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The Neurobiology of Psychic Trauma and Treatment Considerations

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Mental health professionals have long been aware of the psychological effects of traumatizing experiences.

There has been a wide variety of trauma treatment approaches offered, with an equally wide variance of efficacy. Over the past decade, there has been increasing research concerning the effects of psychic trauma on the brain. These neurobiological effects call for an evaluation of treatment methods. This brief article provides only a cursory review, and it is suggested that interested readers further explore the topic through reading and training.

Neuroscience of Trauma

Psychic trauma eventuates in significant neurological activity. There is an increased production of catecholamines (e.g., epinephrine & norepinephrine) that results in increased sympathetic nervous system activity. There are often decreased levels of corticosteroids and serotonin - the most pronounced effect probably being the decreased ability to moderate the catecholamine--triggered fight or flight response. Additionally, there are increased levels of endogenous opioids, which may result in pain analgesia, emotional blunting, and memory impairment.

It is important to realize that chronic exposure to traumatic stress affects the adaptation of these chemicals. In other words, it may permanently alter how people deal with their environment on a daily basis.

A specific example of this neurobiological effect of trauma might be seen in limbic system activity. The limbic system is the part of the central nervous system that guides emotion, memory, and behavior necessary for self-preservation. Trauma may cause limbic system abnormalities in the amygdala and hippocampus. The amygdala, which readies the body for action, may get "hi-jacked" by these neurobiological changes, and the trauma victim responds before the "thinking" part of the brain (i.e., cerebral cortex) can weigh threats.

The resultant hypervigilance seen in trauma victims can cause them to go immediately from stimulus to an arousal response, without being able to make the intervening assessment of the cause of their arousal. This causes them to overreact and intimidate others.

Trauma affects many other parts of the brain as well. The hypothalamic-pituitary-adrenal (HPA) axis is very vulnerable to stress, as are various noradrenergic systems. MRI scans of abused and neglected children show evidence of cortical atrophy or ventricular enlargement. De Bellis and colleagues noted that pediatric subjects with PTSD had smaller intracranial, cerebral, prefrontal cortex, prefrontal cortical white matter, right temporal lobe volumes, and areas of the corpus callosum and its subregions. 1

Because of the excess and adverse neurobiological results of trauma, people with PTSD may experience a deactivation of the prefrontal cortex (which is responsible for executive function). This interferes with their ability to measure and respond to threats.

This not only makes navigating post-trauma life difficult, but interferes with the therapeutic process. High levels of emotional and physiological arousal are occurring, but the ability to process these is hampered. van der Kolk notes, "Trauma by definition involves *speechless terror*: patients often are simply unable to put what they feel into words and are left with intense emotions simply without being able to articulate what is going on."2

This has been demonstrated in a neuroimaging study.3 When people with PTSD relive their traumatic experiences (which is what they are asked to do in therapy), there is decreased activity in the Broca's area of the brain, which is related to language. At the same time, there is increased activity in the limbic system. When traumatized people are reliving their trauma, they have great difficulty verbalizing these experiences. This is indeed speechless terror.

While this is happening, many therapists are following a rote protocol which demands that clients verbalize the horrible events that they have experienced. van der Kolk speaks to this, "Fundamentally, words can't integrate the disorganized sensations and action patterns that form the core imprint of the trauma.... To do effective therapy, we need to do things that change the way people regulate these core functions, which probably can't be done by words and language alone."4

If therapists focus primarily on the emotionally charged content of the trauma, a client's fundamental physiological state can shift. Perry suggests that this shift may lead to the client and the therapy becoming "brainstem-driven."5 The resultant anxiety, in addition to the possible diminished functioning of the Broca's area, leads clients to act in a primitive manner. This renders the verbal language of therapy less accessible, or perhaps useless: "No matter how much you talk to someone, the words will not easily get translated into changes in the midbrain or the brain stem."6

Trauma Treatment

The implications for therapy are obvious. That is, traditional verbal therapy may well be ineffective, and perhaps detrimental. This is not to eschew cognitively-based interventions. Rather, therapists must be cross-trained in expressive (nonverbally based) therapies in order to access trauma in clients, which is frequently based in the midbrain as opposed to the executive neurological areas. Some of these expressive therapies include art therapy, music therapy, play therapy, drama therapy, etc.

Treatment with trauma clients must be multidisciplinary. There is a need for expressive therapies, and there is a need for pharmacotherapy, cognitive and behavioral interventions, EMDR, animal-assisted interventions, filial therapy, group therapy - and the list goes on.

According to Rothbaum and Foa, there are two basic conditions needed in therapy for the reduction of fear, and thus the treatment of PTSD: (1) the person must attend to trauma-related material in a way that will activate traumatic memories; and (2) the context [the therapeutic process] needs to directly contradict the major elements of the trauma, primarily feeling safe.⁷

Safety may, in fact, be the crucial factor in treating traumatized clients. Trauma victims don't just feel psychologically unsafe, but also neurobiologically.

Too many therapists, well-trained in their area of expertise, do not recognize the need to consider these neurobiological effects. Perry notes, "Simply stated, traumatic and neglectful experiences... cause abnormal organization and function of important neural systems in the brain, compromising the functional capacities mediated by these systems.... Matching the correct therapeutic activities to the specific developmental stage and physiological needs of a maltreated or traumatized child is the key to success."⁸ This is true for adults as well as for children.

Conclusion

Some summary comments are offered. Therapy with clients who have experienced psychic trauma must consider the neurobiological effects of that trauma. Therapy should recognize the sensory nature of trauma and the possible need for a sensory approach to treatment. Therapy should be dynamic, interpersonal and relational. Relationship, coupled with an expressive intervention, may provide the safest place for clients to process trauma. The safety of therapy, the emotional resilience of clients, the plasticity of the brain (its ability to regenerate), and the compassion of Christ - this is a potent recipe for healing from trauma.

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Endnotes

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2 Bessel van der Kolk, "Assessment and Treatment of Complex PTSD," *Treating Trauma Survivors with PTSD*, ed. Rachel Yehuda (Washington, DC: American Psychiatric Publishing, 2002), 150.

3 Scott Rauch, Bessel van der Kolk, and Rita Fisler, "A Symptom Provocation Study of Posttraumatic Stress Disorder Using Positron Emission Tomography and Script-driven Imagery," *Archives of General Psychiatry*, 53 (1996): 380-387.

4 Mary Sykes Wylie, "The Limits of Talk: Bessel van der Kolk Wants to Transform the Treatment of Trauma," *Psychotherapy Networker*, 28 Jan/Feb 2004: 30-41.

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7 Barbara Rothbaum and Edna Foa, "Cognitive-Behavioral Therapy for Posttraumatic Stress Disorder," *Traumatic Stress*, eds. Bessel van der Kolk, Alexander McFarlane and Lars Weisaeth (New York: Guilford, 1996).

8 Perry 29.



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