The Impact of Trauma on the Brain: A Healing Framework

Marvin VandenHoek

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University of Lethbridge

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Abstract

This paper addresses the impact of trauma on brain development, as well as some recommended therapy techniques that have been empirically shown to be effective. A brief outline is provided on the structure of the brain, followed by the impact of PTSD on one particular function of the brain: memory. How stress contributes to the development of PTSD is then considered in relation to intimate partner violence. Next, the emotional impact of stress and PTSD is explained. Lastly, a healing framework is proposed that counsellors can use to guide the therapy process. Included in this framework are the techniques of emotional regulation and mindfulness.

Research is increasingly revealing the impact Post Traumatic Stress Disorder (PTSD) has on survivors of traumatic events. 70% of adults in the United States have experienced some type of traumatic event at least once in their lives, and up to 20% of them will develop PTSD (PTSD Statistics, 2015). The plasticity of the human brain provides it with the ability to develop and grow, but also places it at risk when someone is exposed to a traumatic experience (Sapolsky, 2003). This paper will consider the impact of stress and trauma on the brain's structure, memory, and emotions; as well as provide a framework to facilitate the healing process. The relevance of emotional regulation and mindfulness techniques will be discussed.

Brain Structure

The brain is arguably the most complex organ of the human body. Development begins shortly after conception, and from this time all the way until death, the brain is in a constant state of change (Stiles & Jernigan, 2010). It consists of tens of billions of nerve cells, called neurons, which regulate cognitive activity, and is divided into two hemispheres that have four lobes. The two hemispheres are referred to as left and right hemispheres, and the four lobes are the occipital, temporal, parietal, and frontal lobes. Each of these lobes is associated with specific functions.

The occipital lobe is located at the rear of the brain and interprets visual stimuli and information. The temporal lobe is the lower section of the brain that is responsible for hearing and language. The hippocampus, which is associated with the formation of memories, is located in this section as well. The parietal lobe is the middle section of the brain. It regulates sensory information: touch, pain, and other senses. The frontal lobe is the front of the brain and is the reasoning part of the brain. It regulates, motor skills, higher level cognition, and expression.

A part of the temporal lobe that is of particular interest in trauma psychology is the limbic system, as it is primarily responsible for emotions, memories, and arousal. This system includes the hypothalamus, the hippocampus, and the amygdala.

PTSD and Memory Deficits

Much anecdotal evidence exists regarding deficits in brain development in children with PTSD. It is often noticed that these children have a harder time focusing on academic material for extended periods of time Also, higher rates of anxiety among trauma survivors often leads to lower academic performance. Two studies were conducted which explored memory deficits associated with PTSD in children. Beers and De Bellis (2002) found clear evidence of impaired performance on the short delay and long delay free recall tasks of the California Verbal Learning Test for Children (CVLT-C) among children who developed PTSD from a traumatic experience. Among the traumatic experiences included were sexual abuse, physical abuse, and witnessing domestic violence. Similar results were found in another study conducted by Moradi, NeshatDoost, Taghavi, Yule, and Dalgeish (1999). In this study, the Rivermead Behavioral Memory Test (RBMT) was administered to children and adolescents with PTSD as well as to a non-traumatized control group. The children with PTSD scored significantly lower on immediate story, delayed story, and total profiles. These two studies indicate that traumatized children are at a higher risk for particular memory deficits than non-traumatized children.

Another study, conducted by Yasik, Saigh, Oberfield, and Halamandaris (2007), compared verbal and general memory impairments, as well as learning deficits in youth with PTSD to others who had been exposed to trauma but were not diagnosed with PTSD. There were significant deficits in all three of the categories with the group PTSD. Saigh, Mroueh, and

Bremner (1997) also found that youth with PTSD evidenced significantly lower academic achievement than traumatized youth without PTSD.

