CHAPTER 11

The Neurobiological Power of Play

Using the Neurosequential Model of Therapeutics to Guide Play in the Healing Process

Richard L. Gaskill
Bruce D. Perry

Children, like all human beings, are best understood in a social context. We humans are healthiest and most productive when we are born, grow, live, work, and raise our families in social groups (Ludy-Dobson & Perry, 2010). We have existed and thrived for thousands of years because of our neurobiological drive to form safe, nurturing, mutually rewarding, and lasting attachments (Szalavitz & Perry, 2010). In normative attachment relationships, children can safely explore new experiences and master developmental competencies, including the ability to regulate themselves cognitively, affectively, behaviorally, physiologically, and relationally (Blaustein & Kinniburgh, 2005). Secure attachments ultimately become the basis of resiliency in children exposed to distressing experiences (Shapiro & Levendosky, 1999). When these important attachment systems are compromised through multiple and chronic lapses within caregiving systems, crucial neural systems can be altered. This alteration negatively affects key competencies, such as the ability to regulate emotions and experiences. These effects in turn can contribute to neuropsychiatric problems and result in enduring social and emotional difficulties across the lifespan (Blaustein & Kinniburgh, 2005). Zeanah et al. (2004) have reported the prevalence of attachment-disordered children to be as high as 35% of children entering foster care, and as high as 38–40% of high-risk infant and toddler populations. Such demographics suggest the need for play therapy intervention techniques that can appropriately target the neural networks involved in self-regulation and relational functioning.

Any discussion of the role of play in neurodevelopment must first address one core question: What is *play*? What are the key elements that distinguish play from other activities? For the purposes of this chapter, we use the three elements used by Burghardt (2005) to define play in animals. First, play mimics or approximates a common or important purposeful behavior; second, play is voluntary, is pleasurable, and has no immediate survival role or obvious "purpose"; and, finally, play takes place in a non-threatening, low-duress context. These key elements are often at odds with many well-intended (and typically ineffective) therapeutic experiences. It is no surprise that the core elements of play echo some of the essential ingredients of successful therapeutic interactions with maltreated and traumatized children—perceived control, reward, and manageable stress (see Perry & Szalavitz, 2006). Bringing play into therapeutic work, therefore, not only makes sense; it is often an essential element for therapeutic progress. Yet it is important to appreciate that "play" for the toddler looks different from "play" for the adolescent. Play is an effective therapeutic agent when it provides a developmentally appropriate means to regulate, communicate, practice, and master. As with other therapeutic approaches, however, we often select the manner of "play" that we bring into therapy according to a child's chronological age and to our specific training as therapists; there are thus times when the expectations we bring into the therapeutic relationship are unrealistic. The resulting mismatch between a therapist's expectation and a child's capability undermines the potential for true play (i.e., the interaction is not spontaneous or pleasurable for the child), and thereby therapeutic progress. When the therapist (or parent, caregiver, or teacher) understands the real developmental capabilities of the child and the child's current state (e.g., calm, alert, fearful), realistic expectations and developmentally appropriate activities (including the manner of play) can be used to help the child heal. This crucial awareness of the "stage" and the current "state" is informed by an understanding of neurobiology. This chapter provides an introduction to some neurodevelopmental principles that inform play therapy practice.

Play Therapy: Overview, Context, and Efficacy

Historical Overview and Scope of Play Therapy

The developmental importance of children's play has been recognized for hundreds if not thousands of years, beginning with the thoughts of Plato (427 B.C.–347 B.C.) and continuing later with Rousseau's (1762/1930) notions. In the 20th century, Freud (1924), Gesell and Ilg (1947), Erikson (1964), Piaget (1962), Kohlberg (1963), Vygotsky (1967), and other developmental theorists defined, articulated, and advocated for the role of play during childhood. Developmental theorists generally have viewed play as an essential experiential element of social, emotional, physical, intellectual, and psychological development. The somatosensory experiences in some play activities have been viewed as the neurological foundations for later advanced mental skills, such as creativity, abstract thought, prosocial behavior, and expressive language. Furthermore, Zigler, Singer, and Bishop-Josef (2004) have cited a growing body of research finding that "Vygotskian-type" play promotes development of self-regulation, a cornerstone of early childhood development across all domains of behavior (social, emotional, cognitive, and physical). Play has been considered so critical to healthy development that the United Nations recognizes it as a specific right for all children (Office of the United Nations High Commissioner for Human Rights, 1989). Since the period from birth to age 6 establishes the foundation for learning, behavior, and health throughout the lifespan, the United Nations has accorded play equal importance with nutrition, housing, health care, and education.

