THE CASE of PABLO DIEGO

The Integration of Neurofeedback in Therapeutic Work with a Torture Survivor

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"There is a general agreement that traumatic experience, where neither resistance nor escape is possible, overwhelms ordinary human regulatory processes and is fundamentally disorganizing. Inner and outer worlds are rendered chaotic and unpredictable…The primary effect of trauma is a chronic inability to regulate one's emotional life. Survivors also speak of the debilitating sense that what they most trusted, their own minds, seem to have turned against them. "

Susan M. Johnson (Johnson, 2002)

INTRODUCTION

Men, women and children who suffer extreme trauma characteristically experience heightened emotional arousal, memory disturbances and psychic numbing (American Psychiatric Association, 1994). Those who develop post-traumatic stress disorder (PTSD) suffer from extreme physiological responses to sounds, images and thoughts associated with specific traumatic events. A number of studies have shown changes in autonomic reactions including heart rate, skin conductance and blood pressure. (Pitman et all, 1987; Blanchard et al, 1986; Malloy et al, 1983). Several studies of the startle response using neutral acoustic stimuli (white noise) have suggested that triggers not directly related to the traumatic experience may precipitate extreme reactions in people with PTSD (Orr et al, 1995; Shalev et al, 1992; Butler et al, 1990). In a study conducted with the Gulf War veterans, the eye-blink component of the startle reflex was measured in response to white noise bursts of varying intensities. The results indicated that the magnitude of the first startle response, as well as the magnitude of startle responses averaged across blocks of testing, was significantly greater in Gulf War veterans with PTSD than in veteran and civilian comparison groups (Morgan et al, 1996).

Trauma survivors often exhibit symptoms of underarousal as well, particularly physic numbing and dissociation, both in day to day life and in treatment. "Basic research has indicated that the dorsal motor nucleus of the vagus acts to shut down metabolic activity during immobilization, death feigning, and hiding behaviours (Porges, 1997, 2001). These hiding behaviours, components of dissociation, 'the escape when there is no escape', are elicited in the therapeutic context, especially when the patient is attempting to escape from the physiological aspects of an intense emotional experience. (Schore, 2003b, p 132). Schore and Porges are describing extreme parasympathetic reactivity in

response to a real or imagined threat to survival. Further, endocrine measures in chronic PTSD tend to show a state of low serum cortisol (Mason et al, 1986; Yehuda et al, 1990), that is one of the indicators of the over-activation of the parasympathetic nervous system. This state of parasympathetic dominance is manifested in behavioral responses such as social isolation and withdrawal, constricted affect, denial, cognitive impairment and dissociation.

People with chronic PTSD tend to move between two extreme reactions; they either freeze in response to minor stressors or they overreact (van der Kolk & Ducey, 1989). PTSD then is a condition characterized by cycling autonomic instability, with patterns of heightened sympathetic dominance (overreaction) alternating, at times, with dramatic parasympathetic dominance (freezing or dissociation) (Scaer, 2001). Clients with chronic PTSD cycle in and out of exaggerated levels of overarousal and underarousal, of panic and numbing, of hypervigilance and blunted affect. These symptoms are inherently self-perpetuating, and contribute to continued abnormal autonomic oscillation. Stuck in extremes of reactivity, the survivor's whole system is rigidly engaged in pure survival - *as though the traumatic event is happening in the present* - making new learning and resolution of prior experience challenging at best.

PTSD is also accompanied by memory disturbances, consisting of both hypermnesias (flashbacks) and amnesias. Research in the area of the traumatic memories indicates that trauma interferes with declarative memory (conscious recall of experience), but does not inhibit implicit memory that controls conditioned emotional responses (LeDoux, 1998). Traumatic memory is clearly state-dependent. When a current internal state (increased heart rate, body posture, particular emotional mood etc.) replicates the internal state produced during the traumatic event, it can release traumatic material. External reminders like a fight between neighbours or the sight of a plane flying too low can also trigger implicit traumatic memory. It may be the case that traumatic memory requires an internal or external emotional cue, because so much of it is stored in the non-verbal, affect-oriented right hemisphere. It is not readily available to the verbal left. Implicit memory is the memory of the non-verbal right hemisphere. In many cases, the individual can be completely unaware of why they feel fearful, agitated or depressed.

