

Nurture Is Nature: Integrating Brain Development, Systems Theory, and Attachment Theory

The Family Journal: Counseling and Therapy for Couples and Families
21(2) 162-169
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DOI: 10.1177/1066480712466808
tfj.sagepub.com



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Abstract

Addressing both biological processes (nature) and interpersonal processes (nurture) occurring within the infant/caregiver relationship, early human development is reviewed from three perspectives: neurobiology, systems theory, and attachment theory. Utilizing a case illustration to apply the reviewed theories, it is postulated that the integration of neurobiological development, systems theory, and attachment theory substantiates the proposition that nurture is nature.

Keywords

neurobiology, systems theory, attachment theory, attunement, neurobiological development

The dichotomous concept of nature versus nurture has historically been discussed throughout the social and behavioral sciences. At the core of this debate is the question of whether social or biological influences are the best predictors of how an individual's personality and behavior patterns will form. The answer to that question has often been dependent upon the profession with which one most identifies. Physicians may argue that our genetic and biological composition defines our behaviors and psychological functioning; however, a counselor may argue that our social support network and culture are better predictors of our behaviors and psychological functioning. While both are valid arguments, perhaps, the answer to this age-old question is really that environmental stimuli are introduced when the brain is forming and thus, influential in the development of the human brain.

An individual's biology or genetic composition was originally thought to be predetermined. However, Varela, Maturana, and Uribe (1974) posited a simultaneous effect concluding that species in a system mutually affect one another. This early hypothesis laid the groundwork for advancements in neurobiology. As developmental neurobiologists examined the brain, research indicated that, at birth, the brain was not fully developed. This biological underdevelopment of the brain allows the environment to influence development. As the environment influences the development of the infant brain, the interactions between the infant and the caregiver build the foundation for psychological functioning (Madigan, Morgan, Schuengel, Pederson, & Otten, 2007). Responses to stimuli later in life are dependent upon how the infant learns to respond when interacting with the caregiver. This idea does not negate the idea that genetic factors predicting personality and temperament shape psychological responses. But rather, it suggests that these early

social experiences also become ingrained into the biological development of the infant (Siegel, 1999). As this process occurs, the infant's neurobiology reflects the relationship between the infant and his or her caregiver. Thus, the neurobiology and psychological functioning of any individual could be described as a result of the systematic interaction between genetic composition and social influences.

Counselors are encouraged to view and conceptualize their clients from a holistic perspective. Counselors are often trained in both systems and attachment theory; yet, lack a strong neurobiological foundation for conceptualizing both systems and attachment theory. Therefore, it may be difficult for counselors to implement current and cutting edge neurobiological research related to client functioning without the integration of traditional counseling theories. The purpose of this article is to explore how environmental factors alter the psychological functioning of an individual from the "nurture is nature" perspective. This article will review emotional brain development during infancy from birth until approximately age 2. It is during the early years when the infant learns emotional responses and from birth, individuals are capable of forming

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emotional memories (Sprengr, 2008). This article will also review systems theory as well as suggest that attachment theory may be the best description of both the systemic and biological influences on an individual. A case illustration is provided in order to understand direct application of neurobiological, systemic, and attachment influences.

Systems Theory

Recognizing the biological and interpersonal processes occurring during the early years of human development, applying systems theory may explain the concept that nurture is nature. Systems theory evolved from an assortment of ideas (e.g., general systems theory and cybernetics) that initially emerged in the 1940s as a response to current scientific trends focused on reductionism and isolation of elementary units (Gray & Rizzo, 1969). Von Bertalanffy (1972) sought to promote unification and a focus on the “whole” versus the individual, thus placing greater emphasis on organization rather than reduction among the sciences. He developed general systems theory as “a logico-mathematical field, the subject matter of which is the formulation and deduction of those principles that are valid for ‘systems’ in general” (von Bertalanffy, 1950, p. 139). A system was defined as interacting elements that could be animate or inanimate (Gray & Rizzo, 1969). Within this new theory, von Bertalanffy created a new way of relationally conceptualizing human behavior as systemic processes and patterns (Canfield, 2007). For the first time, the individual was seen in the context of a larger, dynamic system that could evolve, adapt to environmental stimuli, and engage in self-preservation (Griffin & Greene, 1999; von Bertalanffy, 1968).

