An Evaluation of the Effects of a Training Programme in Trauma Release Exercises on Quality of Life

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COMPULSORY DECLARATION:

This work has not been previously submitted in whole, or in part, for the award of any degree. It is my own work. Each significant contribution to, and quotation in, this dissertation from the work, or works, of other people has been attributed, and has been cited and referenced.

Signature:_____Date:_____

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ABSTRACT

This study investigated a unique body-based intervention, known as Trauma Releasing Exercises (TRE), which focuses on the neurophysiological residues of stress. TRE is unique in that it invokes neurogenic tremors, as a way to reduce stress and anxiety, and thus improve quality of life (QoL).

Neurogenic tremors are hypothesised to be an innate adaptive mechanism by which the human organism can restore homeostasis. Berceli (2007), the originator of this technique, argues that these tremors originate in the autonomic, limbic and brainstem circuitry, and are instinctively activated in response to experiences of stress and trauma. Berceli (2008) suggests that neurogenic tremors can also be activated therapeutically to discharge an incomplete or dysregulated stress response.

In April, 2010, Berceli conducted the *Introductory Level 1 TRE Training Course* for the first time in South Africa. He returned in September, 2010, and repeated the Course. Fifty participants (8 males and 42 females) attending this four day Course completed three QoL self-report measures before and after the Course, to explore changes in QoL and in anxiety specifically. A main effect for the Course on pre-post scores emerged, and subsequent analyses revealed that this occurred on the QoL variables anxiety and general well-being. No significant differences were established for the variables state anxiety, physical functioning or mental functioning.

While the results are to be interpreted with caution, due to the nature of the study design, there is some evidence to support the ability of TRE and neurogenic tremors to reduce stress and anxiety and improve QoL. However, it remains for future research to delineate the neurological substrate and the potential therapeutic benefits of neurogenic tremors.

INTRODUCTION

The therapeutic value of neurogenic tremors (claimed to be an innate survival mechanism) is an emerging concept, in its research infancy, with no research to date conducted in South Africa. Consequently this is a pilot study, which serves to test this concept on a South African sample. The researcher investigated a unique exercise routine, known as Trauma Release Exercises (TRE), which invokes neurogenic tremors, as a way to reduce stress and anxiety, and thus improve quality of life (QoL).

It has been hypothesised that neurogenic tremors are an innate adaptive mechanism by which the human organism can restore homeostasis (Berceli, 2007). Neurogenic tremors are described by Levine (1997) as the natural, reflexive and vibratory action of muscles in response to stressors and are a function of the autonomic nervous system (ANS). They originate in the sympathetic nervous system (SNS) and if activated help discharge the pent up energy in the SNS in order to restore parasympathetic nervous system (PNS) functioning and calm, once the stressful situation or stressor has abated.

TRE induces the neurogenic tremors and thus represents a unique intervention for autonomic recovery from stress. TRE is designed and taught globally by Dr David Berceli as a four-day training course. The course is publicized as a stress reduction and prevention programme, teaching a self-help, body-based technique to gently relax the stress patterns embedded in the body. The physiological changes then provide a 'knock-on' effect to psychological processes inferring a mind-body approach. The aim of the Course is simply to learn, practice and understand the technique, experience the neurogenic tremors, and to become equipped to use this self-help technique on an on-going basis, to reduce stress and anxiety, thereby improving QoL. Furthermore, Berceli is a traumatologist, and has used this technique globally, to help survivors of natural disasters and war, to overcome symptoms of Post Traumatic Stress Disorder (PTSD). In fact, it was as a result of his time spent working as a catholic missionary in war-torn parts of the world, that he came to devise this technique, as well as further his career in traumatology.

The researcher investigated TRE and neurogenic tremors, by gathering data from participants on a four-day, *Introductory Level 1 TRE Training Course.* Three QoL self-report measures

were used to compare perceived levels of anxiety and QoL before and after the Course, and to demonstrate the effectiveness of TRE to reduce anxiety and improve QoL.

Stress and Anxiety Impact on Quality of Life

Stress is ubiquitous in life. It exists along a continuum of events that may be experienced as mild to the more severe and extremely traumatic, as well as being brief or continuous. It is a highly complex process involving two components: firstly, stressors are non-specific, but can either be perceived exteroceptively (i.e., sensed in the environment) or interoceptively (i.e., sensed in the body). Secondly, regardless of the type, stressors are always perceived as endangering to an individual's physical or psychological well-being, and activate the body's natural physiological stress response, the fight-or-flight-or-freeze response (Selye, 1956).

The stress response is an innate survival mechanism, associated with specific brain circuits and neurotransmitter systems, originating in the brainstem and limbic system, and involving the integrated functioning of all systems in the body, coordinated by the ANS (Mayer, 2000). All the systems in the body work to maintain homeostasis, by reacting to all stimuli, both external and internal, and integrating the information into all the adaptive systems of the body, namely the brain and nervous system, endocrine, and immune systems, which produce this steady internal state (Scaer, 2005).

Stress disrupts the homeostatic balance of the human organism. The physiological response is activated and sustained by the ANS, and sets off a cascade of emotional, cognitive and behavioural responses, in order to restore homeostasis (Scaer, 2005). Thus the symptoms of stress manifest across the entire mind-body continuum and are underpinned by neurobiological processes that mostly remain outside of conscious awareness. Anxiety is often the emotional response to a stressor, with concomitant cognitive and behavioural responses such as excessive worry and avoidance, respectively (Barlow & Durand, 2005).

Selye (1956) points out that many common diseases are caused by errors in an individual's adaptive stress response, rather than as a direct result of damage by germs, poisons or other external agents. In other words, wide arrays of both psychological and physical illnesses are essentially diseases of adaptation, and perpetuate the disruption of homeostasis.

Scaer (2005) regards these diseases of adaptation along the continuum from stress to trauma, underpinned by the variations in the activation and potential malfunctioning of the ANS and the Hypothalamus-Pituitary-Adrenal (HPA) axis. Thus stress-related diseases tend to be connected with sympathetic arousal of the ANS, as low grade fight or flight, while trauma-related diseases are more associated with the parasympathetic freeze response. On this basis, stress can become traumatic, but only if it occurs in the face of perceived helplessness or a lack of control, and especially if features of the stressful experience contain cues related to early life trauma. Yet, most researchers and practitioners tend to refer to the entire spectrum of syndromes as being psychosomatic in nature (Scaer, 2005).

In sum, we are evolutionarily hard-wired to respond to all threats or danger via the flight-fight-or-freeze response. Foreshaw (2002) highlights that while essential for survival, the paradox of the stress response is that it is only adaptive and protective as an acute reaction to a potentially harmful situation. However, it becomes fatal to an individual's psychological and physical survival as it develops into chronic long-term stress or trauma.

Neurological Substrate of the Stress Response and the link to Emotions

While there are multiple determinants of stress-induced psychopathology, the focus of this study is on the automatic, neurophysiological and interoceptively driven aspects of the stress response, which when disrupted or damaged result in unconscious and involuntary changes in the mind and body, having severe implications for a person's sense of self and ability to regulate emotions.

According to Mayer (2000), the stress response is generated by a network of integrated, subcortical-based brain structures, collectively referred to as the Emotional Motor System or the Limbic System. This stress circuitry is activated in response to stressors and is mediated by the ANS and the HPA axis, which are initiated and controlled by the hypothalamus.

Wheatley-Crosbie (2006) describes the ANS as being responsible for overseeing and controlling organ and metabolic functions to maintain homeostasis, and the hypothalamus as being involved in the regulation of emotions and behaviour. More specifically, the hypothalamus is responsible for activating the HPA axis (the brain-endocrine system), which triggers the release of stress hormones from the hypothalamus, pituitary and adrenal glands,

and transports them to all the major regulatory systems of the body. As such, the HPA axis is the quintessential link between the autonomic, endocrine and immune systems, as well as the neuropeptide network.

The stress hormone, cortisol, is responsible for harnessing all systems to resist, tolerate and manage stress in the short-term, but Scaer (2005) points out that this comes at the cost of homeostasis. Thus, in the case of prolonged exposure to both stress and high levels of cortisol, the body changes set off a chain reaction that results in the diseases of adaptation referred to earlier. High cortisol levels also suppress the immune system, rendering the stressed individual susceptible to infection and physical illness, while the increased arousal and the disruption of normal hormone balance affects mental and emotional functioning.

The problem rests with the inability of an individual to switch off the HPA axis. The HPA axis remains switched on, keeping the body in a chronic state of preparedness for any potential future danger, resulting in dysregulated physical, mental and emotional states. As stated by Solms and Turnbull (2002), this involuntary and unconscious visceral information forms the basis of our basic instincts or 'drives'. Perception of this visceral information is consciously registered as feelings of emotion and as reminiscences, while the motor aspect involves the use of this visceral information to influence external action, in the form of stereotyped and automatic motor patterns. This represents the underpinnings of a conditioned stress response, which results in a repetition-compulsion cycle of behaviour, fuelled by the on-going excitation of the ANS, and which is very difficult to extinguish (Scaer, 2005). The connection between physiology and emotions is undeniable, in that emotions also have a survival imperative. Solms and Turnbull (2002) further describe how emotions represent an internally directed perceptual modality, which provides information regarding the current state of the bodily self (interoception), informing goal-directed actions to meet our needs in the external world. While one can attempt to suppress one's emotions, in order to inhibit the stress response, this represents conscious frontal lobe activity, which has no bearing on the unconscious stress response in the subcortical limbic system and brainstem. The HPA axis will still not switch off.

Scaer (2005), and Solms and Turnbull (2002) agree that procedural memory, a kind of bodily memory, is also hard-wired in the subcortical brain. It stores memories of automatic,

unconscious and habitual behaviours learned through conditioning. As such, it is also implicated in the conditioning of the stress response. The unconscious body sensations that a person experiences in a life-threatening situation, together with the patterns of movement in the muscles in response to the threat become permanent procedural memories (i.e., the motor aspect of the limbic system). These memories are consistent, accurate and resistant to decay, adding to the difficulty of extinguishing the HPA axis, and maintaining the repetition-compulsion cycle of behaviour.

Consequently, the HPA axis cannot be consciously deactivated. It is this disparity between conscious control of the cortex and the unconscious control of the limbic system, which needs to be addressed, highlighting the possible therapeutic benefits of body-based interventions such as TRE compared to cognitive-based talk therapy approaches.

Scaer (2005) suggests two types of neuroplasticity, namely neurosensitisation and kindling, which may be responsible for the creation and maintenance of the repetition-compulsion cycle. Neurosensitisation causes heightened sensitivity to external stimulation, as well as a heightened sensitivity to internal cues, while kindling is the process whereby sensitivity to internal cues takes place, even in the absence of external cues, resulting in continual reactivation of the nervous system.