PTSD can, therefore, also be considered a disorder of memory. Traumatic memories are floating free, they are timeless, "without an end or place in history" (Rothschild, 2000). One of the primary goals in treatment of PTSD is to help people to distinguish the past from present. Traumatic experience needs to be located in time and place. These events must find their home in the past and stop haunting the present. The unbounded, non-verbal nature of implicit memory, as well as the emotional and behavioural patterns it kindles, makes this difficult. It also limits the effectiveness of therapeutic techniques that rely on verbal recollection and "working through". (Van der Kolk, Boyd, Crystal, & Greenberg, 1985). At least early in treatment, verbal therapies may be calling on the wrong side of the brain. In recent years, a number of non-verbal techniques, including

EMDR, Visio/Kinestethic Dissociation, and the Emotional Freedom Technique have emerged in the attempt to address PTSD (Commons, 2000).

On the level of neurophysiology, traumatic memories can be understood as patterns of neuronal activation previously associated with fear reaction. Siegel suggests a shift in paradigm toward neuronal firing patterns as the mechanism in memory and behaviour. "…*patterns of firing* (italics mine) serve as codes or symbols that carry information and cause events to happen in the brain. These events themselves are patterns of neuronal activation, which in turn carry further information" (Siegel, 1999). Perry addresses the concept of neuronal patterning specifically as it relates to traumatic fear. "The physiological hyper-reactivity of post-traumatic stress disorder is a cue-evoked state memory. The brain has taken a pattern of neuronal activation previously associated with fear and now, will act in response [even to] a false signal." (Perry,1999). Neurofeedback may well interrupt these otherwise reinforced patterns, providing the PTSD victim relief from reliving traumatic events. Whatever its mechanism turns out to be, the authors' experience to date suggests that neurofeedback helps to significantly reduce fear even in those who have suffered severe trauma.

"The fear response involves mobilisation and activation of systems distributed throughout the brain, involving cortical, limbic, midbrain and brainstem-based neurophysiology" (Perry, 1999). The two areas of the limbic system that have been implicated in the processing of emotionally charged memories are the amygdala and hippocampus (LeDoux, 1996). While the hippocampus is engaged in storing explicit memory of the traumatic event in a form of the autobiographical narrative (also underwritten by neuronal patterns), the amygdala and its neural connections encode implicit (non-verbal and unconscious) memory, memory that serves to warn of danger. Under normal circumstances these two systems share connections in forming a memory. While the hippocampus is recording the spatial and temporal dimensions of experience, the amygdala provides it with emotional valence. Prolonged stress interferes with the workings of the hippocampus, disabling proper evaluation and categorisation of experience. At the same time, stress promotes amygdala activity. The amygdala is a fast learner. It has to be since its job is to ensure survival. The brain's deference to survival over conscious recall explains why survivors of trauma often lack conscious coherent narrative memory of the traumatic experience, having at the same time very powerful implicit, unconscious memories that are difficult to decode, to trust, to make verbal and to extinguish. The prefrontal cortex, as well as the hippocampus, can also be altered by stress. The capacity of the prefrontal cortex to quiet the amygdala can fail in situations of overwhelming stress, making stress-linked learning stronger and more resistant to extinction (Diorio et al, 1993).

Several studies in PTSD based on functional magnetic resonance imaging (fMRI) and positron emission tomography (PET) report reduced anterior cingulate activity (Bremner et al, 1999; Lanius et al, 2001; Shin et al, 2001), decreases in

hippocampal volume (Bremner et al, 1995; Bremner et al, 1997) and increased amygdala activation to trauma-related stimuli (Lanius et al, 2002; Rauch et al, 2000). Based on these findings, recent models of PTSD propose that a failure of anterior cingulate cortex to inhibit input to the amygdala results in hyper reactivity to threat (Bremner, 1999). This in turn allows exposure of the amygdala to overwhelming internal and external arousal cues, thereby promoting the reactivation of neural patterns which manifest as the clinical syndrome, PTSD (Schore 2003b).

To date, the neurophysiology of PTSD has been understood and treated primarily biochemically. Researchers have found that people suffering PTSD have abnormally low levels of cortisol and abnormally high levels of norepinephrine (Yehuda et al, 1996; Yehuda, 1999). Chronic PTSD, appears to be a dysregulation of a normal stress response where cortisol and norepinephrine operate separately (Bremner, 1999). Other studies have focused on the relationship between hormonal changes and clinical manifestations in PTSD. For example, high levels of norepinephrine have been linked to intrusive thoughts and severity of PTSD symptoms (Lemieux & Coe, 1995). But in pursuing the biochemical markers of PTSD, researchers may be overlooking the equally important electrical properties, not only of PTSD but of brain function itself.

