M.S. Gazzaniga, (Ed.), The cognitive neurosciences (pp. 825-837). Cambridge, MA: MIT Press.

Stern, D. N. (1985). The interpersonal world of the infant: A view from psychoanalysis and developmental psychology. New York: Basic Books.

Stern, D. N. (1998). The process of therapeutic change involving implicit knowledge: Some implications of developmental observations for adult psychotherapy. Infant Mental Health Journal, 19, (3), 300-308.

Stern, D.N. (2000). Putting time back into our considerations of infant experience: a microdiachronic view. Infant Mental Health Journal, 21, (1-2), 21-28.

Terr, L. (1988). What happens to early memories of trauma? A study of twenty children under age of five at the time of documented traumatic events. Journal of the American Academy of Child and Adolescent Psychiatry, 27, (1), 96-104.

Terr, L. (1994). Unchained memories. New York: Basic Books.

Tomkins, S. (1992). Affect, imagery, consciousness, Vol. 4: Cognition: Duplication and transformation of information. New York: Springer Publishing.

Tronick, E. (1998). Dyadically expanded states of consciousness and the process of therapeutic

change. Infant Mental Health Journal, 19, (3), 290-299.

Tucker, D.M. (2001). Motivated anatomy: A core-and-shell model of corticolimbic architecture. In G. Gainotti (Ed.), Handbook of neuropsychology, 2<sup>nd</sup> Edition, Volume 5: Emotional behavior and its disorders. Amsterdam: Elsevier.

Tulving, E. (1983). Elements of episodic memory. United Kingdom: Oxford University Press.

van der Kolk, B. (1996a). The body keeps the score: Approaches to the psychobiology of traumatic stress disorder. In B. A. van der Kolk, A. C. McFarlane, & L. Weisaeth (Eds.), Traumatic stress: The effects of overwhelming experience on mind, body, and society. (pp. 214-241). New York: Guilford Press.

van der Kolk, B. (1996b). Trauma and memory. In B. A. van der Kolk, A. C. McFarlane, & L. Weisaeth (Eds.), Traumatic stress: The effects of overwhelming experience on mind, body, and society. (pp. 279-302). New York: Guilford Press.

Varela, F. J., Thompson, E., Rosch, E. (1991). The embodied mind: Cognitive science and human experiences. Cambridge, MA: The MIT Press.

Vygotsky, L. S. (1978). Mind in society. Cambridge, MA: Harvard University Press.

Wheeler, M. A., Struss, D. T., & Tulving, E. (1997). Toward a theory of episodic memory: The frontal lobes and autonoetic consciousness. Psychological Bulletin, 121, 331-354.

Winnicott, D. (1971). Playing and reality. New York: Basic Books.

Wooten, S. (1995). Touching the body, reaching the soul: how touch influences the nature of human beings. Sante Fe, NM: Rosen Method Center Southwest.