Tension Trauma Releasing Exercises (TRE) regulates the Autonomous Nervous System (ANS), increases Heart Rate Variability (HRV), and Improves Psychophysiological Stress in University Students.

Short title: The TRE process improves HRV and psychophysiological stress in university students.

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Abstract:

Background: Increasingly, the need to adapt and meet social, professional and family demands places constant physiological and psychological stress on the body which can cause acute and chronic disease. Increasing stress can mobilize the autonomic nervous system (ANS) causing a decrease in parasympathetic activity, and consequently a decrease in heart rate variability (HRV). Measurement of HRV is non-invasive, assesses the variation between each heartbeat, and is an indicator of the behavior of the ANS. Tension Trauma Releasing exercises (TRE) encourages the body to release deep muscle patterns of stress and tension and can influence the ANS.

Objectives: To measure the effects of TRE on the HRV and psychophysiological wellbeing of university students.

Methods: A pre- post-TRE practice intervention study was conducted using variables of measurement, time, postural position, and psychophysiological variables such emotional and mental wellbeing and body tension.

Results: HRV analysis identified a significant change ($P < 0.05$) for the average of the RR intervals and average heart rate after the application of TRE. There was an improvement in the emotional, mental and tension state.

Conclusion: The results suggest that the practice of TRE in conjunction with a deeper breath, helps in the regulation of the ANS, benefiting the health of the participant. This finding shows promise for decreasing stress and increasing wellbeing of students during their time at university.

Keywords*: Heat rate variability, TRE, Stress, Autonomic nervous system, university student wellbeing*

Introduction

Recent technological advances encourage researchers and clinicians to adapt and seek new ways to measure and understand the mechanisms of the body. There are signs of discomfort, manifested by the body, which identify this constant adaptation to meet the demand, which in most cases are unnoticed by the individual.

Tension & Trauma Releasing Exercises (TRE®) is a series of simple and innovative exercises that activate the body's innate tremor mechanism and in turn, help the body to release deep muscular patterns of stress and tension, providing a better quality of life to the participant. TRE was created by Dr. David Berceli, PhD [1]. This technique safely activates a natural reflex mechanism of vibration or shaking that releases muscle tension, calming the nervous system. When this muscle vibration / shaking mechanism is activated in a safe and controlled environment, the body is encouraged to return to a state of balance, abandoning patterns of anxiety and emotional disturbances. The participant is calmer and more relaxed after a TRE session [1].

Anxiety and stress have been considered risk factors for cardiovascular disease. These factors may be associated with low Heart Rate Variability (HRV). HRV is a non-invasive method that describes the oscillations of the intervals between consecutive heartbeats (RR interval). HRV is simple and useful for assessing the influence of the Autonomic Nervous System (ANS).

The ANS controls the visceral functions of the body, the heart being a central organ in the maintenance of homeostasis and to achieve this, it receives autonomic influences. Heart rate (HR) increases with the increase in sympathetic stimulation and decreases with the increase in parasympathetic stimulation [2], taking on an important role in mediating cardiovascular changes caused by stress.

Stress is present in all body reactions triggered by physical, infectious, and emotional aggressions. The main function of the ANS is to maintain homeostasis at rest in stressful situations [3]. For this study, we indicate that the ANS is subdivided into two: the sympathetic nervous system (SNS) and the parasympathetic nervous system (PNS). The SNS is activated in alarm or threat situations; however, in modern life, stress reactions may not always be linked to fight or flight reactions. Sometimes, stressful situations go almost unnoticed. The PNS assists in returning the organism (individual) to a state of calm [4].

The variability of the heart rate corresponds to fluctuations in the intervals between one beat and another beat of the heart, also called the RR interval [4], which can be captured and recorded through a cardiofrequency meter or through the electrocardiogram (ECG).

Studies demonstrate that the decrease in HRV is related to stress [5], therefore, HRV is a non-invasive method, capable of measuring the activity of the sympathetic and parasympathetic system, thus enabling the diagnosis of stress and other diseases [6]. In addition, HRV analysis has made it possible to measure the effectiveness of techniques, such as stress control, for reducing the sympathetic activity of the ANS [7].

Objectives

The primary objective of this study was to analyze the effects of the stress reduction technique (TRE) on the autonomic control of heart rhythm, showing whether the application of the practice increases HRV. More specifically, we sought to:

- Compare HRV before and after the application of TRE in the research participants.
- Associate the results of HRV with the subjective psychophysiological assessment performed by the participants before and after the practice.

Theoretical foundation

Concept of stress

Stress is the body's psychophysiological response to stressful situations, perceived as good or bad. It is assessed by the person as an overload of his resources. A stressful fact or situation is one that requires adaptation of the organism beyond its limits, that is, changes in the usual ways of dealing with events. The greater the need for adaptation, the greater the need for use of the reserves of adaptive energy, which can lead to physical and mental exhaustion. In that sense, the stress response is an attempt to deal with a challenge, survive a threat or adapt to the moment. [1, 8-12].

Stress is generally related to chaotic living conditions, family and interpersonal conflicts and distressing responsibilities. A stress process can develop due to internal demands such as anxiety, pessimism, dysfunctional thoughts, haste, competition and lack of assertiveness, or external ones such as job stress, overload of social roles, financial difficulties, being part of authoritarian power relationships [12].

Stress is the process of physical and emotional reactions to internal and external factors that disturb the physiological balance (homeostasis) of an animal or person [13]. In this sense, traumatic experiences, for disturbing the body's homeostasis, are included in the stress category. The author clarifies, however, that not all stress is traumatic. Stress can become traumatic if it occurs in a context of impotence, loss of control and if the stressful event is related to previous trauma. The trauma process thus involves experiences of threat, real or perceived, to life. In these situations, the person finds himself in a state of relative helplessness.

The stress response is procedural and in general occurs in well-defined and well-known phases [1, 8-12]. In each phase, there are specific characteristics, symptoms and consequences. The stress model proposes a division of the process into three phases: alertness, resistance and exhaustion.

In the alert phase, exposure to a stressor occurs that triggers the breakdown of organic homeostasis. This causes reactions of the sympathetic nervous system, leading to an increased release of adrenaline. The organism prepares itself for the fight or flight reaction, as an essential form of activation (preservation of life). Adrenaline production generates vigor and energy, which is why the alert phase is understood as the positive phase of stress. Being a temporary stressor, the organism regains its balance naturally [9-12, 14].

The second phase is known as the resistance phase. It occurs when the stressful event lasts for a long [1, 8-13] period of time or when it is very intense. In this case, the body uses remedial actions, in an attempt to recover the adaptive balance. Therefore, it uses its energy reserves, which weakens the body's functioning. At this stage, there is a decrease in adrenaline production and an increase in the production of corticosteroids, which can affect the functioning of the immune system. The organism seeks an adaptation, due to the need to seek internal homeostasis, which is accompanied by reactions opposite to the first phase and many of the initial symptoms disappear, giving rise to the feeling of tiredness. There are generally sensations of general wear and tear and memory difficulties [9-12, 14]

The last phase of the three-phase stress model is the exhaustion phase. At this point, the stressor event exceeded the individual's coping resources, thus exhausting the adaptive energy reserves. The psychosomatic consequences of stress are usually present. There is great organic weakness, with the frequent appearance of ulcers, gingivitis, anxiety, hypertension, dermatoses, sexual difficulties, respiratory and cardiac problems [9-12, 14].

Activating and deactivating stress

Although each individual can easily activate stress and anxiety responses, we find it more difficult to disable the hypothalamic-pituitary-adrenal (HPA) axis when its activity is no longer needed. Thus, stress responses may persist even after the event has passed. Human beings are conditioned to inhibit and / or cushion the natural mechanisms of tremors used by other mammals. This is because tremors are involuntary movements and therefore often uncomfortable, being associated with fear and weakness [15].

If there is no subsequent opportunity for discharge, the body remains in a state of alert, as if the risky situation was still present, resulting in a constant state of readiness and stress. Thus, a psychophysiological cycle is created that leads to the repetition of the chronic pattern of protection and defense, maintaining a chronic level of stress. Post-traumatic reactions thus derive from residual unloaded excitation. On the other hand, the natural release mechanism, if allowed, sends a signal to the brain that the danger has passed and then recovery and return to a resting state is possible. [1, 13-15, 17].

