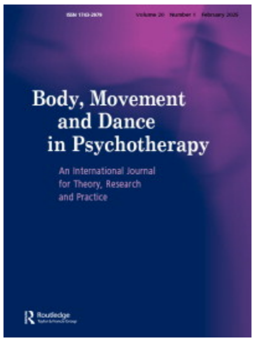

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How the body remembers a traumatic event: a case study from Somatic Experiencing perspective

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ABSTRACT

Somatic Experiencing (SE) is a body-centered approach to healing trauma that emphasises the importance of addressing physiological responses to traumatic experiences. This case study explores the therapeutic SE session in addressing medical trauma, focusing on a 38-year-old female who experienced cardiac arrest. The convergent mixed-method design integrates qualitative and quantitative data to provide a comprehensive analysis of the client's journey through one SE therapy session. Central to this study is the examination of heart rate variability (HRV) as a measure of autonomic nervous system (ANS) regulation. The findings illustrate how SE facilitates the restoration of autonomic balance and emotional regulation through body-centred interventions and therapist-assisted touch. HRV data revealed significant fluctuations corresponding to the client's emotional and physiological states revealed in video recording of the session, highlighting the interplay between sympathetic and parasympathetic responses during the session. This study underscores the importance of incorporating physiological monitoring to enhance our understanding and treatment of trauma-related disorders.

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KEYWORDS Somatic Experiencing; body-oriented psychotherapy; heart rate variability; trauma resolution

Introduction

Trauma profoundly impacts the human body and mind, often leading to complex and persistent physiological and psychological disturbances (Walter & Bates, 2012). Among the myriad approaches to addressing trauma, Somatic Experiencing (SE) offers a unique perspective by emphasising the role of the body in storing and processing traumatic experiences (Brom et al., 2017). SE

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posits that trauma is not merely a psychological event but a disruption of the autonomic nervous system (ANS), leading to dysregulation and chronic stress responses (Payne et al., 2015). Heart rate variability (HRV) serves as a pivotal measure in understanding the interplay between the sympathetic and parasympathetic branches of the ANS. Variations in HRV reflect the body's ability to adapt to stress and regulate emotional states, providing a window into the physiological underpinnings of trauma (Shaffer & Ginsberg, 2017). Higher HRV is generally associated with better emotional regulation and stress resilience, while lower HRV often correlates with anxiety, depression, and other stress-related disorders (Kemp et al., 2010; Thayer et al., 2012). Polyvagal theory underscores the significance of vagal tone in emotional and social regulation, further enriching our understanding of trauma's impact on the body (Porges, 2007).

This case study focuses on a 38-year-old female client, nicknamed Zeren, who sought an SE therapy session to address medical trauma following a cardiac arrest. Through a convergent mixed-method case study design, integrating both qualitative and quantitative data, we aim to provide a comprehensive understanding of the therapeutic process from a SE perspective. The client's journey through the SE session is meticulously documented by video recording and measurement of HRV through the session, highlighting the dynamic responses of the ANS and the transformative potential of body-centered therapeutic interventions. This study not only contributes to the growing body of literature on SE but also underscores the importance of integrating physiological monitoring in trauma therapy to enhance our understanding and treatment of trauma-related disorders.

The role of heart rate variability in autonomic nervous system regulation and emotional health

HRV is the measurement of the variation in time intervals between consecutive heartbeats, reflecting the dynamic interplay between the sympathetic and parasympathetic branches of the ANS (Malik et al., 1996). It serves as a critical indicator of emotional regulation and stress resilience, providing valuable insights into the physiological underpinnings of psychological states (Reissner et al., 2006). Several specific HRV parameters, including RMSSD, pNN50, HF, LF and the LF/HF ratio, offer detailed information about the ANS's functioning.

RMSSD measures the short-term variations in heart rate and primarily reflects parasympathetic (vagal) activity. Higher RMSSD values indicate greater parasympathetic (rest-and-digest) influence on the heart, signifying a well-functioning autonomic regulation system (Shaffer & Ginsberg, 2017). pNN50 represents the proportion of consecutive heartbeats that differ by more than 50 milliseconds. Like RMSSD, this parameter is strongly associated with parasympathetic activity. Higher pNN50 values suggest robust parasympathetic function and greater HRV (Shaffer et al., 2014).

HF power is the spectral component of HRV within the frequency range of 0.15–0.40 Hz. It is predominantly influenced by parasympathetic nervous system activity and is often used to assess the vagal tone. Increased HF power is associated with relaxation and reduced stress (Pham et al., 2021). LF power, ranging from 0.04 to 0.15 Hz, reflects both sympathetic and parasympathetic activity but is often considered an indicator of sympathetic modulation when expressed in normalised units. Elevated LF power can signify increased sympathetic activity, typically associated with stress and arousal (Shaffer & Ginsberg, 2017). The LF/HF ratio is widely used to assess the balance between sympathetic and parasympathetic influences on heart rate. A higher LF/HF ratio indicates dominance of sympathetic activity, while a lower ratio suggests parasympathetic dominance. This ratio is beneficial for understanding the overall autonomic balance and its relation to stress and emotional regulation (Laborde et al., 2017).