Building upon general systems theory, Varela et al. (1974) addressed autopoietic organization. Autopoietic organization places a specific focus on living organisms in a system as one entity acting in a recursive nature with all the components in the network. This concept provided the foundation for communication theories, which recognize that changes within the system affect the system as a whole. Researchers of communications theories at the Mental Research Institute fused systems theories with principles of cybernetics (Griffin & Greene, 1999). Cybernetics focused on the integration of mechanistic principles to understand human communication processes and the exchange of information (Wiener, 1948). Out of their research, evolved a communications model that views the family as a system of interactions between individual family members that function to allow the exchange of information within the system (Griffin & Greene, 1999).

Systems Theory Basic Concepts

Humans are systems (von Bertalanffy, 1969). They have specific systemic properties: (a) wholeness and order, which refers to the concept that the “whole is greater than the sum of its parts” (Cox & Paley, 1997, p. 245); (b) hierarchical structure, which refers to the idea that systems are actually a compilation of subsystems; (c) adaptive self-stabilization, which refers to a

system’s preference and actions to maintain homeostasis or equilibrium; and (d) adaptive self-organization, which describes the capability of systems to adapt and change in response to environmental conditions (Cox & Paley, 1997). Operating within these principles, systems theorists have noted several basic concepts (circular causality, homeostasis, and positive feedback) associated with these systems.

Circular causality. In the earlier ages of science, an “if-then” approach of linear causality was assumed in biological, medical, and technological sciences (von Bertalanffy, 1969). From this perspective, if you put a pot of water on a hot plate, then it will boil, or if you administer medicine to a sick person, then the person could expect to improve. However, system theorists questioned this concept’s application due to the lack of control of external variables in other sciences such as psychology. For example, a child’s decision to disobey his parent’s instruction could be influenced by a variety of factors (e.g., prior learning that the parent is not consistent with punishment, the child’s limited cognitive development, peer pressure, etc.). In other words, it was recognized that human behavior, as occurring in a system of human relationships, could be both cause and effect, or antecedent and consequence (Griffin & Greene, 1999). In infant development, circular causality can be observed in the example of infantile cooing. Although the infant coo may initially be governed solely by biological mechanisms, it may evoke positive reinforcement from the infant’s caregiver. The infant cooing may bring the caregiver near. Eventually, positive reactions of the caregiver will also elicit the infant to coo when the infant desires the caregiver. As social and biological development occurs, it may become increasingly difficult to distinguish cause and effect in the infant/caregiver relationship, and it is possible that caregiver/infant responses influence one another.

Homeostasis. From a systemic perspective, living organisms prefer to operate in a state of equilibrium or homeostasis (Yarhouse & Sells, 2008). Homeostasis occurs when all opposing variables within the system exist in a state of balance (Miller, 1969). For a human system, homeostasis refers to “the relative constancy of the system’s steady state” (Griffin & Greene, 1999, p. 54) and is often considered the state of normalcy regardless of whether it is healthy or unhealthy. To maintain homeostasis, the system creates and enforces rules for established behavioral patterns (Griffin & Greene, 1999). For instance, in family relationships, tension can be used as an intervention to not upset the homeostasis of the family system. If a child’s behavior produces tension in a parent, then the child may learn that the behavior should not be displayed or the child will feel the tense environment. Throughout life, family members learn what behaviors are appropriate or inappropriate to maintain the preferred state, free of tension.

Feedback. The term *feedback* refers to the communication process within the system that function to maintain homeostasis (Miller, 1969). As parts of a system interact, they create

what are called *feedback loops*, or in communication terms, a self-reflexive double interact (Fisher, 1975). In human relationships, there is often a feedback loop that occurs within a family system where one system's input is the other system's output and vice versa (Kim, 1975). These feedback loops can be positive or negative and either maintain or change the system's homeostatic state. Negative feedback is any communication that maintains homeostasis, such as a thermostat engaging the air conditioning to maintain a set temperature (Kim, 1975; Miller, 1969). Positive feedback is any communication that disrupts the current homeostatic state, such as setting the thermostat at a different temperature and the associated heating unit activating to adapt to the new homeostatic state (Kim, 1975). For an infant and caregiver, feedback loops help the infant determine which behaviors and emotions are appropriate. When the infant receives a stern voice or furrowed brow for crying, a negative feedback loop is established between infant and caregiver to maintain a peaceful, happy homeostasis.

