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Brain Development of Attachment Experience: How Does It Affects Our Brain?

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ABSTRACT

Our infant experiences involve our emotions, behavior, perceptions, and our mental models of the world of others and ourselves. Implicit memories encode the early forms of our learning about the world. Implicit memories directly shape our experiences here and now with no clue as to their origins from past events. Attachment research, combined with independent findings from our modern studies of genetics and developmental neurobiology, suggests that certain types of communication in emotionally connected relationships offer an essential experience that a child's mind can develop. This literature review describes how our experience in childhood affects brain development.

1. Introduction

During the early years of life, the primary circuits of the brain are developing, which will be primarily responsible for some essential mental processes involving emotion, memory, behavior, and interpersonal relationships. These processes consist of emotion regulation, the capacity for mindful, reflective behavior, the sense of self, and a self-narrative construction, the capacity to concern for other people's feelings, and capable of interpersonal communication.^{1,2}

Previous studies in attachment suggest that patterns of interaction between caregiver and child have an essential impact on developing these mental processes. The development forms the brain by altering the strength of the synaptic connections

within the brain. These alterations can take several forms: synapses formed from genetically encoded information can be strengthened, weakened, or eliminated; new synapses can be formed in response to life experience; the laying down of myelin functionally enhances the neural connectivity by elevating the speed of conduction of the electrical down the axon length; and regardless of synapse origin, genetic information, toxic materials, and traumatic experiences can lead to synapses elimination.^{1,3}

Brain development and memory

Memory is how previous experiences are encoded in the brain and shape current and future functioning. Memory processes and development are closely

aligned. Infants have forms of implicit memory for the first year of life, including emotion, behavior, perception, and somatosensory. Implicit memory also includes generalizations from repeated experiences, called mental models or schemas. The way the brain prepares itself to retrieve specific memories in response to particular cues is also part of implicit memory and is called priming. When implicit memory is activated, they have no internal awareness that something is being remembered. They affect emotions, behaviors, or perceptions directly, in the here and now, without any consciousness of their connection to some experience from the past. In the second year, children begin to develop a second form of memory, explicit memory. Explicit memory takes two primary forms: factual (semantic) and autobiographical (episodic).⁴

For both types of explicit memory, memory was associated with the internal sensation "I remember something now." For autobiographical memory that develops later, there is also a sense of self in the past. Babies will only have an implicit form of memory available to them. In this way, their mind formation in the early months of life will never be explicitly available to them as they grow. This is normal. A universal finding of "childhood amnesia" and thought to be due to the genetically determined timing of the unfolding of brain structures required for explicit memory. In particular, maturation of the hippocampus in the medial temporal lobe does not occur until after the first birthday and is thought to be necessary for explicit coding. Then, the frontal area of the neocortex (top part of the brain)—an area called the prefrontal cortex—will mature enough to allow autobiographical memory to begin.⁵

One of the key messages from these findings is that although we may never explicitly remember what happened to us as babies, the experiences we have with our caregivers have a strong and lasting impact on our implicit processes. These experiences, as we have seen, involve our emotions, our behavior, our perceptions, and our mental models of the world of others and ourselves. Implicit memories encode the

early forms of our learning about the world. Implicit memories directly shape our experiences here and now with no clue as to their origins from past events. Attachment research, combined with independent findings from our modern studies of genetics and developmental neurobiology, suggests that certain types of communication in emotionally connected relationships offer an essential experience that a child's mind can develop. This is perhaps best seen in terms of understanding self-development.^{3,5}

The development of self and human relations

When we think about psychological development, it is helpful to think about what the "soul" really is about the developing mind. An entity called the psyche or mind is as real as the brain, heart, or lungs, although it cannot be seen directly with or without the aid of a microscope or other modern technological devices. One definition of the soul is the human psyche, intellect, and psychiatry—the mind is considered a subjectively perceived functional entity, ultimately based on physical processes but with complex processes of its own: it governs the total organism and its interactions with the environment. In this definition, we can see the importance of understanding the soul, soul, intellect, and mind in understanding human development. Some authors have offered various views on how self-understanding can be understood. Stern has studied how the self develops within interpersonal relationships during the first few years of life. Damasio has examined neurological structures that include the manifestations of various aspects of consciousness as the roots of three very different forms of self. Interpersonal neurobiology has been examined as the self that emerges from various neural layers and memory integration. The self develops in stages during the first years of life. Each domain of self-experience begins at a certain age but then plays an essential role throughout the lifespan.^{1,6}

