

# The Neurophysiology of Embodiment and Forgiveness in the Treatment of the Trauma

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First published in Connections & Reflections, The GAINS Quarterly/Summer 2010

*“Forgiveness is the key to action and freedom.”*

Hannah Arendt

*“As long as you don’t forgive, who and whatever it is will occupy rent-free space  
in your mind.”*

Isabelle Christian Holland \*

## The Ubiquity of Trauma

Overwhelming trauma affects the body, brain, and mind. Experiences of abuse, life-threatening illness, terrorism, war, and natural disasters can cripple a person’s natural ability to fight back against danger, and leave hypervigilance, psychosomatic distress, panic attacks, rage, disorientation, and the inability to think effectively during states of high physiological arousal in their wake (Ahmed, 2007; Eckberg, 2000; Price, 2007; Wheatley-Crosbie, 2006). While only 7.8% of those exposed to trauma develop PTSD, many others suffer from some portion of these symptoms (Kessler et al., 1995).

In a representative national sample (n= 5877), 60% of men and 50% of women reported experiencing at least one traumatic event in their lives, with 5% of men and 10% of women developing PTSD. Men most commonly reported combat exposure as the cause, while rape and sexual molestation were most frequent for women (Kessler et al., 1995). Trauma encodes terror and pain in the limbic system, creating an expectation that all novel situations are dangerous. This perception causes heightened levels of activity in the hypothalamus-pituitary-

adrenal axis, and can elevate the baseline of autonomic nervous system arousal so the person is continuously experiencing some level of dysregulation. Because of the numerous impacts on body, brain, and mind, understanding the neurophysiology of trauma can help we therapists become agents of regulation and resolution for our patients (Ahmed, 2007; Kessler et al., 1995; Levine, 2008; MacDonald et al., 2008; May, 2005; Rothschild, 2000; Schore, 2002).

### **Neurophysiology of Trauma**

The brain's first responder to severe stress, trauma, or threat is the limbic system, which activates the hypothalamus-pituitary-adrenal (HPA) axis, releasing hormones instructing the body to prepare for defensive action. The hypothalamus stimulates increased arousal in the sympathetic nervous system to initiate the fight-or-flight response. The release of stress hormones (i.e., epinephrine and norepinephrine) results in increased heart rate as well as respiration, and blood flow is redirected to the muscles in preparation for rapid movement. When the fight-flight response is enacted, it discharges energy from the body, and the brain responds by reducing levels of stress hormones.

However, when an individual perceives that neither flight nor fight is possible and believes he or she may die, the limbic system increases activation of the dorsal vagal parasympathetic nervous system and tonic immobility or freezing occurs. During the immobility response, the sympathetic nervous system may remain online so that the heart and brain are still racing; however, the body is frozen in a state of shock (Levine, 2008; Rothschild, 2000).

The other side of the freeze response is dissociation, a complete drop into a low heart rate, low metabolic state that mimics death. Endorphins are released to decrease pain as the body prepares for death (see Porges, 2009 for a complete description of the relationship between the three branches of the autonomic nervous system). Whether the survivor's nervous system remains in sympathetic or drops into dorsal vagal activation during trauma, the inability to effectively fight

back leaves undischarged energy stored in the nervous system, contributing to the formation of trauma-related disorders (Levine, 2008; Rothschild, 2000).

The neurophysiological encoding of trauma occurs in the limbic system during a state of autonomic nervous system hyper- or hypoarousal, tying this kind of activation to reminders of the event, as well as leaving the nervous system in a constant state of irritation. In traumatized individuals, autonomic arousal is no longer a response to an actual external threat and can become a recurring or continual emergency response.

Experiences you or I might perceive as innocuous may be highly activating for traumatized people or cause them to drop into a collapsed, dissociated state. Because of the perceptual bias toward danger encoded in the amygdala, traumatized people have difficulty assessing situations in a calm and rational manner. This is because incoming stimuli are processed outside the integrating and regulating influence of the hippocampus and prefrontal cortex. Instead, implicit memory of the trauma is stored in body sensations, emotions, images, motor behavior, and perceptions, leading to continuously operating mental models of danger.