Brain Development

At birth, the human brain is not fully developed. Certain areas are fully developed or hardwired, including areas that regulate bodily functions associated with survival, such as breathing and regulating heartbeats. Other areas of the brain, such as the cortex are soft wired or capable of change. It might be useful to imagine these areas of the brain as clay. While clay might hold a certain form, it could easily be manipulated. The clay could be the genetic influence on the brain and the manipulation the environmental influence on the brain. Thus, the brain is not only biologically determined, it can be molded and adapted from environmental influences (Huttenlocher, 1994). The environment is vital to development. For example, during instances of severe neglect or exposure to a socially isolated environment, areas of the brain (e.g., prefrontal cortex and limbic system) may be atrophied (Joseph, 1999).

At birth, there is a basic organization of the brain or regions predetermined for specific functions. For example, all individuals have a language center and an emotion center. However, the environment affects how the language center and emotion center will develop. When an infant is born, biologically, he or she is capable of speaking any language, but because of the environment, will speak the language heard. This concept also translates to our emotions. Infants have the capacity to experience any emotion and the potential for developing the ability to regulate emotions. However, how easily one may learn to regulate his or her emotions is dependent upon what was learned from the primary caregiver. The brain is malleable. It is not limited by genetics, but rather supplies a model for how the brain will be organized.

At birth, the infant brain is approximately two thirds of the physical size of the adult brain, yet only about 25% of the volume of the adult brain (Weyandt, 2006). By the end of the second year, the brain becomes 75% of the volume of the adult brain (Berger, 2005). The increase in volume is due to such things as neuron maturation, increased connections

between the neurons, and increased myelination (the substance that insulates the axon of the neuron; Weyandt, 2006). Development of the brain in early life, after birth, typically consists of forming new neural circuitry in such areas as the right hemisphere and limbic system. The brain develops the regions of the brain devoted to survival prior to birth, then develops the emotion center, and the final area of development in the brain is the cortex or cognitive center of the brain (Cain, 2006). In fact, the cortex continues to develop until individuals are in their 20s (Siegel, 2007). Throughout the development process, our emotions and cognitions are heavily influenced by what we learn from our environment and the environmental influences set our neural circuitry.

Right Hemisphere

The brain is divided into the right hemisphere and the left hemisphere. In the first 18 months of life, the development of the right hemisphere exceeds the left hemisphere and individuals are mostly processing information out of the right hemisphere (Trevarthen, 2009). Though this list is not exhaustive, the right hemisphere is associated with: interpersonal relationships, nonverbal communication, attachment, meaning, procedural memory, bodily awareness, motor memory, emotional memory, sensations, emotional awareness and experiences, visuospatial awareness, pattern recognition, impulses, autobiographical information, social awareness, and emotional empathy (Siegel, 1999). Schore (1997) suggested that negative emotions are processed in the right hemisphere and positive emotions are processed in the left hemisphere; yet, Siegel (1999) indicated that more intense emotions, such as joy or rage, are experienced in the right hemisphere. Doi (1973) reported that the right hemisphere is responsible for intuitive reactions and Siegel (1999) reported that the left hemisphere is primarily associated with logic and language. Siegel further noted that the left hemisphere dominates in external awareness, perception, and action whereas the right hemisphere dominates in internal awareness, perception, and action.

It is imperative to provide a clear distinction between the two hemispheres to understand how infants and toddlers process information as well as understand how these areas of the brain develop and influence emotional health. As noted through this review of right hemisphere functions, it can be expected that how one develops and, later in life, processes internal thoughts and feelings, as well as interprets social and emotional cues from oneself and others, are all strongly influenced by the environmental stimuli experienced in the first few years of life. Again, right hemisphere development takes place when the cortex, which controls cognition, and the left hemisphere, which controls logic, are not fully formed. Thus, emotional development and emotional experiences are not as easily interpreted through logic and cognitive processes. This could explain why individuals often have difficulty matching cognitive and emotional processing. In other words, why some individuals are not sure why they feel a certain way.

