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Trauma can impact all people of all identities, and mental health professionals are experiencing an influx of clients presenting for services with symptoms related to trauma (Webber, Kitzinger, Runte, Smith, & Mascari, 2016). According to the U.S. Department of Veterans Affairs (2016), an estimated 6 in 10 men and 5 in 10 women will experience a traumatic experience in their lifetime. Roughly 8 million adults meet diagnostic criteria for Posttraumatic Stress Disorder (PTSD) in a given year (U.S. Department of Veterans Affairs, 2016), and trauma is considered a public health crisis by the U.S. Department of Health and Human Services (2003). In response to this increasingly prevalent concern among the population, it is imperative that counselors are trained to effectively recognize and treat trauma symptomology.

Porges's Polyvagal Theory (PVT; 2018) offered a conceptualization of trauma responses that could prove useful for counselors. Porges outlined the physiological underpinnings of how one's autonomic nervous system (ANS) responds to stress. PVT explores three types of stress responses: social engagement, sympathetic arousal (fight/flight responses), and dorsal shutdown (freeze responses). These responses are connected with various symptoms that correlate with trauma, and they offer one lens for conceptualizing how clients present to counseling for trauma. Within the literature, authors are conceptually connecting symptoms of psychopathology with ineffective

autonomic regulation and vagal dysregulation (DePierro et al., 2013; Fiskum, 2019), as outlined by Porges (2011), but there is limited empirical literature on applying PVT to counseling. Thus, autonomic regulation is an important - but overlooked - factor at play within counseling and trauma treatment.

Because autonomic regulation is tied to which trauma response a client experiences (and exhibits in session), it is important for counselors to have a way to screen for it. In the current study, visual markers indicative of autonomic regulation related to the social engagement, fight/flight, and freeze responses were organized into the Autonomic Response Screening Tool for Counselors (ARSTC). These items did not categorize into the specific trauma responses as outlined within PVT, but they did seem to be representative of two broader yet distinct nervous system processes: sympathetic and parasympathetic processes. These analyses suggested initial evidence for the validity the ARSTC, specifically related to changes in heartrate variability (HRV) between the ARSTC categories of social engagement and freeze, and fight/flight and freeze. Limitations of the study and implications of the results are outlined, and offer a launching point for both counselors and researchers to continue exploring the role of autonomic processes and PVT at play in counseling session.

NOTICING TRAUMA RESPONSES: THE DEVELOPMENT AND VALIDATION OF THE AUTONOMIC RESPONSE SCREENING TOOL FOR COUNSELORS (ARSTC)

by

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APPROVAL PAGE

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CHAPTER I

INTRODUCTION

Trauma can impact all people of all identities, meaning mental health professionals are experiencing an influx of clients presenting for services with symptoms related to trauma (Makinson & Young, 2012; Webber, Kitzinger, Runte, Smith, & Mascari, 2016). According to the U.S. Department of Veterans Affairs (2016), an estimated 6 in 10 men and 5 in 10 women will experience a traumatic experience in their lifetime. Roughly 8 million adults meet diagnostic criteria for Posttraumatic Stress Disorder (PTSD) in a given year (U.S. Department of Veterans Affairs, 2016), and trauma is considered a public health crisis by the U.S. Department of Health and Human Services (2003). In response to this increasingly prevalent concern among the population, it is imperative that mental health professionals are trained to effectively recognize and treat trauma symptomology.

Defining Trauma

One difficulty in preparing mental health professionals to work with trauma is that there are many definitions for the term, which can lead to confusion and a lack of clarity around treatment (Krupnik, 2018; Levine, 1997). In some instances, trauma has been defined as a concrete and objective event, such as an experience of war, violence, or an accident, and this stressor-based definition of trauma is utilized in the current *Diagnostic and Statistical Manual*, (APA, 2013). One concern with this type of definition is that it

limits the possibility for subjective experiences to quality as traumatic; indeed, some have argued that an objective definition of trauma that is rooted in exposure to certain types of events does not adequately describe who will and will not experience symptoms of trauma (Boals, 2018). Though categorizing events can be a helpful start for conceptualizing trauma, it seems there is a noteworthy difference between exposure to events considered objectively traumatic and the subjective experience of traumatization (Boals, 2018).

Perhaps a more useful definition of trauma is one that considers the individual's response to exposure to a distressing event. Some authors have supported a conceptualization of trauma which emphasizes a disruption in self-regulatory processes following the exposure to the event or events, which results in a variety of symptoms (Levine, 1997; Wamser-Nanney, 2016). A response-based definition of trauma allows for consideration of the many outcomes that can follow a traumatic experience, and accounts for the possibility that two individuals who experience the same event can be impacted differently. Krupnik (2018) proposed that "to be considered traumatic, a stress response to an event must meet the necessary condition that the event be outside of the person's normative life experience, and a sufficient condition that the response include a breakdown of self-regulatory functions" (p. 4). This definition has been proposed in order to reduce the vagueness surrounding the term "trauma," and to offer a context-dependent conceptualization of trauma for use in research and clinical practice. This definition will be used in the present study as a starting place for defining trauma as a subjective stress response rather than as a particular type of stressor (event).

Biopsychosocial Model of Trauma

In concert with this definition of trauma, researchers in the field of traumatology are increasingly considering trauma from a biopsychosocial framework (Negriff, Saxbe, & Trickett, 2015), as exposure to extreme stressors can influence one's biology, mental health, and social interactions (Cassidy, Jones, & Shaver, 2013). A biopsychosocial model allows one to categorize the effects of trauma into several spheres, such as societal, relational, and individual. Within society in general, trauma responses can be seen following catastrophic events such as war, acts of mass violence, and natural disasters. Exposure to society-based traumatic experiences has been correlated with a variety of health concerns, including severe obesity, suicide attempts, alcoholism, and use of illicit drugs (Felitti et al., 1998; Sciaraffa, Zeanah, & Zeanah, 2018), which connect to public health concerns and policy efforts to remedy the lethality related to those symptoms. More than $3 billion was spent by the Department of Veteran Affairs and the Department of Defense on support for veterans and active members of the military diagnosed with PTSD in recent years (Institute of Medicine, 2014). In addition to societal events, trauma can result from and impact relationships of all kinds. Those exposed to intimate partner violence (IPV) report more severe and complex symptoms of trauma than those who experience non-IPV trauma (DePierro, D'Andrea, & Pole, 2013). Unfortunately, instances of sexual and physical assault often occur in relationships and family units (Costa et al., 2015), making maintaining relationships increasingly difficult; this relational impact can then extend to the individuals involved. At the individual level, trauma responses are colored by symptoms of anxiety and depression, lack of sleep,

presence of nightmares or flashbacks, social withdrawal, physical pains, memory impairment, low quality of life, and hypervigilance (Boals, 2018; van der Kolk, 2014). At the societal, relational, and individual levels, trauma responses create disconnection and difficulty. Those operating from a biopsychosocial lens often consider how trauma responses are colored by emotional dysregulation and difficulty connecting with others.

Underpinnings of Trauma Responses

The biopsychosocial conceptualization of trauma suggests that societal and relational ramifications of trauma are related to an individual's biological experience of trauma and, as such, it may be helpful to gain a better understanding of the factors which influence an individual's trauma response. One of the most critical components in determining how people respond to their environment and others is whether they feel safe (Porges, 2011). This felt sense of safety is impacted by cues in the environment and from others; it has wide-reaching implications for the way individuals respond and, thus, the symptoms they experience. Stephen Porges (2011) coined the term "neuroception" to describe the physiological process by which a human assesses if a situation or external cue is safe, dangerous, or life threatening. Porges claimed that neuroception is the first process involved in an individual's response to a threat. Neuroception relies on external cues from others to assess for safety, such as observing an open posture, soft facial features, and relaxed breathing. Neuroception is thought to be happening continuously, related to one's autonomic nervous system (ANS), and related to which type of trauma response is activated (Dale et al., 2018).

The ANS functions to protect an organism when it is exposed to threat, and it plays a large role in which behaviors and processes are activated after a traumatic experience. The ANS is comprised of the parasympathetic nervous system (PNS) and the sympathetic nervous system (SNS). The two branches of the ANS serve different functions but their ultimate combined purpose is self-protection (Porges, 2011; Sylvae, 2018). The PNS is associated with growth and restorative processes; it aids in calming and relaxing the organism after exposure to a threatening stimulus and allows for social intimacy (Austin, Riniolo, & Porges, 2007; Diamond & Hicks, 2005; Fiskum, 2019). Activity of the PNS can be measured through activity of the vagus nerve (DePierro et al., 2013), one of 12 cranial nerves, and is thought to be the main component of the PNS (Porges, 2011). Alternatively, the SNS is associated with mobilization of the organism to respond to threat (Fiskum, 2019); it influences cognitive activity and can be indexed through sweat gland activity (DePierro et al., 2013). These two branches work with one another through cycles of activation (SNS activity) and deactivation (PNS activity) to help an individual respond flexibly and appropriately to threatening situations (Porges, 2011; Sylvae, 2018).