Because the linkages between the limbic region and midline structures of the prefrontal cortex are sparse, implicit mental models are the dominant influence on the suffering person's experience. Behavioral re-enactments, in the form of flashbacks, psychosomatic symptoms, nightmares, and relational strategies, may also occur, with no understanding of the meaningful linkage to the original experience (Eckberg, 2000; Van der Kolk & Greenberg, 1987).

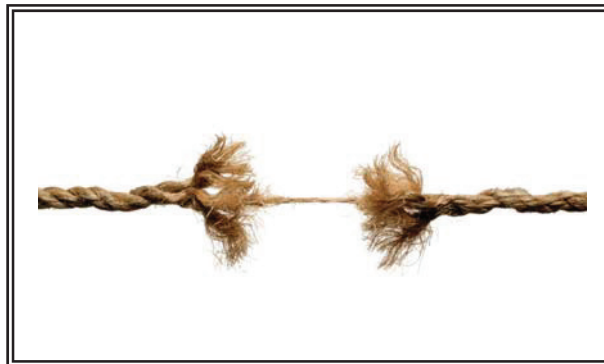
All of these difficulties begin with a hypersensitive amygdala sending the nervous system into overload, so regulation of the autonomic nervous system becomes a priority. Body sensations and movements can become a powerful entry point into the neural nets holding the trauma. Consequently, body psychotherapy can help to stabilize neurophysiology, rebalance the autonomic nervous system, as well

as integrate and organize traumatic material in a meaningful way (Eckberg, 2000; Van der Kolk & Greenberg, 1987).

### **Body Psychotherapy in the Treatment of the Neurophysiology of Trauma**

Body psychotherapy is an approach based on the unity between the mind and body. It is a distinct branch of psychotherapy which recognizes the neurophysiological processes inherent in human beings. This explicit theory of mind-body functioning incorporates the interaction between physiological and psychological processes, and utilizes techniques involving body awareness, therapeutic touch, movement, and breathing. Body psychotherapy has been

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alterations in  
markers as well



validated in  
collected by the  
Association for  
(Young, 2009).  
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improvement in survivors of sexual abuse and natural disasters have been reported (May, 2005; Leitch, 2007; Parker, Doctor, & Selvam; 2008; Price, 2007). Here, we are going to talk about two types of body psychotherapy that are particularly suited to the treatment of trauma: Somatic Experiencing and Sensorimotor Psychotherapy.

In Somatic Experiencing (developed by Peter Levine [2008]), the undischarged energy of trauma is assumed to reside within the nervous system. The overarousal of the sympathetic and underarousal of the dorsal vagal parasympathetic branches of the autonomic nervous system result in dysregulation associated with either flooding, or freezing and dissociation. The energy mobilized for fight or flight is incompletely discharged. Symptoms of shallow breathing, panic, anxiety, and angry outbursts as well as confusion,

dissociation, and collapse indicate a nervous system that is operating outside its window of tolerance. Let's consider working with sympathetic hyperarousal. Titration is a practice by which the therapist directs the client to focus on small pieces of traumatic material so that the nervous system can adjust to each level of excitation. The therapist interrupts autonomic hyperactivation and creates an "oasis" of safety and stability.

For example, clients may be asked to recall a time when they felt safe, a process that has some probability of activating the regulated neural net of that experience. With practice, the client learns to expand the sense of being grounded and stable while beginning to discuss chaotic, emotionally charged material.

Neurobiologically, connections between the limbic region and midline portions of the prefrontal cortex are gaining in numbers and strength, providing the capacity to be in touch with the memory without being overwhelmed by it (Eckberg, 2000; Heller & Heller, 2004).