Limbic System

The etiology of emotional development follows a progression. According to Berger (2005), distress and contentment are expressed at birth. Izard (1982) reported that infants progressively learn to distinguish between pleasant and unpleasant feelings before experiencing more distinct emotions, such as sadness. As infants engage more socially with others, emotions become more refrained and may, in addition to having an intrapersonal focus, have an interpersonal focus (Trevarthen, 2009). For example, Trevarthen (2009) noted that as early as 6 months, infants may display such emotions as pride or shame. The ability to learn and process emotions would not be possible without the development of the limbic system, including the prefrontal cortex. The limbic system (including such areas as the hippocampus, amygdala, and the cingulate gyrus) is considered the emotion center of the brain. It is located in the center of the brain and above areas associated with survival and bodily regulations. The limbic system is associated with memory, learning, motivation such as sexual motivation or hunger, attachment to others, and emotions. This region governs the extent to which we experience positive or negative emotions, our emotional memory, and our emotional motivations.

The emotion center is soft wired and heavily influenced by the environment. Weyandt (2006) noted that subcortical areas experience rapid growth in the first 6 months. This is primarily due to myelination of the neurons. Increased myelination is associated with increased processing speed of the neurons. Even though the hippocampus (an area associated with memory and stress) begins the maturation of the myelination process in the first month of life (Meier, Brauer, Heimrich, Nitsch, & Savaskan, 2004), there are increases in myelination reported in this region throughout the life span (Benes, Trutle, Khan, & Farol, 1994). In the first year of life, the amygdala (an area where we process emotions such as fear and anger) will reach myelination maturation, whereas the cingulate gyrus (where we regulate somatic processes and responses) will continue to develop into the first few years of life (Joseph, 1999). Similarly, the septal areas (where we experience pleasure) also do not reach mature stages until after the first few years of life (Joseph, 1999). The growth in myelination and increased processing speed of the neurons better equips these areas to facilitate their intended tasks. Because of this rapid growth, infants and toddlers can learn such emotions as happiness and sadness from their relationships with their primary caregivers.

Prefrontal cortex. The prefrontal cortex is the bridge between the cortex or cognitive area of the brain and the limbic system. The prefrontal cortex, located behind the eyes and forehead, is where the limbic system extends into the cortex. It is specifically responsible for body regulation, empathy, attunement with another individual, emotion regulation, morality, intuition, self-awareness, emotional and behavioral reactions flexibility, and fear modulation (Siegel, 2007). Thus, the prefrontal cortex enhances the cognitive understanding of how we experience, appraise, and regulate our emotions.

The prefrontal cortex continues to develop into the third decade of life; however, there are significant changes that take place in the first years of life. The changes likely explain why individuals begin basic regulation of their own emotions early on and are not completely reliant on the caregiver for emotion regulation. Fuster (2008) noted that neurotransmitters associated with focus, attention, and memory continue to increase in levels until around age 3 before decreasing to adult levels. The presence of neurotransmitters associated with learning suggests that brain activity is focused on development. This implies that in these early years of life, learning is dependent upon interactions with the environment, including relational interactions. The presence of neurotransmitters translates to communication between the neurons. Thus, when the infant interacts with the environment, it stimulates the interactions between the neurons. Webb, Monk, and Nelson (2001) reported rapid dendrite (part of the neuron that receives messages from other neurons) growth between the neurons in the prefrontal cortex in the first year of life. Synapses, or the connections between the neurons, also experience a rapid growth. In fact, there is an overabundance in synaptic growth that will peak around age 6 before pruning the neuronal connections (Huttenlocher, 1994). Pruning is decreasing the number of neurons or neuronal connections. It is dependent upon the environment and what neuronal connections are frequently utilized. Connections that are not continually used will be pruned.

Integration of neurobiology and emotional development. In order to develop the limbic area, including the prefrontal cortex, infants need consistent physical, emotional, and social contact with the primary caregiver. In fact, infants are biologically determined to display motor behaviors that will engage others (Bowlby, 1969; Schore, 1997; Trevarthen, 2009). For example, in the first few months of life, infants do not smile as a result of pleasant feelings, but it is instead more like a reflex and motor behavior. The right hemisphere facilitates bonding between the infant and caregiver by directing motor behaviors that have a high probability of eliciting caregiver attention (Schore, 2000, 2009). These behaviors serve to keep the caregiver in close proximity to the infant. This facilitates bonding and, in return, develops the limbic system. In fact, contact between the infant and primary caregiver is so important that lack of social contact between the infant and caregiver may result in death of the infant (Joseph, 1999).