Situations of intense and / or repeated stress provoke emotions and feelings that surpass the capacity of elaborating and processing the experience on the part of those who experience them. In these cases, defensive responses of freezing and dissociation are frequent, which are an attempt by the body to reduce pain and / or the intensity of the experience in the face of threatening situations. The freeze response is associated with high levels of sympathetic and parasympathetic activation, simultaneously, and the result is an immobilization of the self-protection system. Dissociation is the temporary loss of connection with thoughts, sensations, or feelings. In both reactions, normal sensations are reduced [1, 18]. Dissociation reactions are present in traumatized people, with differences in intensity and course according to the characteristics of each case. It can be said that dissociation is one of the main responses to stress, ranging from more subtle responses, such as a lack of connection with the body's own sensations, to severe dissociative symptoms present in post-traumatic stress disorder [19].

The state of constant activation, resulting from the residual unloaded excitation is of concern both for the discomfort it causes and for the limitations it imposes. The neurological effects of trauma and chronic stress make it difficult to self-perceive body and environmental signals and to make decisions. Continuous or repeated exposure to traumatic situations can obscure objectivity regarding decisions related to health care, safety, and physical integrity. This is because there is an adjustment to the dangerous situation, considered natural after a certain time. In this case, external assistance is necessary for responsible decision-making [1, 17].

In cases of prolonged trauma, such as exposure to multiple episodes of violence, the neocortex is "hijacked" by the brain's limbic system, which makes decisions based solely on emotions. People exposed to violence may thus lose or have reduced their capacity for self-protection and consideration of alternatives for self-preservation. This process, however, obscures the ability to recognize the danger and to take effective self-protection measures [1, 17].

The chronic state of stress is known to be harmful to integral health, and psychological, physiological, and social damage can occur. With the exaggerated increase in the stress hormone, cortisol, there is a compromise of several physiological functions with reduced immune activity, hormonal imbalance [20], in addition to cognition, such as reduced concentration and decision making. Excess cortisol is neurotoxic and can reduce the size of the hippocampus by up to 25%, thus reducing the activities of the prefrontal cortex and thereby reducing cognitive performance. And it is in the hippocampus that new neurons flourish, neuroplasticity, a function compromised by chronic stress.

Freezing and dissociation are neurophysiological correlates to the concept of emotional anesthesia, described by Ravazzola [21-22], it is the natural reaction expected in the face of stressful situations, being a participant or victim of feelings of pain, indignation, anger, impotence, and shame. This malaise is what would make it possible for the people involved to take measures to simply stop these episodes. The presence of emotional anesthesia, which we could also be called freezing and / or dissociation, prevents this natural reaction of self-protection and empathy and care towards other people. Therefore, it is essential to offer people tools to reduce the anesthesia processes, both to deal with these aspects of life, already installed and to prevent relational conflicts. TRE® is one of the tools that can reduce stress and increase wellbeing.

Tension and Trauma Releasing Exercises (TRE)

TRE® induces neurogenic tremors through a series of seven exercises [23]. It is important to understand that it is the neurogenic tremors and not the exercises alone that are the actual intervention. The tremors are induced from the body's center of gravity, which facilitates its reverberation, dissolving body tensions. Neurogenic tremors often start at the top of the thighs and then reach the Psoas muscle. After that, the tremors can reach the pelvis, lumbar, spine, neck, arms and hands. After the activation of neurogenic tremors, you can reach a state of relaxation, or you can reach a state of great disposition and vigor [1, 15].

TRE is an acronym for Tension and Trauma Releasing Exercises, in Brazil it is known as the Stress Reduction Technique. TRE was developed by Dr. David Berceli, an American social worker, traumatologist and researcher [1]. TRE has been shown to be a safe way to reduce stress, anxiety and deep body tension throughout the body by carrying out a sequence of exercises which activate the body's innate tremor mechanism. It is also a useful complementary practice in the post-trauma recovery process. The technique is the result of research carried out in teaching TRE to large groups of people in times of mass trauma such as war, political violence, and national disaster [24]. Further studies have shown that TRE has been effective in reducing tension and recovering from traumatic and stressful experiences [1, 15], improving quality of life for non-professional caregivers [25], in reducing stress and burnout for high school teachers [26], for the promotion of mental health in adolescents and their families [27], for improving wellbeing in people with multiple sclerosis [28], those in the military [29], and in improving body awareness in the performing arts [30].

In Brazil TRE has been practiced for more than 10 years, being officially in 2019, inserted in the Department of Health of the Distrito Federal (DF) as an integrative practice in health.

The development of TRE® was based on scientific knowledge about body responses to difficult experiences and stress. The traumatization process can occur in all humans and, likewise, the process of restoration and healing is also inherent in all humans. The basic premise of TRE® is that human beings have an organic and natural capacity to restore their health after stressful and traumatic experiences [1, 14]. All human reactions to difficult experiences and stressful situations are related to a combination of psychological, neurological and physiological aspects. These reactions are autonomous, unconscious, and instinctive, changing the anatomy, neurology and biochemistry of the organism. Therapeutic interventions that seek to contribute to the recovery from trauma and stress should therefore consider this relationship between the different levels of human functioning. This implies intervening not only at the cognitive and psychological level of the experience, but in a way to favor the regulation of physiological and bodily responses to adverse situations [1].

The muscles are designed to contract in difficult, stressful and anxious situations in order to protect the body from damage to health and even from possible death. One of the muscles responsible for the body's defense responses is the Psoas, which connects the back, legs and pelvis and overlaps the muscles of the diaphragm and spine. This whole region is essential in the defense responses of the organism. Many of the sympathetic nerves linked to fight and flight responses are found in this region of the body. During perceived or actual danger, these muscles contract, bending the body forward so that its most vulnerable parts - the vital organs, genitals and head are protected from possible injury. Thus, these muscles enable bodily responses to self-preservation. In addition, there is a release of chemical substances such as adrenaline, cortisol and opioids, which allow the body to elaborate the natural responses of defense and self-preservation. Once the risk is over, the natural response is for the body to discharge excess activation and muscle tension through activation of the body’s normal tremor response. This process allows the return to the state of relaxation and prevents the development of physical pain and the maintenance of a state of stress, as well as the development of damage to health. [1, 14]. Therefore, in order to relieve persistent symptoms after a stressful event it is necessary to be able to relax these muscle groups.

These tremors, known as neurogenic tremors are considered as signs of fear and weakness in our culture. However, they are actually the natural and primitive neurological response for releasing excess activation of the nervous system following a stressful event, allowing the return to the state of rest and relaxation [1, 14-17]. Thus, this natural mechanism for self-regulation after stressful events produces physical and mental relaxation. Body rebalancing occurs through the interruption of the hypothalamic-pituitary-adrenal gland (HPA) axis involved in the physiology of stress. This HPA axis links the limbic system of the brain to the adrenal glands, which produce hormones (catecholamines: adrenaline, norepinephrine and cortisol) in response to physical or psychological stress, preparing the body for attack or escape responses. [16]. When the HPA axis is activated, the autonomic nervous system is also affected. The prolonged activation of this axis interferes with the production of growth and reproduction hormones, digestion and the activities of the immune system are reduced. When, on the other hand, the HPA axis is deactivated, the parasympathetic nervous system becomes dominant and the person returns to the state of relaxation, with the reduction of stress and anxiety [15].

Heart Rate Variability (HRV)

The HRV describes oscillations in the interval between consecutive heartbeats (R-R intervals), as well as oscillations between consecutive instantaneous heart rates. It is a measure that can be used to assess the modulation of the ANS under physiological conditions, such as in situations of wakefulness and sleep, physical training, and in pathological conditions. Changes in HRV patterns provide a sensitive and early indicator of health impairments. A high variability in heart rate is a sign of good adaptation, characterizing a healthy individual, with efficient autonomic mechanisms, while low variability is often an indicator of abnormal and insufficient adaptation of the ANS, implying the presence of physiological malfunction in the individual [31].

The HRV indices are obtained by analyzing the intervals between R waves, which can be captured by instruments such as electrocardiographs, analog and digital converters and cardiofrequencies, from external sensors placed at specific points on the body. The H10 polar belt is one of those instruments that capture the RR intervals (S1). It is a belt with electrodes, positioned on the subject's chest, captures the electrical impulses of the heart and transmits them through an electromagnetic field to the monitor. The captured signal is sent via an interface to the Polar Precision Performance software [31].

The HRV indices can be obtained using linear methods, in the domain of time and frequency, and non-linear methods. HRV is currently gaining importance as an ANS assessment tool, which has an important role in maintaining homeostasis, as well as a predictor of the body's internal functions.

Time domain analysis

Time domain analysis is the simplest method of analysis based on statistical calculations performed on the series of RR intervals obtained. The intervals generate time analysis indices, important to assist in the interpretation as the square root of the sum of the square of the differences between the RR intervals (RMSSD); percentage of difference greater than 50 milliseconds between adjacent RR intervals (pNN50); Standard deviation of all normal RR intervals recorded in a time interval, expressed in millisecond (ms).