These issues are underpinned by theories of brain function and neuroplasticity, relating specifically to the distinction between unconscious, subcortical and state-dependent circuits, and the conscious, cortical channel-dependent circuits. A discussion of these concepts follows from an evolutionary perspective.

Evolution-based Learning Mechanisms as part of the Stress Response

Evolutionary theories are useful for the understanding of core structures and mechanisms that are innate and shared by all mammalian species, with positive implications for everyday clinical practice. Most importantly evolutionary theories attempt to isolate ultimate (ancestral and genetic) factors to explain the adaptive function of a psychological mechanism or pattern of behaviour, from the more recent proximate factors which explain the nature of the causal mechanisms underpinning the adaptive function and account for individual differences of activation (Siegert & Ward, 2007).

Of particular interest to this study are the evolution-based learning mechanisms which are useful for the understanding of the basis of abnormal behaviour. From this perspective, it is argued by Timberlake (2007), that learning has also evolved as a function of the structure and processes that ensure survival and adaptation. This is particularly evident in the conditioning of defensive reactions such as fear, panic or rage, which produce stereotypical reactions to situations of threat or danger. Weiss, Sitcoske-O'Shea and Post (2000) suggest that this ability of hard-wired and innate systems to 'learn' or become conditioned is due to their plasticity. Plasticity is experience-induced learning, and it can take place in many and complex ways (e.g. via habituation, conditioning, sensitisation, and kindling) to change the efficacy of neuronal communication and ultimately causes long-term alterations in gene expressions (Weiss et al., 2000).

Panksepp's (2006) classification of seven innate emotional-command systems, together with neuroscientific studies elucidating the principles of neuroplasticity offer explanations of how these mechanisms can be influenced and changed to become either adaptive or maladaptive, as illustrated by LeDoux's (2002) synaptic theory of self, and studies of the conditioned fear response.

Panksepp (2006) contends that there are sufficient links between certain adaptive emotional tendencies and specific neural circuits across all mammalian species, making them useful targets for further study of the neurobiology of emotion. These emotion systems are hard-wired neurobiological circuits in the subcortical brain, and when activated set in motion pre-programmed and automatic physiological, psychological and behavioural output routines, which have been conserved by evolution due to their superior survival value (Solms & Turnbull, 2002). Furthermore, there is already a large body of evidence (mostly from animal studies) demonstrating how these systems may engender psychiatric distress and specific related psychiatric disorders when activation is excessive or imbalanced (Panksepp, 2006).

The emotion system of fear, when aroused is similar across all mammalian species, and is the most intensely researched of the seven systems. It also relates most directly to the emotional state of anxiety, and related anxiety disorders. It is theorised by authors Panksepp (2006) and Solms and Turnbull (2002), that when this system becomes imbalanced due to stressors,

the following cascade of outputs are activated: physiologically, fear is activated in response to danger, and provokes freezing at low levels of arousal and flight at higher levels; behaviourally, running or hiding may result; emergent emotions or feelings may include fear, anxiety, worry, psychic trauma; and finally psychiatric disorders such as generalised anxiety disorder, phobias and PTSD may develop. In other words a combination of both internal visceral changes and externally manifested behaviours, driven by strong emotions ensue.

As already mentioned, there has been success with animal studies, however there is still difficulty finding parallels in human studies. Panksepp (2006) clarifies that the lag in human studies relates specifically to the lack of current scanning technology to access subcortical areas of the brain, as well as any direct physiological measures of emotion systems, making it necessary to rely on the subjective use of self-report measures to determine such mood states as anxiety. Additionally, by virtue of the fact that the neocortex tends to inhibit emotionality, the problem arises that individuals will not act out these instinctual emotion systems. Thus it can only be postulated that they will experience a milder arousal of the system, and that despite a lack of action, these systems will still be activated and thus influence how a person feels.

Panksepp (2003) argues for the scientific value of distinguishing between affective and cognitive processes, based on the distinction between subcortical and cortical brain functions. His model of instinctual emotion-command systems represents a universal capacity of brains across all mammalian species, to provide the evolutionary basis for emotional and motivational processes. Solms and Turnbull (2002) provide the theoretical explanation for these two types of processes. Homeostatic and visceral interoceptive information is generated subcortically to provide information about the current state of the bodily self, and is referred to as state-dependent functions of the brain. These systems operate in a more widespread or global manner to reflect changes in the state of the human organism as a whole. By contrast cognitive processes are anatomically and neurophysiologically distinct, involving exteroceptive sensory systems, and higher cognitive functions of the neocortex, to provide information about the external world. These exteroceptive processes are highly specific, with each of the five senses being channelled on five distinct pathways, and are referred to as channel-dependent functions of the brain.

Panksepp (2003) believes that a focus on these state-dependent functions of the brain may be more successful in terms of potential therapeutic applications compared to the study of the exteroceptive channel-based functions. LeDoux's (2002) synaptic theory of self helps clarify why this may be plausible by way of the plastic nature of neurophysiological circuits.

LeDoux's (2002) synaptic theory of self elucidates how in essence, who a person is, is reflected in the patterns of interconnectivity between neurons in the brain. Synapses connect the neurons, and ensure all brain function. Specifically, synaptic transmission is responsible for all information flow and storage in the brain, as well as retrieval of all information encoded by past synaptic transmission. Thus the synapses participate in every emotion, thought or act that we experience to bring about the processing of every aspect of our being. However due to the plastic nature of these connections they are easily disrupted – as is the case with experiences of stress or trauma.

These changes in connectivity represent the disruption of interoceptive or exteroceptive processes, and it is argued that disruptions in interoceptive processes are far more devastating, locking the brain in an aroused state, which if not reversed could potentially result in psychiatric disorders. LeDoux (2002) argues that one of the ways in which plasticity is induced is by emotional states. Simply stated, "emotional states monopolise brain resources" (p. 320). Moreover, this capacity is due to the fact that interoceptive processes are influenced by chemicals (such as hormones) other than neurotransmitters which cross the blood-brain barrier, and thus link the brain directly with the body (Solms & Turnbull, 2002).

Studies of fear conditioning and memory in relation to the amygdala are numerous and have great potential to provide the necessary understanding for the relationship between synaptic plasticity and learning. The amygdala projects widely to both subcortical and cortical structures, and is thus implicated in both emotional and cognitive processing. Phelps and LeDoux (2005) provide an extensive review of the contributions from both human and animal research on the ability of the amygdala to influence attention and perception, by enabling the preferential processing of emotional and potentially threatening information, to ensure survival.

LeDoux's (2002) work on fear conditioning has been well recognised and is particularly useful in elucidating the ability of state-dependent, emotional systems, to override cortical inhibitory functions effecting decision-making, and memory function. He provides a useful model for the plastic supremacy of implicit systems over explicit systems: in the face of danger, interoceptive information creates emotional arousal via a subcortical 'quick and dirty' pathway from the amygdala to a subcortical structure known as the Periaqueductal Grey, to allow for quick, instinctive reactions. Concomitantly, a second, slower pathway is activated between the amygdala and the prefrontal cortex, which may allow for the inhibition of the instinctive fear response, but will not shut down the subcortical driven emotional arousal, fuelled by visceral sensations.

This literature supports the importance of visceral sensations and associated emotions as being crucial to survival and well-being. By inference, interventions that impact positively on the unconscious aspects of bodily sensations that feed affective processes and ultimately determine general state of emotional arousal, offer potential ways to manipulate the plasticity of brain-body processes in order to better regulate emotions and motivate behaviour.

A Biopsychosocial Model of Stress and Anxiety

The mind-body connection and its reciprocal relationship with the environment are in strong evidence in relation to the effects of stress. The fine line between an adaptive and maladaptive stress response will be determined by a highly complex relationship between nature, number and persistence of stressors, an individual's biological vulnerability (including genetic and constitutional factors), psychosocial resources, and learned patterns of coping (Schneiderman, Ironson, & Siegel, 2005). A broad range of studies follows, with each offering interesting insights and findings to demonstrate this complexity.

Boyce and Ellis (2005) elucidate the evolutionary basis of the stress response and how this genotypic response can give rise to multiple and varying phenotypic responses. This provides the explanation for individual differences in reactivity, as genes and environmental factors combine, such that the worse the conditions the higher the reactivity to emerge, and the more sensitive the system becomes when challenged by subsequent adversities.

As previously mentioned, these symptoms span the mind-body continuum, manifesting physiologically, emotionally, cognitively and behaviourally. As illustrated by Nolen-Hoeksema (2008) physiological or somatic symptoms include, for example, muscle tension, increased heart rate and any other sympathetic nervous system activated bodily functions. Emotional symptoms are expressed as anxiety, fear, dread or irritability. Cognitive symptoms include hypervigilance, unrealistic worries, or a fear of loss of control, and finally behavioural symptoms include escape, avoidance, aggression or freezing.

Impairment of our natural physiological stress response can lead to severe anxiety and mental illness, and in fact anxiety is a prominent feature of many psychological disorders (Nolen-Hoeksema, 2008). Mogotsi, Kaminer and Stein (2000) indicate that anxiety disorders are the most prevalent of all the psychiatric illnesses. Additionally, the physiological and behavioural symptoms of anxiety are the very manifestations of the body's natural stress response, although they have reached unrealistic proportions, and it is these symptoms that also need attention (Nolen-Hoeksema, 2008).

Schneiderman et al. (2005) spotlight the devastation of exposure to intense and chronic stressors during the childhood developmental years and in adulthood. In childhood, the long-lasting neurobiological effects puts individuals at increased risk of anxiety and mood disorders, aggressive dyscontrol problems, hypo-immune dysfunction, structural changes in the central nervous system, and early death. While exposure to extreme stressors during adulthood leads to disorders such as PTSD and acute stress disorder, but has also been concurrently associated with other anxiety disorders (generalised anxiety disorder or panic disorder for example), depression, cognitive impairment, substance abuse, accidents, eating disorders, sleep problems and smoking.

Research into the effects of exposure to traumatic stress on brain function also elucidates some important issues that emphasise the need to address physiological aspects of stress and trauma. Van der Kolk (2006) examines the notion of how reminders of the past in PTSD sufferers automatically activate certain neurobiological responses, which are subcortically initiated, irrational, irrelevant and even harmful in the present. He argues that these responses represent somatic and behavioural residues from the past, which when re-enacted in the present seem out of place and bizarre. Scaer (2005) and Berceli (2008) refer to this

activity as a repetition compulsion cycle of behaviour, as the individual perpetually seeks to complete what was originally a failed attempt to effectively respond to threat. Instead of producing the fight or flight response, the individual freezes or becomes immobilized. This becomes a conditioned response that is very difficult to extinguish, and over which an individual has no conscious control (Van der Kolk, 2006).