Landreth (2002) has suggested that talk and cognitively oriented therapies are inappropriate for children through much of their development, due to the relative underdevelopment of complex cognitive capacities in childhood. The powerful role of play in children's growth, and the slow attainment of adult mental and verbal abilities, both suggest play as a developmentally appropriate strategy for treating children's emotional and behavioral difficulties. Accordingly, play has been incorporated into therapies with children for years. Freud's treatment of "Little Hans" incorporated play into therapy at the turn of the last century (Bratton & Ray, 2000; Bratton, Ray, Rhine, & Jones, 2005; Landreth, 2002). From this time on, there has been significant growth of play therapy theory and practice—from psychoanalytic play therapy in the 1920s, to release play therapy in the 1930s, to relationship play therapy also in the 1930s, and finally to nondirective play therapy beginning in the 1940s and 1950s (Landreth, 2002). Play therapy variations continued to expand through the end of the 20th century with the development of Adlerian play therapy (Kottman, 1995), Jungian play therapy (Allen, 1988), gestalt play therapy (Oaklander, 1994), ecosystem play therapy (O'Connor, 2000), object relations play therapy (Benedict, 2006), experiential play therapy (Norton & Norton, 1997), cognitive-behavioral play therapy (Knell, 1995), developmental play therapy (Brody, 1997), Filial Therapy (Guerney, 1964), and others.

Studies have described play therapy strategies for social maladjustment, maladaptive school behavior, self-concept, anxiety, conduct disorder, aggression, oppositional behavior, emotional maladjustment, fear, developmental disabilities, physical and learning disabilities, autism, schizophrenia, psychoticism, posttraumatic stress disorder, sexual abuse, domestic violence, depression, withdrawal, alcohol and drug abuse, divorce, reading disorders, speech and language problems, and multicultural issues

(Bratton & Ray, 2000; Bratton et al., 2005; LeBlanc & Ritchie, 2001). Recent research has begun to address the efficacy of play therapy versus other treatments, using randomized controlled studies with large sample sizes (Bratton & Ray, 2000; Bratton et al., 2005; Pearl et al., 2012; Tsai & Ray, 2011).

Efficacy of Play Therapy

Over the past 30 years, a number of meta-analytic studies examining multiple play therapy studies have found play therapy to be effective with a wide variety of problematic issues. These studies demonstrated that children had improved prosocial behavior and decreased symptomatic behavior (Bratton et al., 2005; Casey & Berman 1985; LeBlanc & Ritchie, 1999, 2001; Ray, Bratton, Rhine, & Jones, 2001; Weisz, Weiss, Alicke, & Klotz, 1987). The treatment effect sizes ranged from a high of 0.80 (Bratton et al., 2005) to a low of 0.66 (LeBlanc & Ritchie, 2001), with most falling between 0.71 and 0.79. These results indicate that children receiving play therapy interventions performed much better than children who did not receive play therapy, and that play therapy demonstrated a large effect on children's behavior, social adjustment, and personality (Bratton et al., 2005; Ray et al., 2001).

Play therapy interventions appear to be equally effective, regardless of the presenting problem. Play therapy is effective across modalities, ages, genders, and theoretical schools of thought (Bratton et al., 2005; LeBlanc & Ritchie, 1999; Ray et al., 2001). Several studies suggest that the maximum effect size is achieved after 30–40 sessions, whereas shorter or longer treatment durations are less effective (Bratton et al., 2005; LeBlanc & Ritchie, 1999, 2001). LeBlanc and Ritchie (1999, 2001) suggest that short-term play therapy treatment models may obtain negative outcomes because children are acting out previously unexpressed feelings in the early stages of such treatment and have insufficient time to resolve these issues. These authors have observed that children participating in play therapy appear to take considerably more time to process information and make effective changes in thinking or behaving, compared to adults in conventional therapies.