Frequency domain analysis

Frequency domain analysis is used to identify the spectral density of the frequency, generally used in individuals to perform rest analysis. One of the main indices of this analysis is: High Frequency Component (High Frequency - HF), with a variation of 0.15 to 0.4 Hz, which corresponds to respiratory modulation and is an indicator of the vagus nerve acting on the heart; low frequency component (Low Frequency - LF), with variation between 0.04 and 0.15Hz, which is due to the joint action of the vagal and sympathetic components on the heart, with predominance of the sympathetic and very low frequency component (Very Low Frequency - VLF) Less used index whose physiological explanation is not well established. The LF / HF relationship reflects the absolute and relative changes between the sympathetic and parasympathetic components of the ANS, characterizing the sympathetic-vagal balance over the heart.

Non-linearity analysis

This method analyzes Poincaré graphs, a geometric method for analyzing the HRV dynamics, which represents a time series within a Cartesian plane, which can be analyzed in a qualitative (visual) way, through the evaluation of the graph or quantitative, through the reading of the SD1 indices, which represents the dispersion of points perpendicular to the identity line and seems to be an index of instantaneous record of beat-to-beat variability; ; the SD2 that represents the long-term records, and the ratio of both (SD1 / SD2) shows the ratio between the short and long variations of the RR intervals.

Measuring HRV has a wide possibility of use, is a non-invasive, easy to apply, and makes an interesting option for interpretations of the functioning of the ANS and is a promising clinical tool to assess and identify health impairments.

Autonomic Nervous System (ANS)

The ANS is subdivided into sympathetic nervous system (SNS) and parasympathetic nervous system (PNS) and innervates the entire human body. Its adaptive influence acts on the physiological systems according to the energy demand and activity according to the situation in which the individual is. The physiological changes most perceived by the individual in situations of danger and imbalance are heart rate, respiratory rate and sweating [32]. These changes in the autonomic system are a consequence of various stimuli from the visceral region, such as arterial baroreceptors (BA) [33].

According to Junqueira and colleagues [34], the constant influence that the ANS makes on the organs of the organism is essential to ensure its homeostasis and, in this way, it can respond to the demands of the environment. It is in this logic that the ANS acts through its sympathetic and parasympathetic branches, responsible for the regulation of smooth muscles, cardiac, and glands, in addition to innervating several other organs of the body [35]. Heart rate (HR) is constantly subjected to changes caused by the dynamics of the ANS and its SNS and PNS branches, in addition to the hormonal agents of the endocrine system [36]. Stress is the process of physical and emotional reactions to internal and external factors that influence ANS, with the activation of the SNS predominating, where it is also perceived by the increase in HR. Changes in HR, defined as HRV, are normal and expected and indicate the heart's ability to respond to multiple physiological and environmental stimuli, including stress and HR.

In addition, there is also an ANS response to rate and depth of breath. The higher the expiration in relation to the greatest inspiration the amplitude of respiratory sinus arrhythmia, an increase of activity of the sinoatrial node [37-38]. This is because the heart rate increases when inhalation occurs and decreases when exhalation occurs [39]. Thus, a deep breath was encouraged during the intervention procedure.

Materials and methods

Outline of the research

This research is characterized as a pilot pre/post-test experimental study. Variables related to the application of the definition were defined, such as: duration of the practice, position of the practice, in addition to variables related to the participants, such as: use of cardiovascular drugs, smoking, alcoholism, anxiolytic or antidepressant medications and if some form of practice is used in addition to health as acupuncture medicinal plants. The variables related to the practice of TRE were controlled through the intervention and procedure for data collection protocol described in S1, and the variables of the participants were controlled through the demographic questionnaire (S2) and the exclusion criteria questionnaire (S3).

Recruitment and participants

The primary author conducted a lecture about the practice of TRE to a group of university students on about the development of the technique, its history in the world and in Brazil, identifying its scope, as well as the potential for insertion of TRE. At the end of the lecture the prospective volunteers were invited to participate in the research study. All participants who accepted the initial invitation received the questionnaire via e-mail to identify whether they met the criteria requested in the study (S3). The participants received another questionnaire with 14 more questions, in order to better characterize the individuals (S2). The TRE process and the research procedure was explained, questions answered, and written informed consent obtained (S4).

Inclusion and exclusion criteria

Volunteers 18 years of age or older with no chronic disease or routine drug use [40] were invited to participate. Exclusion criterion was based on the responses to the demographic questionnaire (S2) and exclusion criterion for the study (S3). If there was any confirmation of the items: ingestion of alcoholic beverages more than once a week, use of cigarettes, use of some form of complementary health, such as acupuncture, medicinal plants, use of controlled medication, and use of cardiovascular drugs [7, 41, 42], they were excluded from the study. This was a non-probabilistic, self-selecting sample of eight university students.

Research instruments

Polar Heart Monitor

To assess HRV, cardiac parameters were obtained using a Polar cardiac monitor, model H10, measuring RR time intervals (Figure 1). This monitor finds its applicability and scientific validation proven through previously performed studies [43, 44].

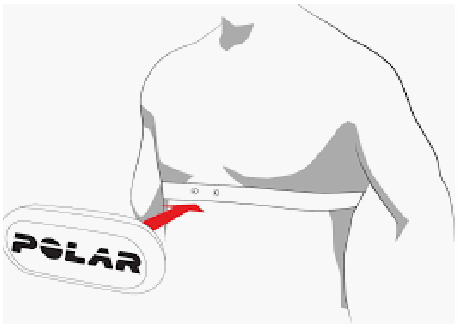

Figure 1: Position of the polar belt on the participant

Software

For processing the data, Elite software was used and to analyze the Kubios HRV (this program is available for free download, however it needs registration, through the website: http://kubios.uku.fi), developed by Biosignal Analysis and Medical Group of images. Kubios HRV calculates the time domain of frequency and non-linearity, contained in this study. [45, 46].

Psychophysiology assessment

An adapted Likert scale using specific emoji added for each score was used to measure a self-reported emotional score from 1 to 10, a mental state score from 1 to 5, and a body tension score from 1 to 5 (S5). Emoji constitute a transformation of the way of communicating, and although each emoji complements the numerical lines, providing them with meaning, this language sustains itself and works by itself, so that an answer to a certain question is answered only with the use of this type of textual element, characterizing its ease of understanding [47].

These measures were developed by the researchers as an indication of participant perception of their emotional, mental and tension states, evaluated before and after the practice (S5). When answering a questionnaire based on this scale, the participants specify their level of agreement with a statement [48-50]. The Likert scale is bipolar, measuring either a positive or a negative response to a statement. This scale is a subjective answer that the participant responds to according to their perception. From a theoretical perspective, the author acknowledges the role of subjectivity and the cultural and historical process of the individual and society in conducting research [50]. This adapted scale draws on a social and emotional intelligence perspective, whereby the participants have some knowledge of their own emotions and have the ability to describe, express or communicate their feelings [50].

Intervention and Procedure for data collection

Each measurement set consists of a measurement during rest, before activating the TRE tremor process (baseline), during tremoring, and after tremoring has stopped (relaxation), always in sequence. Only the before and after tremoring data will be reported. For all these readings, the participants were always in the lying position with their legs bent (Figure 2). The measurements were made on different days, in the first hours of the day. On the day of the practice, each participant received further information about the study and how the study procedure would be conducted:

a) A conversation explaining the technique and the study in more detail, including showing the H10 Polar belt, which will be worn around the chest (Figure 1).
b) The belt is then placed around the chest and the participant instructed to rest on the floor with knees bent (Figure 2). This position is the same as one of the positions used to rest in TRE.
c) After one minute in this rest position, the heart rate is expected to stabilize. Then, the first (baseline) measurement of the RR intervals is performed for five minutes while still in the rest position.
d) After the five-minute (baseline) measurement of the RR intervals is complete, the participant is instructed to relax their legs by straightening them out onto the mat. After two minutes, the participant returns to the same previous position, this time allowing any tremors to begin (Figure 2). The TRE facilitator asks the participant to report when the body begins to tremor (shake).
e) Once the tremors have commenced, and after two minutes of tremoring, the RR intervals are measured again, over a five-minute period. During this period the facilitator invites the participant to breathe more deeply.
f) After the five-minute measurement during the tremoring is complete, the facilitator asks the participant to relax the legs again, straightening them out onto the mat for two minutes.
g) After two minutes, the participant returns to the previous knees bent resting position and the RR intervals are measured again for 5 minutes after the tremoring.