Porges (2011) highlighted the importance of the interplay between the PNS and the SNS in his Polyvagal Theory (PVT). Porges paid particular attention to the role of the vagus nerve (a group of nerves singularly referred to as the vagus nerve) and suggested there are two functions of the vagus that relate to parasympathetic activity. In his PVT, Porges (2011) conceptualized the vagus nerve acting as a “vagal brake” which plays a role in dampening sympathetic influences on the heart so that parasympathetic influences

can allow for increased flexibility in responding to threat. Porges proposed that vagal regulation plays an important role in which trauma response state is activated after a threat. In addition to the commonly known fight, flight, and freeze responses, Porges theorized a fourth defense response of social engagement. He hypothesized these defense responses are organized and engaged in hierarchically (i.e., social engagement first, followed by fight, flight, and freeze), and the process of neuroception aids in determining which of the defense responses is used. If neuroception detects safety, the ANS will support functions which allow for connecting with others by inhibiting primitive survival responses of fight, flight, or freeze (Dale et al., 2018). If safety is detected, the processes involved in fight or flight, such as increased heart rate and cortisol output monitored by SNS, are inhibited by the vagal brake. The same dampening happens for the processes involved in freeze responses, such as drops in blood pressure and heart rate monitored by the PNS (Fiskum, 2019). In other words, if safety is detected, the individual is able to access behaviors to help engage with others because the processes involved in fight, flight, and freeze responses are dampened or inhibited. However, if safety is not detected, the first line of response for social engagement may be inhibited as the SNS readies the person to fight or flee from the threat (Porges, 2011). If these responses fail to protect the human or are not deemed appropriate, a freeze response ensues as the last attempt at self-protection (Porges, 2011).

These four responses are connected with various symptoms that correlate with trauma, and these responses offer one possible lens for conceptualizing clients presenting to counseling for trauma. Within the literature, authors are conceptually connecting

symptoms of psychopathology with ineffective autonomic regulation and vagal dysregulation (DePierro et al., 2013; Fiskum, 2019), as outlined by Porges (2011), but there is limited empirical literature on applying PVT to mental health counseling. As conceptualized, people in fight or flight states, with high SNS activity indexed by sweat gland activity through skin conductance levels (SCL; Austin et al., 2007; DePierro et al., 2013), may present with high anxiety or hyperactivity, unable to effectively downregulate out of their sympathetic state. Those in a freeze state, with low vagal regulation indexed by respiratory sinus arrythmia (RSA) or heart rate variability (HRV; DePierro et al., 2013), may present with symptoms of severe depression, social withdrawal or dissociation, and inability to effectively upregulate out of their parasympathetic shutdown. Importantly, if clients present in a fight, flight, or freeze state, according to PVT they are not in a state of social engagement. It seems to follow, then, that counseling interventions to build rapport and connect with the client will be less effective because the client cannot access that nuanced state of parasympathetic ease and social engagement.

These four states are heavily influenced by the vagus nerve, and there is support within the literature for the connection between the functioning of the vagus nerve, self-regulation, and psychopathology, yet physiology is not often intentionally targeted in cognitive-verbal approaches to counseling (Fiskum, 2019). Additionally, the social engagement function of the vagus nerve through the vagal brake develops within relationship with others. For those counselors working to establish strong therapeutic relationships with clients at the start of treatment, vagal regulation and the client's

corresponding trauma response state can dictate whether the client is able to connect with the counselor. Thus, vagal regulation is an important – but overlooked – factor at play within counseling relationships and trauma treatment.

One reason vagal regulation is overlooked in the counseling process may be the difficulty of accessibly measuring it. Research of ANS processes typically involves the use of an electrocardiogram (ECG; Austin et al., 2007) in which electrodes are places on the participant or other heart rate monitors which strap around the participants' ribcages (Utsey, Abrams, Hess, & McKinley, 2015). While these means of measurement may be considered noninvasive in the medical community (Utsey et al., 2015), they have the potential to be invasive to clients in a counseling setting. To the author's knowledge, there is a single recent study in which researchers used ECG monitors with clients during cognitive behavioral therapy sessions intermittently throughout the duration of their treatment (Blanck, Stoffel, Bents, Ditzen, & Mander, 2019). The authors do not report on the presenting concerns of the clients, and do not comment on the comfort level clients had with using the equipment. They do note, however, that the researchers were not the clinicians and that the researchers were the ones to hook up the clients to the chest strap that was used for ECG data on HRV before sending the clients to meet with their counselors for their sessions. The ECG data was then processed through a computer program to convert it into information reflective of autonomic regulation. While this study is unique in its use of ECG within counseling sessions, it seems that the equipment and personnel needed to run and interpret the data limit the accessibility for this information to be collected and utilized by counselors.

The equipment needed to accurately measure vagal regulation, such as ECGs and chest-strap or electrode heart monitors, is not practical for counselors to use with clients during sessions, and may be thought of as outside the scope of the counselor's practice even though conceptually, autonomic regulation is tied to mental health outcomes (Utsey et al., 2015). Instead of collecting and using physiodata (data on physiological processes; in this case autonomic regulation), other assessments related to trauma typically are used as a convenient way for clinicians to better understand their clients' experiences. There are many formal paper-pencil assessments available for use in trauma counseling to assess for history of traumatic experiences and current symptoms (Green, 1996; McDevitt-Murphy, Weathers, & Adkins, 2005). There are measures to determine whether or not individuals meet criteria for PTSD (McDevitt-Murphy et al., 2005); these measures include questions about both history and symptoms. These inventories can certainly be useful in gaining important information about clients, and they are seemingly used most often to determine a diagnosis or track changes in symptoms over time. However, these inventories are less helpful in gaining information about how clients present in session. From a PVT perspective, such information could be crucial in determining whether clients have the capacity to experience a neuroception of safety, connect with their counselors, and thus benefit from counseling.

Ideally, measures of parasympathetic and sympathetic activity could be obtained during a session to determine a client's trauma response state so that the counselor could respond based on the needs of those states. Unfortunately, parasympathetic activity indexed by RSA is somewhat impractical to measure within a counseling session and, to

the author's knowledge, it has not been done before. As mentioned above, there is one recent study in which researchers examined HRV within counseling sessions (Blanck et al., 2019), but outside of that study, those measuring vagal regulation in trauma survivors have often done so by using equipment to measure HRV and RSA after exposing participants to a mildly activating acute experience, such as watching a sensitive movie scene or exercising (Austin et al., 2007). Sympathetic activity is often measured through sweat gland activity, which requires sensors to measure changes in skin conductance (DePierro, 2013). In general, the equipment needed and calculations required for RSA and HRV are not conducive to in-session measurement, though autonomic regulation remains an important element of trauma counseling.

To further understand the influence of the trauma response state in counseling, consider the following example. A teenage client named Sadie presents to counseling following an experience of physical assault. Her counselor Nala collects information about Sadie's trauma history and current symptoms and learns she is experiencing passive suicidal ideation and symptoms of dissociation, and is withdrawing from her peers and family. Sadie meets criteria for PTSD, and Nala choses to use trauma-focused cognitive behavioral therapy (TF-CBT) with the client based on her age, presenting concerns, and trauma exposure. Nala works in the first few sessions to build rapport with Sadie and teach positive coping skills. Nala begins each session with relaxation and grounding techniques with the intention of helping Sadie feel calm at the start of the sessions. Sadie participates, and then Nala moves towards helping Sadie create her trauma narrative through the TF-CBT protocol. After engaging in relaxation exercises,

the client states she does not remember what happened to her and disengages with the counselor, making it difficult to begin and complete the trauma narrative. Nala attributes the disengagement to the difficulty of the tasks, and spends the next sessions focusing once more on relaxation and grounding techniques, such as deep breathing and guided meditation.

From a polyvagal perspective, Nala could have made different clinical decisions around how best to work with this client. Had the counselor spent time assessing for Sadie's trauma response active in session, she may have concluded that the client was in a freeze state following her physical assault. Through a PVT perspective, Sadie's dissociation, depression, and isolation may be indicative of parasympathetic shut down, so that efforts to relax the client through parasympathetic relaxation exercises actually were contributing to her dissociation. In this freeze response, the client did not have the capacity to socially engage with the counselor, and so efforts to build rapport and begin the trauma narrative were ineffective. By correctly identifying the client's trauma response state early in the session, Nala could have made more informed decisions on how to work with the client (Dana, 2018). The counselor could have chosen to use an active grounding technique, such as jumping jacks, to get the client's heart rate elevated, thus initiating sympathetic activation and pulling the client up out of her freeze response during the session. Though the counselor conducted a thorough intake assessment of the client's history and symptoms, without knowledge of the physiology of trauma and a way to assess for the client's trauma state in session, the counselor missed opportunities to meet the client where she was physiologically and help her engage in counseling.

Purpose of the Study

To the author's knowledge, there is no known screening tool or observational measure that counselors can utilize in session to determine a client's physiologically-based trauma response, and yet this type of information seems conceptually crucial for making decisions in session about how to intervene with the client. Without having information on the client's response state, the counselor may not recognize that the client is not able to access the benefits of social engagement with the counselor in order to do the later work of trauma counseling. Measures of autonomic regulation can be used to better identify the four trauma response states, but it is difficult for counselors to collect physiodata during a counseling session in order to gather that information. The necessary equipment (e.g., ECG equipment and electrode or chest band heart monitors) does not make that type of measurement practical in clinical settings, perhaps explaining the very limited research measuring/exploring autonomic regulation in counseling. In the current study, I addressed this difficulty through identifying visual markers and nonverbal signs indicative of autonomic regulation related to the fight, flight, freeze, and social engagement responses that counselors can readily, and reliably, use during counseling sessions. I created a screening tool of those visual markers of autonomic regulation and explore if those markers categorize into the trauma responses suggested in PVT, and examined if those markers reflected physiodata on autonomic regulation.

Specifically, in the present study I addressed the following research questions: 1) What is the factor structure of the Autonomic Response Screening Tool for Counselors

(ARSTC)? 2) Is the ARSTC a valid indicator, based on heart rate variability (HRV), as measured by HeartMath Inner Balance output of HRV?