The neuronal mechanisms that underlie PTSD can also be understood and addressed, perhaps even more precisely, “bioelectrically” (Schwartz, 1979; Schwartz, 1989; Othmer et all, 1999). The bioelectrical perspective looks at the other domain of neuronal functioning, the electrical domain and at the frequencies at which bundles of neurons fire. The full scope of this theory is too great for this paper, but essentially it maintains, with good empirical evidence, that emotional arousal is in large part governed by the frequencies at which the brain fires. Once one views the brain and its behaviours this way, a new model of psychopathology emerges. The brain is seen as a self-regulatory control system that manages itself primarily in the electrical domain. Psychopathology is seen as a specific failure mode of this control system, or a disregulation in brain function (Othmer et al, 1999). The central nervous system’s electrical or frequency based regulatory activity manifests itself in rhythmic EEG activity. Using this frequency-based dysregulation model, PTSD can be understood as a failure of the brain to regulate arousal in both the central and autonomic nervous systems, leading to extreme fluctuations in state, both emotional and physical. These neuronal patterns or frequency driven states of arousal can be addressed with operant conditioning of the wave forms. This is the essence of neurofeedback training.

In the early 90’s, Peniston and Kulkosky compared rates of medication usage, psychometric measurements of personality and relapse rates for a group of 15 veterans suffering from PTSD who received neurofeedback (alpha/theta feedback with eyes closed) as well as conventional therapies to those of a control group of 14 similar individuals who received only conventional treatment

(Peniston & Kulkosky, 1991). All patients in the study were assessed pre- and post-treatment with the Minnesota Multiphasic Personality Inventory. (MMPI). After a month long course, subjects in the neurofeedback group exhibited positive changes in the MMPI. They reported a significant reduction in nightmares and flashbacks, an easing of fear and anxiety and decreases in psychotropic medication. The alpha-theta neurofeedback group performed significantly better than the control group in all parameters. In a follow-up study, conducted thirty months later, twelve of the fifteen in the experimental group reported no return of symptoms. All fourteen in the control group had relapsed.

Although the author was unable to find any studies specific to victims of torture, I was able to extrapolate from the work done with other trauma survivors and veterans with PTSD to help me design a treatment approach for a torture survivor. My results, which are reported in the case study to follow, are consistent with the Peniston and Kulkosky's findings.

Trauma survivors who suffer PTSD live in states of unmodulated fear. The amygdala, the region of the brain which activates the fear response, drives the PTSD brain. Neurofeedback training appeals to timing (frequencies) and communication in the brain and helps to reorganize the neuronal patterns that trauma created and that PTSD represents. With better regulation, fear quiets. People meeting criteria for PTSD are usually trained to increase the amplitude of lower frequency brain waves in the right hemisphere to quiet arousal and calm the firing of the amygdala.

CASE STUDY

Pablo Diego's is 62 year-old man who was referred to me by his psychotherapist, who had been working with him for over 10 years to help him resolve the terror that still ruled his life. Pablo had been tortured by the Pinochet regime in Chile over twenty years earlier.

Background

Pablo was brought up in a middle-class family in Santiago. He describes his family as strict, but emotionally supportive. His fondest memories are those of the freedom, safety and acceptance he felt as a child during his holidays with his grandparents, wandering around their small village. After finishing his education, Pablo worked as a carpenter. He was a skilled worker and popular with his friends for his sense of humor and his active role in the community. He became a political labor activist and was arrested for his organizing activities by the Pinochet regime on two occasions, once in the mid-seventies and again in the mid-eighties. During these imprisonments, he was brutally tortured. His torturers wore Donald Duck and Mickey Mouse masks while they administered mind altering psychotropic drugs; beat him; applied electric shocks to his genitals and other sensitive parts of his body, and forced water into his rectum with a hose. He endured a mock execution before a firing squad and was forced to watch his

friends and family members being tortured, while his torturers blamed him for their suffering. The main aim of torture was not to extract information from him, as he was to believe, but to break his spirit and to destroy him as a threat to their power. As a political activist in Chile, Pablo was well aware of methods of torture. He knew that if he was to survive he had to play their "game". Very soon, he learned to alter his unbearable reality through voluntary suppression and restriction of his thoughts, emotions and physical reactions. He learned to focus his attention on the next move of his torturer to help stem feelings of overwhelming and humiliating helplessness. He learned to reduce his physical perception of pain and his terror by dissociating. And he survived.

After release from prison the second time, Pablo was under constant surveillance. He was not able to find a job and, afraid for his friends were he to contact them, he became socially isolated. With his father's help, he managed to escape from Chile and he came to Australia as a political refugee in 1984. Although he had managed to escape and to start a new life thousands of miles away from Chile, Pablo never felt safe.