The Likert scale psychophysiology assessment was conducted just prior to commencing the procedure and again immediately after completion of the procedure, subjectively assessing participants' emotional and mental state and tension in the body (S5).

Figure 2: RR intervals recording position (Permission to use courtesy of the Author)

Data processing and statistical analysis

The HRV data were collected by the Polar H10 strap and stored in the Elite application memory software, then transferred to an ACER brand computer after each measurement of the RR intervals and submitted to the Kubios HRV program for analysis. The psychophysiology assessment data was entered into Excel for analysis.

Statistical analysis of the HRV data was performed for each Heart Rate Variability (HRV) index, using the Wilcoxon test, evaluating before and after applying TRE. Results of $p < 0.05$ were considered statistically significant. Descriptive analysis of the psychophysiology assessment measured before and after results.

Results and discussion

TRE induces neurogenic tremors, and these tremors are induced from the body's center of gravity, facilitating reverberation and dissolving body tensions. They start at the top of the thighs and then reach the Psoas muscle, after which they can reach the pelvis, lumbar, spine, reverberating to the upper body. The participant can reach a state of relaxation, or a state of great disposition and vigor. This result of wellbeing perceived by the participants was qualified through the HRV measurements, where the reading of the RR intervals and the processing were performed with the Polar cardiac monitor and supported by the psychophysiological results.

Characteristic of the participants

The age of the participants (*n*=8) varied between 20 and 38 years old, all female. All were single; three with higher education and five had attended college. The results of this research were restricted to participants who did not use drugs, who are not carrying any risk associated with health, and / or complementary health practices, as well as the absence of physical training, alcohol, and cigarettes in the last 24 hours.

Effects of TRE on psychophysiology

Each participant (Am1, Am2,.., Am8) answered an indicator before and after the practice of TRE subjectively assessing their psychophysiological (emotional, mental and tensions in the body) (S5). The results of psychophysiological assessment showed that participants perceived there was an improvement in emotional wellbeing (Figure 3) and a reduction in body tension (Figure 4). Most participants perceived an improvement in mental state with an increased state of mental relaxation after TRE, however, for one participant, the before and after results remined the same (Figure 5).

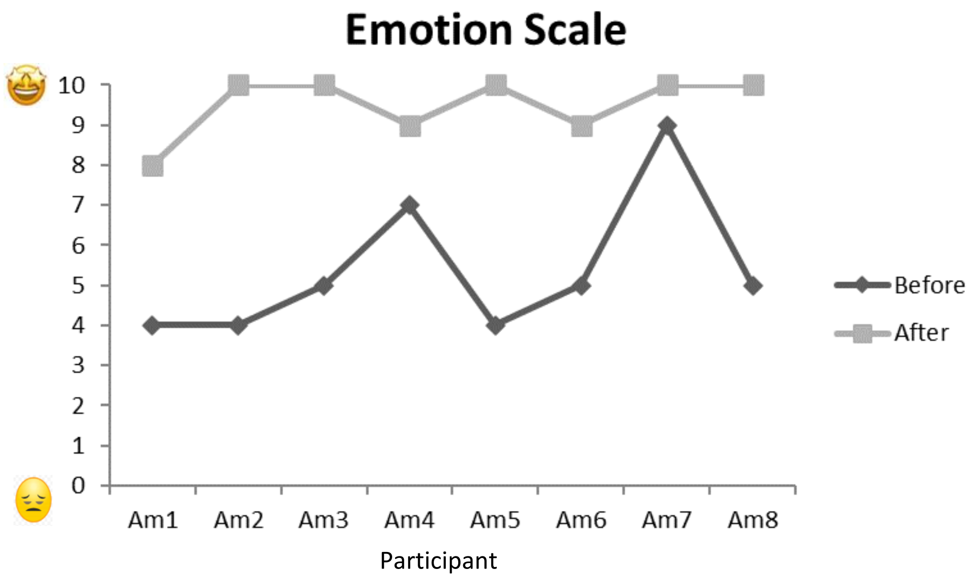

Figure 3. Perception of emotional state.
Emotional scale before and after the practice of TRE, where 1 is the perception of being emotionally distant and 10 is emotionally aware.

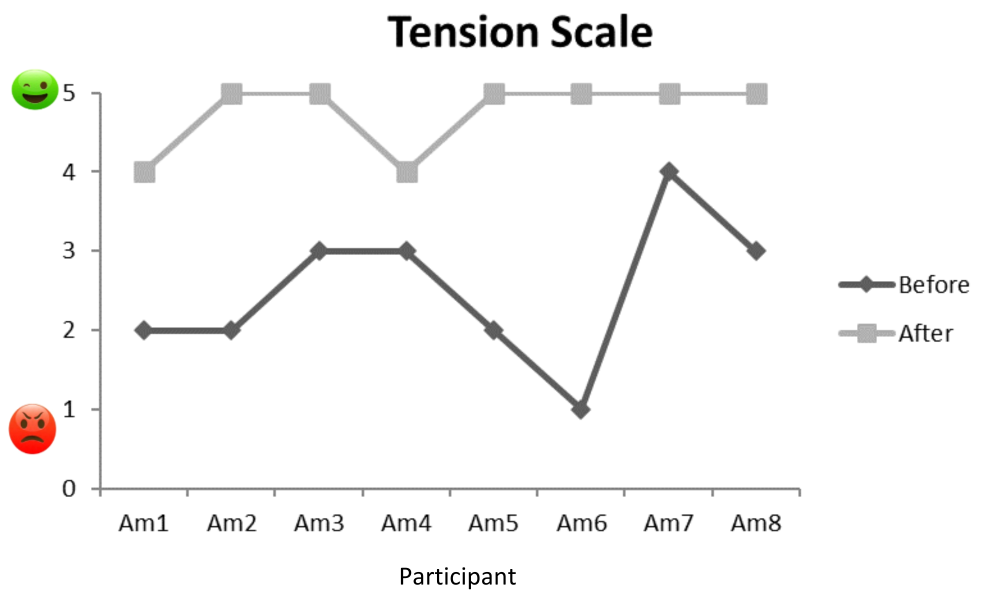

Figure 4. Perception of the state of tension in the body.
State of tension in the body, before and after the practice of TRE, where 1 is the perception of a lot of tension in the body and 5 is of having no tension at all.

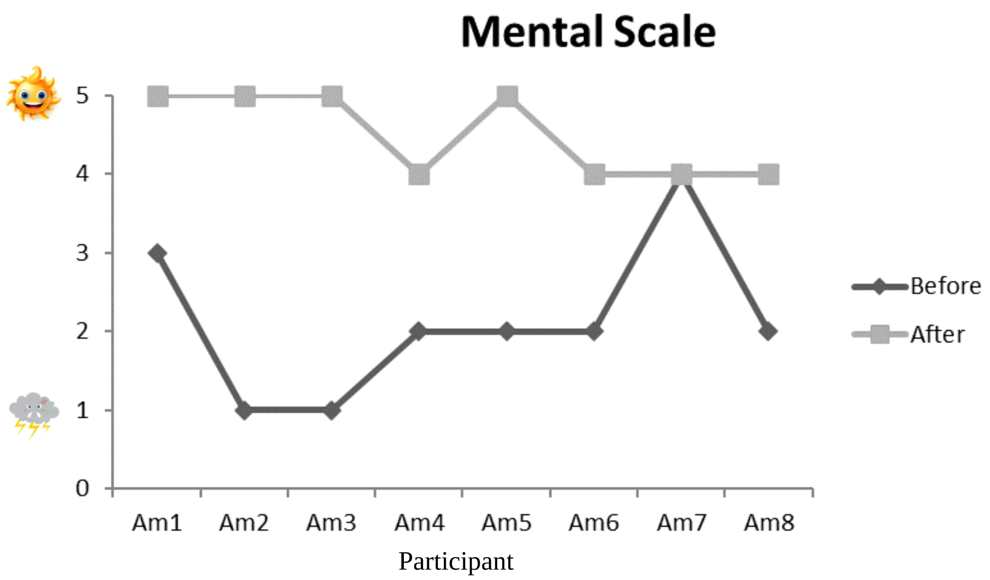

Figure 5. Perception of mental state.
Perceived mental state**,** before and after the practice of TRE, where 1 is the perception of having an activated mind with many thoughts and 5 is feeling calmer and relaxed.

Effects of TRE on HRV

The demonstrated HRV values are derived from 8 people, measured before and after the practice of TRE, always evaluated with a Polar H10 belt and statistically measured by a non-parametric Wilcoxon test.