Likewise, findings demonstrate activation of subcortical brain regions that support intense emotions, while decreasing activity in higher cortical brain structures responsible for the inhibition of emotions and the translation of experience into communicable language (Van der Kolk, 2006). This speaks to the notion of evolutionary hard-wired subcortical emotion circuits that automatically and unconsciously activate distinct action tendencies, which override top-down executive brain functions discussed earlier, thus suggesting that emotional arousal has across-the-board consequences for information processing in the brain, and ultimately the types of treatment that may be effective.

Finally, Mehling et al. (2009) review the perspectives on the mind-body continuum, or the embodied self, to support the idea that body awareness, involving both physical sensations and emotions, is key to the regulation of affect, and thus to the sense of self. As such, it has been suggested that the improvement of body awareness to treat such anxiety disorders as PTSD may have potential clinical benefits. However, they agree that more research is needed to study the sensory processes of interoception and proprioception, to clarify their neural basis.

The above literature, although very diverse, offers support for the idea that the impact of the stress response necessitates the inclusion of the physiological and evolutionary aspects of the human species, in order to deal with individuals as embodied beings, embedded in the world. Human beings have an inherited biological and neurological substrate, the likes of which are heavily dependent on, and determined by an individual's physical and emotional experiences of their environments (Solms & Turnbull, 2002). This speaks to a strong mind-body connection and the plasticity of our neurobiological circuits, which are hard-wired, but modifiable through learning and experience throughout the lifespan (Blakeslee & Blakeslee, 2007).

It follows then that the concept of neuroplasticity provides a plausible argument for the expansion of techniques to include body-based interventions in psychological practice. Pallanti (2008) is adamant that therapeutic interventions that harness the neuroplastic capacity of the brain are the way of the future. However, it remains for the requisite technological advances and further research to uncover the exact mechanisms to be targeted in order to effect brain modulation both functionally and structurally.

Treatment Implications for Stress and Anxiety

While a range of treatments are available to treat stress-induced psychopathology, the problem is around access to these services, as well as the economic viability, and cultural appropriateness of said interventions. Interventions by psychologists tend to be focused on the cognitive and emotional aspects of stress and anxiety, and are epitomised by the 'talking cure'.

From a sociocultural perspective, talk therapy may be an implausible and ineffective treatment option for many people, especially if they come from a non-western culture. For example, in some cultures psychological distress, such as anxiety, is more readily communicated as bodily symptoms of pain, poor sleeping, stomach aches, tight chest or headaches, while in others, cultural taboos may prohibit discussion of personal problems outside of the family or community context (Nolen-Hoeksema, 2008). In the case of trauma, Bracken (2002) argues that the current cognitive approach to processing trauma is not valid in other cultures and in low-income contexts. As such, he supports the idea for a radical paradigm shift in the area of mental health.

Although psychologists acknowledge the concept of an "embodied self", as well as the fact that stress and anxiety have a neurophysiological substrate, they lack techniques to deal with the body. When the stress response becomes imbalanced or damaged this sets in motion a vicious repetition compulsion cycle of unconscious, involuntary and instinctual neurophysiological processes which remain 'activated'. According to Berceli (Lecture notes, April 18, 2010) despite cognitive, emotional, or interpersonal manifestations of stress, it is first and foremost an instinctive physiological response, and it stays in the body in the form of deep chronic patterns of muscle tension, together with a dysregulated ANS, if untreated.

The only universally experienced aspect of stress and trauma is the neurophysiological aspect.

From a neuroscientific perspective it is argued that affective processes and emotions arise from the more evolutionary ancient subcortical areas of the brain (specifically the limbic system), and as such are not directly accessed by way of talk therapies. According to LeDoux (2002) talk therapies which require insight, activate the executive functions of the evolutionary younger cortical areas of the brain (specifically the prefrontal cortex) in order to execute action plans. This includes top-down processes to inhibit subcortical instinctive processes, but this does not result in the shutting down of these subcortical based systems or the re-wiring of them. Impairment results, with either the overwhelming of the cortical functions, thwarting inhibitory processes, or the overactivation of cortical processes, causing the suppression of physiological sensations and emotions (Solms & Turnbull, 2002).

Berceli (2008) proposes that TRE represents a viable alternative and/or adjunct to the talking cure, and may redress the potential problems highlighted with regard to the accessibility and applicability of such a treatment for stress-induced psychopathology. This body-based intervention targets the subcortical neurophysiological processes of the limbic system, making it universally and thus multi-culturally appropriate. There is also no need to actually talk about the stressful issue or problem, and once an individual has learned the technique, it can be used as a self-help technique, making it cost-effective. Furthermore it offers both short-term and long-term recovery benefits. The release of specific deep chronic tension patterns in the body provides immediate relief, while the on-going use of the technique could enhance one's resilience to cope with future stresses and traumas.

TRE: Exercising to induce Tremors

Berceli (2007) situates his technique within the theoretical framework of evolutionary adaptation, and draws on research from various disciplines including biology, neurophysiology, cognitive neuroscience, somatic psychology, and traumatology to put forward a basic physiological rationale for recovery by way of his body-based intervention. He argues for a return to focus on the innate survival mechanisms of the human species, and how these have gone awry. Together with Levine (1997) and Scaer (2005), Berceli (2007) is adamant that tremoring is in fact an innate and adaptive mechanism which humans share with

other mammals in the wild. It is firmly believed that if this mechanism has survived evolution, it must have adaptive and survival benefits, and thus should be harnessed to bring about innate healing. (The mechanisms underpinning these neurogenic tremors will be elaborated on, in the following section, "Neurogenic Tremors".)

TRE is a very simple exercise technique designed to fatigue a specific group of muscles known as the flexor muscles. Koch (1997) describes in detail the chief flexor muscle, the illiopsoas, which is our core muscle. There are two psoas muscles, one attaching on either side of the lumbar spine, linking ribcage and trunk with the legs, by passing through the pelvis, over the hip joint, and attaching on the inner side of each femur. This core muscle is responsible for posture, directly affects range, movement and rotation of the pelvis and legs, as well as our ability to breath. It is richly supplied by nerve fibres of the somatic and autonomic nervous systems, and thus responds to and is affected by both visceral (organ) and skeletal systems.

Scaer (2005) concurs that the healthy functioning of the psoas muscle is tantamount to overall health and vitality of an individual, as well as one's ability to cope with and adapt to stress. By virtue of its unifying function it is implicated in the fight, flight, or freeze response. In the face of danger all internal systems (skeletal and visceral) work in unison to prepare for action. The role of the psoas is to contract, bringing the extremities of the individual together, into the foetal position, to protect all vulnerable parts (genitals, vital organs, head, eyes, ears, nose, and mouth). This contraction is referred to as 'flexor withdrawal'.

Koch (1997) further explains that under optimum functioning conditions, once the stress response has completed itself, the body should be able to restore homeostasis, and return to a state of relaxation, with all muscles lengthening and relaxing. However, Levine (1997) highlights that this is often not the case, due to a maladaptive conditioning of the stress response, either due to repeated firing with little opportunity for recovery, and/or an inability to complete the process. As a result a conditioned response is set in motion that maintains the body in a state of tension, which accumulates over time and creates anxiety.

Thus fear is lodged in the body (as muscular tension patterns) and is fuelled by the actual nerve excitation or arousal of the ANS which radiates to all organs, and which is not fully

discharged (Scaer, 2005). It follows that this nervous energy is the root cause of maladaptive functioning at all levels - the physiological, psychological, emotional and behavioural - as an individual gets trapped in a repetition-compulsion cycle of behaviour, in the desperate attempt to complete the process and restore safety and calm. (See the previous discussion of the limbic system, ANS and HPA axis) (Levine, 1997).

Berceli (2008) suggests that the only solution is to discharge the residual energy trapped in the ANS. This is literally achieved by shaking it out, and thereby releasing the psoas. This release is in fact the spontaneous activation of the tremors, and represents a restorative mechanism, which can be induced with TRE.

TRE is subject to copyright and consequently cannot be described here. However, photographic images of TRE may be found in the book, *The Revolutionary Trauma Release Process. Transcend Your Toughest Times,* and on the DVD, *Trauma Releasing Exercises.* Suffice it to say that TRE is a routine of seven simple exercises which, when followed, fatigue the flexor muscles and evoke neurogenic tremors, separate to the actual exercises themselves. This is an important distinction to note, as while exercising per se can be argued to reduce stress, with TRE, it is specifically the added experience of neurogenic tremors that qualifies this routine in its uniqueness. This important distinction is expanded on below.

Neurogenic Tremors: A Restorative Mechanism

Berceli (2008) maintains that the neurogenic tremors originating in the limbic, autonomic, and brainstem circuitry, are activated in response to experiences of stress and trauma. As such they are responsible for discharging pent up energy that is mobilised by the sympathetic division of the ANS, thus allowing for the completion of the fight, flight or freeze response, as well as releasing deep patterns of muscle tension, and a return to relaxation. This speaks to the potential of the neurogenic tremors to modify visceral sensations and interoceptive information processes. The knock-on synaptic effect implies the ability to alter physical and emotional states of arousal, which in turn will alter higher executive functions.

Levine (1997) and Scaer (2005) hypothesise that trembling is an innate restorative mechanism. Based on studies of animals in the wild, they argue that somatic trembling is a natural response to a shocked or disrupted nervous system, and it is activated in an attempt to

restore homeostasis of the body. Levine (1997) further argues that this somatic trembling is quite common to all mammalian species, including humans, but that western society has 'socialised' these tremors out of us, fuelled by the egocentric perception of trembling as being a sign of lack of control and therefore undesirable. This also ties in with the western approach to treatment with talk therapies referred to earlier - the focus being ultimately on strengthening the cortical pathways for improved downward causation to inhibit inappropriate and/or undesirable emotions and behaviour (D. Berceli, lecture notes, April 18, 2010).

Berceli (2008) has been using this technique world-wide over the past fifteen years in his capacity as a traumatologist. While he has gathered an extensive body of anecdotal evidence, there is currently no peer reviewed research to confirm his claims, with the exception of his doctoral dissertation, submitted to Arizona State University. The relationship between stress and exercise is well-documented, and as TRE is essentially an exercise technique, a review of current findings follows.