From birth to two months, the emerging self begins when the body picks up sensory data, and the baby has a sense of organization of the emerging world as first-hand experienced. From 2-3 months to 7-9

months, babies have an initial sense of "core self," in which the baby's center of will, coherence (sensation of the body), affective (emotionality), and continuity (sense of self across time in the form of memory) are all central features. From nine months to about 18 months, the "subjective self" emerges in which there is a sense of self and self with others involving shared concerns, intentions, and emotions between caregiver and child. By the second birthday, the "verbal self" has begun, where words begin to be shared between oneself and others. Beyond this period, the "narrative self" emerges in which autobiographical narratives play a significant role in defining the self.^{1,4}

Damasio has suggested that various neurological studies (both normal and diseased brain) can be examined to reveal three forms of "self" and two forms of consciousness. Within the structures in the brain that represent sensory information from the external world (perception) and the body (via the "somatosensory system") are created the "proto-self." It can be seen as the brain's direct experience with the outside world and the body.^{1,5} This representational process may be called a "first-order" neural map. Higher circuits in the brain are neural processes that create a "second-order" map of the proto-self as it is altered by its interaction with the world/body. In other words, these higher brain regions can have a neural map of the proto-self before interaction and then the proto-self only following the interaction with the world/body. This second-order map is essentially a neural symbol of change: it compares the proto-self before and after the interaction. This process of change defines the "core self." The brain's ability to focus on the "object" produces changes in the proto-self that creates the core self—whether something in the world (a physical object), something in an actual body, or an image within the mind itself—creating a higher consciousness that Damasio⁸ calls "core consciousness." Core awareness is the "here and now" experience of focused attention, which is essentially a measure of how the proto-self is transformed by interaction with "objects" in the internal or external world.^{3,6}

This neurological view of creating core experiences of self can also help us to understand the importance of collaborative and contingent communication in infant development and perhaps normal functioning throughout life. Secure attachment is created in the form of interpersonal communication that resonates with each other. We can propose that the alignment of the state of mind inherent in contingent communication makes it possible for the core self of each member of the interacting pair to have a sense of "fullness": when the proto self is altered in response to interaction with another, the possibility of transactions in a collaborative relationship allows the evolving core self to have a sense of coherence. The fundamental way determines such coherence in the response of the "other" of the "object" in the world is directly dependent on the signals provided by the pre-altered proto-self. Subsequent collaborative change in the proto-self creates a coherent core self-experience and is inherently defined as connecting to others.⁷

One aspect of the self is auto-noesis, or self-knowledge, as revealed in autobiographical narratives. Studies about parent-child attachment have established that one of the most potent predictors of infant attachment to parents is the coherence of the parents' autobiographical narratives. Narrative coherence can be checked by determining the free and flexible flow of information as individuals tell their life stories, starting with the memories they recall about their earliest experiences. The research instrument used to assess this coherence was the Adult Attachment Interview. The interview is a narrative description by the adult of their memory of the earliest relationship experience with their parent. One can view such autobiographical records as revealing the mind's capacity to achieve a certain number of integrations of functions. The process can be called "coherent auto-noesis." This integration seems to enable the individual to have a sense of internal connection to the past, and present, and prepare for the future as informed by the past and present. In this way, coherent auto-noesis allows past, present, and future fluid flows. Flowing and flexible reflection on the

past, present, and future is the hallmark of a coherent autobiographical narrative.^{8,9}

2. Conclusion

Childhood experiences related to caregivers and accepted parenting patterns are still stored in the brain as a way of how we react, emotional patterns, and how respond to interpersonal relationships with our environment.

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