Multiple studies (Bratton et al., 2005; LeBlanc & Ritchie, 1999, 2001; Ray et al., 2001) point to the importance of parental involvement as an essential predictor of positive outcome. When parents received structured play therapy supervision or guided interactions between themselves and their children, effectiveness rose dramatically. Bratton and colleagues noted that the Filial Therapy model (Guerney, 1964) and the child–parent relationship theory model (Landreth, 2002) yielded larger effect sizes than other studies. This is not surprising, given that play therapy with humanistic interventions produced a larger effect size than nonhumanistic treatments. Children learn through play, and this often requires a patient, supportive, and caring adult to scaffold that process (Vygotsky, 1967).

The Developing Brain and the Vulnerability of Childhood

The human brain is organized in a hierarchical manner. The higher regions in the brain mediate the more complex and executive functions, while the lower areas mediate the simpler, more regulatory functions. There are four developmentally distinct regions (brainstem, diencephalon, limbic, and cortical) that are woven together by multiple neural networks, some of the most important being the well-studied monoamine (i.e., norepinephrine and dopamine) and other related (e.g., serotonin, acetylcholine) systems. These networks originate in lower areas of the brain; have widespread distribution (collectively to all brain areas and the body); and have a direct impact on all motor, social, emotional, and cognitive functioning, as well as the stress response. When these networks develop normally, there is smooth functional integration. When these networks are impacted by intrauterine insults (e.g., prenatal alcohol or drug exposure), early life attachment disruptions, or traumatic stress, these networks will be dysregulated, resulting in compromise in all in the functions impacted by their wide distribution. These crucial networks play a role in integrating, processing, and acting on incoming patterns of information from the primary sensory networks (such as touch, vision, and sound), which monitor the external environment; somatic networks (such as motor–vestibular, cardiovascular, and respiratory), which monitor the internal environment; and cerebral networks (such as cortical modulating networks), which monitor the brain's internal environment.

The continuous input from the brain, body, and world, coupled with their widespread distribution, provides these networks with a unique role in the stress response—and in stress- or trauma-related dysfunction. Furthermore, as neurodevelopment progresses from lower (i.e., brainstem and diencephalon) to higher (i.e., limbic and cortical) areas, these regulatory neural networks play a key role in the development of the brain from the intrauterine period through adolescence. The timing and pattern of activation of these regulatory neural networks play a crucial role in shaping the functional capacity of all brain and body areas (see Perry, 2001).

Neurons and neural networks change in response to activity. In the case of the stress response networks, predictable, moderate activity leads to flexible and capable stress response capacity (with a potential for demonstrating resilience), whereas extreme, unpredictable, or uncontrollable activation leads to a sensitized, overly reactive set of stress response networks (see Perry, 2008, 2009; Ungar & Perry, 2012). Any developmental insult—such as prenatal alcohol or drug exposure, or extreme, prolonged activation of the stress response (such as that seen in maltreatment or other traumatic experience)—will alter the development of these crucial neural networks, and thereby disrupt functioning in all of the areas these regulatory networks innervate.