Exercise Research

Exercise is capable of counteracting the effects of stress and anxiety and is thus an important determinant of quality of life. There is no shortage of research documenting the benefits of exercise to achieve physical wellbeing, however research is less clear about the link between exercise and improved mental well-being, only providing support for the potential benefits (Schomer & Drake, 2001).

Stein, Collins, Daniels, Noakes and Zigmond (2007) report a growing interest in central nervous system mechanisms underlying the positive effects of exercise on brain function and cognitive-effective performance, implicating neurotrophic, neuroendocrine, neuropeptide and neurotransmitter systems specifically. Furthermore they specify an increase in clinical evidence of the use of exercise to prevent and treat psychopathology as well as enhance resilience, in the form of attenuated responses to stress.

Other neurobiological studies of exercise provide strong evidence of the favourable influence of exercise on brain plasticity, by facilitating neurogenerative, neuroadaptive, and neuroprotective processes (Dishman et al., 2006). In short, exercise has the ability to

influence both form and function of the central and peripheral nervous system, and although these mechanisms are not fully understood and in need of further study, there is agreement that they seem likely to play a crucial role in mediating these effects.

As already mentioned, no studies have focused on exercises to induce tremors. Berceli (2008) points out that typical exercise is limited in its efficacy, as without the tremors to activate the release of the psoas muscles and to engage the ANS directly, release of muscular tension remains at best surface or superficial in nature. This speaks to the quintessential difference between typical exercise and Berceli's technique. Typical exercise requires the functioning of the cortex to coordinate movement and execution. TRE requires this involvement of the cortex to begin with, when performing the exercise routine, but is directed at activating the brainstem and limbic system, from where the tremors originate. The essential premise is that the tremors bypass the thinking cortex, and work within the subcortical, unconscious and involuntary systems of the brain. Thus he argues that one does not require conscious control or awareness in order to access and modulate the stress response mechanism.

Implications of TRE and Neurogenic Tremors

To reiterate: One of the basic tenets of cognitive neuroscience - which states that "(e)xperience changes the brain" (Lillienfeld & O'Donohue, 2007) - is key to this technique and argument, and has extensive applicability to all clinical contexts and therapeutic interventions. It follows that all the levels of complexity are understood to be intertwined in reciprocal chains of causation, such that if an intervention succeeds in producing therapeutic change at any one of the levels, then there is the potential for a ripple effect, to generate corresponding effects across the adjacent levels (Ilardi, Rand & Karwoski, 2007).

If information about the internal state of the body is the basis for an awareness of the physical self, and ultimately the sentient self, as perceived by our emotions; and if the state of the body can be altered via changes in neural connections (specifically to a state of rest and relaxation) then the information regarding the internal state of the body will change, and thus provide a different awareness of self which in turn will impact on thoughts and feelings.

It stands to reason that physiological interventions such as the tremor technique can capitalise on the natural inbuilt mechanisms of survival, to soothe the ANS, and restore SNS and PNS cycles to within an optimal range of fluctuation. Weaver (2001) posits that the ANS is the gatekeeper of the subconscious mind, and as such its healthy functioning is vital to our emotional life. A well-regulated body will in turn improve regulation of emotions and thoughts - in other words, reducing stress and anxiety, and thus building resilience to cope more effectively with future stressors. Furthermore, emotion systems are said to coordinate learning, so the broader the range of emotions experienced, the broader the emotional range of the self. In neurological terms, LeDoux (2002) postulates that "you are your synapses" (p.322) - the self or the personality is highly susceptible to change as a result of experiences that alter neural connections, specifically if interoceptive in nature.

The maladaptive functioning of the stress response as a result of experiences of stress and trauma has concomitant physiological, psychological and emotional consequences, all of which can also be conceptualised as impacting on a person's general health and well-being, or quality of life. This relates to the issue of how this study draws on the specific concept of QoL to explore the possibility of TRE to impact on the mind-body continuum to reduce stress and anxiety, and thereby improve general well-being.

Quality of Life

Quality of Life (QoL) as a concept provides measurable markers of health and well-being status. Measurement is via self-report and has been widely used in studies to evaluate treatment programmes for general health problems as well as psychiatric illness (Magotsi, Kaminer & Stein, 2000). It is further argued that these measures of QoL are highly informative and have significant bearing on the success or failure of intervention outcomes (Gladman, 1998).

According to Boehmer and Luszczynska (2006) the definition of QoL and its measurement are not formally or universally agreed upon. This results in the many and varied quantifiable markers (of health and well-being status), which tap into various dimensions of functioning, such as physical, psychological, social, and emotional functioning, distress levels, spirituality, and vitality, or the absence or presence of symptoms such as pain, anxiety or depression. Thus QoL measures do not comprise a homogenous set of items, but there is much overlap or

commonality to provide an objective framework for the measure of subjective experience of functioning and general well-being (Boehmer & Luszczynska, 2006).

This multidimensional concept provides a more holistic perspective on health or well-being than the traditional medical model, which tends to focus on the causality of health problems and their specific symptoms. Furthermore, as the format of measurement is self-report, the focus is shifted to evaluating the potential benefit or harmfulness of an intervention to address an individual's well-being from a subjective point of view, and in direct relation to individual contexts of day-to-day living (Bertella et al., 2007). This approach in turn eliminates observer bias, as regardless of what symptoms or illnesses have been diagnosed by a professional, the effectiveness of an intervention on overall well-being or QoL, needs to be evaluated first and foremost by the client. As Kohen, Burgess, Catalan and Lant (1998) mention, studies have shown that there is poor agreement between clinician and patient ratings of QoL, due to the fact that mood states (particularly anxiety and depression) impact on QoL self-reporting. Thus self-report measures provide objective indicators of a person's subjective experience, and it is these objective indicators that form the basis of this investigation, and which are derived directly from the dimensions and subscales of the self-report measures used in this study (to be described in detail in the Method Section).

The impetus for this focus on self-report and QoL, also relates to the fact that emotion is subjective but vitally connected to our physiology and sense of survival (Weaver, 2001). It represents a psychophysiological experience, and as such can be operationalized in both psychological and physiological terms. However, in this study the focus remains exclusively with the use of self-report measures to investigate experiences of well-being. The reasons for this will be elaborated on, in the following section, as well as in the Discussion Section.

Rationale for the Present Study and Specific Aims

This research is pertinent to the South African context by virtue of the fact that stress, trauma and anxiety are common features of daily life in South Africa. Furthermore, health and psychological care resources are often scarce and inaccessible. These implications in turn impact negatively on the quality of life experienced by the majority of the South African population.

South Africa is ranked as one of the most violent countries in the world, with an estimated 3.5 million people seeking healthcare for non-fatal injuries, yearly, of which half are as a result of violence (Seedat, Van Niekerk, Jewkes, Suffla & Ratele, 2009). Exposure to such violence in the form of murder, robbery, inter-gang violence, rape, intimate partner violence, and abuse and neglect during childhood, puts individuals at risk for serious health problems such as HIV, sexually transmitted infections, substance abuse, as well as mental disorders such as PTSD and suicidality. Additionally, stress and trauma are continuous, with the threat of future victimization a perpetual reality created by unavoidably dangerous living and/or working conditions (Kaminer & Eagle, 2010). These dire conditions have potentially disastrous and on-going consequences for both physical and psychological well-being, particularly when people are powerless, and have no choice but to return to these conditions immediately post trauma.

Against this backdrop of on-going stress and traumatisation, South Africans are in need of an intervention that can address multiple issues; ideally a simple, brief, cost-effective intervention that can transcend differences in language, culture and religion, as well as address both somatic and psychological correlates of stress and trauma. Berceli's technique proposes to be universal in its application making it potentially relevant to the multi-lingual and multi-cultural South African population.

In April, 2010, Dr David Berceli came to South Africa to teach TRE for the first time. This marked the beginning of training TRE practitioners in South Africa. He then returned in September 2010, to repeat his introductory course and to follow-up on the training of participants who attended the Course in April. This provided an opportunity to conduct a quasi-experiment in a real life setting, to investigate possible changes brought about by the Course. Dr Berceli was contacted prior to his arrival in South Africa, and agreed to allow a study such as this one to be conducted on the training.

This study represents a follow-up to Berceli's (2007) investigation, and is the first pilot study of TRE use in South Africa. However, Berceli's study could not be replicated or improved upon according to recommendations set out in his dissertation. The research design of the current study was constrained by practical issues such as time limitations, cost, and limited availability of trained TRE assistants, which in turn limited access to a relevant sample

population. In short the novelty of TRE and its too recent introduction to South Africa meant that a replication of the original investigation (Berceli, 2007) was beyond the resources of this study. Specifically, it was not possible for the researcher to conduct the study unaided, and trained practitioners could not be consistently available to assist.

The aim of the study is thus to explore a South African sample population's self-reported experience of TRE, in terms of its effectiveness to reduce physical stress in the body, as well as mentally and emotionally, with specific reference to the perception of anxiety levels, to give an overall sense of an improved quality of life.

The following hypotheses are examined:

- Participation in the four-day *Introductory Level 1 TRE Training Course*, including seven sessions of TRE, will lead to a reduction in anxiety, and an increase in QoL, as demonstrated by the quantifiable markers of physical, mental and emotional well-being.

- The continued practice of TRE at home, for four weeks after the Course, executed no less than three times per week, leads to a further reduction in anxiety, and a further increase in QoL.

METHOD

Design

This pilot study is quasi-experimental, involving a one-group pretest- posttest design. Originally, the study was designed to include two phases, but due to practical constraints (see below) only the first phase was feasible. In the absence of any research other than Berceli's (2007) original study, the protocols used in this study emerged as a result of combining aspects of Berceli's design with suggestions made by neuroscientist and TRE practitioner Dr Cassiani Ingoni, who accompanied and assisted Dr Berceli on his first visit to South Africa (R. Cassiani Ingoni, personal communication, April 18, 2010).

In the first phase of the study, scores on three self-report measures administered before and after participation in the Course were compared in order to demonstrate that participants report an overall improvement in the physical, psychological and emotional aspects of their well-being, with a specific focus on their anxiety levels. Thus, the intervention was the Course and the variables of interest were encapsulated by the overarching concept of QoL. These included the specific indicators of anxiety, a physical component of functioning, a mental component of functioning, and an emotional component of general well-being. These variables were derived specifically from the dimensions or subscales of three QoL self-report measures, and are represented by the pre-post means scores on these measures.

The second phase of study involved the administration of the three self-report measures on the group a third time, four weeks after the Course. This represented an attempt to create a longitudinal study of the single group, in the absence of a control group. However, this third set of scores has not been included for analysis, due to a poor response rate (to be explained in more detail in the discussion of participants and the procedure). Consequently, there is no second phase to this study, as originally planned.