He was referred to STARTTS (NSW Service for the Treatment and Rehabilitation of Torture and Trauma Survivors) in Sydney in September 1994. His symptoms included flashbacks, nightmares, intrusive memories, sleep disturbances, explosive episodes, withdrawal and hypervigilance. He suffered from overwhelming feelings of guilt and shame. He felt responsible for the torture and execution of several of his comrades. Pablo also had trouble with sexual functioning, a common symptom of people who are exposed to sexual torture. He also complained of chronic body pain. Pablo was distrustful and fearful to the point of paranoia. It took many years of therapy and extensive case management and advocacy before Pablo started to trust his therapist. Once that hard won trust was established, Pablo was referred to a physiotherapist to address the physical consequences of torture. He also went into family therapy to work on issues with his wife and children.

With the help of his psychotherapy, Pablo made substantial progress. He learned to manage his symptoms. He learned to live with anxiety and to manage his anger outbursts and trouble sleeping. He understood himself better. He became a member of a Spanish speaking community group and he found a job as a painter. He was, however, never symptom free. Pablo was always hypervigilant, and, fearful, he resisted any form of the relaxation exercise.

At the beginning of 2002, Pablo was diagnosed with malignant stomach cancer. He underwent a total gastrectomy in April of that year. There is evidence to suggest that victims of severe trauma experience increased rates of morbidity and mortality (Sibai, 2001). Many of these studies which focus on health problems of former prisoners of war find a high incidence of cardiovascular and gastrointestinal diseases (Burnett, 2001; Schnurr, 2000). On an intuitive level, one could speculate that Pablo developed stomach cancer as a result of his inability to process and "digest" his torture. He literally could not stomach what had happened to him. And like the malignant cells, his torture was a foreign body in his system that had to be isolated and removed. His stomach surgery

could thus be seen as a drastic, unconscious attempt to “excise” the memory, through removing the stomach.

Being confronted with a potentially lethal illness is a traumatic experience in itself but for Pablo it also triggered a cascade of posttraumatic symptomatology related to torture. The necessary surgical intervention and the intrusions that attended it, particularly the medical examinations and the injection of catheters, sent him back into flashbacks, nightmares and intrusive memories.

Pablo’s therapist asked me to see him because he thought that neurofeedback might help reduce his patient’s debilitating post-surgical pain. Pablo’s health and his future were uncertain, and his therapist was searching for something that might bring some dignity back into his client’s life, if only through reducing his pain. It took his therapist almost a year to persuade Pablo to try a course of neurofeedback training. Pablo feared the sensors used in neurofeedback training to detect electrical activity in his brain. Because of his torture, he was convinced that the electrodes would be used to shock and hurt him.

Once Pablo did agree to start with neurofeedback, we had several transitional sessions, to help him “transfer” the trust from his therapist to me. The transition went smoothly. It was agreed that Pablo would see me twice per week, but that he also could see his former therapist as he wished.

After the initial assessment it became clear that, along with chronic pain, Pablo was experiencing classic symptoms of Post Traumatic Stress Disorder. He complained about being “jumpy” and oversensitive to sounds, especially during the night. Even the slightest sound would wake him, so he had to sleep in a separate bedroom, far away from other rooms, completely isolated from other family members. Despite that, he would rarely sleep for more that 3-4 hours. He talked about getting very angry with his wife and children as well as about his deep remorse for screaming at them. He found it nearly impossible to concentrate. Before the operation, he had enjoyed reading, but he now found it difficult to focus. As he got to know me, he also acknowledged having flashbacks and nightmares related to torture.

Before beginning the neurofeedback training, I did a complete assessment of Pablo’s level of arousal using a symptom-focused questionnaire. The majority of Pablo’s symptoms, such as difficulties controlling his temper, startle response, nightmares, hypervigilance and his difficulty falling asleep, indicated a high degree of arousal in the right hemisphere. However, he also had trouble with focus and concentration, symptoms that indicate decreased arousal in the left hemisphere. Pablo first needed to learn to produce calming alpha waves in the right temporal-parietal part of the brain, in order to lower arousal in his right hemisphere. This training protocol has been demonstrated to reduce symptoms of over-arousal. After several sessions, I also added training at Pablo’s right prefrontal cortex, the control center of the fight-flight-freeze amygdala, where he also learned to produce calming brain waves. Although Pablo would need left-hemisphere training to raise arousal for increased concentration, I decided to

postpone this training until he had achieved a good degree of emotional stability and a sense of calm.*

Treatment course

Pablo came twice weekly for 30 minutes of neurofeedback training and 30 minutes for reassessment and talk therapy around the issues that arose during or after the training.