The resulting alterations in the regulation and functioning of both central and peripheral autonomic neural networks (as well as the neuroendocrine and the neuroimmune systems) will result in increased risk of significant and lasting emotional, behavioral, social, cognitive, sensory–motor, and physical health problems (Anda et al., 2006; Felitti et al., 1998; Perry, 2006, 2008, 2009; Perry & Dobson, 2013; Perry & Pollard, 1998; Perry, Pollard, Blakley, Baker, & Vigilante, 1995). Manifestations of the resulting sensitized stress response systems have been well documented. They include intrusive recollections; persistent avoidance of associated stimuli or numbing of general responsiveness; and arousal symptoms of hyperarousal, hypervigilance, increased startle response, sleep difficulties, irritability, anxiety, and physiological hyperactivity. Maltreated and traumatized children may exhibit behavioral impulsivity, increased muscle tone, anxiety, a fixation on threat-related cues, affect regulation, language disorders, fine and gross motor delays, disorganized attachment, dysphoria, attention difficulties, memory problems, and hyperactivity (Perry et al., 1995). Furthermore, these physical, emotional, psychological, and intellectual effects may persist across the lifespan (Anda et al., 2006; Spinazzola, Blaustein, & van der Kolk, 2005). Nearly two-thirds of traumatized children exhibit physical signs and symptoms indicating dysregulation in brainstem or diencephalic functions, such as inhibition of gastrointestinal processes, cardiac activity, blood pressure, respiration, anxiety, and hypervigilance (Hopper, Spinazzola, Simpson, & van der Kolk, 2006; Perry, 2001, 2008). The specific physical signs and symptoms will depend upon a multitude of contributing factors, including genetics, epigenetics, intrauterine environment, early bonding experiences, history of developmental adversity, and attenuating relational buffers (see Ungar & Perry, 2012). This creates a confusing clinical picture that does not fit neatly into our current inadequate model of categorization. The comorbidity of neuropsychiatric diagnoses associated with childhood maltreatment is so pervasive that it encompasses nearly all diagnoses in the new fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; American Psychiatric Association, 2013), resulting in the inability of current diagnostic labels to capture the complex heterogeneous dysfunction adequately (Perry, 2008; Perry & Dobson, 2013).

Although traumatic experiences may have a negative impact on adult functioning, the same adverse experiences have a much more deleterious impact on children because of the pervasive impact on development. Traumatic stress in adulthood affects a developed and functioning brain; trauma in childhood affects the organization and functioning of the developing brain. Adults suffering a traumatic event have been found to attain asymptomatic posttreatment status 75% of the time, but children suffering a traumatic event have been found to achieve asymptomatic status only 33% of the time (van der Kolk et al., 2007).

The Stress Response and State-Dependent Functioning

The crucial regulatory neural networks involved in the stress response (and multiple other functions) are themselves modulated through patterned, repetitive, and rhythmic input from both bottom-up (i.e., somatosensory) and top-down (i.e., cerebromodulatory) systems. The brain processes (and acts) on incoming input at multiple levels; although the brain is essentially an open and interactive system, this multilevel process of sensing, processing, and acting on the environment basically begins at the site of initial input of sensory, somatic, or cerebral input to the lower areas of the brain. The primary regulatory systems that originate in the lower areas of the brain begin to sort, integrate, interpret, store, and respond to incoming stimuli long before conscious portions of the brain receive the information, if they receive it at all (Marteau, Hollands, & Fletcher, 2012; Perry, 2006). Primary somatosensory processing takes place below the level of consciousness, and only novel, significant, or potentially threatening stimuli are passed on to higher cortical centers for further processing (Perry, 2008; Sara & Bouret, 2012). When the input to these regulatory networks is unfamiliar (novel), disorganized (chaotic), or associated with potential threat (i.e., reexposure to a cue from a previous traumatic experience), there will be alterations in the activity of these systems. In the crucial norepinephrine-containing networks originating in the locus coeruleus, for example, a complex and graded response that is proportional (in typically functioning individuals) to the level of threat (Sara & Bouret, 2012) will begin. A key part of that response is a shift of "control" from higher, cortical systems to limbic, then diencephalic systems. Neuroimaging during highly emotional states demonstrates increased activation of subcortical regions and significant reduction of blood flow to the frontal lobe during intense arousal (van der Kolk, 2006). This shift in activation alters cognitive, social, emotional, and motor functioning. In other words, novelty, chaos and threat change the "state" of the individual. This shift in state involves shutting down the cortical modulatory networks that could typically be recruited and involved in conscious, intentional modulation of the feelings of anxiety, hunger, thirst, anger, and other "primitive" feelings and perceptions. The result is that less mature, more poorly regulated, more impulsive behaviors will result under perceived threat. And if child's developmental experiences have been such that they have fewer cortical-network-building experiences (e.g., neglect- or chaos-related poverty of touch, words, relationships), their cortical modulation networks will be relatively underdeveloped as well. The combination of a sensitized set of regulatory neural networks (i.e., the stress response systems are "locked into" a persisting state of fear) with a "shut-down" and underdeveloped cortex will result in a very impulsive, globally dysregulated child. This is worth remembering when one is interpreting trauma-related and attachment-related behavioral problems with maltreated children; exhausted and frustrated caregivers, teachers, and therapists are quick to personalize and infer deliberate intention to automatic, elicited behaviors. The capacity for self-reflection, planning, and intentional behavior requires a relatively organized, regulated, and accessible cortex.