Participants

Participants in this study included some but not all of the people who attended the Course. Participants were recruited by way of convenience sampling. Of the 74 people enrolled in the Course, 50 subjects (42 females, 8 males) participated in this study, ranging in age from 21 to 70 years. They were very diverse in terms of their professions and their reasons (a

combination of both personal and professional) for attending the Course. The demographic 'race' cannot be commented on, as many participants took offence to the question and either left it out or answered "South African".

The remaining 24 people on the Course did not participate in the study for several reasons. Some people declined at the outset, some arrived late and so were not eligible to participate, and some did not complete the self-report measures after the Course, and so were excluded from the study.

With reference to the original plan for the second phase of the study, of the initial 50 participants, only 18 subjects responded to the email request four weeks after the Course, to fill out the self-report measures a third time. It is thus due to the poor response rate, that this second phase of the study was excluded from analysis.

Measures

The three self-report measures used in this study are a combination of two generic QoL measures, these being the 36-Items Short Form Health Survey (SF-36), and the Psychological General Well-Being Index (PGWBI), and a condition-specific measure, the State-Trait Anxiety Inventory State Version only (STAI Form Y-1). According to Matza, Boye and Yurgin (2007), a combination of both generic and condition-specific measures is highly recommended for a more comprehensive approach to evaluative research. Each type has its own advantages; the generic evaluates overall functioning and allows comparison across populations in terms of the general impact of an intervention, while the condition-specific measures and demonstrates greater responsiveness to change in relation to more specific functioning. In this particular study, the SF-36 compares physical and mental functioning of individuals, while the PGWBI compares the overall psychological or emotional dimension of functioning of individuals, and the STAI Form Y-1 scores represent a measure of the level of anxiety present in individuals. The Cronbach Alpha coefficients were calculated to determine the reliability of the three self-report measures used in this study, and are reported individually at the end of the discussion of each measure.

The State-Trait Anxiety Inventory State Version only.

Spielberger's State-Trait Anxiety Inventory (STAI) (Gros, Antony, Simms & McCabe, 2007) is a two-part inventory, measuring two distinct but not entirely independent aspects of anxiety, namely state and trait anxiety, by way of the STAI Form-Y1 and the STAI Form-Y2, respectively. The STAI Form-Y2 consists of a 20-item Trait measure, targeting a respondent's general proneness to anxiety (e.g. "I am a steady person"), while the STAI Form-Y1 consists of a 20-item State measure, targeting a respondent's feelings of anxiety at the present moment in time only (e.g. "I feel tense") (Gros et al., 2007, p.369). Since the focus of this study is specifically on the transitory emotional state of anxiety as a marker of the possible effects of the exercise routine, TRE, on participants regardless of their differing stable dispositions, only the 20-item state measure (STAI Form Y-1) was used.

The STAI Form Y-1 is quick to administer. The 20 questions are rated according to a four-point Likert scale, with items subdivided into two categories consisting of 10 'anxiety absent' questions (e.g. "I feel calm") and 10 'anxiety present' questions (e.g. "I feel nervous"). Kendall, Finch, Auerbach, Hooke and Mikulka (1979) provide factor analytic evidence of state-item factors being sensitive to stresses, while Bieling, Antony, and Swinson (1998) give supporting evidence of their sensitivity to experimental manipulation.

The measure is scored by assigning a score of 1, 2, 3, or 4 consecutively to the answers: "not at all", "somewhat", "moderately so" or "very much so" for the 'anxiety present' subscale, but scores are reversed (a score of 4 is assigned to "not at all" instead of a score of 1 and so on) for the 'anxiety absent' subscale. The result is a range of scores between 20 and 80, and the higher the score, the more anxious a person is feeling.

The STAI has a long-standing history in both research and clinical practice. Bieling et al. (1998) and Gros et al. (2007) cite its use in over 3000 studies and its translation into more than thirty languages as evidence of its continuing popularity. There is also reliable evidence to suggest the sound psychometric qualities of the STAI. It has demonstrated excellent internal consistency (ranging from .89 to .96 across many adult samples), good test-retest reliability (with coefficients ranging from .73 to .86) and adequate convergent and discriminant validity with other measures of state and trait anxiety in previous studies (Gros et al., 2007; Sears et al., 2007). The work of Seedat, Fritelli, Oosthuizen, Emsley, and Stein

(2007), as well as work by Roberts, Emsley, Pienaar, and Stein (1999) provide evidence of its use in South African research studies.

For this study, the STAI form Y-1, overall, was found to be highly reliable both pre-intervention (20 items; $\alpha = .92$) and post-intervention (20 items; $\alpha = .82$). When further broken down into the two 10-item subscales, the anxiety-present and anxiety-absent subscales, the following Cronbach coefficients were determined: the anxiety-present subscale, pre- ($\alpha = .87$) and post-intervention ($\alpha = .7$) respectively, and the anxiety-absent subscale, pre- ($\alpha = .88$) and post-intervention ($\alpha = .84$) respectively.

The 36-Items Short Form Health Survey.

According to Ware (n.d.) the SF-36 is considered to be the definitive generic QoL measure. As such the advantages of the SF-36 include its ability to achieve a psychometrically sound compromise between the seemingly opposing goals of brevity and comprehensiveness, as well as the fact that it can be self-administered. The items of the SF-36 cover eight domains, which are divided into two dimensions or scales. It thus provides a physical health summary of functioning, and a mental health summary of functioning.

The physical health summary or physical component (PCS) is divided into the four domains: physical functioning (PF, 10 items); role limitations due to physical problems (RP, 4 items); bodily pain (BP, 2 items); and general health perceptions (GH, 5 items). The mental health summary or mental component (MCS) consists of the four domains: social functioning (SF, 2 items); general mental health (MH, 5 items); role limitations due to emotional problems (RE, 3 items); and vitality (VT, 4 items). These eight domains and two summary scales are scored on a scale of 0 – 100. The scores are then transformed using norm-based scoring algorithms to provide for improved comparison across all 8 domains, and across investigations, with a mean of 50 and a standard deviation of 10. The scoring algorithms also reduce bias in relation to estimate scores created for missing data (Ware, n.d.).

Accordingly, the SF-36 provides reliable information regarding an individual's health status, at a given point in time, as well as the amount of change in that status over time, in terms of physical and mental functioning respectively. There are two versions of the questionnaire; the original form requires a four week recall when responding to items, while the acute form

is with reference to the past week only, for shorter periods of administration. Other than the one week versus the one month recall period, the questions on each version are identical, and can thus be used interchangeably (Ware, n.d.).

Although not formerly validated in South Africa, high correlations with other QoL measures indicate content/construct validity (Benitha & Tikly, 2007). The study by Benitha and Tikly is an example of successful use of the SF-36 on a disease-specific black South African sample population, despite the fact that English literacy was a requirement in the absence of any black language translations.

For the purposes of this study, the original version was administered prior to the first TRE session on day one, to get a baseline indication of each participant's health and wellbeing for the previous four weeks. The acute version was then administered on day four and after seven TRE sessions, to track possible outcomes in relation to TRE. Finally the original four week version was administered via email, four weeks after the TRE Course, to further track possible changes. The use of the two versions of the SF-36 relates only to the change in the duration of time for which the exact same questions are being asked, i.e., four weeks versus four days.

In this study, the Cronbach coefficients for the SF-36 were calculated for the two dimensions - the physical component (PCS) and the mental component (MCS) - before and after the Course. The physical functioning scale (PCS) both pre- and post intervention were very low, pre- ($\alpha = .3$) and post- ($\alpha = .39$) the Course, respectively. While on the mental functioning scale (MCS) negative Cronbach coefficients were calculated, both before the Course ($\alpha = -.28$) and after the Course ($\alpha = -.24$). A further look at the individual subscales for each dimension provides a clearer indication of where the inadequacies of internal consistency lie, as is indicated by all values below .7, as well as the negative values, presented in Table 1.

Table 1. *Cronbach's Coefficient Alphas for the SF-36 pre- and post- the Course*

Dimensions	Subscales	# of items	α Pre	α Post
PCS	**PF**	**10**	**.89**	**.87**
	RP	**4**	**.92**	**.7**
	BP	**2**	**.83**	**.83**
	GH	4	-.3	-.1
MCS	**RE**	**3**	**.8**	.68
	SF	2	-4.97	-.7
	MH	5	-1.64	-1.03
	VT	4	-.46	-.23

Note. Cronbach's coefficient alpha values .7 and higher are in boldface. All other values are negative. PCS = physical functioning scale (including the following 4 subscales): PF = physical functioning; RP = role limitations due to physical problems; BP = bodily pain; GH = general health perceptions; MCS = mental functioning scale (including the following 4 subscales): RE = role limitations due to emotional problems; SF = social functioning; MH = general mental health; VT = vitality.

Regrettably, the internal consistency of the SF-36 for this study was not adequate. This was demonstrated, in part, by the negative Cronbach alpha values for four of the eight subscales. It is important to note that the perception is that Cronbach alpha values range from 0 to 1, however, Gliem and Gliem (2003) highlight the fact that there is in fact no lower limit to Cronbach alpha values. Furthermore, Chong (2001) contends that it is possible to compute a negative value when the item covariance of the measure is extremely poor. This suggests that despite it being the most widely used QoL measure in research, it was not appropriate as an outcomes measure of the Course – an issue that will be taken up again later in the discussion of the limitations of the current study.

The Psychological General Well-Being Inventory.

The PGWBI, developed by Harold Dupuy, is a generic QoL survey that measures subjective state of well-being or discomfort from an emotional or affective perspective. Information and distribution of the PGWBI is provided on the Patient-Reported Outcome and Quality of Life Instruments Database (ProQolid), designed by the MAPI Research Institute and managed by the MAPI Research Trust, in collaboration with the author himself (MAPI Research Trust, n.d.). The 22 items are rated according to a six-point Likert scale and are divided over six different dimensions or affective states: anxiety, depression, positive well-being, self-control, general health and vitality. As with the SF-36, there are two versions of this measure, which differ only in terms of time recall, thus questions are identical for both versions, but one is administered for the 'past month', and the other for the 'past week'.

Scoring of emotional states indicates an individual's quality of life and ranges from 0 to 110, with scores from 0 to 60 indicating severe distress, 61 to 72 moderate distress, 73 to 98 no distress while scores from 99 to 110 indicate positive well-being. The raw global score is the sum of the six subscale scores, which are all transformed to a 0 to 100 scale. Scoring is as per the approach set out in the recently published users' manual by Chassany et al. (2004). The original language of the measure is American English, although there are British, Australian and Canadian English versions. All translations are by MAPI Research Trust and the acute version specifically has been translated into Afrikaans, Zulu and Xhosa (MAPI Research Trust, n.d.).