Table 1 shows a significant difference before and after the application of TRE, referring to the mean of the RR intervals (M_RR), which indicates a reduction in heart rate (HR), also statistically evidenced ($P < 0.05$). The remainder of the Time Domain indices are higher after TRE, indicating an increase in HRV. The standard deviation (SD) obtained in each index is of high value in relation to the mean, needing to evaluate each index a better before and after each measured sample. (Figure 6: 6a to 6k).

Table 1. Result of HRV indices in the Time Domain

Time	M_RR [a] (ms) [b]	M_HR [c] (bpm) [d]	SDNN [e] (ms)	RMSSD [f] (ms)	NN50 [g]	PNN50 [h] (%)
Baseline TRE Mean (SD)	897(143)	69(12)	69(39)	82(53)	111(73)	36(24)
After TRE Mean (SD)	954(142)	64(10)	76(37)	87(55)	113(70)	39(26)
P	**0.03**	**0.034**	0.293	0.398	0.779	0.176

[a] M_RR – average of the RR intervals; [b] ms – milliseconds; [c] M_HR – average of heart rate; [d] bpm – beats per minute; [e] SDNN – standard deviation of the RR intervals; [f] RMSSD – root-mean-square of successive normal sinus RR interval difference; [g] NN50 – number of successive RR interval differences > 50 ms; [h] PNN50 – percentage of successive normal sinus RR intervals > 50 ms.

Table 2 shows an increase in the spectral analysis indicators, very low frequency (VLF), low frequency (LF) and high frequency (HF) in absolute units (ms^2), which may be related to the increase in the RR interval itself, since the unit of measurement of these spectral variables is milliseconds squared. The LF, HF component and the LF / HF ratio are indicating an increase in Vagal activity. However due to the size of the SD, it becomes necessary to evaluate each index before and after each participant measure (Figure 6: 6a to 6k).

Table 2. Result of HRV indices in the Frequency Domain

Time	VLF [a] (ms2) [b]	LF [c] (ms2)	HF [d] (ms2)	LF/HF [e]
Baseline TRE Mean (SD)	150(135)	2046(2013)	2984(3216)	1(0,9)
After TRE Mean (SD)	223(247)	2488(2117)	3439(3509)	1(0,4)
P	0,441	0,401	0,123	0,362

[a] VLF – very-low-frequency; [b] ms^2 – absolute power; [c] LF – low frequency; [d] HF – high frequency; [e] LF/HF – ratio between LF and HF

Observing the average result of SD1 in Table.3, an increase is evident. SD1 represents short-term variability. An increase in this index shows an increase in HRV. Due to the high SD, it is necessary to individually evaluate each participant before and after the measurements. Figure 6 (6a to 6k) shows HRV indices for each participant before and after TRE.

Table 3. Result of Nonlinear HRV Indexes

Time	SD1 [a] (ms)	α 1 [b]
Baseline TRE Mean (SD)	58(38)	0,9(0,2)
After TRE Mean (SD)	61(39)	0,9(0,2)
P	0.453	1

[a] SD1 – standard deviation perpendicular the line of identity; [b] α 1 – Short-term fluctuations

Figure 6 (6a to 6k) shows HRV indices for each participant, before and after TRE. Figure 6a demonstrates the behavior of the SDNN indices before and after the application of TRE for each participant, showing that these indices had an increase in 4 of the 8 participants evaluated, equivalent to a 50% increase in HRV. Figure 6b demonstrates the behavior of the HR indices, representing a reduction HR index in 7 of the 8 participants evaluated after the application of TRE, equivalent to an 87% increase in HRV. Figure 6c demonstrates the behavior of the RMSSD indices before and after the application of the TRE, showing an increase in 6 of the 8 participants evaluated, equivalent to a 75% increase in HRV. Figure 4d evaluating the behavior of the SD1 indices, before and after the application of the TRE indicating that these indices had an increase in 5 of the 8 participants evaluated, equivalent to a 62% increase in HRV. Figure 6e demonstrates the behavior of the PNN50 indices before and after the application of TRE showing that these indices had an increase in 6 of the 8 participants evaluated, equivalent to a 75% increase in HRV. Figure 6f demonstrates the behavior of the NN50 indices before and after the application of TRE, illustrating that these indices had an increase in 4 of the 8 participants evaluated, equivalent to a 50% increase in HRV. Figure 6g demonstrates the increase in the RR interval, representing an increase in 7 to the 8 participants evaluated after the application of TRE, equivalent to an 87% increase in HRV. Figure 6h demonstrates the behavior of the VLF indices before and after the application of TRE representing an increase is identified in 5 of the 8 participants evaluated, equivalent to a 62% increase in HRV. Figure 6i demonstrates the behavior of the LF indices before and after the application of TRE, representing an increase in 5 of the 8 participants evaluated, equivalent to a 62% increase in HRV. Figure 6j demonstrates the behavior of the HF indices before and after the application of TRE, showing an increase in 6 of the 8 participants evaluated, equivalent to a 75% increase in HRV. Figure 6k demonstrates the behavior of the LF/HF ratio after the application of TRE, showing an increase in 5 of the 8 participants evaluated, equivalent to 62% increase in HRV. As shown in Figure 6 (6a to 6K) there is variation in the individual results, with a high average standard deviation.