Another crucial aspect of this shift is its impact on the capacity to feel pleasure. Release of dopamine in the two regions of the brain—the nucleus accumbens and the ventral tegmental area—can provide a sensation of pleasure. These "reward" areas can be stimulated in many ways, ranging from cortically mediated, intentional behaviors that are consistent with an individual's beliefs or values (e.g., sharing candy with someone) to primarily limbic mediated relational interactions (e.g., a laugh with a friend) to diencephalon-mediated appetitive experiences (e.g., eating sweet, salty, or fatty foods) to brainstem-mediated regulatory behaviors that decrease physiological distress (e.g., drinking cold water when dehydrated). As the individual moves down the arousal continuum, the reward "options" shrink. In a state of high arousal or fear, delayed gratification is impossible. Future consequences or rewards of behavior become almost inconceivable to the threatened child. Reflection on behavior is impossible for the child in an alarm state, and cognitive strategies to modify behavior (even if previously internalized and mastered) cannot be recruited in an efficient way because the cortex is relatively inaccessible under threat. Cut adrift from the internal regulating capabilities of the cortex, the individual acts impulsively to any perceived threat. The key to helping the child begin to move back to a more regulated state, making the child feel safe and thereby more available for cognitive engagement and therapeutic change, is to utilize the direct somatosensory routes and provide patterned, repetitive, rhythmic input. Therapeutic change starts from a sense of safety; in turn, the sense of safety emerges from these regulating somatosensory activities.

Finally, these complex children will be very resistant to traditional therapeutic (i.e., primarily cognitive-behavioral or cognitive-relational) interventions (see the case vignette below). Traditional psychodynamic or cognitive-behavioral play therapies that support the development of cognitive regulatory control are likely to fail when the lower brain networks are disorganized, underdeveloped, or impaired. A neurodevelopmentally informed assessment process and therapeutic strategy can help the clinical team better understand such a child's developmental stages and state reactivity; to be effective, the clinician must *know the stage and watch the state.*

Implications for Play Therapy

We (Gaskill & Perry, 2012) have previously outlined the primary challenges of integrating a neurodevelopmental perspective with traditional play therapies. Child mental health treatment models, including play therapy, evolved out of adult psychodynamic and cognitive-behavioral therapies that use primarily cognitive and verbally mediated (i.e., top-down) interactions focusing on executive processing, insight, understanding, planning, and decision making. Ultimately, maltreated children will need to address cognitive issues such as guilt, shame, self-esteem, grief, and loss, and to gain understanding of, acceptance of, and a new perspective on their experiences—but these cortically mediated issues must be addressed in a developmentally sensitive sequence, and only after some modulation of the primary regulatory networks has been established (Perry, 2001, 2006, 2008, 2009; Cook et al., 2005).

Accordingly, the play therapists will often need to use bottom-up modulatory networks (somatosensory) to establish some moderate self-regulation prior to the implementation of insightful reflection, trauma experience integration, narrative development, social development, or affect enhancement. Doing so will require therapeutic methods to access and provide reorganizing input to the regulatory networks of the lower brain areas (Kleim & Jones, 2008; Perry, 2008, 2009). The key to treatment is to be sure that the child is regulated and that relational and cognitive expectations are appropriate for the child's developmental age. Furthermore, this requires rethinking traditional "dosing" and context of therapy.