HRV parameters have been extensively utilised in psychological research to track emotional states and autonomic regulation. For example, higher HRV is associated with a greater ability to regulate emotions and adapt to stressors, indicating a well-functioning ANS (Thayer et al., 2012). Conversely, lower HRV is often linked to anxiety, depression and other stress-related disorders, highlighting the dysregulation of autonomic functions (Kemp et al., 2010). One of the prominent theories connecting HRV to emotional regulation and the ANS is the polyvagal theory (Porges, 2007). This theory posits that the vagus nerve, a major component of the parasympathetic nervous system, plays a crucial role in social engagement and emotional regulation. According to Porges, HRV is a direct measure of vagal tone and thus provides a window into the regulation of the ANS (Mccraty & Shaffer, 2015; Porges, 2021).

In psychological settings, HRV is utilised as a biofeedback tool to enhance emotional self-regulation. For instance, in therapeutic practices such as biofeedback and mindfulness-based interventions, individuals learn to modulate their HRV to achieve a state of calm and emotional balance (Lehrer et al., 2020). This is particularly relevant in interventions like SE, a body-focused therapy aimed at resolving trauma by restoring autonomic regulation through increased awareness of bodily sensations (Payne et al., 2015).

Somatic Experiencing and the power of touch

SE is a therapeutic biopsychosocial approach that focuses on the connection between the mind and body in processing and healing trauma and introduces several key concepts integral to its therapeutic framework (Levine, 1997). Resources refer to the internal or external tools, strengths, or capacities an individual possesses to regulate their nervous system and manage overwhelming experiences. Pendulation, a core concept in SE, involves the rhythmic movement between states of activation (arousal) and deactivation (relaxation) within the nervous system. Titration refers to the careful pacing or gradual exposure to traumatic memories or bodily sensations in small, manageable doses during therapy sessions (Levine, 1997; Ogden & Minton, 2000). SE highlights the significance of these concepts in trauma recovery and the adaptive regulation of the nervous system (Payne et al., 2015).

Research often delves into the theoretical foundations of SE, which integrates concepts from neuroscience, biology, psychology and anthropology. The literature discusses how SE views trauma stored in the body and emphasises the nervous system's role in regulating responses to stress. Studies have explored the efficacy of SE in treating various forms of trauma, including PTSD, childhood trauma, and chronic stress (Andersen et al., 2017; Brom et al., 2017; Leitch et al., 2009; Parker et al., 2008). Research often includes both qualitative and quantitative data, examining changes in physiological responses, psychological symptoms, and overall well-being post-SE interventions (Özel, 2024; Winblad et al., 2018). Research explores the applicability of SE across diverse populations, including children, veterans, survivors of natural disasters and individuals with complex trauma (Özel, 2024; Parker et al., 2008). However, there is limited research investigating the neurobiological mechanisms underlying SE.

Therapeutic touch has increasingly been recognised as a valuable component in psychotherapy, particularly in the context of trauma treatment (Westland, 2011). This approach involves the use of touch to promote physical and emotional healing, and its efficacy is supported by emerging research that highlights its benefits in regulating the ANS and enhancing emotional regulation. Studies suggest that therapeutic touch can help decrease physiological arousal and increase parasympathetic activity, fostering a state of calm and safety in clients (Field, 2019). In trauma therapy, touch can facilitate the reconnection between body and mind, helping clients process and integrate traumatic experiences more effectively (Schleip, 2020). Incorporating therapeutic touch within modalities such as SE can enhance the therapeutic alliance, deepen the client's sense of safety, and support the resolution of traumatic memories stored in the body (Heller & Heller, 2018). These insights underscore the therapeutic potential of touch in fostering holistic healing and improving psychological outcomes in clients undergoing trauma therapy.

Methodology

Research design

The convergent mixed-method case study design, which combines qualitative and quantitative methods within a single case study design, was used in this study. This design allows researchers to investigate a single research question from different angles, using both qualitative and quantitative methods to complement each other. By combining both qualitative and quantitative approaches in a case study, researchers aim to complement each other's strengths. The qualitative method, which is video recording, provides depth, context and nuanced understanding. Integrating these methods allows researchers to create a more comprehensive and holistic understanding of the case, enhancing the overall validity and reliability of the study's findings.

Research question and hypothesis

This study aims to explore the impact of SE on the ANS regulation by examining shifts in HRV in an individual who has experienced medical trauma, specifically cardiac arrest. The research seeks to answer the question: How does a SE session influence HRV and ANS shifts in an individual recovering from medical trauma?