Tracking the body's moment-to-moment experience regulates arousal and brings the client into the present moment rather than being engulfed in the sensations of the trauma

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Another part of this approach directs attention to body movements. The therapist directs the client to imagine doing what his or her body wanted to do in response to the threat. The instinctive reactions to threat are fighting to confront or fleeing to avoid danger. However, in intense life-threatening situations, there is often not sufficient time to initiate any action, resulting in feelings of helplessness and the perception of impending death, which leads to freezing and immobility. As the freeze response subsides, there can be trembling and shaking as the nervous system releases and reorganizes.

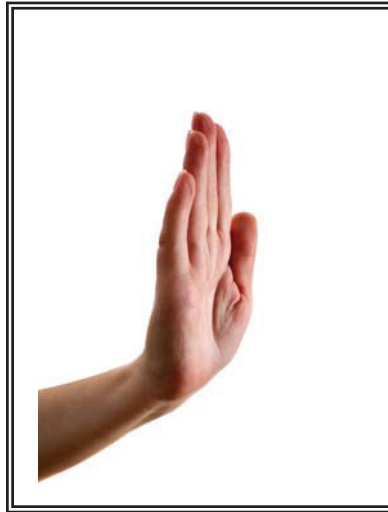
The client's impulse to fight or flee resurfaces as mobility returns and energy is discharged. However, it is not necessary to actually engage in gross motor movements of the flight or fight response. Clients who feel their body organize fight and flight responses and feel the body prepare to move, and then move

even slightly or in slow motion, can experience a tremendous release of energy. Physiological completion of the desired response to trauma helps to release the blockage in the nervous system and permits integration of the experience so that the trauma becomes an event in the past rather than a point of fixation. There is a shift from a fragmented to an integrated state as physical and emotional symptoms resolve (Eckberg, 2000; Heller & Heller, 2004).

Sensorimotor psychotherapists (Ogden & Minton, 2000; Ogden, Minton, & Pain, 2006) suggest that the client is assisted to engage in detailed tracking of sequential physical movements and sensations associated with unassimilated sensorimotor reactions (e.g., motor impulses, muscular tension, trembling, changes in posture, breathing, and heart rate). The therapist directs the client to describe how emotion manifests physically. Panic may be associated with rapid heartbeat, trembling, and shallow breathing, while dissociation can manifest as slowed heart rate and lack of awareness of the body. The therapist observes and tracks the level of autonomic hypoarousal or hyperarousal in the client. When the upper or lower edge of the window of tolerance is reached, clients are directed to temporarily disregard emotions and thoughts to focus on physical sensations and movements until the sensations and movements stabilize. Tracking the body's moment-to-moment experience regulates arousal and brings the client into the present moment rather than being engulfed in the sensations of the trauma.

In addition, sensorimotor psychotherapists focus on helping the client develop bodily resources of regulation and perform “acts of triumph” that allow the client to complete the action that could not be expressed during the trauma. The ultimate goal of Sensorimotor Psychotherapy (SP) and Somatic Experiencing (SE) is to regulate and then integrate three levels of processing—cognitive, emotional, and sensorimotor (Levine, 2008; Ogden & Minton, 2000). Clients who complete this process often find that the trauma does not have to be repeatedly reworked.

Eckberg (1998) writes about a client whose increased body awareness led to restoration of physiological and emotional equilibrium. When therapy began, this survivor of childhood torture was immobile except for microscopic movements of rocking. The therapist directed her to observe these movements. Initially, she froze and said that she could not pay attention to the movements. Gradually, over the course of treatment, she focused on small movements and allowed them to expand into full rocking motion. As she did this, she clenched her fists and reported that she wanted to hit and scream. At first, the impulses were constricted. She eventually allowed the impulses to be expressed safely in the therapeutic setting as hitting, pushing, and releasing her inhibited scream. The therapeutic release of physical and emotional energy resulted in restoration of the capacity to protest, stand up for herself, and assert herself in interpersonal relationships.