An analysis of the usability of the PGWBI by Chassany et al. (2004) showed substantial support for the construct validity of the six dimensions, as well as for cross-cultural equivalence. When scores differed, in terms of clinical and socio-demographic data such as sex or marital status, the differences were consistent across all diseases and all age categories. Although not as well cited as the SF-36, it has been used in numerous international studies researching, for example, the relationship between hypertension and QoL. One such study by Breeze, Rake, Donoghue, and Fletcher (2001), which included a South African sample, demonstrated "…80% power to detect a standardised difference of 0.3 or more on the PGWB subscales at a significance level of 1%" (p.858).

In this study, the 'one week' version, in British English was used before and after seven sessions of TRE, and the 'one month' version was used via email, four weeks after the Course. The Cronbach alpha coefficients indicated that the PGWBI was found to be highly reliable overall both pre- and post intervention, pre- ($\alpha = .96$) and post ($\alpha = .91$) the Course, respectively.

Procedure

This study was approved by the University of Cape Town, Department of Psychology, Ethics Committee, and permission was given by Dr Berceli to proceed with the study. Participation was by voluntary consent and participants were specifically informed that they could withdraw from the study at any time, while continuing to be part of the Course.

A questionnaire booklet with a covering letter (Appendix A) setting out the terms and conditions of participation and containing the three self-report measures to be filled out, was handed out to participants on arrival at the Course, and before the first exercise session. Once Dr Berceli had welcomed everyone, the researcher made an announcement to introduce herself and to explain her study and request participation. The researcher was present for the full duration of the Course, to observe and to assist, and to answer any questions or allay concerns with regard to her research. The completed questionnaire booklets were personally collected by the researcher prior to the first TRE session, mid-morning on day one.

The Course was conducted by Berceli and consisted of seven sessions of TRE, performed twice daily, and monitored by Berceli and his fourteen assistants. These TRE sessions were always followed by feedback in the form of Question and Answer Sessions to discuss the participants' experiences of neurogenic tremors. Berceli also gave short, informal lectures to introduce theoretical concepts, and utilised video clips to demonstrate practical examples of the theory, as well as to share individual experiences of TRE with the participants.

On the fourth day, and after seven sessions of TRE, the researcher made a final announcement reiterating the terms and conditions of participation and expressing appreciation and thanks for the time and input of all participants. The researcher also reminded participants that she would contact them via email four weeks later to request a final response to the questionnaires (i.e., phase two of the study). The researcher again

handed out the questionnaire booklets, with a covering letter (Appendix B) reiterating the terms and conditions of participation in the study and personally collected all responses. There were fifty participants in total who completed the questionnaire booklets before and after the seven sessions of TRE.

With regards the second phase of the study, four weeks after the Course, the fifty participants were requested by email, to complete the questionnaire booklet again. Participants were expected to practice TRE no fewer than three times per week during this second phase, and the researcher requested completion of the self-report measures directly after completing a session of TRE, as had been done on the fourth day of the Course. The only changes to the questionnaire booklet involved the replacement of the one week versions of the SF-36 and the PGWBI respectively, to the one month versions. However, as already mentioned, only eighteen of the original fifty participants responded, resulting in the decision to exclude this second phase from analysis.

Ethical Considerations

Participation was by voluntary and informed consent only and participants were informed of their right to withdraw from the study at any time during their attendance on the Course.

Confidentiality was ensured. It was necessary for participants to provide their name and email address to ensure correct record keeping and comparison of data, to allow for any communication regarding the study and to request a four week response after the Course. However, the researcher was the only person to have access to the questionnaires, to score the questionnaires and to code the data. In coding, all personally identifying information was removed thereby ensuring anonymity. Also, the questionnaires will be kept for the required two year period, before being destroyed, and during this time, only the researcher will have access to these questionnaires.

The researcher did not foresee any likelihood of risk or harm arising due to participation in the study. Participants had already signed an indemnity form as a pre-condition for participation in the Course. Furthermore, execution of TRE poses few concerns as no specific level of fitness is required, the technique does not test endurance or fitness levels, nor is it intended to cause any pain. While the induced tremors are not under voluntary control

when activated, they can be terminated with immediate effect by stopping the exercises – either by stretching the legs and rolling onto the side of the body, if lying down on the floor, or by standing up and walking around. It was made clear to participants at the start of each session, that they could and should stop the exercises or the tremors in the event of pain, fatigue or overwhelming emotion. Berceli and fourteen assistants were present throughout the duration of the Course, to help participants through the exercises.

It is believed that no overt benefits could come from participation in the study. The benefits come directly from participation in the Course. Completion of the questionnaires at different time intervals (before and after the Course and then again four weeks later) could indirectly provide on-going motivation to continue using the technique beyond the Course. However, the results of the study will be shared with all participants and will provide a scientific validation/demonstration of their experience of TRE.

Data Analysis

The statistical software package STATISTICA version 9 (Statsoft, Inc., 2008) was used to analyse data. Descriptive statistics were analysed first to determine the pre-post mean scores on the three self-report measures, followed by a mixed-design Multivariate Analysis of Variance (MANOVA). Due to the number of analyses performed, as well as the need to reduce the chance of a Type 1 error, the significance level was set to the more stringent alpha level of .01 rather than the conventional .05 level. All assumptions were not upheld and will be discussed in the Results section which follows.

In preparation for the MANOVA, the sample was categorised and examined according to the four factors, namely gender, age, number of previous TRE sessions, and the Course. Gender was ignored as a variable due to the unequal sample sizes (n = 8 for men compared to n = 42 for women). In terms of age, the sample ranged in age from 21 to 70 years. Analysis was carried out by dividing age into three levels – the 20 to 39 group, the 40 to 59 group and the 60 and older group. These groups were approximations of appropriate lifespan cut-offs as set out by Sigelman and Rider (2006). The factor "number of previous TRE sessions" was divided into three levels – 'demo' (0 to 1 session), 'few' (2 to 12 sessions) and 'more' (13 sessions or more). These levels were created to account for any previous experience of TRE by participants. Finally, the Course itself represented the intervention.

The mean scores on the three self-report measures before and after the Course were compared, and specifically, five variables were assigned for analysis. These variables include:

- State anxiety (STAI), the score on the STAI Y-1 measure;
- Physical functioning, represented by the physical summary scale score (PCS) on the SF-36;
- Mental functioning, the mental summary scale score (MCS) on the SF-36;
- Anxiety, a variable derived from the anxiety subscale on the PGWBI; and
- General well-being, which is the global score on the PGWBI.

Thus to clarify, a MANOVA was conducted to investigate the effect of the four factors, gender, age, number of previous TRE sessions, and the Course, on the selected QoL dimensions state anxiety, physical functioning, mental functioning, anxiety and general well-being. The analysis of these five variables involved the comparison of the group's pre-post mean scores on the three self-report measures.

RESULTS

Details of three of the four factors used to characterise the participants in this study are presented in Table 2. The fourth factor, the Course, is not included as it is the intervention, and all participants received the intervention (i.e., everyone participated in the Course).

Table 2. *The three factors used to categorise and examine the sample prior to the MANOVA.*

Gender		
	Female	42
	Male	8
Age		
	20-39	11
	40-59	30
	60+	6
Number of sessions		
	Demo	29
	Few	11
	More	7

* Age measured in years

** Number of previous TRE sessions includes three groups/levels: Demo = 0-1 sessions, few = 2-12, and more = 13 or more sessions.

The underlying assumptions for normality were upheld, with all four factors being normally distributed. The underlying assumptions for homogeneity of variance were, however, violated for two of the factors, namely, gender and age. As mentioned before, prior to analysis, gender was removed from the analysis due to the unequal sample sizes, but sample

sizes for age were equal. Since MANOVA is a robust statistical technique, it was possible to proceed with this analysis.

There was no significant main effect for either age, $F(10, 68) = 1.16$, $p = .32$, $\eta^2 = .728$, or for number of previous TRE sessions, $F(10, 68) = 1.6$, $p = .12$, $\eta^2 = .654$, on pre-post scores. Nor was there an interaction effect between age and sessions and the Course, $F(20, 113.7) = .9$, $p = .6$, $\eta^2 = .617$. The analysis revealed only a main effect for the Course on pre-post scores, $F(5, 34) = 86.34$, $p = .0001$, $\eta^2 = .926$. This indicates that there was a significant change in some of the dependent variables from the measure before the Course to the measure after the Course. In fact, regardless of age, or number of previous TRE sessions, attending the Course accounted for 92% of the variance. The issue of whether it is the Course as a whole, or the TRE sessions specifically, that account for this change, will be elaborated in the Discussion section.

To explore where the actual differences existed for the factor, the Course, post hoc tests were conducted. Tukey's Honestly Significant Difference (HSD) was used to identify significant differences pre- and post- the Course, on each of the five dependent variables. The means and standard deviations of the five variables on the self-report measures pre- and post-the Course are summarised in Table 3.

Table 3. *Anxiety and Quality of Life Mean Scores Pre- and Post- the TRE Course for the five variables selected for analysis.*

	PRE Course			POST Course		
Variable	M	SD	95% CI	M	SD	95% CI
STAI Y-1	33.63	9.74	[30.77, 36.49]	26.72	6.44	[24.83, 28.61]
PCS	49.54	10.09	[46.58, 52.5]	51.08	6.43	[49.19, 52.97]
MCS	47.7	13.39	[43.76, 51.63]	54.59	7.71	[52.32, 56.85]
ANX	63.48*	22.88	[56.77, 70.2]	83.57*	13.98	[79.46, 87.68]
GLOBAL	70.05*	18.35	[64.67, 75.44]	83.37*	10.89	[80.18, 86.57]

Note. M = Mean, SD = Standard Deviation, and CI = Confidence Intervals. STAI Y-1 = State anxiety variable, PCS = physical functioning variable derived from the SF-36, MCS = mental functioning variable derived from the SF-36, ANX = anxiety variable derived from a subscale on the PGWBI, and GLOBAL = psychological well-being variable and global score on the PGWBI.

*$p<.01$

Tukey's HSD showed significant differences in pre-post means scores on the Course for the dependent variables anxiety and general well-being. Anxiety before the Course (M = 63.48, SD = 22.88) compared to after the Course (M = 83.574, SD = 13.98) was significantly improved (p = .000012). The same was true for general well-being before the Course (M = 70.05, SD = 18.35) compared to after the Course (M = 83.37, SD = 10.89) (p = .000014). Thus the significant differences were demonstrated in the pre-post mean scores of the PGWBI. The pre-post mean scores of the SF-36 and the STAI-Y1 however, were not significant.