Interpersonal processes (nurture) are essential for physical processes (nature) to occur. We are born with few emotions; therefore, emotions must be learned (Izard, 1982). Infants witness emotions before they experience them. The caregiver shares his or her emotions with the infant and the infant physically feels that emotion, but is unable to identify the emotion. The infant sees the caregiver's facial expressions and physical behaviors displayed when experiencing the emotion and begins to associate those behaviors with that particular feeling (Siegel, 1999). Ideally, the primary caregiver displays a comprehensive array of emotions for the infant to learn. As the limbic system continues to develop, the infant learns these emotions on his or

her own and is able to display the emotions at appropriate times.

The infant also experiences emotions the caregiver identifies. The caregiver initially helps the infant regulate his or her own emotions through activities like cuddling or soothing talk. Then, dependent upon the situation, the toddler learns how to soothe himself or herself. For example, the toddler may learn that a gentle rocking motion is soothing. Through the development of the prefrontal cortex, the individual learns to regulate his or her own emotions. Therefore, emotional development is an interpersonal process facilitated by the development of the limbic system and integrated into our neuronal circuitry.

Attachment Theory

At the beginning of life, the infant first experiences the family system in the relationship with the primary caregiver. Attachment theory (Bowlby, 1969, 1973, & 1980) postulated that all individuals have an innate, biological drive to bond with another individual. Infants in isolation are vulnerable and helpless. From an evolutionary perspective, this internal, biological drive to attach to the caregiver allows the infant to elicit responses from the caregiver that are essential for the infant's survival (Bowlby, 1988). There is an interconnected relationship between the infant and primary caregiver in whom the infant is predisposed to form a bond of affection and to experience distress when separated from that caregiver. From this biological drive, the infant displays behaviors to establish this bond and the caregiver, through biological influences like the hormone oxytocin, is driven to bond with the infant (Ackerman, 1994). Biology and the interactions in the interpersonal relationship are fundamental in understanding attachment theory. Thus, attachment theory may be the best framework for integrating neurobiological development and systems theory utilizing a nurture is nature perspective.

Attunement

Attunement is considered a necessary component of a secure attachment to another individual (Meyer, 2011). It is a process where the caregiver mirrors the emotional expression of the child in the expression's shape, strength, and duration (Haft & Slade, 1989; Stern, Hofer, Haft, & Doer, 1985). Attunement is a vital mode of communicating empathy from the caregiver and informing the child of the caregiver's emotional availability (Haft & Slade, 1989). In the attunement process, the infant's emotional development is shaped by the caregiver's responses to certain emotions, and the infant comes to understand that some affective experience is not to be shared (Haft & Slade, 1989). The caregiver's reactions to emotions become the way the child creates personal connections and understands which expressions are allowed and sharable.

Bowlby (1988) saw the ability to form attachment bonds and attuning with others as imperative to one's mental health and social adjustment. Expectations about how available and responsive attachment figures are and one's perception of one's

own goodness and worthiness of love are founded in these early developmental attachment experiences (Lopez, 1995). It is these first attachments that teach the child about the social world and influence the way he or she sees himself or herself and others. The early experiences set the relational tone for the individual's life. Hooper (2007) stated that relationships later in life may be contingent upon the infant caregiver relationship. Hooper further noted that establishing a secure base or a consistent bond of trust and well-being may contribute to positive relationships in adulthood and that separation from the caregiver or an attachment bond without trust and love between the infant and caregiver may produce lasting, devastating outcomes for the child. Disruptions to the attachment process may alter psychosocial functioning (Madigan et al., 2007).

Attachment Styles

Bowlby (1969, 1973, & 1980) began the exploration into the quality of the relationship between infants and their caregivers. The nature of one's attachment in infancy seems to remain stable over one's lifetime (Ainsworth & Bell, 1970) and is considered a vital construct in an individual's social development. Reaffirming the biological basis of the infant/caregiver connection and its role in survival, Ainsworth and Bell (1970) defined attachment as "an affectional tie that one person or animal forms between himself and another specific one—a tie that binds them together in space and endures over time" (p. 50). From this view, the bond of attachment is not time limited and links the two.