I tracked Pablo's progress using the quality of his sleep, the frequency and intensity of his anger outbursts, concentration and memory difficulties, intensity and frequency of his headaches and stomach pain.
After his first session, Pablo reported that he felt unusually relaxed, and that he had enjoyed his walk to the railway station. Usually he would feel frustrated when waiting for a train to arrive. By the fourth session, Pablo reported that his body was more relaxed and he was feeling calmer. His friends also noticed that he was more able to take things in stride. He reported being able to let things go that would have led to fights just a couple of weeks before. He also noticed that he fell asleep more easily. His stomach pain, however, remained unchanged.

At session eight, he spoke about the rectal examination that he'd had during the preceding week. As he talked about this experience, he became increasingly anxious and tense and he held his stomach in pain. I asked him to describe the sensations he felt in his body. He said that he had a burning sensation in his rectal area and a pulsating headache as well as very unpleasant sensations in his abdomen. I asked him not to resist the feelings, but to listen to what his body was trying to tell him. He remembered the cold water forced into his anus with a hose. The sensation during the torture was similar to what he was experiencing now. I asked him to close his eyes and to observe what happened in his body as he trained. After ten minutes of the neurofeedback, Pablo reported that his headache had diminished and that his stomach pain was less intense. He was impressed with the power of training. Talking about trauma would usually leave him feeling agitated, ashamed and depressed. Ten minutes of brainwave training helped him to calm these emotions. I asked him to finish this session with the progressive muscle relaxation, so that he could experience his body in a relaxed state. He did.

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* The first protocol introduced involved placement of electrodes at P6-A2 (all electrode placements are described using the "10-20" system), and rewarding brainwave activity at 8-11 Hz and inhibiting 2-6 Hz and 21-36 Hz.
The second protocol used was FPO2-A2, rewarding 5-8 Hz and inhibiting 2-6 Hz and 21-36 Hz.

By session ten, Pablo's body pain became more bearable and his headaches decreased significantly. He slept better and felt calmer when awake, but he also reported that he was having more trouble concentrating and that he felt tired during the day. I decided to add left hemisphere training to his protocol to help to increase his alertness and his energy level. My decision was supported both by the fact that he was calmer, less afraid and less reactive, as well as by his EEG profile. He had significantly lowered his amplitude of "high beta", activity that has been clinically associated with anxiety. He was also able to increase amplitudes of the posterior alpha brainwaves. These changes indicated that Pablo would be able to tolerate a slight increase in his arousal level with the training of the left hemisphere.**

By session thirteen, Pablo reported that his desire to read had returned. He was amazed at his ability to concentrate on a book even while travelling by train. He was also feeling more energetic and alert during the day, and able to sleep throughout the night without waking. But he was concerned. The previous night his wife had to wake him in the middle of the night because she thought someone was trying to enter their garden. He was worried about sleeping too deeply and no longer being "on guard" to protect his family. For Pablo, being "on guard" meant having control over the threatening world. The absence of hypervigilance felt to him like losing control, which was, understandably, deeply frightening. We talked about the reality of threat to him or his family in the present. Pablo used the session to re-conceptualize what it meant to be safe. He was able to think about this differently with me because he was now much less afraid. Our talk sessions were devoted to helping him experience the past as the past and the present as the present - in essence to help him catch up to his new, emerging experience of himself.

** The following protocol has been used: 24' P6-A2, rewarding 8-11 Hz and inhibiting 2-6 Hz and 21-36 Hz, followed by 6' FC3-A1, rewarding 15-18 Hz and inhibiting 2-6 Hz and 21-36 Hz.

During the fifteenth session, Pablo expressed his concern that his memory was getting worse. Decrements to memory can occur with an imbalance in neurofeedback protocols. I kept this in mind as we explored his “memory issues”. He had forgotten his wife’s birthday. As we talked, it became clear that he was angry with his wife and he was punishing her. This was not a problem with memory; it was a problem in his self-awareness and in his relationship with his wife. The rapid changes he was experiencing were changing his relationship with her, and both of them were having difficulties adjusting. The focus of our work shifted away from past horror to the more mundane but important issues in his family.