Presentation of the case

Zeren sought an SE session to address medical trauma resulting from a cardiac arrest history. Before starting the session, informed consent was verbally obtained, and the participant signed agreements regarding privacy and confidentiality to ensure ethical compliance. Approximately six months prior to the therapy session, she experienced cardiac arrest due to arrhythmia, which necessitated cardiopulmonary resuscitation (CPR) for revival. Following this incident, Zeren reported persistent memory issues and a sensation of being unable to fully return to her pre-trauma state, feeling as though a part of her remained stuck at that moment. At the time of the medical emergency, Zeren was experiencing significant financial strain due to impending divorce proceedings and was heavily overworked. Despite feeling excessively fatigued, she initially opted to rest on the evening of the incident. However, at her mother's insistence, she visited the hospital. Although she felt well, she sought emergency care by driving the car alone, during which her heart rate escalated to 330 beats per minute, resulting in cardiac arrest and requiring CPR twice. She subsequently spent approximately 10 d in intensive care unit (ICU), with 5 of those days on a ventilator, during which her brain suffered from a minute of oxygen deprivation, leading to memory loss. She continues to experience ongoing memory issues.

Instruments

HRV

In this study, the device used for measuring ANS parameters from the left hand is the Elite CorSense. The Elite CorSense HRV monitor provides accurate R-R interval monitoring, features a 500-hertz sensor array, and comes with a convenient smartphone app to keep all data in one place. The Elite HRV's Corsense HRV Monitor includes three multi-wavelength LED emitters, five wide visible spectrum photodetectors, and one infra-red detector. This advanced measurement system is calibrated to account for variations in skin tone and circulatory factors to measure relevant biomarkers. The CorSense HRV monitor monitors the data collected through a process known as Photoplethysmography. Although less accurate than traditional measurements like an electrocardiogram, the practicality of photoplethysmogram makes it a more suitable technology for a range of applications (Lu et al., 2009).

The Elite HRV device and application create significant positive differences in user convenience compared to other techniques, with the ability to collect RMSSD, SDNN, LN, PNN50%, LF/HF ratio, LF power and HF power data in real-time (Esco & Flatt, 2014). Additionally, compared to the frequently used Kubios HRV version 2.2 software in similar studies for HRV analysis, it has been shown that the Elite HRV device can be used with equal success in examining RMSSD values (Perrotta et al., 2017).

Video recording

The 90-min session conducted by Sonia Gomes was video recorded. The camera angles and positions were strategically set to capture a comprehensive session view without disrupting the natural flow of interactions.

Data analysis

Quantitative analysis of HRV

Quantitative analysis of HRV was conducted using both time-domain and frequency-domain methods. The HRV data were collected using the Elite CorSense HRV monitor, which recorded participants' heart rate data over a specified period. The Elite HRV application was used to calculate specific parameters such as RMSSD, SDNN, PNN50%, LF/HF ratio, LF power and HF power. The HRV charts generated from these analyses were meticulously examined to identify shifts and trends in HRV over time. The results, detailed in the results section, illustrate the changes in HRV as measured by the Elite CorSense device and analysed using these methods, offering valuable insights into HRV patterns and their correlation with different physiological and psychological conditions.

Qualitative video analysis

The qualitative component of this study employed content analysis to examine the video recordings of the SE session. This method allowed for a systematic examination of observable patterns related to ANS regulation and trauma recovery.

Three independent coders, each familiar with qualitative analysis and SE, were responsible for tracking and coding visual markers of nervous system changes, including body language, physiological activation, emotional expression and client self-reports. Initial coding was conducted independently by each observer to ensure objectivity, followed by collaborative discussions to resolve discrepancies and refine the coding scheme. Regular meetings ensured consistency in interpretation and application.

To enhance replicability, the study provided thick descriptions of the identified themes, supported by direct quotations from both the therapist and the client. These descriptions offer in-depth insights into the observed shifts during the SE session, allowing future researchers to follow a similar methodological approach. The structured content analysis framework contributes to a comprehensive understanding of how SE therapy facilitates physiological and emotional recovery in individuals with trauma.

Merging qualitative and quantitative data

The data analysis process involved systematically linking video-coded observations with HRV measurements to capture autonomic shifts during the SE session. Content analysis was used to code visual indicators of nervous system changes, including body language, physiological activation, emotional expressions, and verbal engagement. Three independent coders analysed the video footage and categorised moments that reflected shifts in autonomic regulation. These qualitative insights were then merged with quantitative HRV data to establish connections between observed behaviours and physiological responses.

Results

Initial activation and social engagement and transition to social engagement

The SE therapy session consisted of two stages, starting with the client's high activation level and initial stabilisation of her existing activation level. The client exhibited no upper body movement, indicating a dorsal vagal state. Low HRV and RMSSD values indicated a low parasympathetic tone and low LF power, suggesting a system-wide shutdown in freeze. The therapist used physical touch to increase ventral vagal activation, leading to the client's emotional discharge and movement from the dorsal vagal state towards sympathetic discharge. Throughout this process, titration was used to carefully introduce activation in small doses, preventing overwhelm while allowing the nervous system to process the experience gradually by using gentle pressure on the client's feet to promote grounding, a technique designed to foster a sense of stability and presence. During the transition to social engagement, marked by laughter and jokes, there was a dramatic increase in RMSSD, HRV, LF and HF power values, indicating the client's shift from shutdown to social engagement on a nervous system level. The therapist continued to support the client physically and through psychoeducation, leading to a decrease in sympathetic activation and slight declines in HRV and RMSSD. However, they remained higher than at the session's start.