Ainsworth and Bell (1970) contributed the empirical support for Bowlby's conceptualization of attachment through the strange situation experiment, where infants and caregivers were observed in various situations. Caregivers and infants aged 12–18 months were in a room when a stranger joins them. The remainder of the experiment involves both the stranger and caregiver leaving at various times, sometimes leaving the infant alone or with only the infant and stranger together. At the end of the experiment, the infant and caregiver are alone in the room. Ainsworth and Bell observed the infant's behavior toward the caregiver throughout the experiment.

Ainsworth, Blehar, Waters, and Wall (1978) named and characterized the first three attachment patterns as anxious avoidant, secure, and anxious resistant. In the anxious avoidant group, the infants engaged in exploration while their mothers were absent and actively avoided their mothers when they returned. They showed no preference between the stranger and caregiver. Additionally, they avoided the caregiver when put down after holding. The secure group consisted of infants who behaved as if the caregiver was a secure base for exploring. The caregiver's departure upset them. After being separated from the caregiver, they readily sought reunion and were calmed by the return. In general, they demonstrated little resistance or avoidance. Anxious resistant infants struggled with both the separation to explore and the reuniting after absence. Essentially, they would pursue as well as resist contact with their caregivers. Main and Solomon (1986) offered a

fourth style, the disorganized–disoriented group. These infants appeared confused and apprehensive when they were reunited with their caregivers, as though they were conflicted. For this style, the affect was changeable and depressed. It is thought that each person will develop one of these attachment styles.

The behaviors repeating in the infant/caregiver relationship are ingrained into the neurobiology of the individual. Due to the timing of the learning, these behaviors are integrated into the right hemisphere and prefrontal cortex associated with interpersonal relationships and social functioning as well as the limbic system associated with emotions. How individuals process and regulate their emotions will be integrated into the functioning of the prefrontal cortex. Individuals not representing the secure style may experience distress, confusion, or avoidance with those to whom they are closest. When these individuals are upset, they may have difficulty turning to others for consoling and thus, causing more psychological disruptions during a troublesome time. These individuals may not be able to trust or feel comfortable relying on others. They may have difficulty attuning with others or mirroring the emotional state of others. In return, others may also feel the insecurity in the relationship causing the attachment styles to be pervasive. The interactions in the relationships reflect a circular pattern of behaviors.

Case Illustration

Let us look at an example of an individual growing up in a home where the father works and the mother stays home with the baby (the individual). This is a violent home where the father engages in violent behaviors toward the mother. This is the homeostasis. The mother, the subject of the violence, is depressed. The mother displays depressive behaviors: depressed mood, excessive crying, disengagement from others, lack of energy, and apathy toward others and pleasant situations. When anticipating the father's return home from work, the mother becomes hyperaroused and displays anxious behaviors: increased heart rate and breathing, increased irritability, increased motor behaviors, and restlessness. The behaviors displayed by both parents mutually affect one another. The father returns home from work and feeling the tension in the home also becomes tense. The father acts on his stress with physical violence toward the mother. This reinforces the mother's depressed mood and anxious behaviors, thus, supplying the feedback that maintains the homeostasis.

These interactions within the system lead to an established pattern of attachment. Initially, the infant would cry to attract the attention of the mother; however, the mother was not consistently responsive to the infant's distress. The mother does not have the energy to give the attention to the infant that is needed for a secure attachment to develop. The infant learns that consistent caregiving will not occur and decreases attention-seeking behaviors. Based on the interactions with the mother, the infant develops an anxious avoidant attachment style. Furthermore, witnessing the mother's mood, the infant learns that displays of depressive symptoms are the norm. The

infant also observes the stress response displayed by the mother when anticipating the father's return home and learns to fear the father. The infant feels the hyperaroused stress response from both parents leading to the physical violence as well.