I have included this moment in the treatment course to highlight the importance of providing neurofeedback within a therapeutic relationship, when at all possible. Had Pablo and I just been engaged in neurofeedback, it would have been difficult to discern the meaning of his concern about his memory. Moments like these occurred regularly and could be sorted out in the therapeutic context. Neurofeedback enhanced Pablo’s trust in me, which meant he shared more with me, which, in turn, made it possible for me to better understand him. He was less afraid which allowed him to collaborate in his treatment and hear my interpretations and challenges without reactivity. It was important, if not vital, to Pablo’s overall treatment that both therapist and patient were able to discern the ripple effects of his brainwave training. It allowed us to discern, moment to moment, his evolving neuropsychological state and the effects this might have on his close relationships and on his sense of self.

By the eighteenth session, Pablo reported general improvement in his day-to-day functioning. He was feeling calmer, more energetic and more focussed. His sleeping had normalized and his body pain, although still present, was bearable. He felt, physiologically and emotionally, more stable. He was regaining a sense of control over his body and his emotions. Now he was ready for the next stage in therapy – work on repressed traumatic memories.

Traumatic memory becomes personal history

As spoken to above, traumatic memories often lack narrative and context. They are encoded in the form of vivid sensations and images (Brett & Ostroff, 1985). To access them, Pablo needed to enter the state of consciousness in which unconscious material is accessible, in the form of hypnagogic imagery (Cowan, 1993; Wickramasekera, 1993). This is a state commonly experienced by people just as they are falling asleep, by people in hypnotic trance and by anyone who is in a dissociative state. In the brain, these states are associated with “theta” frequency band (White, 1999).

A form of neurofeedback called alpha/theta training*** allows clients to change their state of consciousness by altering their brainwave activity. In alpha/theta training, a client enters a state characterised by alternating periods of alpha (8-11 Hz) and theta (5-8 Hz) brainwave activity. The theta state allows access to non-verbal and non-processed memories, and the alpha state provides the bridge, or the link, to the conscious mind so that the client can remember what he has accessed, process it verbally and integrate it into his/her life narrative.

Pablo's stability and his openness to further exploration had made it possible to begin to integrate alpha/theta training into his therapy. I combined alpha/theta with autogenic training and guided imagery that we designed together and that I narrated in a soothing voice. We always finished the sessions with verbal processing of the traumatic experiences as they emerged. This process appears to complete a cycle of action the brain has been trying to complete since the trauma. The events are moved from unconscious, implicit, right hemisphere memory to declarative, verbal, left hemisphere memory. When implicit traumatic memory can be put into words, it can be placed in time. This is only the case, when the process can no longer be hijacked by the amygdala, when Pablo was no longer likely to be re-traumatized by his own account. The neurophysiological stability that he had attained with eyes open training made his deep confrontation with the torture possible. While he was in the hypnagogic state, I gave Pablo positive, self affirming messages to incorporate into his unconscious core beliefs. He had chosen these positive cognitions to replace the destructive, damaging beliefs imprinted during the torture; I spoke them to him.

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*** Eyes open training for self-regulation of physiological arousal is characterised by externally focused attention, sensory awareness and mental alertness in the context of a calm and relaxed body state. Eyes-closed alpha/theta training, involves progressive detachment from sensory input, with an inward focus. In eyes open training the rewards are themselves alerting and attention getting. In eyes closed training the rewards are unobtrusive, just above the hearing threshold.

The following protocol has been used:

- 6' Pz-A2, eyes open, reward band 8-11 Hz, inhibit band 2-6 / 21-36 Hz
- 30' Pz-A2, eyes close, reward band, 5-8 Hz / 8-11Hz, inhibit band 2-5 Hz.
- 6' FC3-A1, eyes oped, reward band 15-18 Hz, inhibit band 2-6 / 21-36 Hz.

Each session would begin with Pablo making himself comfortable in a reclining chair, unfastening his belt and taking off his shoes. I would cover him with a soft warm blanket to anchor him, like being tucked into bed as a child. The training began with five minutes “eyes open” alpha reward. After that, I would ask Pablo to close his eyes and to focus on his body sensations. During his earlier, eyes open, sessions, Pablo had become more familiar with sensations and emotions and was less frightened by them. Through the autogenic training, he learned to relax his muscles, to increase his body temperature and to recognise any “blockades”, any parts of his body that were tense, uncomfortable or painful. He used diaphragmatic breathing to increase relaxation. Then I would ask Pablo to describe a safe place and enter it with all his senses, (Jorgensen, 1992) and to experience himself as safe and protected. Very quickly, Pablo was able to reconstruct sights, smells, sounds and tastes connected to his grandparent’s village. These memories offered him sanctuary and perhaps even, access to neuronal patterns that represent a state of being safe and free from fear. While in this safe place, I asked him to send positive messages to his unconscious, messages such as “I feel safe, calm and in control”, “I am in peace with myself, with other people and with my past”. Then, I would ask Pablo to allow himself to enter a deep state of consciousness through alpha/theta neurofeedback and to allow this inner healing process to happen.