Processing childhood trauma and emotional regulation

Zeren's childhood trauma led her to suppress her anger, causing dysregulation. Still, through psychoeducation and physical support from the therapist, she experienced relaxation and a sense of more space in her upper body. After the initial calming of activation and establishment of social connection, Zeren began to discuss the topic she wished to work on. Upon analysing the video, there wasn't initially a notable emotional response. The body did not give any reaction, which may indicate that Zeren was in total dissociation. Looking at the HRV data, there was no significant change in the ANS when discussing factual information with emotional isolation. The connection between video-coded indicators and HRV was particularly clear during this stage, as HRV remained stable despite the therapist's verbal interventions, confirming a state of emotional detachment. As Zeren continued to narrate her story and interact with the therapist, the consistently low LF/HR ratio value accompanying all the data supports the notion that they were still predominantly in the parasympathetic realm, characterised by a high vagal tone.

During the moment when Zeren narrated the instance of their heart-stopping, a sudden change in the rhythm on the monitor was observed. Upon closer examination, the cardiac pacemaker, which should come into play in the event of a possible arrhythmia, had activated precisely at that moment. The pacemaker kicks in with the sudden drop in heart rate, resulting in the disappearance of the previously seen HRV. Instead, the heart maintains a steady pace under the influence of the pacemaker rhythm (see Figure 1).

Deep emotional processing and autonomic regulation

Looking at the parameters of the ANS, the level of HRV plummeted to the lowest level observed throughout the session. Similarly, RMSSD, LF and HF

Figure 1. HRV of Zeren.

values were also at their lowest levels. All of these physiological indicators suggested that Zeren had entered a state of total emotional shutdown and freeze. During this freeze, Zeren's heart rate decreased to such an extent that it might prompt the activation of her pacemaker, a device implanted to manage heart rhythm irregularities, and restore normal cardiac function. These critical physiological indicators underscore the intensity of the autonomic response during the therapy session.

Upon reviewing the video, the client appeared relatively calm while recounting the story. The right side was paralysed, and the left hand sometimes moved. Zeren continued to reexpress her experience during the ICU stay following her cardiac arrest. Observing her body, signs of freezing were observed. The measurements of HRV supported this observation. When Zeren talked about forgetting her son, HRV, RMSSD and HF values remained low, indicating a continued parasympathetic tone. At the same time, the sympathetic activation indicator LF Power showed a tendency to increase. She was experiencing sorrow on a sympathetic level.

To support regulation, the therapist used titration to carefully process small parts of the traumatic memory instead of engaging with the full intensity at once. This was done by momentarily shifting the focus to present-moment sensations, helping Zeren stay grounded and engaged without being overwhelmed.

The therapist supported the client by holding her arm during this activation, giving Zeren more emotional space. Additionally, the therapist encouraged self-touch, prompting Zeren to place her own hands on her chest, which provided a sense of containment and allowed her to regulate her physiological response. At that moment, her system was disorganised. With physical touch support and psychoeducation, she became more calm.

Additionally, grounding techniques such as pressing her feet on the floor were introduced to stabilise her nervous system. As she started to take a deep breath, HRV and RMSSD levels increased significantly. During the discussion about her divorce and conflicts with her husband, Zeren began to exhibit signs of fear in her body language and breathing, expressing feelings of collapse and crying. Her shoulders tensed and her breathing became shallow, which was clearly reflected in the HRV data, as a sharp increase in LF power, indicating sympathetic activation, was observed. She conveyed a transition from fear to sorrow, developing a dependency on him and experiencing emotional conflict. Despite claiming hope, fear was predominant in her emotions. She exhibited deep, exhaustive breathing patterns.

Emotional regulation and ventral vagal activation

While the therapist was re-educating her, her movement led to changes in her breathing, indicating a shift in her emotional state. The therapist encouraged Zeren to maintain eye contact, reinforcing her positive attributes, which facilitated an emotional change. Zeren's return to a more positive state and fear-free physiology was marked by a more ventral vagal state, with increased eye contact and deep focus on the therapist. At an autonomic level, decreasing LF power values indicates sympathetic activation is decreasing.

As she revisited her narrative, which was initially challenging for her to breathe, but with continued psychoeducation and encouragement towards a ventral vagal state, she became calmer, and her breathing stabilised and soothed. HRV started to increase, which suggests that Zeren was in a more regulated place while the therapist was talking. In this process, the therapist also guided her in pressing her feet to the ground, reinforcing grounding and bodily awareness, which correlated with an increase in HRV. Throughout the psychoeducational process, Zeren appeared calm despite occasional episodes of rapid breathing indicative of mild anxiety. However, upon examining the data, a significant decrease in HRV, RMSSD, HF and LF values was observed, indicating that Zeren was experiencing a state of freeze.