Need for the Study

As illustrated in the case vignette above, the counselor's work with Sadie could have taken a much different course had the counselor's choices been informed by an initial assessment of autonomic regulation. Because autonomic regulation is tied to which trauma response a client experiences (and exhibits in session), it is important for counselors to have a way to screen for it. PVT offers one way to conceptualize the physiology related to trauma responses and emphasizes the importance of vagal regulation within ANS processes for flexibility between defense responses and social engagement. Without a way for counselors to assess for vagal regulation in session, it may be that the client cannot socially engage with the counselor and benefit from a positive therapeutic relationship and other counseling interventions. If the counseling field had a way to assess for vagal regulation in order to cater interventions to clients' autonomic needs, client outcomes might improve and healing from trauma could become a familiar practice among therapists, rather than a specialty area. Although PVT has explicit connections to trauma responses as they are described within the literature (Austin et al., 2007), autonomic regulation of the PNS and SNS influences how all people operate in and move through the world (DePierro et al., 2013; Porges, 2007). Thus, this theory may later be applied to a variety of presenting concerns related to dysregulation in therapy, such as depression, anxiety, personality disorders, and tendencies toward self-

harm. However, it seems the field is still somewhat distant from application without a way to assess for autonomic regulation in session.

Additionally, one of the most influential change factors in counseling is the therapeutic relationship (Sandberg, Gustafsson, & Holmqvist, 2017). Many have explored the necessary factors for establishing a positive therapeutic alliance, and there is support within the literature that feeling safe in the relationship is a common factor for positive therapeutic relationships (Gentry, Baranowsky, & Rhoton, 2017). Given its attention to feelings of safety and social engagement, it seems that PVT offers a unique perspective on the counseling relationship. The vagal brake develops and is fine-tuned in relation to others as the individual picks up on facial cues and body language of the other person (Porges, 2011; Wagner, 2015). These cues, such as vocal prosody, pace of breath, and eye contact, are observable and can be tracked. Not only can they be tracked, but, according to PVT, they are indicative of the person's vagal regulation and subsequent trauma response state. Given the importance of these processes within trauma counseling, counselors first need a screening tool to know what to track to later know how to interpret what they track in session in terms of trauma response states. With a screening tool to assess for these states in session, counselors may be better equipped to recognize and support vagal regulation in session. This in turn may support the client's neuroception of safety and positive therapeutic relationship, thus preparing counselors to more effectively treat trauma and respond to their clients' therapeutic needs.

A final point of consideration is that a screening tool for indicators of autonomic regulation may provide insight on how to make clinical decisions that would support

coregulation with clients. According to PVT (Porges, 2011), a neuroception of safety is what allows for primitive defense responses to be dampened by the vagal brake. A felt sense of safety encourages the nervous system to support behaviors conducive for social engagement and exercise one's vagal brake in relation to others. PVT offers one way to conceptualize the mechanisms of coregulation within a therapeutic relationship, as it suggests that if a client is in sympathetic arousal or parasympathetic shutdown, the client necessarily has limited capacity for social engagement. Within a counseling relationship, this might look like a client who comes to session for many weeks but has limited ability to build rapport with their counselor, perhaps independent of the counselor's efforts to attune to the client in traditional ways of asking questions and validating the client's experiences. The client may withdraw from therapy or be resistant to the counseling process as a way to manage their own dysregulation and block at connection. However, PVT provides a framework for how individuals learn to first coregulate with others during infancy before they can self-regulate as they age; thus, if counselors had a way to assess for autonomic states of their clients, they could learn to use their own regulation as a tool to help clients. Researchers may soon conceptualize the vagal brake as the mechanism for coregulation within a therapeutic relationship. Because the vagal brake develops in relation to others and responds to implicit cues from others, the regulation and grounding of the counselor conceptually has far-reaching implications within PVT. With more awareness of the regulation of clients, counselors may learn to fine-tune their regulation to intentionally influence their clients' capacity to sense safety and remain in a state of social engagement. Though conceptual inquiries related to PVT and coregulation

are of interest (Sbarra & Hazan, 2008; Wagner, 2015), it seems that the first step in empirical research is to create a way for counselors to accessibly and reliably recognize autonomic states of their clients.

Definition of Terms

This study involves a number of terms specific to PVT and physiology, which may be unfamiliar to some readers. These terms are defined below as they will be used for the purposes of this study.

Trauma is defined as a stress response which disrupts self-regulatory functions and overwhelms a person's ability to cope (Krupnik, 2018; Sylvae, 2018). These experiences can occur on societal, relational, and individual levels (Brubacher, 2018; Milstein, 2019; Levine, 1997). Examples of experiences that can result in disruption of self-regulatory functions can include, but are not limited to, exposure to interpersonal violence, sexual abuse and assault, physical assault, experiences of war, natural disasters, acts of terrorism, experiences of neglect, prolonged bullying, and racial aggression.

Autonomic regulation is defined as the regulation of the autonomic nervous system (ANS). When referring to physiological regulation or dysregulation, the author is referring to this particular branch of the nervous system, as it is responsible for regulating automatic physiological processes such as heart rate, blood pulse, and digestion. The ANS is related to an individual's experience of arousal and stress. The autonomic nervous system is comprised of the parasympathetic nervous system (PNS) and the sympathetic nervous system (SNS), and the interplay between the PNS and SNS is what determines how mammals respond to threat (Porges, 2011).

Parasympathetic regulation is defined as the regulation of the parasympathetic branch of the ANS. The PNS is the inhibitory branch of the ANS and is associated with calming down the system after exposure to a stressor. Within this system are the ventral vagal complexes and dorsal vagal, which incorporate components of soothing as a result of social engagement, as well as allow for immobilization in response to threat (Dana, 2018; Porges, 2011).

Sympathetic regulation is defined as the regulation of the sympathetic branch of the ANS. The SNS is the excitatory branch of the ANS and is associated with mobilizing the system to protect itself and fight or flee in the face of threat (Dana, 2018).

Polyvagal theory (PVT) is the theory created by Steven Porges (2011), described in *The Polyvagal Theory: Neurophysiological Foundations of Emotions, Attachment, Communication, and Self-Regulation.* Porges explored the relationship between the vagus nerve and the parasympathetic nervous system (PNS), proposing there are two branches within the vagus nerve that contribute to PNS functioning. Porges hypothesized that there are two nuclei within the vagus nerve that have different functions: the nucleus ambiguous (NA) and the dorsal motor nucleus of the vagus (DMNX). The DMNX is associated with the dorsal branch of the vagus, which is the least evolutionarily advanced of the two branches of the vagus. The dorsal vagus is unmyelinated, meaning it lacks the fatty sheath that often develops around nerves to increase the speed at which signals can be sent through the nerve. The NA is correlated with the ventral branch of the vagus, which is thought to have developed much later and is characterized by its myelination.

In theory, the earliest mammals were equipped only with the dorsal portion of the vagus, which allowed them access to SNS responses of fight or flight in the face of threat and the PNS response of freeze or shutdown. As mammals evolved, the ventral vagus and vagal brake developed and allowed mammals a new option of responding: social engagement. The vagal brake dampens the dorsal portion response of immobilization and allows the organism to utilize the more evolutionarily advanced response option of social engagement. These four options represent possible responses to threat incorporated within PVT: social engagement, fight, flight, and freeze. According to Porges (2011), these four responses occur hierarchically, meaning that social engagement is thought to be the first response option in most situations, and freeze is thought to be the last resort option in the face of extreme and life-threatening stressors.

The *vagus nerve* is one of 12 cranial nerves and is the main component of the PNS. It is comprised of a bundle of nerve fibers within a sheath and is the longest of the cranial nerves. It is involved in processes of connection and immobilization. This nerve connects bidirectionally with the brain and body, allowing for information to travel from the brainstem to the heart and stomach, and up to the face through afferent and efferent nerves (Dana, 2018).

The terms *afferent and efferent* refer to the directionality of nerve signals. *Afferent* nerves take signals from sensory stimuli inward to the central nervous system (CNS), and *efferent* nerves carry signals away from the CNS towards the muscles.

The *dorsal vagal complex* (DVC) is associated with the immobilization/freeze response. It is considered the most primitive part of the ANS and is unmyelinated. The

dorsal vagus is utilized when the ANS perceives life-threatening experiences (Dana, 2018).

The *ventral vagal complex* (VVC) is associated with the social engagement and connection responses. It is considered the newest part of the ANS and is characterized by its myelination. The ventral vagus allows for connection with others when the ANS perceives safety (Dana, 2018).

The *vagal brake* is a concept within PVT associated with the ventral vagus. It is responsible for suppressing heart rate and dampening sympathetic activation. It is thought to develop in relation with others in the first year of life and influences one's capacity for social engagement. When the vagal brake is removed, the SNS is able to ready the body for mobilization responses like fight and flight (Porges, 2011).

Fight and flight responses are defined as trauma responses which rely on sympathetic mobilization. These can include, but are not limited to, verbal and physical aggression, running away, hypervigilance, and avoidance (Sylvae, 2018).

Freeze responses are defined as trauma responses which rely on parasympathetic, dorsal vagal immobilization or shut-down. These can include, but are not limited to, dissociation, complete social withdrawal, or feigning death. Freeze responses can be initiated when the ANS perceives a life-threatening experience (Sylvae, 2018).

The *social engagement response* is regulated by the VVC and allows mammals to engage with others and regulate with one another. This response is thought to develop first in infancy and is only a response option when safety is detected by the ANS (Porges, 2011).

Neuroception is the subcortical process by which an organism's ANS assesses whether a cue is safe, dangerous, or life-threatening (Dana, 2018; Porges, 2011).