As the process of integration moves forward, clients become regulated enough to begin to consider forgiveness of themselves and those who injured them. One of the approaches in SE is to educate the client about the nervous system and the automatic responses triggered by limbic system and brain stem activation during the trauma. These circuits literally turn off the neocortex so the person can act quickly to survive, leaving the traumatized person without prefrontal conscious decision-making resources (Eckberg, 2000; Levine, 2008; Schore, 2009).

Because many clients blame themselves for their lack of rapid response to extreme situations such as abuse or life-threatening disasters, this kind of education helps reduce shame. As shame abates, the process of forgiveness of self and/or others becomes more possible. Self-forgiveness can also release the mind from reliving the trauma and prompt restoration of balance in the autonomic nervous system. This, in turn, can reverse the harmful physical manifestations of

emotional trauma (i.e., adverse cardiovascular and immune reactions, damage to tissue in the hippocampus and prefrontal regions) as a result of the stress response. The following section discusses the beneficial neuropsychological and neurophysiological effects associated with the process of forgiveness.

### **The Neuropsychological and Neuro-physiological Effects of Forgiveness**

Hallowell (2004) traced forgiveness to the Greek term “aphiemi” defined as setting a slave or prisoner free. In order to forgive, it is necessary to renounce resentment and anger. Forgiveness overrules hatred and is a special psychological ability requiring courage, strength, and patience. The yoke of hatred and resentment lifts, resulting in the release from feeling victimized. Anger and resentment have been linked to heart attacks, elevated blood pressure, headaches, back and joint pain, substance abuse, and reduced immune function. In contrast, forgiveness can improve physical and emotional health. It has been linked to decreased resting heart rate, blood pressure, headaches, backaches, neck pain, and diminished need for medication.

Cioni (2007) describes forgiveness as a therapeutic process that involves re-constructing cognitions about the offender and self. According to object relations theory, the violated individual has an inner struggle with hostile images or object-representations during the forgiveness process. The image of the offender can be re-imaged so that there is a re-experiencing of the self and the violator. Cognitive restructuring and object transformation can facilitate the violated individual’s choice to forgive. All of this presumes that the brain is in a progressively more integrated state with the autonomic nervous system experiencing greater regulation as healing from the traumatic event or relationship progresses.

According to Newberg et al. (2000), forgiveness is a complex neurocognitive and affective process, which is an important part of psychotherapy and behavior change. The process of forgiveness can be divided into the following



components: 1) recognition of injury to the self; 2) commitment to forgive; 3) cognitive and affective activity; and 4) behavioral action. Forgiveness requires a sense of self with an intact posterior superior parietal lobe, especially in the dominant hemisphere (i.e., the left hemisphere in right-handed individuals). This brain region helps make distinctions between the self and other, and identifies specific objects that can cause damage to the self. The interconnections between parietal, frontal, and temporal lobes, with the input of the sensorimotor system, form the “primary circuit” linking the self with the external world, including the offender. These circuits form memories of self-world congruence in the amygdala and hippocampus. The hippocampus maintains memories of previous sensory, cognitive, and affective experiences, and coordinates memories in an overall description of the self and relation of the self to the external world (Newberg, d’Aquili, Newberg, & de Marici, 2000).

Now, let’s explore the neurobiological and neurochemical correlates of injury and forgiveness. During a traumatic experience, one or more of the sensorimotor systems receives input of initial damage to the self. The input is compared to the existing memory of the self and relationship with the world. When there is incongruency, the injured self activates the stress response, which triggers the sympathetic nervous system via the limbic system and hypothalamus. As a result, there is a feeling of being upset, a sense of discomfort, which generates more visceral feeling through altered heart rate, blood pressure, and stress hormones. Negative feelings are also encoded in the amygdala and integrated into the hippocampus in response to the injurious nature of incongruency. The stress response caused by an activated sympathetic nervous system is



accompanied by release of norepinephrine resulting in altered neuronal plasticity (Newberg, d’Aquili, Newberg, & de Marici, 2000).