Changes in memory are important in how clients with stress-related psychopathology present (Bremner, 1999). Not only do PTSD clients demonstrate a variety of memory problems, they also often have problems with nondeclarative memory. It is these memories that that cannot be wilfully brought into the conscious mind, such as how to ride a bicycle (Bremner, 1999). These types of nondeclarative memories often include abnormal reliving of traumatic memories when the client is exposed to certain situational cues (Brewin, et al., 1996; as cited in Bremner, 1999).

Stress and PTSD

The first criteria for PTSD according to the Diagnostic and Statistical Manual – Version 5 (DSM-5) are exposure to actual or threatened death, serious injury, or sexual violence in either direct exposure to the event, witnessing the event, learning of a traumatic event occurring to a close family member, or experiencing exposure to aversive details of the traumatic event (*DSM-5,* 2013, p. 271). The question can be asked whether other stressors in the lives of children and adolescents will increase the probability of contracting PTSD. Silva, Alpert, Munoz, Singh, Matzner, and Dummit (2000) found that "the child at greatest risk for developing PTSD is the vulnerable anxious child who is exposed to violence, especially violence in the family" (p. 1234). In other research, Levendosky, Bogat, and Martinez-Torteya (2013) found that approximately half of the children in their study that were exposed to intimate partner violence (IPV) developed some trauma symptoms. The development of trauma symptoms and PTSD is thus not only a factor of being directly subjected to violence. In fact, the DSM-5 identifies

witnessing events that occur to others, especially primary caregivers as criteria for PTSD in children six years and younger.

McDonald, Jouriles, Ramesetty-Mikler, Caetano, and Green (2006) found that each year, approximately 30% of children in the United States who live in two parent homes are exposed to domestic violence. Up to 50% of these children meet the criteria for PTSD (Rossman, Hughes, & Rosenberg, 2013). Although some challenges exist with diagnosis of PTSD in youth (Marolin & Vickerman, 2011), it is generally accepted that youth who are exposed to intimate partner violence are at risk for PTSD and often suffer from PTSD symptoms (Jarvis, Gordon, and Novaco, 2005). Children's brains are still developing, and so they are particularly vulnerable to the negative effects of high levels of glucocorticoids in their system (Schwartz & Perry, 1997).

As mentioned above, the hippocampus is the part of the brain that mediates the stress response. It is involved in memory forming, organizing, and storing of information. When someone is faced with a threat, the amygdala identifies whether incoming input is relevant for survival. It does so in coordination of the hippocampus, which relates the information (threat) to past experiences (Vander Kolk, 2014).

As the brain detects stress, the hypothalamus sends signals to the adrenal glands to secrete glucocorticoids, hormones that produce different effects in response to the stress. Some studies have suggested that hippocampal damage is associated with direct exposure of glucocorticoids to the hippocampus (Sapolksy, et al., 1990; as cited in Bremner, 1999). Functions of new learning and memory that are mediated by the hippocampus are also impacted by stress. Once again, it has been repeatedly shown that exposure to the stress of an unfamiliar environment results in deficits in working memory and new learning (Diamond, Fleshner, Ingersol, & Rose, 1996).

If stress results in damage to the hippocampus, there are several implications that must be considered. First of all, if the hippocampus is the key component of the brain that is responsible for memory, and if traumatic stress impacts the functioning of the hippocampus, how accurate are memories of traumatic events. Much research has been done about false memories and memory retrieval related to childhood sexual abuse (Ware, 1995; Rubin, 1996). The question also arises what the impact is of children growing up on stressful environments on their school performance and academic achievement. More importantly, what can be done to reverse or prevent the damage that may have occurred?

The Emotional Impact of PTSD

Jean Piaget stated that "the goal of development is decentration: having your emotions, not being them." As the prefrontal cortex develops, the brain develops the autonomy it requires to organize and store information, feelings, and emotions. It is not, however, very capable of abolishing emotions, thoughts, and impulses (Vander Kolk, 2006). Damasio, et al. (2000) used neuroimaging studies to discover that people in highly emotional states experience increased activation in subcortical brain regions, and reduced blood flow in the frontal lobes. As a result, it is usually difficult for people to organized a "modulated behavioural response" (Vander Kolk, 2006, p. 280) when they experience intense emotions.