Heart rate variability (HRV) is a measure of the time interval between heartbeats, and it is indicative of ANS activity. HRV can be calculated through *pulse rate variability* (PRV) and is influenced by both PNS and SNS activity. There are several metrics used for capturing HRV that are categorized as time domains and frequency domains, and the metric used in the present study was a time domain called the Root Mean Square of Successive Differences (RMSSD). Time domains capture the variability in the measurements of the interbeat intervals (IBI). RMSSD "reflects the beat-to-beat variance in HR [heartrate] and is the primary time-domain measure used to estimate the vagally mediated changes reflected in HRV" (Shaffer & Ginsberg, 2017).

Respiratory sinus arrythmia (RSA) is suggested by Porges (2011) to be an index of vagal regulation (specifically the PNS within the ANS). RSA is reflective of the state of the vagal brake and represents a heart rate pattern that corresponds closely with the frequency of spontaneous breath (Porges, 2011). Porges noted the importance of quantifying RSA within his PVT and stated that it is typically used in combination with measures of heart rate.

Brief Overview

In Chapter I, trauma was defined and the physiological processes related to traumatic responses were described. The components of the autonomic nervous system and polyvagal theory were explained. Chapter I also included the statement of the purpose of the study, need for the study, and research questions. Chapter II provides a

review relevant literature related to the physiological underpinnings of trauma responses and symptoms associated with various trauma response states according to polyvagal theory (PVT). Chapter III outlines the methodology of the study, including an overview of the hypotheses, participants, variables, procedures, data analyses, and limitations. Chapter III also includes a full report of the pilot study results. Chapter IV will describe the results of the study. Finally, conclusions, discussion of the results, and implications for future research will be presented in Chapter V.

CHAPTER II

LITERATURE REVIEW

Nuances in Defining Trauma

Within the literature, trauma has been defined in several different ways. An early trend within with traumatology research was to write about trauma as a concrete event "outside the range of normal human experience" (3rd ed., rev.; DSM-III-R, American Psychiatric Association, 1987) that causes distress. The emphasis was on the event. Since then, researchers have explored large categories of events that were considered traumatic, such as exposure to childhood abuse (Dalton, Greenman, Classen, & Johnson, 2013; Felitti, 1998; Negriff, Saxbe, & Trickett, 2015; Poole, Dobson, & Pusch, 2017; Riber, 2017), sexual violence (Serrata, Rodriguez, Castro, & Hernandez-Martinez, 2019), and war (Suffoletta-Maierle, Grubaugh, Magruder, Monnier, & Frueh, 2003). The diagnosis for PTSD seems to rely on a similar emphasis on trauma being an event, as the inclusion criteria specify types of events that involve actual or perceived threat of injury, sexual violence, or death can result in PTSD (American Psychiatric Association, 2013). Researchers explored the impact of these traumatic events by looking at outcome measures and trends related to the physical and mental health of those who were exposed to traumatic events, finding consistent negative outcomes. Though the specific symptoms that may result after exposure to an event such as childhood abuse, sexual violence, or war can vary, the overwhelming trend among the literature is that individuals who

experienced those events often suffered a variety of consequences, including symptoms of anxiety, depression, interpersonal difficulties, and isolation (Riber, 2017; Serrata et al., 2019, van der Kolk, 2014). Perhaps because the event seemed to precipitate the symptoms, trauma became defined as the event itself.

With increased research, however, it became evident that not all people who experience events considered traumatic develop the same negative symptoms. Researchers became interested in factors which contributed to resiliency (Friedberg & Malefakis, 2018; Poole et al., 2017; Raghavan & Sandanapitchai, 2019), and what became known as post-traumatic growth (Idås, Backholm, & Korhonen, 2019; Wang, Lee, & Yates, 2018). If two people both experienced the same event, why was it that they could have different outcomes that could be seemingly debilitating or encouraging? Researchers explored various circumstantial factors that seemed to contribute to resilience and which appeared to buffer the negative outcomes thought to result from traumatic events (Friedberg & Malefakis, 2018; Ungar, 2013). Ungar (2013) found that community involvement and environmental condiditons are several factors which influence whether an individual experiences an event as traumatic or as an opportunity for resilience. One of his main points was that he claimed that resilience should be thought of as an environmental factor rather than an exclusively individual factor, and highlighted that resilience looks different across and within cultures. He concluded with a call for communities (the environment) to aide individuals as they cope with potentially traumatic events.

As advancements in medicine and biology evolved, researchers in the field of traumatology began thinking of trauma through a biopsychosocial lens (Negriff et al., 2015). They considered the influence traumatic events had on physiology, social interactions, and mental health. Researchers noticed that exposure to extreme stress was correlated with disruptions in regulatory processes which influence emotion regulation (Calkins et al., 2008), symptoms of hypervigilance which led to difficulty in relating and connecting with others (Porges, 2011), and a variety of mental health diagnoses, including PTSD, anxiety, depression, borderline personality disorder, and eating disorders (van der Kolk, 2008). With the realization that emotion regulation contributes to many of the diagnoses and symptoms related to exposure to traumatic events, researchers increasingly considered the role of physiology related to emotion regulation to better understand the impact of trauma (van der Kolk, 2008). Some authors started to write about trauma as an experience which causes a disruption in self-regulatory capacities, such as emotion regulation (Beduna, & Perrone-McGovern, 2018; Brubacher, 2018). This shifted the event-oriented definition to one that included attention to biological mechanisms that contributed to symptoms of trauma. The inclusion of the biological components related to trauma seemed to help researchers better understand why some persons who are exposed to a traumatic event experience severely distressing symptoms, while others appear to be less impacted. The impact seemed dependent on the individual's regulatory capacity and, in that way, the inclusion of biological components allowed for the individualized subjective nature of trauma to be captured (Krupnik, 2018).

Trauma now seems to be understood as a distressing event which results in a disruption of regulatory functions. There is a wide body of literature related to the negative physiological ramifications of trauma, and researchers are increasingly exploring the symptoms of trauma through the lens of self-regulation. Regulation of the nervous system, specifically the autonomic nervous system (ANS), can be disrupted after exposure to overwhelming experiences like trauma, and that disruption can lead to difficulty with coping (John et al., 2019; Levine, 2010; van der Kolk, 2014). ANS regulation is connected with emotion regulation (Brubacher, 2018), one's ability to self-soothe (Calkins et al., 2008), attention-control (Whedon, Perry, Calkins, & Bell, 2016), and connection with others (Porges, 2011; Sbarra & Hazan, 2008; Wagner, 2015). Symptoms of trauma such as hypervigilance, disengagement, difficulty maintaining relationships, panic attacks, and depression have been connected with disruptions in typical ANS regulation (Porges, 2011; van der Kolk, 2014). Thinking of trauma as being rooted in the nervous system, rather than the event, offers a conceptualization for the individualized and subjective nature of traumatic symptoms that differ between people based on genetics and developmental challenges that could be considered traumatic (Payne, Levine, & Crane-Godreau, 2015). In other words, the bio/physiological lens suggests symptoms differ based on the combination of the person and the event.

Peter Levine (1997; 2010) is one traumatologist who has advocated for a physiological focus when conceptualizing trauma. He pointed out that, contrary to the DSM-III's definition of trauma as an experience "outside the range of usual human experience" and "markedly distressing to almost anyone" (American Psychiatric

Association, 1987), trauma is a much broader concept (Levine, 1997). He noted that some events which are considered usual experiences, including falls, accidents, illnesses, and surgeries, can be experienced as traumatic. Additionally, violence and rape are frequent in some communities, making those events within the range of experience for those who live there (Levine, 1997) yet these events would be considered traumatic even though they are not "outside the range" (American Psychiatric Association,1987) of common experiences in those communities. Though those events are often experienced as traumatic, through the DSM-III's definition of trauma they would not be considered as such. Years later, Levine advocated that trauma is "a profound experience of 'dis-ease' or 'dis-order'" (Levine, 2010, p. 34), in reference to regulation. This lack of ease and lack of order characterize trauma for Levine. This conceptualization of trauma emphasizes the disruption of regulatory processes that accompanies trauma and offers a helpful starting place for exploring trauma treatment.

In recent years, many researchers have begun using the phrase "potentially traumatic events" within the literature (Hashoul-Andary, 2016; Owens, 2016; van der Velden, Pijnappel, & van der Meulen, 2018). This phrasing accounts for the subjective nature of traumatic experiences and incorporates the idea that not all people will experience the same event as traumatic. Use of the phrase "potentially traumatic events" broadens the scope of what trauma can consist of and better captures the nuances of traumatic experiences. This term offers a helpful launching point for rethinking what "trauma" is, and conceptually allows for the possibility that the event itself is not the trauma. Instead, trauma can include both an event *and* a reaction. As such, for the

purposes of this study, trauma will be defined as a stress response outside of an individual's normative life experience which disrupts self-regulatory functions (Krupnik, 2018) and surpasses the individual's ability to cope (John et al., 2019). The present definition incorporates both elements of defining trauma that have been covered, noting that there are categories of distressing events which typically lead to traumatic reactions (violence, abuse, illness), and that ultimately the symptoms of trauma develop from disruptions in self-regulation, which then lead to difficulty in coping.