Zeren demonstrated hypertonicity, characterised by a blend of anger and sadness, which required a delicate approach to distinguish and address these intertwined emotions through ongoing education. As Zeren acknowledged her sorrow and remorse, beginning to connect with her heart by placing her hand on it and channelling sympathetic energy to distinguish her anger, her body responded to these emotional shifts. Following the sympathetic discharge, there was a significant increase in HRV, suggesting that she had transitioned to the ventral vagal system.

Physiological and emotional integration

After the first cycle of trauma processing finished and when Zeren was more connected to her heart and in a more regulated place, the therapist suggested going to the table. The therapist placed her hands on Zeren's shoulder blades, akin to a pizza shape, to enhance the ventral vagal support, providing a sense of containment and aiding in relaxation and parasympathetic activation. This technique allowed for greater integration between emotional expression and physiological recovery, evidenced by an increase in HRV and RMSSD. Zeren started to open up, with improved breathing coordination between her chest and abdomen. Assisting with neck support helped free the nerves, guiding her into deep relaxation and resulting in a more rested body.

Pendulation was introduced as a key technique here since the therapist guided Zeren between states of activation and deactivation to help her ANS develop greater flexibility. Zeren expressed difficulty breathing, prompting the therapist to place a hand on her diaphragm and another on her back to open sternochondral and costochondral cartilage. As soon as more space was open, Zeren started to cry with fear. Nervous system data showed that LF, HF and RMSSD levels were low, indicating that she was in a freeze. Interestingly, HRV was not as low as other values. With the support of the embrace of the therapist, an increase was observed in all ANS parameters.

The client expressed feeling disconnected and lifeless, saying, 'I am not able to come back, I do not feel alive. I am not here', and 'I am afraid'. At this moment, she was encouraged to feel her heartbeat with her own hands, reinforcing self-awareness and reconnection to the body. When looking at the HRV data at that moment, Zeren's ANS is in a state of total shutdown, indicating a freeze. The therapist then urged her to feel the heartbeat to engage the ventral vagal system, which gradually helped her become calmer. Zeren started to cough and described the strange taste of the tube at the ICU and began to feel discomfort. With the coughing, Zeren, previously in dorsal shutdown, began to show activity in the sympathetic nervous system, as there was an increase in LF data.

Similarly, there was a tendency for HRV to increase as well. The client hugged the therapist and listened to her heartbeat. She acknowledged the comforting nature of the therapist's heartbeats, saying, 'Your heartbeats are so nice, so peaceful'. The increase in HRV and HF power values indicates that the client is starting to transition into the ventral vagal state while hugging. Through touch, she was becoming more aware and present.

As Zeren began to approach self-regulation in the social engagement zone towards the end of the session, she made a joke. Particularly when

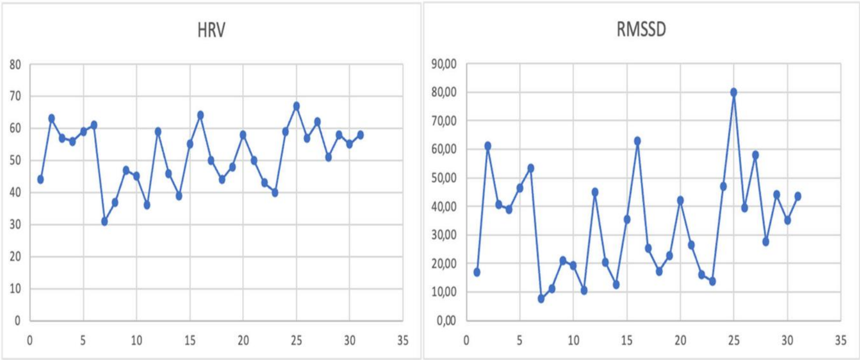

Figure 2. HRV and RMSSD flow of Zeren.

making the joke, HRV reached its highest level among all recordings. Similarly, there was a noticeable increase in RMSSD, LF, and HF levels. With laughter, Zeren not only supported social interaction but also released accumulated sympathetic energy in the nervous system.

As Zeren was in a more regulated state, they moved to chairs to close the session. ANS parameters went through various stages throughout the session in response to the fluctuations of emotions. Particularly when looking at the HRV data, a significant increase was observed compared to the beginning of the session. Zeren's HRV flow and RMSSD data during the therapy session can be seen below (see Figure 2).

Discussion

The results of the study, which particularly focused on ANS monitoring during the SE therapy session, reveal the intricate interplay between physiological responses and therapeutic interventions. Through the use of HRV RMSSD and the LF/HF ratio, dynamic responses from the sympathetic and parasympathetic branches of the ANS were observed. This physiological monitoring enabled Zeren's autonomic state throughout the therapy sessions, providing objective data to complement subjective experiences.

Zeren, who experienced significant life changes and traumatic events, exhibited profound autonomic disruptions as reflected in her HRV patterns. SE and therapist-assisted touch played a pivotal role in regulating her heart rhythm and promoting a shift from sympathetic or dorsal vagal dominance towards ventral vagal activation. This shift is essential in trauma therapy as it facilitates relaxation, social engagement, and the processing of traumatic memories. This serves as a valuable example of how freezing can manifest even in seemingly composed appearances when emotional isolation is at play.