Roger Sperry, a Nobel Prize winner in Physiology and Medicine for his work with split-brain research in 1981 said: "the brain is a organ of and for movement: The brain is an organ that moves the muscles. It does many other things, but all of them are secondary to making our bodies move" (Vander Kolk, 2006, p. 280). People experience sensations combined with the urge for physical activations as a physical feeling or an emotion. During trauma, people are often confronted with overwhelming emotions and lose the ability to use emotions as a guide for

effective action. This is what contributes to the common "freeze" response in the face of danger or traumatic experiences. Vander Kolk (2006) states "Trauma can be conceptualized as stemming from a failure of the natural physiological activation and hormonal secretions to organize an effective response to threat" (p. 282). This explains why trauma survivors often struggle so much to cope with their emotions and have a hard time understanding the confusion that they feel themselves trapped in.

The Healing Process

The phase oriented treatment approach to PTSD has been recognized as a standard approach in trauma therapy (Hobfoll & De Vries, 1995). Phase one involves the re-establishing of safety and stabilization. Phase two provides desensitization and processing of the traumatic memories. Lastly, phase three allows the client to reconnect and integrate with family, friends, and others.

Phase One – Safety and Stabilization

Those who have been victims of trauma have experienced a deep and profound loss of control in their lives. They are often unable to feel any sense of security, and thus, the first priority is to re-establish this. When a child has fallen, the natural instinct of a caregiver is to remove the child from the danger, hold the child close and comfort the child to restore a sense of safety. Similarly, PTSD survivors need to be brought to a sense of safety and control before they will be able to talk about what happened. In this phase, the foundation is laid that enables the patient to deal with the challenge of confronting the trauma (Vander Hart, Brown, & Vander Kolk, 1989). The client is helped to feel safety in daily life, (re)establish social supports, control the symptoms, and contain the intrusive memories.

It is also during this stage that trauma survivors are removed from the situation where the trauma occurred. Abused or neglected children are provided with safe and caring homes, battered spouses are provided with safe places to live, etc. The goals of this stage are to help poorly defended clients develop coping strategies before asking them to confront the trauma in a counselling session. Methods may include: relaxation training, stress reduction exercises, problem solving, emotional regulation, and mindfulness. The length of time this stage is requires will vary, but it is important that counsellors are aware that it the memories are explored too soon, the client is at risk of being re-traumatized when the therapy process proceeds at a faster rate than they can handle (Rothschild, 2000).

Gelinas (2003) identifies five tasks that need to be accomplished during the stabilization stage (p. 95-96):

1. *Reduce physiological hyper-arousal.*
2. *Reduce repetitive re-experiencing characteristic of the bi-phasic presentation.*
3. *Begin work with the patient's traumatic dissociation.*
4. *Establish the therapy.*
5. *Reduce the level of chaos so therapy rather than chronic crisis intervention can occur.*

Phase Two – De-sensitization and Processing

Stage two involves the trauma survivor beginning to reflect on what happened and processes the emotions and the memories of the event(s). Recent research suggests that basic talk therapy may be less effective than other treatments such as Eye Movement Desensitization and Restoration (EMDR) or Somatic Experience (SE) (Vander Kolk, 2002). These treatments allow the memories to be processes while the person is in a more relaxed state. As a result, the memories become regular memories that are part of the survivor's historical narrative, and no

longer traumatic memories. The trauma survivor is able to see them objectively without dissociation or hyper-arousal symptoms.

Gelinas (2003) uses the word "integration." Integration happens in two ways during this phase. Firstly, there is integration of the elements of the dissociated and fragmented traumatic material. Secondly, there is integration of the material into the conscious memory and personality of the individual. (p. 97).