Prevalence of Trauma

Though trauma was once thought to be outside the range of usual human experience (Levine, 1997), it is quite prevalent among many communities (van der Kolk, 2014). As of 2015, an estimated 70% of the population, or 223.4 million people, has experienced some type of traumatic event and, of those individuals, 20% are expected to develop PTSD (Introduction: PTSD Statistics). In 2019 it was found that roughly 25% of the population of youth and children has been exposed to at least one traumatic event (John et al., 2019), and an in 2015 an estimated 24.4 million people meet criteria for PTSD at any given time (Introduction: PTSD Statistics). Those with PTSD have been found to have high comorbidity with opioid addiction (Bernardy & Montaño, 2019), and are 5.3 times more likely to complete death by suicide than those without PTSD (Gradus, 2017). Of those who seek treatment for PTSD, about half report receiving inadequate treatment, and one report from 2010 (Introduction: PTSD Statistics) found that the annual cost to society for anxiety related mental health diagnoses, including PTSD, was well

over $42.3 billion. This elevated cost was suggested to be linked to misdiagnosis and under treatment of presenting concerns (Introduction: PTSD Statistics).

Although PTSD statistics are one way to comprehend the impact of trauma in the United States, as explored above, there are experiences and consequences that may not meet criteria for a PTSD diagnosis yet are still considered traumatic by those who experience them. With more clients reporting instances of abuse, discrimination, natural disaster, and medical trauma, leaders in the field of mental health are charged to think critically about ways to address this overwhelming need for clinicians prepared to work with trauma (Courtois & Gold, 2009). Counselors in the field have witnessed a significant increase in clients presenting to counseling for concerns related to exposure to traumatic experiences, and with this rise is an increased need for trauma-competent counselors to treat these clients (Courtois & Gold, 2009; Webber et al., 2016).

Trauma as Regulation

Symptoms of trauma often involve emotional and physiological dysregulation, which can be reflected in symptoms of depression, anxiety, hypervigilance, and substance use (Brubacher, 2018). It seems that counselors may benefit from approaching trauma conceptualization and treatment through a lens of regulation and dysregulation, as suggested in the definition of trauma presented above. Within the counseling literature, it is common to find researchers writing about trauma and its direct and indirect influence on emotion regulation. Researchers seem to focus on many of the symptoms of emotion dysregulation that follow trauma, including symptoms of anxiety and depression, lack of sleep, presence of nightmares or flashbacks of the event, social withdrawal, physical

pains, and hypervigilance (van der Kolk, 2014). Experiences of trauma have been connected with suicidality and substance use (Felitti et al., 1998), borderline personality (Austin, Riniolo, & Porges, 2007; Porges & Furman, 2011) and bipolar diagnoses, and difficulties with relationships (Brubacher, 2018; Sandberg, Gustafsson, & Holmqvist, 2017). These symptoms and diagnoses have also been connected with difficulty in emotion regulation (Schore & Schore, 2008), which is thought to influence symptoms of anxiety following exposure to threats (Poole et al., 2017).

It is less common within empirical counseling literature to find a conceptualization of trauma as a disruption in physiological regulation, though researchers in human development and psychology are increasingly considering the physiological implications of trauma. In fact, emotional dysregulation has been described as a function of disrupted self-regulation, which is influenced by the functioning of one's autonomic nervous system (ANS; Calkins et al., 2008). Although researchers are conceptually incorporating mention of physiological processes involved in counseling (Porges & Furman, 2011; Quillman, 2013; Wagner, 2015), it seems less common for them to speak about trauma and its symptoms through a physiological perspective (i.e., the root of emotional dysregulation rather than the outgrowths of it like the symptoms listed above). An exploration of factors which influence dysregulation of autonomic functioning may provide a broad basis of understanding the ways in which trauma can result in negative health outcomes that have been connected with emotion regulation (Felitti et al., 1998; Schore & Schore, 2008). Disruptions in autonomic regulation are linked to many of the symptoms included in the diagnostic criteria for Post-Traumatic

Stress Disorder (PTSD), in that such disruptions influence one's ability to adaptively respond in the face and absence of a threat (Williamson, Porges, Lamb, & Porges, 2015).

Loman and Gunnar (2010) noted that the ANS and the endocrine system both play large roles in which behaviors are activated after exposure to a threat. One area of interest has been the role of the hypothalamic pituitary adrenal (HPA) axis (Loman & Gunnar, 2010). The HPA axis helps to regulate hormone secretion (Kolb, Whishaw, & Teskey, 2016) and seems to play a role in which behavioral response is activated in an organism after threat (van der Kolk, 2014). One research team (Kolb et al., 2016) found that different areas in the brain are connected with the activation and inhibition of the HPA axis, and that exposure to extreme stress can lead to defective functioning of the HPA axis, resulting in excessive amounts of cortisol production. The excess of cortisol can in turn impair the brain's ability to downregulate out of a stress response once the threat has passed (Kolb et al., 2016). This cortisol excess can influence brain structures such as the amygdala, infralimbic cortex, hippocampus, and medial prefrontal cortex, which play a large role in one's ability to self-regulate after exposure to a stressor (Loman & Gunnar, 2010). Importantly, the neural development of these regions is dependent on experience and, as such, experiences of trauma can have a significant impact on the functioning of the HPA axis (Greenough, Black, & Wallace, 1987; Whedon et al., 2016).

Within the endocrine system, chronic stress can result in an underproduction of cortisol, referred to as hypcorticolism, which plays a significant role in activating the body's response to stressors (Whedon et al., 2016). Hypocorticolism seems to be most

closely associated with the commonly known freeze response. One interesting consideration is how hypocorticolism may or may not impact one's ability to maintain or disengage attention from a given stimulus. Attention and impulse control are associated with higher-level cognition, and control of attention influences development of cognitive flexibility, receptive vocabulary, and behavioral impulse control (Whedon et al., 2016). When it comes to attention and stressors, hypocorticolism could seemingly inhibit one's ability to disengage attention from the old stressor stimulus, like one from chronic stress, and refocus attention to new features of perceived safety.

Hypocorticolism could certainly show up inf trauma survivors who present to counseling, as reflected in their hypervigilance and difficulty with feeling safe after their traumatic experiences. It also seems that there could be some connection between hypocorticolism and behavioral impulse control, which is defined as the "capacity to inhibit a dominant behavioral response tendency in accordance with a goal or external demand" (Whedon et al., 2016, p. 1342). If hypocorticolism is associated with lowered capacity to behaviorally or outwardly respond to a threatening stimulus, it seems likely that attention control is in some way also related to a similar process. It would be interesting to know if hypocorticolism and impulse control interact in a significant way, because those stuck in a freeze response seem less able to move their attention from the past stressor to a new environment of safety (Sylvae, 2018), and thus move out of their freeze response. Loman and Gunnar (2010) have indicated that this response is most related to animals who experience neglect or a habitually absent caregiver, which correlates with responses of children who may experience early neglect. For clinicians,

knowledge of these processes and how they may influence the symptoms of clients in therapeutic treatment could be exceptionally helpful because this knowledge attends to the biological processes that follow exposure to trauma. This knowledge allows for a fuller conceptualization of the client through a biopsychosocial framework and could be incorporated into decisions on interventions and treatment goals.

As noted above, cortisol production influences one's attention and behavior, and malfunctions in cortisol output can result in a rigidity in response (Kolb et al., 2016). Steven Porges (2011) mentioned a rigidity in responses that can result from exposure to extreme stress within his exploration of vagal regulation. Vagal regulation refers to the regulation of the vagus nerve, which is a part of the parasympathetic branch of the ANS. Porges seemed to think that while cortisol output is important to consider when studying the impact of trauma, the vagus nerve influences the HPA axis in an interesting and noteworthy way. There is support within the literature that vagal regulation covaries with cortisol levels (e.g., Gunnar, Porter, Wolf, Rigatuso, & Larson, 1995), and Porges hypothesized that studying vagal regulation helps researchers move away from an overemphasis on cortisol and sympathetic activation when studying exposure to extreme stress. Porges's Polyvagal Theory offers some explanation in regards to attention control and behavioral inhibition that is experienced after exposure to trauma, and will be discussed in detail in a later section.

It is important to note that much of the experimental research on affective or autonomic regulation has not involved exposure to toxic stress due to ethical considerations. Instead, moderately stressful situations have been created in the

laboratory to elicit the need for emotion and autonomic regulation. For example, Diamond and Hicks (2005) studied the relationships of attachment style, current relationship security, and negative emotions in young men by measuring vagal tone before, during, and after a task designed to elicit frustration. The men were asked to complete a subtraction problem and, during that task, they were given negative feedback from an instructor. Although the results of this study supported that vagal tone is associated with affective regulation and attachment perceptions in minorly distressing scenarios, the authors did not explain how these variables relate after repeated or prolonged exposure to toxic stress. With the acknowledgement that toxic stress impacts many individuals through their lifetime, as highlighted in the statistics presented in the previous section, it is prudent to better understand how to help those who experience it in a way that allows for resilience and healing.

Connection Between Emotional and Physiological Regulation

Investigating the physiological mechanisms related to autonomic regulation in trauma survivors may provide a launching point for addressing emotional regulation in treatment for trauma survivors. Knowledge of these mechanisms and how to track them within a counseling session would encourage a bottom-up, body-based approach to complement the myriad of top-down theories and offer an alternative treatment, which has the potential to more effectively cater to clients' therapeutic needs (Grabbe & Miller-Karas, 2018). Additionally, Flores and Porges (2017) have suggested that a direct influence of physiological distress and subsequent autonomic regulation can impact how individuals relate to others. Relational patterns have been connected to emotion

regulation capacity (Brubacher, 2018) and, as such, attention to physiological processes within a trauma counseling session may allow for the counselor to be better attuned to the client's emotion regulation and ability to connect with and relate to within the therapeutic relationship. For this reason, the author suggests that emotion regulation be thought of as autonomic regulation for the purposes of the present study.