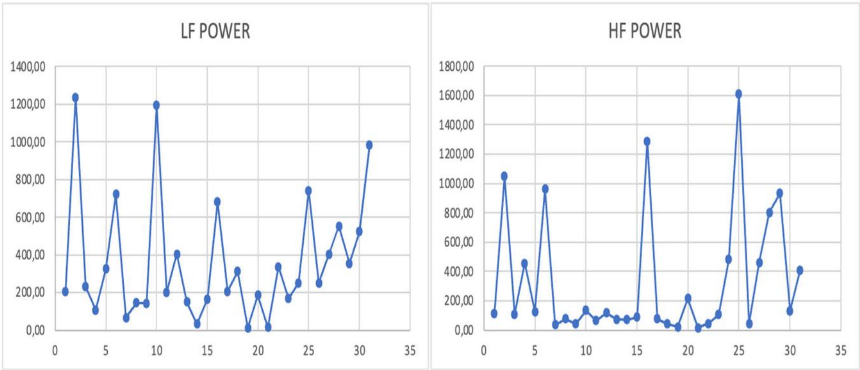

Figure 3. LF and HF power flow of Zeren.

The significant life changes and traumatic experiences faced by Zeren, including cardiac arrest and subsequent memory issues, represent profound autonomic disruptions. Such traumatic events can trigger the ANS to shift towards a state of defence, activating the dorsal vagal complex and leading to immobilisation or shutdown states. This physiological state aligns with Zeren's experiences of memory loss and the profound impact of her cardiac arrest. A significant decrease in RMSSD and HRV levels compared to baseline while working through cardiac arrest and ICU memories was observed. Additionally, LF levels were significantly dropped, addressing emotional shutdown states. LF Power and HF power are good indicators of sympathetic and parasympathetic systems reflectively. The LF/HF ratio indicates which branch of the ANS is more dominant. An increase in this ratio supports the predominance of the sympathetic branch, while a decrease suggests that the parasympathetic system is more predominant. Throughout the session, fluctuations in the nervous system were observed due to the processing of traumatic material. With each cycle, as a new emotion is processed, the journey in the ANS from the trauma vortex towards the resilience vortex through pendulation was observed (see Figure 3).

The therapeutic intervention, particularly the therapist-assisted touch, can be understood through polyvagal theory as a means to activate the ventral vagal system. This system is responsible for social engagement behaviours and is linked to feelings of safety and calmness. The regulation of Zeren's heart rhythm during therapy suggests a shift from sympathetic or dorsal vagal dominance towards a state of ventral vagal activation, promoting relaxation and social engagement states. Through therapist-assisted touch and somatic interventions, RMSSD, HRV and HF ratios increased significantly. This physiological shift could facilitate Zeren's engagement with the therapy, allowing for a more profound processing of traumatic memories.

Moreover, the observed change in heart rhythm when discussing her cardiac arrhythmia and arrest and the activation of her pacemaker can be interpreted through the lens of neuroception, a term described by Porges (2007) to explain how neural circuits distinguish whether situations or people are safe, dangerous, or life-threatening without conscious thought. The participant's physiological responses during these discussions likely reflect a neuroceptive process, where her nervous system detects threat cues related to her traumatic memories, eliciting a protective physiological response. It is a well-known fact that traumatic memories are recorded in the body, and during trauma processing, the body exhibits similar ANS responses as during the actual event. While this is a commonly understood concept, witnessing and recording such a precise instance provides valuable evidence for evidence-based treatment.

The integration of somatic education, polyvagal theory and therapeutic touch offers a comprehensive approach to trauma recovery. By addressing the vagus nerve's dysregulated physiological, emotional and tonic aspects, SE facilitates sensorimotor reintegration, restores autonomic regulation and fosters a coherent self-perception. This approach transforms trauma at the physiological level and creates a therapeutic environment conducive to healing and personal development.

In conclusion, the findings highlight the effectiveness of the SE approach in understanding and addressing the physiological underpinnings of trauma. By leveraging somatic interventions and integrating theoretical frameworks such as polyvagal theory, SE provides a nuanced and holistic perspective on trauma recovery. It emphasises the importance of embodiment, regulation and therapeutic presence in the therapeutic process, offering a valuable trauma therapy framework.

The integration of SE techniques with physiological monitoring provides a comprehensive understanding of trauma responses. The case study demonstrates the effectiveness of social interaction, physical touch and psychoeducation in modulating the ANS and facilitating trauma recovery. The observed physiological changes during therapy sessions underscore the importance of addressing both emotional and physiological aspects of trauma. With its emphasis on SE and therapist-assisted touch, SE approach effectively regulates heart rhythm and promotes a shift from sympathetic or dorsal vagal dominance towards ventral vagal activation. This shift is crucial for trauma recovery, facilitating relaxation, social engagement and the processing of traumatic memories. By leveraging somatic interventions and integrating polyvagal theory, SE provides a nuanced perspective on trauma recovery, emphasising embodiment, regulation and therapeutic presence in the healing process.