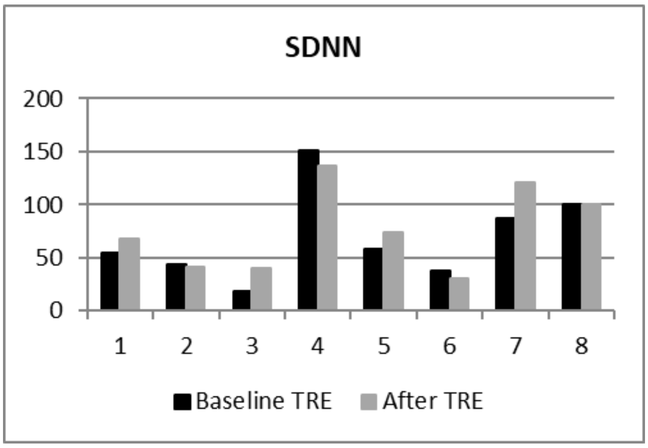

Figure 6a: HRV index - SDNN

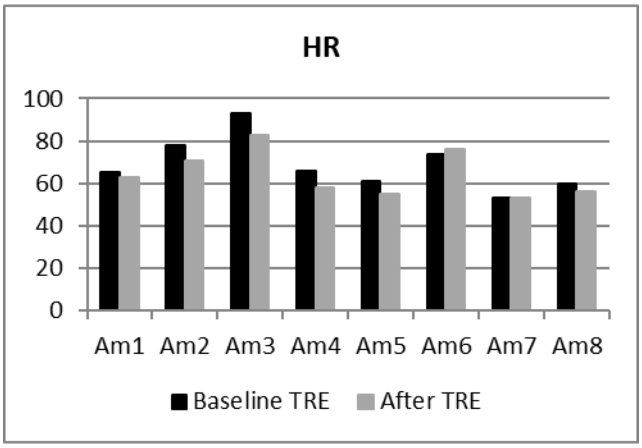

Figure 6b: HRV index - HR

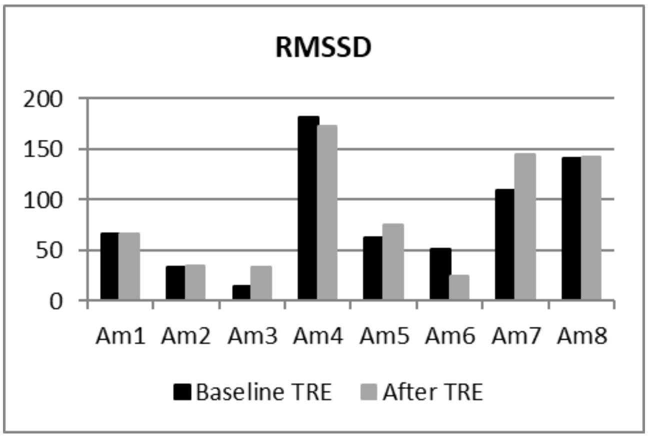

Figure 6c: HRV index - RMSSD

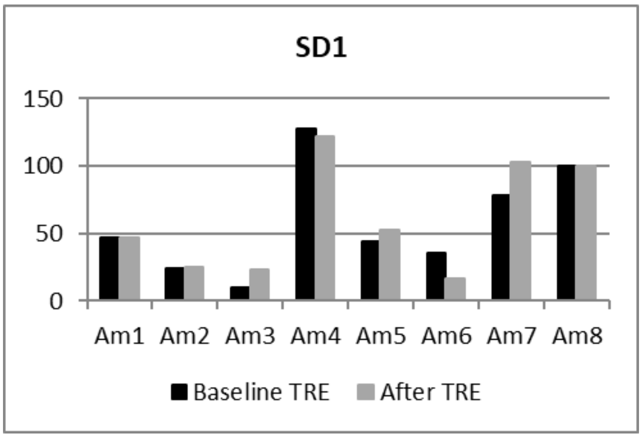

Figure 6d: HRV index - SD1

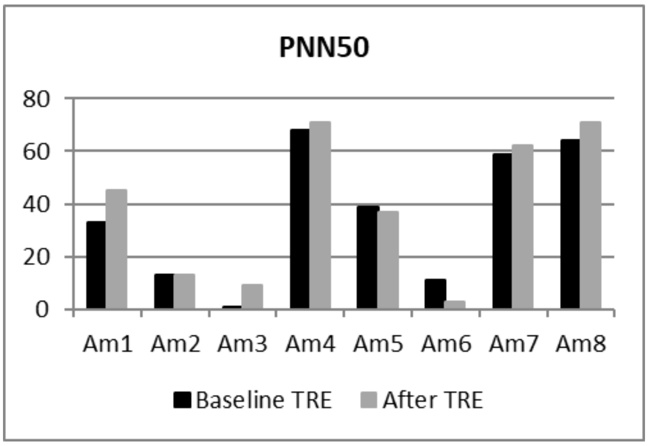

Figure 6e: HRV index - PNN50

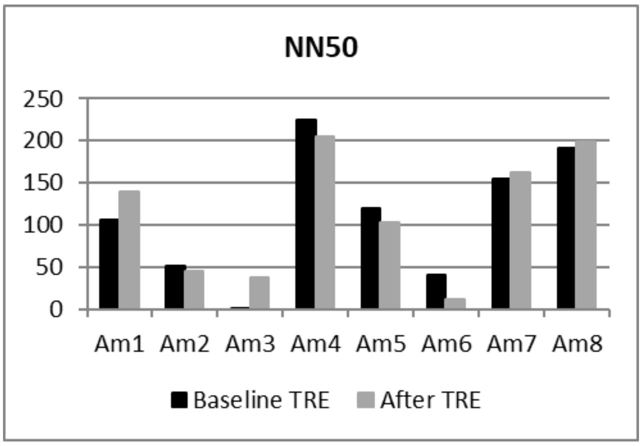

Figure 6f: HRV index - NN50

Figure 6a to 6f: HRV indices.

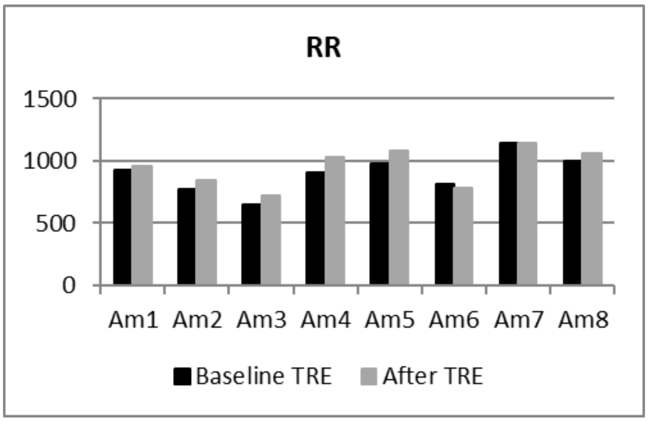

Figure 6g: RR interval

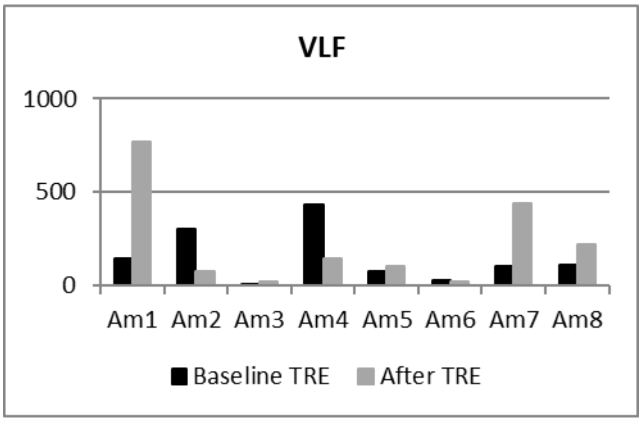

Figure 6h: HRV Index – VLF

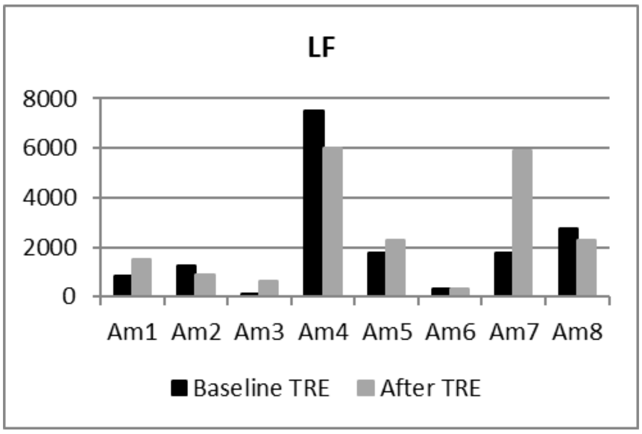

Figure 6i: HRV Index - LF

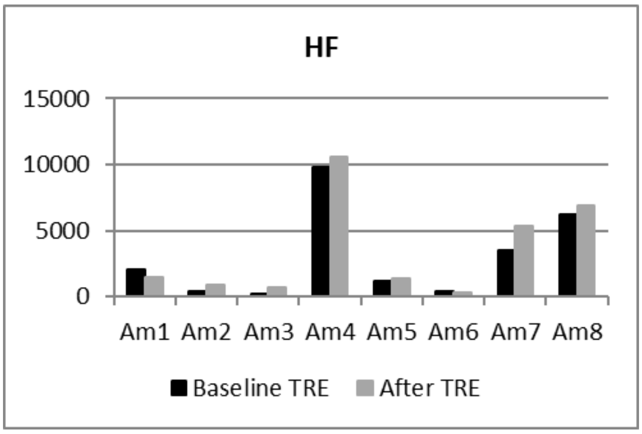

Figure 6j: HRV Index – HF

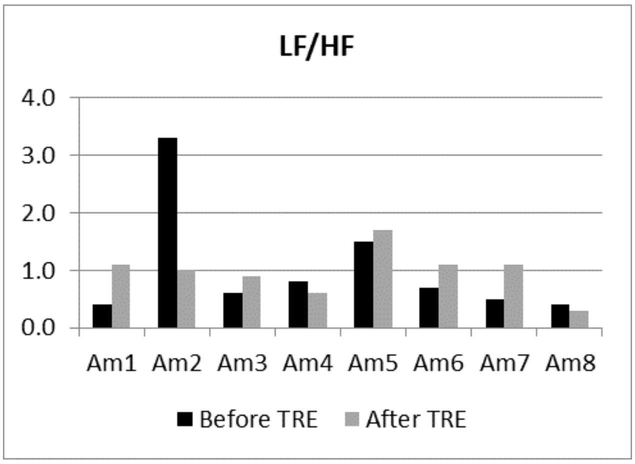

Figure 6k: HRV Index - LF / HF

Figure 6g to 6k: HRV indices.

Strengths and Limitations

The main strength of this study is that it used an objective measure of HRV to identify the impact of TRE. The authors acknowledge the small sample size, however as this was a pilot study offered to help reduce stress in university students, it was shown that this method is a non-invasive, easy, cost effective and acceptable method to use. There are limitations. Participants were self-selecting, used self-reported measures designed by authors for psychophysiological variables, and there was no control group. Longitudinal studies, with a control group are recommended for future research into the effects of TRE.

The results of this study can be used to provide preliminary evidence for the effects of TRE to include in subsequent research and funding proposals.

Conclusions

Comparing heart rate variability (HRV) before and after the intervention with TRE, it can be said that according to the time domain, frequency and linearity indices, there was an increase in HRV after the TRE. A statistically significant average heart rate (M_HR) and average of the RR intervals M_RR (Tables 1 to 3) are identified, indicating that there is an autonomic change, as it reduced the M_HR and respectively increases M_RR significantly after the application of TRE.

Some of the participants had high HRV indexes in relation to the others and this causes the average of the standard deviation to increase (Figure 6: 6a to 6k), which may indicate that there was an increase HRV in 69% of the indexes after the TRE.