Trauma Counseling

Overview

The lack of clarity in defining and conceptualizing trauma reviewed above is evident not only in the counseling literature, but also in the methods employed to address trauma in counseling sessions. Gentry, Baranowsky, and Rhoton (2017) summarized common factors within evidenced based practices for trauma counseling and, while the results are helpful for a general understanding of common factors of trauma counseling, the authors only included treatments approved by the U.S. Department of Veterans Affairs (VA). Outside of cognitive processing theories, stress inoculation, and eye movement desensitization and reprocessing (EMDR), the VA has reported no recommendation for or against other trauma treatment methods, though many others are used. To better understand how trauma is conceptualized and approached in counseling, it may be helpful to briefly and conceptually consider several modalities used in trauma treatment to examine what common factors are thought to be most influential. The following section will include descriptions of four trauma treatments used in counseling, and then the author will summarize common factors across these approaches as another way to conceptualize trauma.

TF-CBT

One popular treatment is trauma-focused cognitive behavioral therapy (TF-CBT; Cohen, Deblinger, & Mannarino, 2005), an evidence-based manualized treatment designed to alleviate trauma symptoms in youth and adolescents. The treatment is intended for clients between the ages of 3 and 18, and typically involves 12-18 sessions. The treatment approach involves a heavy emphasis on caregiver involvement and utilizes joint sessions with caregivers and their children (Cohen et al., 2005). This treatment involves three phases: skill-building and stabilization, narrative creation and processing, and integration and consolidation. In the initial sessions, counselors teach clients positive coping skills for emotion regulation, such as mindfulness, journaling, or deep breathing, and then works with clients on affect recognition, helping clients learn to name their feelings. The next phase of treatment involves the creation and processing of clients' trauma narrative, in which clients write or draw the details and timeline of their traumatic experience. Counselors work with clients to use positive coping skills if a client becomes overwhelmed when creating and rereading the narrative. Maladaptive thoughts related to elements of the narrative/memory are identified and processed. The third phase begins when the narrative is complete and clients can feel more regulated when reading/discussing the narrative, and it involves helping clients integrate more adaptive thoughts about the events in the narrative (Cohen et al., 2005).

The trauma narrative is a critical component of TF-CBT. The narrative is reviewed to identify maladaptive thoughts and rework some of the meaning making processes that followed the traumatic event (Cohen et al.2005). It is important to note,

however, that before creating and working with the completed trauma narrative, the therapist builds rapport and teaches relaxation and positive coping skills. That sets the stage for working with the trauma narrative, as the therapist guides the client through relaxation and grounding exercises as needed to avoid overwhelm throughout. This allows clients to process the narrative without the overwhelm that they experienced during the event (Cohen et al., 2005). The goal is to reprocess the narrative with the therapist in a safe environment to support the dissolution of overwhelm. Zorzella, Muller, and Cribbie (2015) found that the therapeutic relationship was associated with improved outcomes within TF-CBT, and they suggested that a positive perception of the therapeutic relationship encourages increased engagement with the exposure component of the trauma narrative, possibly due to a greater sense of safety.

Clinicians who use cognition-focused, or top-down, exposure approaches like TF-CBT attempt to address their client's presenting concerns and emotional dysregulation by teaching positive coping skills, creating linear accounts of traumatic experiences known as trauma narratives, practicing grounding experience with clients, and challenging clients to correct unhelpful thoughts related to trauma and replace them with more helpful ones (Cohen et al., 2005). Cognitive behavioral techniques in trauma counseling seem to rely on a definition of trauma that centers around what happened to the client, and so creating narratives and re-experiencing the trauma cognitively are methods used to alleviate symptoms associated with trauma. As mentioned above, skills for distress tolerance and positive coping skills are taught to clients in hopes of reducing distress when feelings of discomfort arise in TF-CBT. Exposure therapies rely on creating a type

of titrated experience, in which the client gradually works up to increasingly distressing experiences (Brown, Zandberg, & Foa, 2019), similar to how the trauma narrative is created. In these modalities, clinical treatment of trauma seems rooted in two things: the content of the narrative and overriding symptoms associated with it.

TF-CBT is most effective for younger clients with few comorbid symptoms (Goldbeck, Muche, Sachser, Tutus, & Rosner, 2016), though many researchers (Cisler et al., 2016; O'Callaghan, McMullen, Shannon, Rafferty, & Black, 2013; Unterhitzenberger et al., 2015) are building bodies of literature pertaining to use of TF-CBT with particular age groups. Thus far, there has been a wealth of empirical evidence supporting the use of TF-CBT in clients through age 18 (Goldbeck, Muche, Sachser, Tutus, & Rosner, 2016; 2016; Cisler et al., 2016; Unterhitzenberger et al., 2015). These researchers have examined the impact of TF-CBT on the neurophysiology of clients, and neuroimaging has indicated that TF-CBT has positive effects on emotional regulation within the amygdala of teenagers (Cisler et al., 2016).

EMDR

Another type of evidence-based therapy used for trauma treatment is Eye Movement Desensitization and Reprocessing therapy (EMDR). In EMDR, change is hypothesized to occur within an eight-step model in which the client's brain reprocesses a negative belief into an adaptive belief (Murray, 2016). EMDR is a structured treatment and involves eight phases: history-taking (a), preparing the client (b), assessing the target memory (c), processing the memory to adaptive resolution (d-g), and evaluating treatment results (h) (APA, 2017). The counselor works to collect thorough intake

information from the client to establish goals for treatment, and then prepares the client for EMDR by making sure the client has adequate resources and coping skills established to aid in emotion regulation. The counselor then works with the client to identify and gather information about the target memory, before prompting the client to focus on the memory and engage in eye movements or tapping until the client no longer reports distress related to the particular memory or thought. After desensitization occurs with the help of the eye movements or tapping, the client and counselor work to create a positive cognition to focus on and continue the eye movements or tapping. Clients are often prompted to do a body scan to notice sensations that may be tied to the target thoughts or memories before ending the session, and treatment proceeds by reassessing in subsequent sessions the level of distress associated with the target memories and repeating the process as needed (APA, 2017).

Like in TF-CBT, an early stage of EMDR (stage 2) involves resourcing interventions to prepare the client for reprocessing. Before reprocessing the negative belief, the therapist teaches calming and grounding techniques, and helps the client identify support systems and coping strategies. Importantly, establishing a strong therapeutic alliance is also considered a resourcing intervention, as it is thought to support increased engagement in the reprocessing piece of EMDR (Murray, 2016). It seems that, as in TF-CBT, the therapeutic relationship supports the client's sense of safety and willingness to engage in the exposure interventions that come later in therapy.

EMDR has been empirically supported for use in treating a variety of mental health diagnoses, including PTSD (Nardo et al., 2010; Usta et al., 2018), obsessive-

compulsive disorder (OCD; Marsden, Lovell, Blore, Ali, & Delgadillo, 2018), depression (Wood, Ricketts, & Parry, 2018), and autism spectrum disorder (ASD; Lobregt-van Buuren, Sizoo, Mevissen, & de Jongh, 2019). Unlike TF-CBT, which is designed for use with clients between the ages of 3 and 18, EMDR has been used with a variety of age-groups. In a meta-analysis of 30 studies (Lewey et al., 2018), TF-CBT was found marginally more effective than EMDR for use with children and adolescents experiencing toxic stress, yet both treatments were found effective for treating children and adolescents with post-traumatic stress.

EFT

Another evidence-based theory to consider is Emotionally-Focused Therapy (EFT). EFT is a type of therapy which emphasizes the healing that occurs within attachment relationships (Brubacher, 2018). With John Bowlby's (1982) attachment theory at its core, EFT is used mainly with couples and occasionally with individuals, and EFT practitioners conceptualize clients through their primary attachment fear of abandonment or rejection (Brubacher, 2018). EFT consists of three stages: de-escalation of the negative cycle, restructuring bonds between the couple, and consolidation. Within the first stage, the therapist works with the couple or client to build rapport and assess treatment goals. The counselor works to identify the negative cycle of communication or actions that are causing distress, and then connect that cycle with the attachment fears of the couple or client. The second stage involves repairing bonds that have been impacted by the negative cycle by examining and working with the primary attachment fears of

clients. The final stage aims to consolidate the repaired bonds and create a new cycle of interaction in which attachment needs are met (Brubacher, 2018).

It is well documented that trauma influences one's ability to relate to others (Quillman, 2013; Sandberg et al., 2017; Wagner, 2015), and EFT uses enactments, or planned interpersonal therapeutic interventions, to aid partners in communicating their attachment needs with one another in order to decrease relationship distress (Brubacher, 2018). EFT has empirical support as an effective treatment for relational distress in trauma survivors who experienced childhood abuse (Dalton, Greenman, Classen, & Johnson, 2013), though it is unclear the extent to which EFT can be used to reduce trauma symptoms outside of relational distress. However, Dalton et al. (2013) found that a strong therapeutic alliance was correlated with low drop-out rates in their study of EFT with couples with a female partner who was a survivor of childhood abuse, which suggests that the therapeutic relationship plays a role in the extent to which clients engage in the process of therapy or, in this case, enactments. This notion is supported by Brubacher (2018) in her description of Stage 1 of EFT, in which the therapeutic alliance is established and initial assessment of the presenting concern takes place. Brubacher (2018) noted that the therapeutic alliance has been found to account for 20% of the variance in EFT outcomes, indicating that it is indeed a powerful component of change within this theory.