Repeated activation of the stress

response without resolution can have permanent effects on cardiovascular, nervous, and immune systems. The negative emotional response to the injurious event can magnify its impact and motivate the injured individual to resolve the incongruity. Resolution occurs through cognitive and affective processing within temporal, frontal, and parietal lobes responsible for higher order functioning as well as the limbic system. Cognitive and affective processes of the cerebral cortex in combination with neuronal alterations and plasticity create a revised understanding of the self, reconciled self, and relation of the self to the world.

The right hemisphere is utilized creatively to solve problems presented by the abstract linguistic processes of the left hemisphere. When resolution of the problem occurs, there is a discharge from the right hemisphere, which activates the parasympathetic nervous system and results in happiness and relief that the problem is resolved. The establishment of positive feelings eventually results in motor functions to control behavior toward the offending individual as part of a revised understanding of the self and its relationship with the world (Newberg, d'Aquili, Newberg, & de Marici, 2000).

This description of the neurophysiological correlates of forgiveness offers a picture of what happens in the embodied brain. The subjective experience usually unfolds slowly as the survivor gains a broader understanding of self and other. This emerges as the result of stronger connections between the limbic region and midline prefrontal structures supports regulation and the capacity to observe and experience at the same time. During the process, clients go through many stages of cognitive and affective changes. For example, Spy (2004) noted that survivors of trauma often experience a sense of self-blame and lack of self-worth. Following the trauma, they have a sense that they should have done something different to avert the painful experience.

On an emotional level, survivors of trauma need to forgive themselves, or the victim in one situation can become the perpetrator in another context. For example, a client came to therapy with deep resentment, anger, and fantasies of

vengeance against his father who had abused him as a child. During the course of therapy, he gained insight into how his unforgiveness resulted in anger and conflict in his relationships. He described how his wife had threatened to leave him. He was able to see his father's rage in himself and how he used anger to protect himself from his emotional pain. The client was gradually able to forgive himself. The therapist supported his self-forgiveness as the way to begin forgiving others.

Reed and Enright (2006) contrasted the effects of therapy focusing on forgiveness to anger validation, assertiveness, and interpersonal skill building for women following spousal emotional abuse. Subjects in forgiveness therapy had significantly greater improvement in depression, anxiety, posttraumatic stress symptoms, self-esteem, forgiveness, environmental mastery, and finding meaning in suffering. Witvliet, Ludwig, and Vander Laan (2001) examined the immediate emotional and physiological effects of granting forgiveness in contrast to holding grudges (being unforgiving) toward real-life offenders when imagining hurtful memories. Unforgiving thoughts were linked to greater aversive emotions, higher brow electromyograph (EMG) activity, skin conductance, heart rate, and blood pressure in contrast to baseline. These effects persisted into the recovery period. In contrast, forgiving thoughts were associated with increased perceived control and decreased physiological stress responses. These findings suggest that chronic unforgiving responses may cause deterioration of health while forgiveness may enhance well being and autonomic function.

## **Conclusion**

Trauma results in activation of the limbic system, hypothalamus-pituitary-adrenal axis, and autonomic nervous system associated with neurophysiological dysregulation. This overwhelming undischarged energy must be released to stabilize the function of the brain, mind, and body. Positive treatment outcomes

are associated with body psychotherapy for survivors of sexual abuse and natural disasters (Leitch, 2007; Parker, Doctor, & Selvam; 2008; Price, 2007). In addition, body psychotherapy stabilizes the autonomic nervous system (Heller & Heller, 2004; Ogden & Minton, 2000). When this is combined with working toward forgiveness, we see additional positive effects on the autonomic nervous system and decreases in emotional trauma (Reed & Enright, 2006; Witvliet, Ludwig, & Vander Laan, 2001). It is evident that blocked emotional and physical energy trigger the reenactment of past trauma. In contrast, the therapeutic release of emotional and physical energy through body psychotherapy as well as forgiveness can safely reverse the effects of trauma and free the brain, mind, and body from being locked in a prison of traumatic shock, chaos, anger, and fear.

\* The authors wish to thank Jessica Cullen for her assistance in finding the initial quotes.

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