Complex, deeply troubled children need more than the traditional once-a-week play therapy model. They will require therapeutic environments that immerse them in positive, repetitive rehearsals of healthy interactions and activities. These interactions and activities often need to be regressive in nature, requiring low adult-to-child ratios (often 1:1) and activities frequently associated with much younger children, as many foundational experiences (neural networks) have been missed or are incomplete (Perry, 2006, 2009, in press; Perry & Dobson, 2013). The numbers of interactions required to change ingrained low-brain patterns call for extensive commitment from parents, teachers, therapists, and extended family, as the time required exceeds the capabilities of a single individual (Perry, 2009).

Fortunately, many playful activities that provide the activation necessary to modulate and reorganize these regulatory neural networks can be integrated into play therapies and playful therapeutic experiences (most therapeutic change happens outside of therapy). Play therapists should never forget that if something is not fun, it is not play, and that it is impossible for a child to have pleasure in a relational interaction if the child's brain is in an alarm state. The key, therefore, to being true to the "play" in play therapy is helping the child become regulated and thereby safe. Once basic state regulation has been established, more traditional play therapies will be effective. Bottom-up interventions for children with state-regulatory difficulties will consist of some variety of somatosensory activity (e.g., music, dance, walking, drawing). Although language will undoubtedly be necessary in the process of working with these children, play therapists must realize that in dysregulated children it will not be likely that words, reasoning, or ideas will change the primary regulatory networks in the lower areas of the brain. Rather, regulatory organization and creation of normal homeostatic states depend more on the "primal language" of gentle tones of voice; comforting, repetitive sensory experience; and soothing repetitive and patterned movements by patient, safe adults. Providing this "primal language" may take the form of child-directed free play; repetitive, patterned sensory integration activities carried out at home, school, and clinic; or fine and large motor activities. All such activities will require an atmosphere of enjoyment, safety, and attunement between adults and children. As noted above, this work must often be done in very low adult-to-child ratios that match a child's functional age, often 1:1 (see Gaskill & Perry, 2012). For a child with severe dysregulation, the play therapist may need to restrict the environment as well, to control environmental stimuli to match the child's developmental age; otherwise, overstimulation of the child is likely to produce frustration, irritability, tantrums, aggression, and withdrawal (including dissociation).

Finally, the unique aspects of each child's history, genetic endowment, and epigenetic influences preclude a "one-size-fits-all" treatment model (Ungar & Perry, 2012). Such multifaceted symptomatology requires play therapists to incorporate neurobiological principles, comparing play therapy techniques, delivery methods, treatment frequencies, optimal numbers of treatment sessions, and outcome measures (Bratton et al., 2005; Perry & Dobson, 2013; Ray et al., 2001). A crucial element in any therapeutic approach with these children is patience. Neural plasticity is a primary neurophysiological process underlying therapeutic change; expressed plasticity (i.e., changing a neural network) requires adequate (sometimes thousands of) repetitions (Kleim & Jones, 2008). Play therapists, family members, teachers, and other caregivers who are not aware of this can often become frustrated/confused and give up (Perry, 2009).

The Neurosequential Model of Therapeutics

The Neurosequential Model of Therapeutics™ (NMT) is a developmentally sensitive, neurobiology-informed approach to clinical problem solving. NMT is not a specific therapeutic technique or intervention. As described by Brandt, Diel, Feder, and Lillas (2012),

> The Neurosequential Model of Therapeutics™ (NMT) (Perry, 2006) provides an integrated understanding of the sequencing of neurodevelopment embedded in the experiences of the child, and supports biologically informed practices, programs, and policies. As a global evidence-based practice (EBP) and coupled with the NMT's brain mapping matrix, the model supports providers in identifying specific areas for therapeutic work and in selecting appropriate therapies, including evidence-based therapies (EBTs), within a comprehensive therapeutic plan. Organized NMT-based intervention models, such as NMT therapeutic child care, can be EBTs. (p. 43)

A key component of the NMT is an assessment process that informs a clinician about a child's broad set of brain-mediated strengths and vulnerabilities. From this assessment process, the general direction for therapeutic, educational, and enrichment expectations and opportunities can be determined. In the case of play therapy, simply stated, the NMT can help the therapist appropriately design the most developmentally appropriate forms of play to bring into the therapy. The following case vignette illustrates the power of play in the therapeutic process. It also illustrates the specific value of selecting developmentally appropriate forms of play in a relationally safe context, and of using adequate "dosing" in a patterned, repetitive, rhythmic, and rewarding manner.