Although these three modalities (TF-CBT, EMDR, and EFT) do not comprise an exhaustive list of trauma treatments being used in counseling, they can be looked at together as a survey of approaches used to address trauma in therapy. Each of these

modalities addresses trauma primarily through cognition and affect, as the counselor and client(s) work to increase emotion regulation related to memories of experiences or interactions. Though at first glance the change factors for these treatment methods may be conceptualized differently, each method includes some mention of the therapeutic relationship and creating a sense of safety to set the stage for later work. An alternative perspective may be that establishing the therapeutic relationship and practicing grounding skills or positive coping allows for the subsequent interventions to have their desired effect. Given the negative influence experiences of trauma have on interpersonal relationships and one's ability to relate to others (Iwakabe, 2018; Knox, Hess, Hill, Burkard, & Crook-Lyon, 2012; Porges, 2011; Quillman, 2013; Sandberg et al., 2017), it seems establishing a positive therapeutic alliance in the initial stages of treatment is not only a common suggestion (Brubacher, 2018; Cohen et al., 2005; Murray, 2016; Sylvae, 2018), but perhaps a critical component in starting a client's healing from trauma.

Although it may be that creating a safe and positive therapeutic alliance and teaching positive coping and emotion regulation skills are important aspects of trauma counseling, it seems that counselors may miss opportunities to effectively help clients master these tasks without an understanding of the physiology related to both relating to others and regulating emotion. Though these treatments are used often for those who have had traumatic experiences, it seems they do not pay much attention to the notion that trauma disrupts regulatory processes within the ANS that necessarily influence the course of treatment. The treatment modalities described above task the therapist to

connect with clients and help ground them, but do not provide information for counselors to accurately assess the most effective ways to relate to and ground each client.

SE

An alternative treatment modality used with those who have had traumatic experiences is Somatic Experiencing® (SE). Although SE is not considered an evidence-based practice for treating trauma symptoms, SE is based in biological theories and is used in the present discourse as a contrast to the content-driven, top-down approaches of TF-CBT, EMDR, and EFT. SE practitioners work to intervene directly with the client's ANS. The practitioner is trained to track visual cues thought to be indicative of parasympathetic and sympathetic activation, under the premise that the ANS initiates protective responses when exposed to threat. Within SE, change is hypothesized to occur when clients are able to complete a physiologically incomplete self-protective response (such as fight, flight, or freeze) that resulted from their trauma (Levine, 1997). Therapists work with clients to pendulate, or move back and forth between, their "trauma vortex" and "counter vortex," or areas of nervous system arousal and areas of nervous system regulation. Therapists guide clients through small cycles of activation/deactivation related to images, affect, sensations, behaviors, and meaning making, so that they learn to trust their system to regulate larger cycles of activation (Sylvae, 2018). The first step in this treatment modality also involves a type of grounding called resourcing, in which the therapist has the client identify motions, images, sensations, or even objects in the room which remind the client of a positive association or feeling. Before clients can engage with the larger cycles of activation or deeper elements of their trauma vortex, resourcing

must occur to increase their sense of safety (Levine, 1997). This is done in relation to the therapist, and as such it is imperative that the therapist also feels relaxed and safe (Sylvae, 2018).

As with TF-CBT, EMDR, and EFT, safety within the context of the therapeutic relationship and preliminary grounding are important precursors for change. What sets this modality apart, however, is that the other three mentioned do not go into the physiological underpinnings of building rapport and grounding techniques. Empirical support for SE is limited, and the treatment is not considered an evidence-based practice. However, researchers have begun to explore the utility of the SE in several studies. Briggs, Hayes, and Changaris (2018) found that brief 10-session group treatment based in SE had a positive impact on symptoms of depression and somatization for gender non-conforming clients. Brom et al. (2017) conducted a randomized controlled outcome study and found that SE is an effective modality for clients with PTSD, as intervention effects in this study indicated improvement in posttraumatic symptom severity at the conclusion of treatment. Though it is rooted in a physiological understanding of trauma, a limitation of this modality is its limited empirical support. Brom et al. (2017) noted that the difficulty of manualizing SE enough to be empirically researched was one important limitation of their study and contributes to the lack of empirical support within the literature for SE. Regardless, it is used here as an example of a modality of trauma counseling that emphasizes the physiological implications of trauma exposure that rather than the narrative of trauma history. In the present study, SE is presented as a contrast to

previously mentioned modalities as it encourages clinicians to work explicitly with nervous system dysregulation rather than trauma content or narratives.

It may be that common treatments used in trauma counseling do more to address symptoms of ANS dysregulation than the root of the dysregulation. While the modalities covered above do include elements intended to target dysregulation (positive coping and relaxation skills), they do little beyond this surface level effort. By focusing on things such as affect connected to cognitions, instead intentionally intervening to correct the dysregulation that characterizes the affect, clients may struggle to sense lasting change. Unfortunately, this may lead counselors to misread the client and show preferential attention to teaching the client skills for deactivation and parasympathetic activity, such as deep breathing, and ignore the possibility that clients may need assistance in upregulating their ANS through activities which target the SNS.

Common Factors

In identifying key components of effective trauma counseling, Gentry et al. (2017) noted the therapeutic relationship, self-regulation, and relaxation to help client manage autonomic arousal are key components of trauma counseling. As explored above, several evidence-based practices used in trauma counseling mention these elements but address them from a top-down and somewhat indirect approach. The idea that relating to others and practicing autonomic regulation are critical components in trauma treatment is well-supported within counseling literature (Gentry et al., 2017; Quillman, 2013; Sandberg et al., 2017), though it seems that researchers are only beginning to consider how these two critical components may relate to each other

physiologically. A small number of researchers (Porges & Furman, 2011; Quillman, 2013; Wagner, 2015) are explicitly applying PVT as a way to conceptualize the overlap between connection within the therapeutic relationship and autonomic regulation, but this emerging trend lacks empirical support within the counseling literature. In an attempt to advocate for the direct applicability of PVT within trauma counseling, the following section includes a review of PVT and how it applies to individuals who experience trauma in terms of relating and regulating.

Polyvagal Theory

Autonomic Nervous System

In order to consider the impact of trauma at an individual level, it will be helpful to better understand the physiological processes involved in the daily functioning of mammals. The nervous system has two main branches: the central nervous system, which includes the brain and spinal cord, and the peripheral nervous system, which enervates the central nervous system. Within the central nervous system are the somatic and autonomic branches. The somatic nervous system is related to voluntary muscle movement and the autonomic nervous system (ANS) is related to involuntary processes within the body. The ANS is comprised of the sympathetic nervous system (SNS), which relates to activating the body in the face of threat, and the parasympathetic nervous system (PNS), which relates to social engagement process and those which result in the shut down of the organism in the face of threat.

Within this complex interplay between various components of the nervous system, the ANS has particular relevance for those studying trauma. The ANS functions

to protect an organism when exposed to threat and, as such, it plays a large role in which behaviors and processes are activated after a traumatic experience. The two branches of the ANS serve different functions but their ultimate combined purpose is self-protection (Porges, 2011; Sylvae, 2018). The PNS is associated with growth and restorative processes, and many associate states of relaxation with PNS activity. The PNS aids in calming and relaxing the organism after exposure to a threatening stimulus (Diamond & Hicks, 2005). Alternatively, the SNS is associated with mobilization of the organism to respond to threat. These two branches work with one another through cycles of activation (SNS activity) and deactivation (PNS activity) to help an individual respond flexibly and appropriately to threatening situations (Porges, 2011; Sylvae, 2018).

Vagus Nerve and Neuroception

In his Polyvagal Theory (PVT), Porges (2011) noted that traditional theories of arousal and stress include an overemphasis on sympathetic activation and lack proper attention to parasympathetic activity. He focused on the nuances of the PNS with particular attention to the vagus nerve, and suggested that the interplay between the PNS and the sympathetic nervous system (SNS) is what determines how mammals respond to threat. Though described as a single nerve, the vagus nerve is technically a collection of nerve fibers, 80% of which are afferent, meaning they take signals from sensory stimuli inward to the CNS, and 20% of which are efferent, meaning they take signals away from the CNS towards muscles. The vagus has lateralized trunks which originate from the left and right sides of the brain stem, and the left and right sides of the vagus perform different tasks within the body.

Given that the vagus is part of the PNS and that 80% of vagal fibers are afferent, it seems that sensory stimuli have a significant role in how an individual experiences stress and subsequent trauma. The afferent fibers of the vagus contribute to what Porges called neuroception, which is thought to take place in the prefrontal and temporal cortices (Geller & Porges, 2014). Neuroception is an implicit process that is constantly occurring within the nervous system and helps an individual assess whether internal (fever, illness) and external (person or environment) cues are safe, dangerous, or life threatening. If neuroception detects safety, the ANS will support functions which allow for spontaneous connection with others by inhibiting defense responses. Porges hypothesized that the neural pathways that influence the myelinated ventral vagus have evolved to be "nueroanotomically and neurophysiologically" linked with the neural pathways that influence the muscles that control facial expression (Geller & Porges, 2014). These same muscles control one's gaze, head gesture, hearing, and vocal prosody (Geller & Porges, 2014). Thus, the facial expression, gaze, head gesture, hearing, and prosody of others is part of the neural process of neuroception which determines if the individual is safe. That information is part of what the afferent fibers detect and send up to the brain to either allow for spontaneous social engagement or engage in a defense response (Geller & Porges, 2014).