DISCUSSION

As a consequence of the lack of empirical evidence regarding the therapeutic benefits of neurogenic tremors, with only one previous study to date (Berceli, 2007), there is little to compare these results with. However, with regard to the limitations of the current study, this discussion will make reference to Berceli's (2007) study, as well as current literature and research findings, with a view to possible future research directions.

The purpose of the present study was to investigate the usefulness of the TRE Course and TRE for the reduction of self-reported anxiety and the improvement of self-reported QoL. To clarify, as per the hypotheses, the researcher attempted to show firstly, that participation in the four-day Course reduces stress and anxiety and thereby improves QoL. Secondly, the researcher attempted to show that the continued practice of TRE for four weeks after the Course, executed no less than three times per week, leads to a further reduction in anxiety, and a further increase in QoL. However this second hypothesis was not addressed in the current study.

Specifically, results of the STAI Y-1, denoted by the variable state anxiety, and the SF-36, denoted by variables physical functioning and mental functioning, were not statistically significant. Only the results of the PGWBI, denoted by the variables anxiety and general well-being, were significant. Moreover, in the absence of any interaction effects, the strength of the overall effect of the Course (i.e., the main effect size of the Course, F (5, 34) = 86.34, p = .0001, η^2 = .926) was notable. Although the results are not conclusive, they show promise, with some evidence to support the first hypothesis.

Taken together these results suggest that participation in a four-day, intensive, *Introductory Level 1 TRE Training Course* may result in a perceived reduction in anxiety and improvement in subjective well-being/QoL, as demonstrated by the scores on the PGWBI self-report measure specifically. However these results need to be interpreted cautiously and, considering the limitations of this study, are not to be extrapolated beyond the confines of the current research design or context. The major limitation in terms of ascribing causality to the observed differences between the before and after measures, as is typically the case, resides

in the form of quasi-experimental design that the study was forced to rely on. Accordingly, a discussion of these design limitations follows.

Limitations and Directions for Future Research

The validity of this study was constrained by cost implications and various practical difficulties, which were outlined in the rationale for this study. Consequently, there were several threats to internal validity which need consideration vis-à-vis the original study by Berceli (2007) and with a view to possible further research on the topic.

Firstly, the absence of experimental controls made it impossible to specify the causal attribution regarding the changes on the dependent variables. Without a control group it was not possible to isolate TRE (the exercise technique) and neurogenic tremors from the Course as a whole, in terms of treatment evaluation. This represented a key departure from Berceli's (2007) design, in which comparisons were made between a treatment group (who performed the exercises and experienced the neurogenic tremors) and a control group (who performed the exercises but were not allowed to experience the neurogenic tremors). It was not possible to include a control group to serve as a comparison in this pilot study. As an alternative the researcher took a longitudinal approach by originally designing a second phase for comparison, to track the progress of the participants four weeks after the Course, in an attempt to address the issue of causal attribution. However, as mentioned already, the poor response rate resulted in the decision to exclude this second phase from analysis.

Additionally, the lack of a control group highlighted potential confounding variables inherent in the four-day Course. The Course is first and foremost about learning and doing the exercises and Berceli (Lecture notes, September 8, 2010) clarifies this at the outset. The express goal is to experience TRE (and neurogenic tremors) and to become adept enough to practice the technique alone (i.e., as a self-help technique) and on an on-going basis to address both past stresses and traumas, as well as preventatively for day-to-day stress management. All course lectures and discussions serve to affirm participants' personal experiences of neurogenic tremors, provide a theoretical basis for the experience, as well as provide a conceptual overview of underlying principles and the potential therapeutic value of the tremors.

Consequently, it could be argued that the participants were being primed to expect certain results from the experience of neurogenic tremors. On the other hand, this approach serves to dispel fears, concerns or discomforts surrounding the involuntary nature of the tremors, which can initially be an alarming and potentially anxiety-inducing experience. Berceli (2007) highlighted this problem in his study, arguing that in fact the experience of the tremors was perplexing and therefore initially created anxiety rather than reducing it.

Future studies would do well to attempt to control for the initial disconcerting nature of the neurogenic tremors. The researcher speculates that the Course simply provides an added advantage of preparing the participants and allowing them to quickly gain clarity and insight into how the technique works and most importantly the safety to explore it, especially when compared to learning the TRE technique from a DVD or a book, as is often the way when learning self-help techniques. In other words, the Course represents assisted learning, which is quicker, compared to a self-taught scenario in which an individual would engage in more trial-and-error behaviour and, consequently, proceed more cautiously.

Secondly, the use of convenience sampling and the simple inclusion criteria of being enrolled on the Course constrain the generalizability of the results. It is important to note that people were willing, motivated and interested in being on the Course and learning the technique for which they paid a fee. Furthermore, they represented a well-functioning, relatively healthy population sample, as can be deduced from the mean scores on the self-report measures. Although this intervention can be used for the day-to-day management of stress, it was originally designed to help people who have suffered trauma. This study is thus conservative in its use of a convenience sample. In fact the restriction of range in this study may have resulted in an underestimation of the true effectiveness of the Course to reduce anxiety and improve QoL. There will be a more detailed discussion, following the outline of gender issues, with regard to the more relevant and potentially traumatised populations on which a true effectiveness study should concentrate.

On the issue of gender, this study could not explore possible gender differences due to the disproportionate ratio of females to males on the Course. It is hypothesised that the tremor mechanism is innate to the human species in general, which suggests that regardless of gender, it has potential therapeutic value (Berceli, 2007). Nevertheless gender-based

differences abound biologically, psychologically, emotionally and behaviourally and are often socially and culturally constructed (Nolen-Hoeksema, 2008). This could result in differing reactions on any of the above mentioned levels to stress as well as to the treatment thereof. Exercise may impact differently on the female psyche compared to the male psyche, for example (Berceli, 2007). Also, if one considers TRE as an alternative approach or adjunct to "the Talking Cure" it could be interesting to investigate potential gender differences in client preferences for a body-based intervention or talk therapy. Thus, it stands to reason that the issue of gender requires further exploration.

Returning to the issue of relevant research populations, it should be noted that Berceli's work in the field of traumatology over the past fifteen years, has focused on PTSD symptoms of hyperarousal. Feedback from many of his clients supports the use of TRE to provide marked symptomatic relief, and ultimately recovery, from trauma. Berceli (2008) argues that TRE is applicable across the continuum of stress and trauma, releasing old traumas and/or day-to-day stress. His work with military personnel, survivors of war and natural disasters, firefighters and individuals employed in other trauma-inducing professions, demonstrates the potential value of TRE (Berceli, 2008).

Public interest in the practice of TRE is growing, and together with such growth in practice is a corresponding growth in anecdotal evidence to support its use. There are many and varied personal stories of triumph to be read on the TRE website, including the success story of a young American soldier, Adam McCabe, who was part of the marine corps division, sent to Iraq. He speaks of his struggle with PTSD, on his return from Iraq. He mentions how sceptical he was of the technique, but that this was quickly changed after trying TRE, and experiencing a number of improvements in well-being including and most importantly, his renewed ability to sleep again for the first time since his return from Iraq (Retrieved on December 15, 2010 from http://traumaprevention.com/articles/). There are many such success stories, which suggest an urgent call to researchers to now provide the scientific evidence to improve the understanding and practice of TRE, as well as to isolate the efficacy of neurogenic tremors to clarify their potential therapeutic value.

Berceli (2007) has suggested the need to study specific populations – people working in trauma-inducing professions, such as the military, emergency services, social workers and

psychologists. In South Africa, relevant populations include policemen and women, paramedics, survivors of torture, abuse and other crimes, and even the perpetrators of such crimes. In September 2010, Berceli led a pro bono TRE workshop for two hundred inmates at the Pretoria Central Prison. Berceli and his team of trainee TRE practitioners were well-received by the prisoners and the trainees in turn found the experience to be positive (Retrieved on November 10, 2010 from http://traumaprevention.com/wp-content/uploads/2010/04/TRE_S_at_Pretoria_Prison.pdf). Further research with this particular population seems plausible and offers the chance to explore gender-related issues simultaneously (as discussed earlier).

In terms of the three self-report measures used in this study, the issue of bias relates to two specific concerns: firstly, the possible inadequacy of the self-report measures to specifically evaluate the effects of the Course on anxiety and QoL; and secondly, the lack of non-self-report measures to substantiate this subjective evaluation of well-being. This speaks to the need for future research to include non-self-report measures, such as physiological measures, or observer reports, in order to provide a more comprehensive account of well-being (Diener & Ryan, 2009).

Additionally, the sensitivity of the measures may have been impacted upon by the generally healthy and high-functioning sample population, the time factor (only four days between pre- and posttest scores) and the physical intensity of the Course. The mean scores obtained on all three measures prior to the start of the Course highlight the fact that this particular sample population was, on average, not highly anxious, nor was their QoL particularly compromised. This again highlights the restricted range of the study, and thus the fact that changes were too subtle to be registered by the measures. The four-day time frame from first to last test may also have been too short. Whereas the response versions of the QoL measures were for either a one-week or one-month time period, and four days may not have been enough time for effects to become evident in some individuals.

With regard to the first issue of possible inadequacies, the internal consistency for each of the measures, and their subscales, was examined using Cronbach's Alpha Coefficients. The STAI had good internal consistency, suggesting that it was a reliable measure of anxiety in the current study, but the results were not significant. If the percentile ranks for male and

female working adults across the three age groups 19 - 39, 40 - 49, and 50 – 69 (Spielberger, 1983, p.18), are used as a baseline indicator, on arrival for the Course, this sample population represented a non-stressed group within the 47 – 52 percentile range, based on a raw score of 33 to 34 (STAI PRE, $M = 33.63$, $SD = 9.74$). As already mentioned the problem is in fact a restriction of range, and thus the drop in anxiety indicated by the post-mean score ($M = 26.72$, $SD = 6.44$) is limited by this fairly normal sample.

Regrettably, the internal consistency of the SF-36 for this study was not adequate. The most likely reason for the inadequacy of the SF-36 is the incompatibility between the questions and the four-day Course. Many of the questions referred to changes in daily functioning and routine, which were not impacted upon during the four-day intensive Course. Participants gave feedback to this effect, commenting on their struggle to answer many of the questions. The researcher also noted that many participants did not understand the meaning of the phrase "full of pep" and so left this question unanswered.