Limitations

While this study provides valuable insights into the effects of SE on ANS regulation and trauma recovery, several limitations must be acknowledged. First, generalisability is limited due to the single-case design and one-time SE session. Future studies should include larger sample sizes and multiple SE sessions to explore long-term effects and broader applicability.

Second, potential confounding factors must be considered, particularly in interpreting the client's memory lapses. It remains unclear whether these lapses resulted from dissociative mechanisms linked to trauma or memory impairments caused by oxygen deprivation during the cardiac arrest. Distinguishing between these factors is challenging, and future research could incorporate neurological assessments or cognitive evaluations to clarify these influences.

Additionally, while the study employs a convergent mixed-methods design, integrating both qualitative (video analysis) and quantitative (HRV measurement) data, there are inherent limitations to each method. HRV measurement, though a valuable physiological indicator, does not capture the full complexity of trauma processing and emotional regulation. Likewise, content analysis of video recordings, while providing rich qualitative insights, is subject to interpretative bias. Efforts were made to reduce bias by involving multiple coders and using thick descriptions with direct quotations, but subjective elements remain inherent in qualitative research.

Despite these limitations, this study contributes to the growing body of research on SE by demonstrating a structured approach to physiological and behavioural tracking in trauma therapy. Future research should aim for larger-scale studies with repeated sessions, control groups and additional physiological and neurocognitive measures to strengthen the validity and applicability of findings.

Disclosure statement

No potential conflict of interest was reported by the authors.

Notes on contributors

Selin Yurdakul Head of the Palliative Care Unit, is a medical doctor with expertise in internal medicine, neuroscience, and clinical psychology. A certified Somatic Experiencing Practitioner, she researches somatic therapies and heart rate variability in treating psychological conditions like PTSD, focusing on the autonomic nervous system.

Dilara Özel earned her doctorate in Educational Sciences with a focus on Guidance and Psychological Counselling. She is currently pursuing postdoctoral research at the University of Glasgow in the School of Education. Her primary research interests encompass trauma, refugee education, and peace education.

Sonia Gomes is a senior Somatic Experiencing (SE) instructor and Clinical Psychologist with over 30 years of experience in body-oriented psychotherapy. As a mentor and member of the SE International Faculty, she trains and mentors professionals worldwide, emphasising SE's role in trauma healing and personal growth. She also created the SOMA Program, an advanced SE specialisation focusing on touch and movement for emotional regulation in trauma therapy.

References

Andersen, T. E., Lahav, Y., Ellegaard, H., & Manniche, C. (2017). A randomized controlled trial of brief Somatic Experiencing for chronic low back pain and comorbid post-traumatic stress disorder symptoms. *European Journal of Psychotraumatology*, *8*(1), 1331108. https://doi.org/10.1080/20008198.2017.1331108

Brom, D., Stokar, Y., Lawi, C., Nuriel-Porat, V., Ziv, Y., Lerner, K., & Ross, G. (2017). Somatic experiencing for posttraumatic stress disorder: A randomized controlled outcome study. *Journal of Traumatic Stress*, *30*(3), 304–312. https://doi.org/10.1002/jts.22189

Esco, M. R., & Flatt, A. A. (2014). Ultra-short-term heart rate variability indexes at rest and post-exercise in athletes: Evaluating the agreement with accepted recommendations. *Journal of Sports Science & Medicine*, *13*(3), 535–541. https://pmc.ncbi.nlm.nih.gov/articles/PMC4126289/

Field, T. (2019). *Touch*. MIT Press.

Heller, D. P., & Heller, L. (2018). The practical application of touch in trauma therapy: Enhancing resilience and regulation. *Journal of Bodywork and Movement Therapies*, *22*(2), 455–462. https://doi.org/10.1016/j.jbmt.2018.04.00

Kemp, A. H., Quintana, D. S., Gray, M. A., Felmingham, K. L., Brown, K., & Gatt, J. M. (2010). Impact of depression and antidepressant treatment on heart rate variability: A review and meta-analysis. *Biological Psychiatry*, *67*(11), 1067–1074. https://doi.org/10.1016/j.biopsych.2009.12.012

Laborde, S., Mosley, E., & Thayer, J. F. (2017). Heart rate variability and cardiac vagal tone in psychophysiological research - Recommendations for experiment planning, data analysis, and data reporting. *Frontiers in Psychology*, *8*, 213. https://doi.org/10.3389/fpsyg.2017.00213

Lehrer, P. M., Woolfolk, R. L., & Sime, W. E. (2020). *Principles and practice of stress management*. Guilford Publications.

Leitch, M. L., Vanslyke, J., & Allen, M. (2009). Somatic experiencing treatment with social service workers following Hurricanes Katrina and Rita. *Social Work*, *54*(1), 9–18. https://doi.org/10.1093/sw/54.1.9

Levine, P. A. (1997). *Waking the tiger: Healing trauma. The innate capacity to transform overwhelming experiences*. North Atlantic Books.