Phase Three – Reconnection and Integration

The third phase of trauma treatment involves reconnecting the client with family, friends, and acquaintances. This is where they establish the capacity to enjoy life and have fun again. The emotions are no longer triggered, and the trauma is now a part of their lives, and not consuming their life. In this phase, the counsellor "actively supports the patient while challenging any avoidance and facilitating a more realistic and adaptive engagement in the world" (Gelinas, 2003, p. 97).

Key elements of trauma therapy

Two key components of trauma therapy that are often integrated in to all three of the treatment phases are emotional regulation and mindfulness. Trauma survivors are taught to manage the emotional highs and lows of the therapy process. Mindfulness has shown to be a very effective tool to accomplish this emotional stability.

Emotional Regulation

It is generally accepted that the process of healing from trauma/PTSD needs to include the processing of the emotions that were frozen during the trauma (Greenberg, 2010). Various therapies have been developed in order to accommodate this, each with it's own way of allowing the client to process the emotions in a safe and empathetic environment. Emotional regulation is

often taught to trauma survivors as a way to reduce intense and distressing emotions (e.g., anger, depression, and anxiety). They are provided with a set of skills that enable them to effectively manage these emotions, as well as to identify vulnerability factors, triggering events, and obstacles that may alter their emotional experience (Frye & Spates, 2012). The goal of reducing or eliminating the symptoms and enhancing resilience is often achieved in this manner.

Mindfulness

Mindfulness refers to "a state of active, open attention on the present" (Mindfulness, 2015). It is a state in which people accept each moment as it arises; they observe thoughts and feelings non-judgementally. Mindfulness techniques have been practiced around the world by various cultures for centuries as a way to reduce the emotional and physiological effects of stress.

As stated earlier, trauma survivors often have memories that are too painful for them to face. As a result, many of them suppress the intrusive thoughts, and remove themselves from situations that create any related negative experiences. Such avoidant behaviours have been shown to be counterproductive to the healing process (Folletet, Palm, & Pearson, 2006). It has, in fact, been demonstrated that those who actively avoid thoughts of the trauma, may even suffer from the "rebound effect" where instructions to suppress these thoughts actually results in an increase in the frequency of these thoughts (Hays & Gifford, 1997).

The integration of mindfulness skills has been shown to increase trauma survivors' ability to "contact painful memories, thoughts, and feelings without engaging in avoidance strategies" (Folletet, Palm, & Pearson, 2006, p. 52). Jaycox, Foa, and Morral (1998) found that clients who were able to remain emotionally engaged early in treatment and were able to remain this way received greater levels of benefit from their treatments.

The power of mindfulness comes from its emphasis on bottom-up processing (Siegel, Germer, & Olendzki, 2009). Mindfulness brings attention to the stream of sensory data that enter the system through each of the senses: vision, hearing, scent, taste, and other bodily sensation; as well as to the thoughts and images that arise in the mind. The focus is on these, rather than on the upper level schemas of narratives and beliefs that are usually used to guide us through our experiences. Mindfulness also provides survivors the opportunity to experience their feelings and sensations safely, without being overwhelmed with these upper level negative perceptions (Vander Kolk, 2006).

Mindfulness has been practiced around the world for centuries. New brain imaging techniques have provided a wealth of support for and explanation of it as it relates to psychotherapy. Many therapy models are beginning to integrate mindfulness into their practices (Roemer & Orsillo, 2002; Academic Mindfulness Interest Group, 2006). This trend is likely to continue, but it will take some time to find ways to effectively integrate it into the various therapeutic methods.

Conclusion

Stress, and particularly, traumatic experiences powerfully impact the physiology and the functioning of the brain. The emotional impact of PTSD is increasingly being recognized as a debilitating mental illness. However, research is also increasingly providing empirical evidence for various healing methods. The three step method of re-establishing of safety and stabilization, desensitization and processing of the traumatic memories, and reconnect and integrate with family, friends, and others provides a therapeutic framework for counsellors who work with trauma survivors. Emotional regulation and mindfulness techniques are two methods that can be integrated into this framework. These tools, along with the key components of empathy and a

strong, person-centred therapeutic relationship, will pave the way towards healing for trauma survivors.

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