Case Vignette: Tom

History

Tom is a 7-year-old boy who has been living with a foster family for the last 13 months. He was the only biological child born to an 18-year-old mother who actively used multiple drugs (marijuana, nicotine, alcohol, and cocaine) during her pregnancy. He was born addicted to cocaine and spent 2 weeks in a pediatric intensive care unit following his birth at 36 weeks' gestation. Both of his biological parents had extensive family histories of mental health problems, substance abuse, and criminal behavior. The parents split up when Tom was 2 months old, due to domestic violence; he lived with his mother, who was described as "disengaged, withdrawn, and flat." Multiple reports of abandonment and neglect were made, and at 14 months child protective services placed Tom with his biological father. The father lived in a violent, drug-filled, chaotic world, with no stable housing. Visitations (both formal and informal) with the mother continued during this time. The father tended to drop Tom off when he was involved in a criminal activity or drug binge. During visits, Tom witnessed his mother having sex and being beaten up by various men; Tom was also physically (and possibly sexually) abused by several of these men. His mother locked him in a bedroom, only episodically feeding him and rarely interacting with him. At age 5, Tom was removed and placed in foster care after his father was arrested for armed robbery of a convenience store; the father had walked into the store with Tom and used him as a decoy during the robbery.

Original Presentation

At the time of removal, Tom demonstrated abnormalities in functions mediated by all areas of the brain, from brainstem to cortex. He had excessive salivation and blinking. He was extremely fearful, anxious, and hypervigilant; he had an increased startle response, as well as sleep difficulties and frequent nightmares. He was also aggressive and threatening: He lashed out at other children in placement and was cruel to the pets; he "plotted to trap and kill" the carers. Tom was violent to peers, strangers, and especially all of his foster parents (hitting, kicking). He demonstrated a wide range of primitive and unsocialized behaviors, including growling and snarling; smearing feces; urinating while standing and having meals; gorging food; and consuming soap, shampoo, and dishwater. He had extreme tantrums that could last for 3 hours. He picked skin to the point of bleeding when upset. Tom misread signals; he found smiles threatening. He tried to control others, would lie to do so, and would blow up when he did not get what he wanted. He had articulation problems, pressured speech, and echolalia. Finally, his cognition was very primitive: He could not demonstrate either literacy or numeracy (i.e., he could not recognize letters or numbers).

Clinical Course

Tom's difficult behaviors resulted in five disrupted placements over 14 months; all of the carers felt he was too dangerous (at age 6) to keep in their homes. During this time, he was in weekly therapy at a local mental health authority and had two therapists over this period. The notes indicated that "evidence-based" trauma-focused cognitive-behavioral therapy was used by one therapist (with no apparent improvement), and that play therapy was used by the second therapist. The play therapy was conducted in the office of this therapist, who primarily attempted to use sandtray work as part of the process. The therapist expressed frustration at Tom's limited "capacity for insight" and his "unwillingness" to share his fears or concerns. She documented that in the majority of the sessions he refused to sit and "do therapy," but insisted on standing, walking around, jumping, and making many attempts to leave the office. Tom did not seem to be having a lot of fun in the form of "play" that this therapist wanted to integrate into therapy.