The objective statistical results from HRV assessment along with the subjective descriptive results from the psychophysiological assessment showed that the TRE process, together with the participant taking a deeper breath during practice, improved emotional and mental states and reduced body tensions, thus increasing wellbeing.

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References

1. Berceli D. Exercícios para Liberação do trauma. Recife: Libertas Editora (2010).
2. Oliveira M. Variabilidade da frequência cardíaca e sistema nervoso autônomo, VII Encontro Latino Americano de Pós-Graduação – Universidade do Vale do Paraíba (2012).
3. Loures DL, Sant'Anna, I, Baldotto CSDR, Sousa EBD, Nóbrega ACLD. Estresse Mental e Sistema Cardiovascular. Arquivos Brasileiros de Cardiologia, 78(5), 525-530. doi: 10.1590/S0066-782X2002000500012.
4. Sbissa PPM. Efeito Da Meditação Mindfulness Sobre a Variabilidade Da Frequência Cardíaca. 2012. URI: http://repositorio.ufsc.br/xmlui/handle/123456789/93753
5. Schubert C, Lambertz M, Nelesen RA, Bardwell W, Choi JB, Dimsdale JE. Effects of stress on heart rate complexity--a comparison between short-term and chronic stress. Biol Psychol. 2009 Mar;80(3):325-32. doi: 10.1016/j.biopsycho.2008.11.005. Epub 2008 Dec 3. PMID: 19100813; PMCID: PMC2653595.
6. Jong MMJ, Randal DC. Heart rate variability analysis in the assessment of autonomic function in heart failure. Journal of Cardiovascular Nursing, v. 20, n. 3, p. 186-195may/june, 2005.
7. Phongsuphap S, Pongsupap Y, Chandanamattha P, Lursinsap C. Changes in heart rate variability during concentration meditation. Int J Cardiol. 2008 Nov 28;130(3):481-4. doi: 10.1016/j.ijcard.2007.06.103. Epub 2007 Aug 30. PMID: 17764770.
8. Braz SV. Stress, qualidade de vida e mitos conjugais. Dissertação de mestrado. Pontifícia Universidade Católica de Campinas (2010).
9. Calais SL, Andrade LMB, Lipp, ME. Diferenças de sexo e escolaridade na manifestação de estresse em adultos jovens. Psicologia: reflexão e crítica (2003) 16 (2), 257- 263. DOI: 10.5935/1808-5687.20160004.
10. Gallo S. Sentimentos da mulher frente ao relacionamento amoroso. Dissertação de mestrado. Pontifícia Universidade Católica de Campinas. Campinas, São Paulo (2006).
11. Sadir MA, Bignotto MM, LIPP MEN. Stress e qualidade de vida: influência de algumas variáveis pessoais. Paidéia (Ribeirão Preto), Ribeirão Preto , v. 20, n. 45, p. 73-81, Apr. 2010. doi.org/10.1590/S0103-863X2010000100010.
12. Scaer R. The trauma spectrum. New York: W.W. Norton (2005).
13. Selye HA. (1976). The stress of life. New York: McGraw-Hill.
14. Berceli D. Exercícios para Liberação do Estresse e das Tensões: Uma técnica inovadora para dissolver as tensões crônicas profundas e restaurar o sentimento interno de paz e calma. Brasília. Centrar: Centro de Terapia e Resiliência (2006).
15. Berceli D. Evaluating the Effects of Stress Reduction Exercises. Tese de doutorado. Arizona State University, Arizona (2007).
16. Levine PA. O despertar do tigre: curando o trauma. São Paulo: Summus (2004).
17. Levine PA. Uma voz sem palavras: como o corpo libera o trauma e restaura o bem-estar. São Paulo: Summus (2012).
18. Berceli D. Técnica para redução do estresse profundo. Centrar. Centro de Terapia e Resiliência (2008).
19. Cassimo SMV. Trauma e dissociação em vítimas de violência doméstica. Dissertação de mestrado. Instituto Superior Miguel Torga, Coimbra, Portugal (2009).

20. Watkins A. Mind-Body Medicine – A Clinician´s Guide to Psychoneuroimmunology, Churchill Livingstone, 1997.
21. Ravazzola MC. Historias infames: los maltratos em las relaciones. Buenos Aires: Paidós (1997).
22. Ravazzola MC. Violencia familiar: el abuso relacional como un ataque a los derechos humanos. Sistemas Familiares, 4(3), 29–41 (1998).
23. Berceli D, Phillips D. TRE Exercises: Official Video. https://www.youtube.com/watch?v=9ZFI9sCiEkY2020]
24. Berceli D. Neurogenic tremors: A body-oriented treatment for trauma in large populations. Trauma and Gewalt (German) 2010;4(2):148-56.
25. Berceli D, Salmon M, Bonifas R, Ndefo N. Effects of self-induced unclassified therapeutic tremors on quality of life among non-professional caregivers: A pilot study. Global Advances In Health And Medicine. 2014;3(5):45-8.
26. Johnson SM, Naidoo AV. Can evolutionary insights into the brain's response to threat suggest different interventions for perceived stress and burnout for teachers in high-risk schools? SA Journal of Psychology. 2017;47(3):401-15.
27. Amaral, A., E. Andrade, G. Angnes, E. Sardeiro, L. Carvalho, V. Fonseca and A. Vasconcelos Innovative solutions for the promotion of adolescent mental health in primary care.The Adolescence & Health Magazine (Official publication of the Center for the Study of Adolescent Health (NESA) of the University of the State of Rio de Janeiro 2018, 15 (1): 66-72.
28. Lynning M, Svane C, Westergaard K, Bergien SO, Gunnersen SR, Skovgaard L. Tension and trauma releasing exercises for people with multiple sclerosis – An exploratory pilot study. Journal of Traditional and Complementary Medicine. 2021, doi.org/10.1016/j.jtcme.2021.02.003.
29. Heath R, Beattie J. Case Report of a former soldier using TRE (Tension/Trauma Releasing Exercises) for posttraumatic stress disorder self-care. 2019, Vol 27; No.3. Journal of Military and Veterans' Health. 2019;27(3):35-40.
30. Thommessen CS, Fougner M. Body awareness in acting: A case study of TRE as a supporting tool for drama students' personal and professional development Theatre, Dance and Performance Training. 2020;11(4):434-52.
31. Vanderlei LCM, Marcelo P, Rosângela AH, Tatiana DDC, Moacir FDG. Noções básicas de variabilidade da frequência cardíaca e sua aplicabilidade clínica. Rev Bras Cir Cardiovasc [online]. 2009, vol.24, n.2, pp.205-217. ISSN 1678-9741. doi:10.1590/S0102-76382009000200018.
32. Juliana L. Respostas fisiológicas de homens saudáveis a variações de nível de dificuldade de um videogame tipo puzzle 2018.
33. Hainsworth R. Reflexes from the heart. Physiol Rev. 1991 Jul;71(3):617-58. doi: 10.1152/physrev.1991.71.3.617. PMID: 2057525.
34. Junqueira LF. Disfunção Autonômica Cardíaca. In: C.C., P. (Ed.). Doenças do Coração - Tratamento e Reabilitação: Guanabara-Koogan, 1998. cap. 58, p.306-311.
35. Carlson NR. Fisiologia do comportamento. 7ed. São Paulo: Manole, 2002.
36. Wilmore JH, Costill DL. Physiology of sport and exercise. Champaigm: Human Kinetics. 1994.
37. PORGES, S. W. (2001). The polyvagal theory: phylogenetic substrates of a social nervous system. Int J Psychophysiol, 42(2), 123-146.
38. PORGES, S. W. (2007b). The polyvagal perspective. BiolPsychol, 74(2), 116-143. doi: 10.1016/j.biopsycho.2006.06.009