During the alpha/theta sessions, Pablo was training to produce more alpha and theta brainwaves and to suppress very low frequency brainwaves, or delta waves. This suppression was used to inhibit the possibility of abreaction as well as the onset of sleep. This approach helped Pablo to access his traumatic memories from a witness perspective and protected him from abreaction. The session would last an average of thirty minutes and I would finish it by gradually raising the frequency that I rewarded, bringing him back, slowly, into the present. We would end with an additional six minutes of eyes open, left hemisphere training at higher frequencies to help Pablo prepare to re-enter the external world.
During the fifth alpha/theta training session, Pablo experienced a visual image of himself as a child, standing close to the beach. He saw calm water and felt hot air on his skin coming in from the island. He said that for the first time, after so many years, he felt completely safe again. The nights following the session, he reported pleasant but vivid dreams which were unusual for him. He also continued to have nightmares. These were, however, less distressing to him than they had been.

At the eighth session he experienced his first “witness state”. The witness state is referred to throughout hypnosis, EMDR and alpha/theta literature and it refers to a person’s ability to see the traumatic scene from a distance. In this state, they are watching it, not experiencing it (White, 1999). He vividly remembered marching through the mountains in a cold rain. His feet were wet and he was

freezing. At the same time he had a feeling of being cocooned in his chair under the blanket, with his whole body pleasantly warm. He was able to see and feel this event from the perspective of the present and from a safe place. It was a memory, no longer a reality. This recall did not disturb him. He expected it would have.

During alpha/theta session fifteen, Pablo had several memories about the torture involving his penis. First he spoke about the recent catheterization. This had been a painful and humiliating experience for him. Then he remembered how he was sexually tortured with electric shocks back in the seventies and eighties. His torturers would start by manipulating his penis to induce an erection, and then insert a wire through his penis to administer electric shocks. Pablo was astonished when he also remembered a sexual incident at age six. A girl, slightly older than he, put a small balloon on his penis. He remembered that the balloon was very tight and he felt intense pain. As his trauma history unfolded, it included a whole complex of experiences around sexual humiliation, and sexual pleasure turned into suffering. Rather than processing one particular event, Pablo was processing a whole set of events with a shared emotional theme. It seems possible if not likely that these events were closely encoded in his brain. We stopped the neurofeedback to explore these memories verbally and then he resumed his training. After this session Pablo reported positive changes in his sexual functioning.

Pablo had several more witness state experiences during alpha/theta training where he observed key traumatic events while in a calm, peaceful state. This process helped him to consolidate his traumatic experiences and make them part of his historical memory. He reported feeling increasingly safe in his body, and also in the world around him. He also told me that he started to enjoy the taste of food, something that had disappeared after his cancer treatment.

At his 24th alpha/theta session, I asked him to re-write his script of a safe place and to find a place in his present, not in his past, where he feels safe and contained. After the session, he told me that he had visualised being in the Australian bush surrounded by eucalyptus trees. It was a very hot and humid day, so he could almost feel the humidity on his skin. Than he added, ”but I do not like to get wet “ (one of his traumatic memories involved being wet and cold). Then he recalled that the previous week it had been a stormy night and his 5 year old son came to him scared of the heavy rain. Pablo said, “I took him to the window and showed him our garden, and told him that the rain was good and that we need water for our plants. My son was worried that our chickens and the dog would get wet, but I told him that they were safe under the trees. I also told him that we are safe in our house. But it’s not just that I told him that**,** it’s that **I felt** that. It was such a nice feeling looking through the window in the rainy night feeling warm and protected inside the house”.

As Pablo talked about his experience, I looked at his face and remembered our first session. The first time I saw him, his face was a mask of pain and tension. Nothing else was coming through. Now it was alive, and his eyes were shining. It felt as if he was fully inhabiting himself for the first time. I felt, while we were talking, that we were both there, the two of us. And I felt grateful; grateful to Pablo for his willingness to open to his history and to me; grateful to be in the position to welcome Pablo's emerging self and grateful, oddly perhaps, to the technology itself that seemed to make this recovery and this relationship possible.

Pablo's therapy is still in progress. Topics that are emerging now are less and less related to torture and more about his relationships with other people in the present and his evolving perception of the world around him. Pablo is exploring a new personal universe, a universe that was unavailable to him when he was flooded by fear. He experiences a new capacity within himself to feel pleasure, relatedness and peacefulness. This is the life he now can begin to live.