NMT Assessment and Recommendations

Tom was ultimately placed with foster parents who were familiar with the NMT. Clinicians certified in the NMT consulted with the play therapist working with Tom. An NMT assessment was conducted (see Perry & Dobson, 2013 for more details). As part of the NMT assessment process, a brain map was constructed indicating functional status (fully developed and typically functioning relative to a mature adult brain, emerging or precursor capability or mild to moderate compromise, undeveloped or severely dysfunctional). Brain functions are localized to the brain region mediating the specific function (e.g., cardiovascular regulation is a brainstem function; sleep is a diencephalon function; attachment is a limbic function; and abstract cognition is a cortex function). This oversimplification attempts to localize function to the brain region that is the final common mediator of the function, with the knowledge that all brain functions are the product of complex, transregional neural networks. This approximation, however, allows a useful estimate of the developmental/functional status of the child's key functions, establishes the child's "strengths and vulnerabilities," and determines the starting point and nature of enrichment or therapeutic activities most likely to meet the child's specific needs. The map becomes a comparison with a typical, same-age child. The graphic representations allow a clinician, teacher, or parent to quickly visualize important aspects of a child's history and current status. The information is key in designing developmentally appropriate educational enrichment and therapeutic experiences to help the child. Not surprisingly, this assessment demonstrated that while Tom was chronologically 6 years of age, he was developmentally functioning below the level of a toddler in some domains, and in others at or below the level of an 18 month old. He was extremely dysregulated, and it was estimated that his baseline level of arousal was high alarm. This meant that he would have minimal access to any cortically mediated functions and would have minimal cerebromodulatory capability. In short, words were not going to change Tom's behavior. A shift in therapeutic strategy was recommended. The foster parents, Tom's teachers and the play therapist were willing to shift their expectations and interactions with Tom away from cognitive-predominant to an enriched somatosensory schedule. Therapy took place while Tom and his therapist walked, in parallel, in a park. The school allowed Tom to avoid small-group activities (for which he was not yet developmentally ready), and to pursue a schedule of primarily somatosensory activity with a 1:1 aide (walking, playing with clay, finger painting, rocking in a chair, swinging, kicking a soccer ball, etc.). In the home, time with caregivers was spent walking, running, helping groom the pets, giving and receiving hand massages, and sitting side by side in a rocking bench (while his foster mother read to another of the children). The number of "intentional" (i.e., scheduled) somatosensory regulatory and therapeutic hours in the week was increased from 3 (which had been somewhat random) to 18 in the first 3 months of placement, and then to 30 (set up in a more scheduled, predictable pattern).

This regulating set of activities had the effect of minimizing Tom's dysregulated, impulsive, and aggressive behaviors. The positive impact on his state resulted in improved relational functioning, with a corresponding decrease in the anxiety that the teachers and carers felt when Tom was around. The confidence and positive affect of the adults contributed to additional regulation and reward. The positive feedback cycle led to a remarkable cascade of improved functioning that reflected a shift in his baseline state (from high arousal at baseline to low arousal/high alert). This shift in state "unmasked" some previously unexpressed functional capability; moreover, there was improved internalization of new cognitive and relational experiences, which contributed to the building of new functional capabilities. Most remarkable was that Tom passively learned to read (and now loves to read) by sitting next to his foster mother as she read to another child. Certainly Tom has far to go. But prior to the 8 months (at this writing) of the developmentally targeted regulatory interventions, he had 14 months of traditional therapeutic work with minimal impact. Of primary interest to a play therapist is the joy Tom now feels while he is succeeding; play therapy is most effective when it can capture the core elements of true play. The neurobiological power of play can only be fully expressed, however, when the types of adult-imposed play activities match the developmental needs and strengths of the regulated child.

Conclusion

Children who have experienced trauma, chaos, and neglect exhibit complex functional compromise in multiple domains, including physiological, motor, emotional, social, and cognitive. The specific nature and presentation of this multidomain functional compromise will vary, depending upon such factors as genetics and epigenetics, as well as the timing, nature, and pattern of both stressors and relational "buffers" in a child's life. A central finding in these children is a sensitized set of regulatory neural networks that originate in lower areas of the brain and have a wide distribution in the brain and body. By integrating a neurobiology-informed clinical approach, play therapists can select and sequence developmentally appropriate play activities that will help regulate these children and facilitate therapeutic efforts to enhance their relational and cognitive capabilities. The NMT is an evidence-based practice that can provide a practical and useful clinical framework to help play therapists identify the strengths and vulnerabilities of maltreated children, and implement developmentally appropriate therapeutic, educational, and enrichment services.

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