39. LIN, G.; XIANG, Q.; FU, X.; WANG, S; WANG, S.; Chen, S; . . . WANG, T. (2012). Heart rate variability biofeedback decreases blood pressure in prehypertensive subjects by improving autonomic function and baroreflex. J Altern Complement Med, 18(2), 143152. doi: 10.1089/acm.2010.0607
40. Neto Pedro LC. Estatística. Ed. Blucher Ltda, 1977.
41. Tonkin AL. Autonomic Dysfunction: Drug-Induced. Encyclopedia of Neuroscience, 2009. p. 809-815.
42. Paschoal MA, Volanti VM, Pires CS, Fernandes FC. Variabilidade da freqüência cardíaca em diferentes faixas etárias. Brazilian Journal of Physical Therapy, 10(4), 413-419. Doi: 10.1590/S1413-35552006000400009
43. Kingsley M, Lewis MJ, Marson RE. Comparison of Polar 810s and an ambulatory ECG system for RR interval measurement during progressive exercise. Int J Sports Med. 2005 Jan-Feb;26(1):39-44. doi: 10.1055/s-2004-817878. PMID: 15643533.
44. Emilio J, Santiago A. Comparison between photoplethysmographic heart rate monitor from Polar Vantage M and Polar V800 with H10 Chest strap while running on treadmill. First published online: December 3, 2020.
38. Tarvainen MP, Niskanen JP, Lipponen JA, Ranta-Aho PO, Karjalainen PA. Kubios HRV--heart rate variability analysis software. Comput Methods Programs Biomed. 2014;113(1):210-20. doi: 10.1016/j.cmpb.2013.07.024. Epub 2013 Aug 6. PMID: 24054542.
39. Heatley Tejada A, Dunbar RIM, Montero M. Physical Contact and Loneliness: Being Touched Reduces Perceptions of Loneliness. Adaptive Human Behavior and Physiology. 2020;6(3):292-306. doi: 10.1007/s40750-020-00138-0.
40. Salovey P, Mayer JD. Emotional Intelligence. Imagination, Cognition and Personality. 1990;9(3):185-211. doi:10.2190/DUGG-P24E-52WK-6CDG.
41. Paiva ALN, Bispo R. Emojis, as emoções representadas graficamente no ciberespaço Universidade Federal de Alagoas, Alagoas, AL. 2017.
42. Likert R. A technique for the measurement of attitudes. Archives of Psychology, 1932;22(140), 1-55.
43. González R, Fernando L. Epistemología cualitativa y subjetividad. São Paulo: EDUC, 1997.

Supplementary 1

Measurement Protocol

1. The belt must be moist in the region of the electrodes.
2. Place the Polar H10 belt in the center of the chest, as shown, it should not be loose or tight.

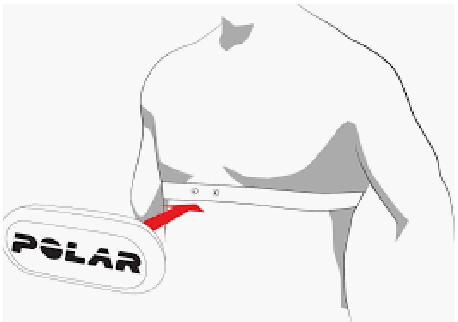


Figure 1: Position of the polar belt on the participant

3. Keep the central part of the belt, as shown in the image above.
4. Activate the Polar and check if the signal capture is correct, if not, adjust the strap again.
5. Beginning of exercises to activate Psoas.
6. For data collection before, during and after TRE. The participant will be barefoot according to the position of the figure:

Figure 2: RR intervals recording position
Permission to use courtesy of the Author

7. Before starting the measurement, the heart rate is expected to stabilize, and just after one minute, the five-minute measurement starts at this stage, before the TRE
8. Right after the end of the RR intervals measurement before the TRE, the participant relaxes his legs, drops on the mat and waits for around two minutes to return to the same previous position, but now performing the TRE practice. The TRE facilitator asks the participant to report when the body begins to shake. After reporting, wait two minutes to start measuring RR intervals over a five minute session. During this time the facilitator invites the participant to take a deeper breath.
9. Finishing the RR intervals measurements during the TRE, asks the participant to relax the legs, leaving them on the mat for two minutes, where soon after returning to the same previous position to measure the RR intervals for 5 minutes after the session TRE, relaxation.

Supplementary 2

Participant Questionnaire

Interview date :________
1. Birth :_________ Age:____anos
2.Job:______________
4. Religion :_______________
5. Marital status: ( ) single ( ) married) ( ) widower ( ) separated
6. Educational level:
( ) Illiterate / Incomplete primary
( ) Complete primary / incomplete gym
( ) Complete high school / studying higher education
( ) Complete higher education

7. How do you consider your sleep? ( ) great ( ) good ( ) fair ( ) bad ( ) Terrible

8. What is the weekly frequency of your alcohol intake?
( ) null ( ) 1 time ( ) 2 to 3 times ( ) more than 4 times ( ) daily
Did you drink alcohol in the last 24 hours? ( ) Yes No

9. Do you smoke?
( ) no () occasionally ( ) every day, how much? ______ ( ) stopped, how much time?____
Have you smoked in the last 24 hours? ( ) Yes ( ) No

10. How often do you regularly practice recreation?
( ) never ( ) 1 time ( ) 2 to 3 times ( ) more than 4 times ( ) daily

11. Do you practice any kind of sport or physical activity? ( ) Yes ( ) No __________________
a-) How many times a week?
() 1 time () 2 times () 3 times () 4 times () 5 times2
b-) How long ago?
() less than 1 year () more than 1 year () more than 2 years () more than 5 years

12. Has physical limitation, () knee () spine () respiratory. Which:______________________
health-related illness, syndrome or risk factor?
1 ( ) Diabetes. 2 ( ) Arthrosis.3 ( ) Cardiovascular disease. Which:________.
4 ( ) Hyperthyroidism5 ( ) Irritable bowel syndrome. 6 ( ) others, which: ____________________.

13. Do you take any medication? ( ) Yes No
( ) Antibiotic ( ) Beta-blocker ( ) Insulin ( ) Muscle relaxant ( ) Analgesics
( ) Anti-inflammatory ( ) Antidepressant ( ) Anxiolytic ( ) Others: __________________________

14. Do you carry out any type of complementary health practice? () Yes () No Which: __________
How long: _________
1 () Hypnosis 2 () Physiotherapy 3 () Acupuncture 4 () yoga 5 () Massage 6 () Tai Chi Chuan
7 () Meditation. Which?:_________
8 () Medicinal plants and herbal medicine
9 () Others: **______________________**

Supplimentary 3

Exclusion criteria for the study

1. The measurement of your chest, according to the position of the Polar belt in fig.1, must comprise between **65 to 95cm**

Cinta Polar H10

2. What is the weekly frequency of your alcohol intake?
( ) null ( ) 1 times ( ) 2 to 3 times ( ) more than 4 times ( ) dailyente

3. Do you smoke?
( ) no ( ) occasionally ( ) every day, how much? ______ ( ) stopped there how much time?____________

4. Do you use any form of complementary health practice such as acupuncture, medicinal plants / phytotherapy, meditation or hypnosis?
( ) no ( ) yes

5. Do you use antidepressant, anxiolytic, antihypertensive medication or cardiovascular drugs?
( ) no ( ) yes

Supplementary 4

Free and informed Consent From (FICF)

Dear participant this is an invitation for you to be part of research which is named as Tension Trauma Releasing Exercises (TRE) Modulating the Autonomous Nervous System (ANS), Evaluated by the Heart Rate Variability (HRV). This study aims to investigate the effect of analyzed TRE on heart rate variability (HRV), in the quality of life.

It is a voluntary participation. If you accept to be part os this research, we ask for your permission to use the data that will be collected through the particpant's questionnaire, the emotions scales, mental state and body tension and data collected through the HRV analysis device. We emphasize that time, you can leave the survey. We remind you that TRE is used in the Public Health System in the Federal District (Brazil) and it is recognize by the Federal Council of Psichology. This technique has been widely used in more than 60 countries and in Brazil, it has already been used for 10 years. The names of the participants will not be revealed in the research.

Any additional information or explanation about this research can be obtained from FICF. The researcher phone +55 51 992523548

I (participant): ____, consider myself informed about the research "Tension Trauma Releasing Exercises (TRE) Modulating the Autonomous Nervous System (ANS), Evaluated by the Heart Rate Variability (HRV)" and I agree to be part of it. I also agree that all the data collected through the participant's questionnaire from the humoe scale, the evaluated stress scale and data collected through the analysis device (HRV).

If you want to receive the results of this survey after your conclusion, please leave your email address here so it can be sent to you.

Email____.

Porto Alegre, __/__/__

____
Research Participant Signature

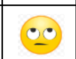
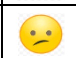
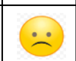
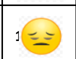
____
Researcher Signature

Supplementary 5

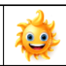
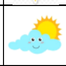
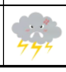
Subjective Evaluation

Use the scales below to assess your emotions, mental state and body tension

Emotional score (1-10)

		SCALE	BEFORE	AFTER
				
				
				
				
				
				
				
				
				
				

Mental state (1-5)

		SCALE	BEFORE	AFTER
				
				
				
				
				

Body tension score (1-5)

		SCALE	BEFORE	AFTERS