As an infant and toddler, the right hemisphere dominates the thought process; thus, left hemisphere logic is not present. The right hemisphere and the limbic system, including the prefrontal cortex, are responsible for emotions, emotion regulation, and emotional and procedural memories. The interactions between the individual and the caregivers influence the development of the brain including the psychological health of this individual. The infant is witnessing depressed mood and a lack of positive emotions. Thus, the individual will not as easily display positive emotions because those emotions were not prominent when emotional learning initially occurred. In addition, the infant is witnessing and experiencing a hyperaroused stress response on a regular basis. Similar to when we exercise on a regular basis and our muscles strengthen, the connections between the neurons associated with anxiety and hyperarousal will strengthen. This makes it easier for the individual to go into an anxious state, regardless of whether or not an anxious response is appropriate. Furthermore, because these patterns were established in the brain during development, it will be harder to break these patterns later in life and integrate new patterns. These patterns were not formed when the infant could logically understand the situation, and therefore, he or she will not be able to interpret the context into the memory. Instead, these patterns become part of the typical emotional response and integrated into the developing neural circuitry. As illustrated in this case study, the nurture component extrapolated from systems theory and the nature component of brain development are interwoven in attachment theory. The resulting symbiosis of these three theories substantiates the concept that nurture is nature.

Implications for Counselors

Adopting a nurture is nature perspective has several implications for counselors. First, this perspective creates a new understanding of a holistic approach to counseling in which natural and nurturing influences such as emotions learned from one's caregivers are viewed in relation to current psychological functioning. Thus, counselors should assess the neurobiological influences on the client, as a component of their holistic view of clients. Counselors may appraise clients' emotional development by measuring such constructs as affect regulation. Affect regulation skills are a demonstration of prefrontal cortex and limbic functioning. Counselors may want to include experiential activities that will elicit emotions and allow clients to process their emotions. Responses by clients may indicate if improvement in affect regulation skills is needed. In addition, counselors may influence the client's current psychological functioning by applying the attachment concepts into the counseling relationship. Specifically, what may improve psychological functioning is the formation of a secure attachment between counselor and client (Meyer, 2011) that may allow the

client to form new affect patterns in a safe environment. The counselor will want to attune to the client and be mindful to demonstrate emotional mirroring and empathy. The counselor, as the surrogate caregiver, can model more healthy affect patterns that the client can learn.

This perspective also recognizes that some client issues may reflect patterns developed during infancy. Specifically, when patterns are learned in infancy these patterns were acquired prior to full hippocampal development and when the right hemisphere was dominating cognitive functioning. Therefore, these memories will not be accessible via explicit memory or with cognitive knowledge of development. This suggests that exploring the etiology of the emotional functioning may prove to be futile because the client did not have the cognitive abilities during the learning period to understand the basis for the behavior. Instead, counselors should investigate what emotional patterns are beneficial for the client and what patterns are no longer useful. Likewise, the neural wiring from this period may be more difficult to change compared to neural wiring developed later. Therefore, while not impossible, adapting neural wiring set in early development may be laborious or require more time to complete. Thus, counseling may require more time for goal obtainment and the counselor and client should be prepared for additional sessions.

Finally, this perspective suggests that what clients learned from their primary caregivers, such as displays of emotions, affect regulation, and emotional processing were solidified early in life and affirm the responsibility of the primary caregiver. Accordingly, counselors could use this perspective as an educational tool for new parents as to the importance of natural and nurturing influences to both current and future psychological functioning. If childcare is an area of concern for clients who are also parents, parenting classes or sessions specifically focused on bonding with children may be necessary. Counselors may, also, use this model to educate adult clients on how their past is currently affecting their present. Clients may be relieved to know that their relationship patterns are reflective of early relationships. This also may alter treatment considerations. Clients with a history of traumas or clients who did not bond with their primary caregiver, may need to learn how to connect with others and appropriate relational behaviors.

Conclusion

This article integrated the traditionally opposing constructs of nature versus nurture into a holistic perspective of client development in which nurture is nature. Applying systems and attachment theory throughout early brain development, clinicians can observe the process and consequences of nurture is nature (e.g., affect regulation). Clinicians are encouraged to utilize this perspective to more effectively conceptualize client concerns, to form secure attachments with clients, to create treatment plans that address specific client concerns dependent upon both natural and nurturing factors (e.g., relational goals), and to educate clients on healthy ways they can employ the nurture is nature perspective to influence future generations.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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