Another concern is that the physical aspect of the Course was in fact demanding, with the result that participants initially would have been more exhausted and suffering from muscle stiffness and possible aches and pains, as their bodies adjusted to a twice-a-day exercise routine, including tremors. This could have impacted on the way in which participants responded to those questions making up the physical summary score (denoted by the variable physical functioning). Future studies could explore the effect of varying the frequency of the exercises. For example, comparisons could be made between groups doing the exercises daily, every second day, or every third day and so on, as well as taking a more longitudinal approach to studying the efficacy of the tremors.

The PGWBI was found to be the most reliable measure of the Course on both the variables anxiety and overall general well-being, producing significant results. The exceptionally high Cronbach alpha values calculated both before and after the Course confirm the reliability of this measure. The style of questions differs substantially to those of the SF-36 and participants did not appear to struggle to respond to any of the questions. Prior to the Course, participants could be categorised as experiencing moderate distress, as the mean score of participants ($M = 70.05$) fell within the 61 – 72 range, with significant improvement post the Course, the mean score ($M = 83.37$) increasing to fall within the 73 – 98 range, to reflect a

state of ‘no distress’. Use of the PGWBI in future studies of TRE would be beneficial to create the opportunity for cross-study comparisons and represents a promising method by which to subjectively measure the relationship between physiological processes and emotion. Neuroscientists may not agree on the exact brain circuitry of emotion or yet articulate the differences in brain circuitry for negative emotion compared to positive emotion. However, the essential assumption is that the function of emotion is to connect and co-ordinate mind and body, such that each impacts on the other (Pally, 2000).

Panksepp (2006) also provides a valid argument for the importance of self-report of emotion in humans, since the potential imbalance of activity in emotional processing (what he refers to as the Emotion Command Systems) may be a critical cause of psychiatric distress, and as yet these systems cannot be monitored neurochemically.

Mehling et al. (2009) highlight the fact that current research into the neural basis of interoceptive and proprioceptive processes that underpin body awareness could ultimately inform mind-body approaches aimed at improving body awareness by way of the regulation of physiological and affective arousal. They further argue that such mind-body therapies as yoga, tai chi, breath therapy or body-oriented psychotherapy, are growing in popularity as people seek alternative ways to reduce stress, and have also been recommended for the treatment of more severe conditions such as PTSD. However, to date, they lack the requisite theoretical and research backing to support their potential clinical value.

Pollatos, Kirsch, and Schandry (2005) more specifically demonstrate the interrelationship between interoceptive awareness, anxiety and intense emotional arousal. They provide evidence of the ability of interoceptive awareness to mediate the relationship between anxiety and experienced intensity of emotion and argue that future research needs to investigate the potential consequences of altering interoceptive awareness in relation to anxiety.

It could be argued that Berceli’s (2007) use of TRE to reduce anxiety at a physiological and neurological level, by releasing deep chronic patterns of muscle tension, is consistent with the ideas of Mehling et al. (2009) and Pollatos et al. (2005) in terms of altering interoceptive or bodily awareness. Berceli (2007) also suggests the potential usefulness of conducting further

research to look at possible gender differences in perceptions of bodily self-awareness, as well as gender sensitivity to the actual exercises and neurogenic tremors.

Finally, it is necessary to comment on the one-sided approach of the current study in terms of evaluating outcomes. This relates to the absence of any physiological measure of anxiety in the current study and represents the second key departure from Berceli's (2007) research design. The hypothesised involvement of the ANS and HPA axis dictates a need for a physiological measure. However, the use of such a measure was beyond the scope of this pilot study.

Berceli's (2007) use of Heart Rate Variability (HRV) as a measure of ANS functioning did not produce significant findings. It was highlighted as a limitation, along with the suggestion to use more reliable measurements such as blood analysis. A later discussion with Berceli (D. Berceli, personal communication, April 18, 2010) on the topic of physiological measures resulted in his suggestion of salivary cortisol testing as a better alternative for future research endeavours. Currently, salivary cortisol data represents the best measure of HPA axis activity (Kemeny, 2003) and Kirschbaum and Hellhammer (2000) provide evidence of the growing popularity and the advantages of assessing free cortisol in saliva in stress research.

The consensus in current QoL and stress-health research practice is for the use of a combination of measures, including self-report measures together with non-self-report measures, such as physiological or ambulatory measures and observer reports. According to Houtveen and De Geus (2009) psychometrically, ambulatory measurements serve to boost incremental validity. The argument follows that for certain psychophysiological concepts such as anxiety and other QoL dimensions, the exclusive use of self-report measures for evaluation purposes is not ideal. Rather, to present both sides, namely the psycho-emotional response as well as the underlying physiological reactivity, is both complementary and more comprehensive and desirable (Diener & Ryan, 2009). Thus, if future studies are to be more comprehensive in design, these research practices require careful consideration.

CONCLUSION

The exploratory nature of this study has produced more conjecture than fact. This speaks to the lack of research on TRE and neurogenic tremors currently. The fact that Berceli (2007) draws on such diverse areas of theory as evolution, neurobiology, cognitive neuroscience, neuropsychology and traumatology opens a number of scientific doors to the study of TRE and the potential therapeutic value of neurogenic tremors. This also infers the necessity for a collaborative, integrative and interdisciplinary approach to future research (Ilardi et al., 2007).

This innovative body-based intervention may provide a solution to a problem that has long been in existence - the dominance of egocentric western concepts that underpin therapeutic practice. Bracken (2002) argues that this results in limitations in terms of cross-cultural issues of self, reality and context, specifically in response to stress and trauma.

All individuals regardless of cultural beliefs have a body which is evolutionarily designed to adapt and survive, but when the innate stress response becomes maladaptive, both mind and body suffer the consequences. Again, it is proposed that TRE in its simplicity attempts to work with the body and the nervous system, and is universal and thus potentially multicultural in its application. Furthermore, the potential of TRE to directly target subcortically derived unconscious and involuntary processes linked to intense emotional arousal, (and which over-ride inhibitory and executive functions of the cortex,) and switch these processes 'off', has major implications for rewiring neural pathways by harnessing the neuroplastic capacity of the brain.

In terms of evolutionary adaptation, the survival value of negative emotions such as fear, anger and anxiety to motivate a reaction to environmental threats, is well-recognised. However, Diener and Ryan (2009) propose that positive emotions can likewise be motivators to drive adaptive behaviour. Fredickson's (1998) evolutionary model, the "broaden and build theory" (cited in Diener & Ryan, 2009: 395), postulates the experience of positive feelings to be linked with the ability to increase thought-action repertoires, the upshot being improved intellectual, psychological, social and physical resources over time.

There is much that can be done to improve the well-being of individuals, and particularly within the realm of unconscious processes of the mind-body continuum. TRE represents one such potential method. It is a cost-effective, self-help technique that can be easily taught, either one-on-one, or to large groups of individuals. The exercises are simple and adaptable to suit individual fitness and physical capabilities. Most importantly, it appeals to the diversity of the South African population, transcending cultural and language barriers (Berceli, 2008). Neurogenic tremors may have the potential to provide an effective and innate coping mechanism to aid recovery and promote adaptive and on-going survival. This is truly a self-help technique which focuses on empowering individuals to draw on internal resources to cope with and overcome stresses and traumas that they are otherwise powerless to avoid. This is particularly important in the absence of external coping resources such as possible medical or psychological treatments.

Lillienfeld and O' Donohue (2007) in their outline of the fundamentals of clinical science emphasise the importance of an idea to generate consilience. This refers to the capacity of an idea to foster connections across diverse domains of knowledge and to generate scientific explanations at different levels of analysis - genetically, neurochemically, neurophysiologically, mentally, behaviourally, psychologically and socially. It is further argued that the cognitive neuroscience perspective which outlines cognitive, affective and behavioural neural substrates, has this capacity, and as such provides a powerful framework for innovative treatment research. Furthermore the astounding pace at which new research findings are being discovered in this area, lends credence to the possibility that cognitive neuroscience could help to bridge the gap between research and practice, and in this instance with specific reference to TRE. It thus remains for future research to delineate the neurological correlates of the tremor mechanism, to further explore the potential therapeutic benefits and efficacy of neurogenic tremors, and thereby substantiate the clinical utility of TRE to treat stress and trauma, and to improve quality of life.

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APPENDIX A

Dear Participant

Thank you kindly for agreeing to participate in this study. Your time and commitment is truly appreciated.

Please note that your name, identity and your responses to the questionnaires will never be made public. All information will be used to evaluate the effects of TRE on physical and psychological well-being in general, and will remain confidential and anonymous. The only reason I ask for your name and contact details is to ensure correct record keeping and comparison of data, as well as to allow for any communication regarding the study. Once a statistical analysis of the data has been carried out the information will be destroyed. Also, no-one but myself will have access to these questionnaires.

Participation is on a purely voluntary basis and as such, you may withdraw from the study at any stage. However, I would like to point out the possible benefits of your participation. By completing the questionnaires at different points in your TRE process, you will be able to track your own progress and the impact of TRE on your well-being, in a formalised manner. You will also help to make a South African contribution to the scientific research of TRE.

I will be available throughout the duration of the course to answer in person any queries you may have, and then will keep in contact via email thereafter to organise further tracking of your progress.

Thanks again.

Sincerely,

Taryn McCann

NAME: _____

EMAIL ADDRESS: _____

SEX: _____

AGE: _____

RACE: _____

REASON FOR ATTENDING THE COURSE: (just one sentence)

_____

_____

_____

HAVE YOU PERFORMED TRE PRIOR TO THIS COURSE? (YES OR NO)

_____

_____

IF YES, HOW MANY TIMES HAVE YOU DONE THE EXERCISES, OR FOR HOW MANY WEEKS OR MONTHS HAVE YOU BEEN DOING THEM?

_____

_____

_____

APPENDIX B

Dear Participant

Congratulations on your completion of Level 1 of TRE. Consider these 7 sessions to represent the first phase of your personal process.

Once again, your willingness to participate is truly appreciated. I would also like to reiterate that confidentiality and anonymity are assured, and that you may withdraw your consent at any time.

Please fill in the questionnaires to track this first phase of your process. The next phase of your process will be 4 weeks from now. I will contact you via email, and provided you have continued to practise TRE over the next 4 weeks, I will again ask you to fill out the questionnaires, to further track your progress.

I wish you everything of the best, and look forward to your responses in 4 weeks time.

Sincerely,

Taryn

NAME: _____

EMAIL ADDRESS: _____

DO YOU PLAN TO CONTINUE WITH THE PRACTICE OF TRE AND TO JOIN A SUPERVISION GROUP?

IF YOU DO NOT PLAN TO CONTINUE WITH TRE, PLEASE STATE THE REASON(S):

_____
_____
_____
_____