When Pablo first came to see me, he was suffering from chronic, debilitating stomach pain, frequent and severe headaches, intensive anger outbursts, sexual disfunction, and PTSD symptoms that included recurrent nightmares, flashbacks, intrusive memories, hypervigilance, startle responses, concentration and memory difficulties, physic numbing and dissociation. His hopes for neurofeedback related primarily to reduction of stomach pain, improved sleep and an ability to control anger outbursts. After 46 sessions of neurofeedback and psychotherapy, Pablo is aiming for much more than that.
Pablo's stomach pain has been reduced from severe, intolerable pain to a mostly aggravating problem with digestion. His headaches are less intense and less frequent. He does not feel angry anymore so has no need to control angry outbursts and his general ability to tolerate stress has increased significantly. He is sleeping soundly at night and although he is still experiencing nightmares, he calls them "soft" nightmares, because they do not bother him as they used to. He has occasional flashbacks, but he is learning to use them to retrieve memory. They no longer kindle intense emotional reactivity. Instead, they seemed to be contained events, both psychologically and within his nervous system. He reports no episodes of dissociation or physic numbing. He is in the process of regaining his sexual function and improving his relationship with his wife. Although he welcomes all of these changes, Pablo feels the most important gain from neurofeedback has been his increased capacity to relate to other people and to enjoy his life.

His life is going on, bringing happy and sad moments for Pablo. He has been a member a cancer support group and just recently, he lost several close friends. Even in the face of these multiple losses, Pablo perceives himself feeling much better. Recently, he came to see me the day after one friend's funeral. While talking about it, Pablo told me that although he felt sad and very emotional, he also felt deeply connected with other people who were there sharing their grief

and distress. He told me that, for the first time, he became aware that he was no longer locked into his own past, that he was able to reach outside and see other people clearly and to share their pain. He said that he even felt a level of enjoyment, realising that the day was sunny and that the nature around him was beautiful. He described it in the following way: “I enjoyed living in the moment. I felt so contained looking at the green leaves of the tree where my friend was buried. I saw clearly all those people there, and I understood how they felt, just from looking at their faces. It was a deeply emotional experience to be able to reach outside of myself and feel connected”.

Conclusion

Post traumatic stress disorder makes multiple claims on the lives of those who suffer it. Although Pablo felt isolated in his distress, he is not at all alone. It is difficult to acquire reliable statistics on the incidence of PTSD worldwide but it is safe to assume that many millions of children and adults suffer from this devastating aftermath to traumatic events. Pablo’s case may open new ways of conceptualizing PTSD as well as new approaches to treatment.

This case illustrates several important considerations in the treatment of persistent post-traumatic stress disorder. The first and most apparent is the enhancement of recovery with neurofeedback training. Two kinds of training were employed, eyes open “beta/SMR” for stabilization of the sympathetic and parasympathetic systems and the dissolution of reactivity and fear, and deep state or alpha/theta training for retrieval of dissociated memories. Memories that had been implicit became explicit. These changes seem to have occurred as a result of appealing to the electrical domain of the brain through the EEG, conditioning the brain to make certain frequencies while inhibiting others and, perhaps in the process, changing the underlying neuronal patterns that were perpetuating fear and reactivity.

It is also the authors’ conclusion that although neurofeedback was essential, it was not sufficient. Neurofeedback seems to have made affect regulation, particularly the regulation of fear, possible. As Pablo gained regulation, he gained trust in the therapist and confidence in psychotherapy. It was the author’s experience that neurofeedback enhanced the therapeutic endeavour and that psychotherapy potentiated neurofeedback by helping Pablo recognize and incorporate the changes he was experiencing with the training. It is the authors’ belief that optimal treatment for those who have suffered severe trauma at any point in their lives, particularly victims of horrific torture, should include neurofeedback, primarily for affect regulation, and psychotherapy for interpersonal connection and integration of a new sense of self.

In order to be successful, psychotherapy requires that the client have a capacity to change and learn from experience. As we have seen, the persistent overarousal that is characteristic of chronic PSTD undermines flexibility and new

learning. It is next to impossible to change, learn and adapt when the brain's only priority is survival. Once the trauma survivor is freed from the grip of survival fear, real change can begin. The client and the therapist can then focus on processing traumatic events and integrating them into the client's life story, while helping him/her reconstruct a sense of self in an internal reality no longer organized by fear. The present is now open and waiting.

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