Lu, G., Yang, F., Taylor, J. A., & Stein, J. F. (2009). A comparison of photoplethysmography and ECG recording to analyze heart rate variability in healthy subjects. *Journal of Medical Engineering & Technology*, *33*(8), 634–641. https://doi.org/10.3109/03091900903150998

Malik, M., Bigger, J. T., Camm, A. J., Kleiger, R. E., Malliani, A., Moss, A. J., & Schwartz, P. J. (1996). Heart rate variability. Standards of measurement, physiological interpretation, and clinical use. *European Heart Journal*, *17*(3), 354–381. https://doi.org/10.1093/oxfordjournals.eurheartj.a014868

Mccraty, R., & Shaffer, F. (2015). Heart Rate Variability: New perspectives on physiological mechanisms, assessment of self-regulatory capacity, and health risk. *Global Advances in Health and Medicine*, *4*(1), 46–61. https://doi.org/10.7453/gahmj.2014.073

Ogden, P., & Minton, K. (2000). Sensorimotor psychotherapy: One method for processing traumatic memory. *Traumatology*, *6*(3), 149–173. https://doi.org/10.1177/153476560000600302

Özel, D. (2024). 'We are all in this together': Coping with stress during uncertain times through somatic experiencing. *Group Analysis*, *57*(2), 256–270. https://doi.org/10.1177/05333164231189471

Parker, C., Doctor, R. M., & Selvam, R. (2008). Somatic therapy treatment effects with tsunami survivors. *Traumatology*, *14*(3), 103–109. https://doi.org/10.1177/1534765608319080

Payne, P., Levine, P. A., & Crane-Godreau, M. A. (2015). Somatic experiencing: Using interoception and proprioception as core elements of trauma therapy. *Frontiers in Psychology*, *6*, 93. https://doi.org/10.3389/fpsyg.2015.00093

Perrotta, A. S., Jeklin, A. T., Hives, B. A., Meanwell, L. E., & Warburton, D. E. (2017). Validity of the elite HRV smartphone application for examining heart rate variability in a field-based setting. *The Journal of Strength & Conditioning Research*, *31*(8), 2296–2302.

Pham, T., Lau, Z. J., Chen, S. H. A., & Makowski, D. (2021). Heart rate variability in psychology: A review of HRV indices and an analysis tutorial. *Sensors (Basel, Switzerland)*, *21*(12), 3998. https://doi.org/10.3390/s21123998

Porges, S. W. (2007). The polyvagal perspective. *Biological Psychology*, *74*(2), 116–143. https://doi.org/10.1016/j.biopsycho.2006.06.009

Porges, S. W. (2021). Polyvagal Theory: A biobehavioral journey to sociality. *Comprehensive Psychoneuroendocrinology*, *5,* 100069. https://doi.org/10.1016/j.cpnec.2020.100030

Reissner, A. T., Clifford, G. D., & Mark, R. G. (2006). The physiological basis of the electrocardiogram. In G. D. Clifford, F. Azuaje, & P. E. McSharry (Eds.), *Advanced methods and tools for ECG data analysis* (pp. 1–25). Artech House.

Schleip, R. (2020). Fascia as a sensory organ: A target of myofascial manipulation. *Journal of Bodywork and Movement Therapies*, *24*(4), 89–95. https://doi.org/10.1016/j.jbmt.2020.04.004

Shaffer, F., & Ginsberg, J. P. (2017). An overview of heart rate variability metrics and norms. *Frontiers in Public Health*, *5*, 258. https://doi.org/10.3389/fpubh.2017.00258

Shaffer, F., McCraty, R., & Zerr, C. L. (2014). A healthy heart is not a metronome: An integrative review of the heart's anatomy and heart rate variability. *Frontiers in Psychology*, *5*, 1040. https://doi.org/10.3389/fpsyg.2014.01040

Thayer, J. F., Ahs, F., Fredrikson, M., Sollers, J. J., & Wager, T. D. (2012). A meta-analysis of heart rate variability and neuroimaging studies: Implications for heart rate variability as a marker of stress and health. *Neuroscience and Biobehavioral Reviews*, *36*(2), 747–756. https://doi.org/10.1016/j.neubiorev.2011.11.009

Walter, M., & Bates, G. (2012). Posttraumatic growth and recovery from post traumatic stress disorder. In V. Olisah (Eds.), *Essential notes in psychiatry*. InTech Open.

Westland, G. (2011). Physical touch in psychotherapy: Why are we not touching more? *Body, Movement, and Dance in Psychotherapy*, *6*(1), 17–29. https://doi.org/10.1080/17432979.2010.508597

Winblad, N. E., Changaris, M., & Stein, P. K. (2018). Effect of somatic experiencing resiliency-based trauma treatment training on quality of life and psychological health as potential markers of resilience in treating professionals. *Frontiers in Neuroscience*, *12*(70), 70. https://doi.org/10.3389/fnins.2018.00070