The process of neuroception seems influenced by one's own sense of safety internally, and the sense of safety of one's external surroundings, especially other people. Neuroception aids in determining the intention of others' voices, faces, and hand movements, and Porges clarified that "the neuroception of familiar individuals and

individuals with appropriately prosodic voices and warm, expressive faces translates into a social interaction promoting a sense of safety" (Porges, 2011, p. 58). Neuroception is thought so important that it has been suggested that counselors working clients with trauma histories pay attention to how they can intentionally support a neuroception of safety with clients (Geller & Porges, 2014). Geller and Porges (2014) suggested that counselors can notice a neuroception of safety in clients via certain physiological markers, such as an open posture, soft facial features, and breathing, though they did not elaborate much on the details of those markers. They did, however, make a strong case for the utility of PVT within trauma counseling by emphasizing the importance of neuroception and social engagement in a counseling relationship.

Vagal Nuclei and Complices

Neuroception is thought to be influenced by the ventral branch of the vagus, which is one of two branches articulated within PVT. Porges hypothesized that there are two nuclei within the vagus that have different functions, the nucleus ambiguous (NA) and the dorsal motor nucleus of the vagus (DMNX). The DMNX is associated with the dorsal branch of the vagus, which is unmyelinated and the least evolutionarily advanced of the two. The lack of myelination results in slower conduction of signals, and Porges sometimes referred to the dorsal vagus as the vegetative vagus. The DMNX is located in the dorsomedial medulla, which is a structure within the brainstem, and most cells that come from the DMNX connect with structures beneath the diaphragm, such as the intestines and stomach (Porges, 2011). The DMNX is associated with the dorsal vagal

complex (Porges, 2011), which results in the activation of a defense response of immobilization if safety is not detected through neuroception (Flores & Porges, 2017).

According to PVT, a second branch of the vagus evolved over time to dampen the dorsal branch of the vagus and allow for prosocial behavior in mammals. The NA is correlated with the ventral branch of the vagus, which is thought to be evolutionarily "newer," characterized by its myelination (resulting in faster conduction of signals), and related to neuroception. Most cells that originate in the NA connect to structures above the diaphragm, such as the larynx, pharynx, heart, esophagus, and bronchi (Porges, 2011). These structures relate to the cues of open posture, breathing, and soft facial features that were suggested by Geller and Porges (2017) to support a neuroception of safety, thus further emphasizing the connection between structures above the diaphragm, the NA, and neuroception. Although neuroception is thought to be subconscious and refined through evolution (Flores & Porges, 2017), it does seem that there are particular structures within the body that implicitly influence neuroception within individuals and with others. An understanding of the role of the NA narrows the structures that influence neuroception to those above the diaphragm (Porges, 2011).

Within PVT, a third medullary nucleus is included, the nucleus tractus solitarius (NTS), and these three nuclei together (NA, DMNX, and NTS) are the primary regulatory structures of the vagal system within the medulla (Porges, 2011). However, the NA and DMNX have more critical roles in influencing heart rate and are the primary focus within Porges's writing. To elaborate on their roles in influencing heart rate, Porges coined terms for the ventral and dorsal vagal complices. The dorsal vagal complex (DVC) is

regulated by the DMNX and initiates the primitive survival response of immobilization when neuroception detects life-threatening danger. The DVC is associated with the unmyelinated dorsal vagus, which is shared with reptiles and amphibians and considered the most phylogenetically primitive response option. If neuroception does not detect safety, it may trigger either SNS activation to mobilize the individual or it may trigger the DVC to initiate immobilization and death-feigning behaviors. These options of mobilization and immobilization are two of the three behavioral strategies outlined in PVT (Porges, 2011).

The third behavioral strategy outlined in PVT is that of social communication or social engagement, and is it influenced by the ventral vagus complex (VVC). The VVC is associated with and regulated by the NA, which is linked to neuroception, processes and structures above the diaphragm, and social engagement responses. The VVC remains a viable behavioral strategy if safety is detected, and it is engaged by dampening the DVC and SNS influences on the heart. This action effectively inhibits fight or flight and immobilization responses in the individual. The myelinated pathways of the ventral vagus slow the heart rate of the individual and dampen cortisol output, inhibiting SNS activity that would result in fight or flight responses. Thus, the VVC, which is considered part of the PNS because the vagus is a primary component of the PNS according to PVT, can inhibit both SNS activation and extreme PNS activation that would result in activation of the DVC. The VVC allows for a bias towards prosocial behaviors and spontaneous social engagement, helping individuals read cues related to facial expression and voice intonation to regulate their physiological state (Flores & Porges, 2017).

Vagal Brake

Following neuroception, the VVC and the DVC are processes that have a significant impact on how an individual responds to internal and external cues, and these processes are regulated by what Porges called the vagal brake (2011). Within PVT, the NA or ventral vagus is likened to work as a vagal brake, in that it works to dampen the dorsal vagal behavioral strategies. As a reminder, the ventral vagus evolved over time with myelination to regulate the dorsal immobilization responses and allow for greater flexibility in response to threat. Withdrawal of the vagal brake is thought to influence attention control, emotional regulation behaviors, and cognition (Calkins et al., 2008). Vagal tone, which measures the influence of the ventral vagus or vagal brake on the heart, is associated with flexible and adaptive regulation of negative emotions (Diamond & Hicks, 2005). Porges (2011) wrote the following to summarize the role of the vagal brake:

> Neurophysiologically the vagal brake provides a mechanism to support the metabolic requirements for mobilization and communication behaviors; functionally, the vagal brake, by modulating visceral state [homeostasis], enables the individual to rapidly engage and disengage with objects and other individuals and to promote self-soothing behaviors and calm behavioral states. Thus, withdrawal of the vagal brake is associated with adaptive states of mobilization and a reinstatement of the vagal brake with calm behavioral recovery. (pp. 268-269)

This explanation emphasizes that the vagal brake is involved in the activation and inhibition of various defense responses related to the VVC and DVC, based on whether neuroception determines the individual should engage or disengage with the environment.

It is important to note that the vagal brake is thought to develop in relation to others (Porges, 2011). At birth, the myelination of the vagus begins and, until it is developed, the infant relies on the primary caregiver for affective regulation. The infant has limited ways to communicate a myriad of needs and depends on the caregiver to attune to those needs and help the infant learn to self-regulate. The infant is aided by physiological coregulation from its caregiver, which supports the development of the vagal myelination and subsequent autonomic regulation (Schore & Schore, 2008). During this development, the infant learns to rely on its caregiver as needed until the ventral vagus and other brain structures have developed to allow for self-regulation. If the infant does not have an attentive caregiver, the development of the vagal brake may be impacted and the infant may be less able to regulate with others in the future (Poole et al., 2017; Porges, 2011).

Hierarchical Defense Responses

According to PVT, the earliest mammals were equipped only with the dorsal portion of the vagus, which allowed them access to SNS responses of fight or flight in the face of threat, and the PNS response of freeze or shutdown in the face of threat. As mammals evolved, the ventral vagus and vagal brake developed and allowed mammals a new option of responding: social engagement. The vagal brake dampens the dorsal portion response of freeze and allows the organism to utilize the more evolutionarily advanced response option of social engagement. These four options represent possible responses to threat incorporated within PVT: social engagement, fight, flight, and freeze. According to Porges (2011), these four responses occur hierarchically, meaning that

social engagement is thought to be the first response option in most situations, and freeze is thought to be the last resort option in the face of extreme and life-threatening stressors. These responses are initiated after the organism assesses safety or threat through neuroception, which is constantly occurring in mammals. Typically, a neuroception of safety allows for the vagal brake to remain in place and allow mammals the opportunity to socially engage with one another in times of safety through the VVC. If safety is not detected through neuroception, the vagal brake is removed, and the next available options are fight or flight through sympathetic activation and mobilization. If those responses fail to protect the organism, the dorsal portion of the vagus activates the strongest PNS response of freeze or immobilization through the DVC.

Consider the following example to integrate the concepts of PVT as they have been presented. An individual is walking alone on a street and sees a large dog with its owner coming towards her. Neuroception aids in the process of her appraisal of safety in that environment based on cues from within her body (efferent signals) and cues from her senses (afferent signals). If safety is detected, perhaps by the dog looking friendly or wagging its tail, the vagal brake inhibits the processes involved in fight or flight, such as increased heart rate and cortisol output monitored by the SNS. The same happens for the processes involved in freeze responses, such as drops in blood pressure and heart rate monitored by the PNS. Safety is detected, and the individual is able to access behaviors that help her engage with the owner of the dog and perhaps pet or play with the dog. However, if safety had not been detected (e.g., the dog snarls or the owner doesn't seem to have firm control of the dog), the vagal brake would be removed, inhibiting the first

line of response of social engagement. Withdrawal of the vagal brake activates sympathetic processes to ready the individual to fight or flee from the dog. If these responses fail to protect the individual or aren't deemed appropriate during the risk assessment of neuroception, a freeze response ensues as the last attempt at self-protection. The DVC takes over, slowing the heart rate and metabolic processes to allow for death-feigning behaviors in a last effort for survival.

Measuring Vagal Regulation

As outlined through PVT, these four defense responses correspond with the actions of the vagal brake (Porges, 2011) and are considered four patterned responses to trauma (Dana, 2018; Sylvae, 2018). Measures of vagal regulation can be useful in better understanding an individual's response to threat, in that measures of vagal regulation provide information on PNS functioning. Vagal regulation corresponds with parasympathetic activity, but low measures of vagal regulation, according to PVT, may be indicative of removal of the vagal brake and initiation of sympathetic activation or parasympathetic shutdown.

Cardiac vagal tone is typically indexed through respiratory sinus arrythmia (RSA; Dale et al., 2018; Porges, 2011). RSA amplitude is reflective of the state of the vagal brake, and represents a heart rate pattern that corresponds closely with the frequency of spontaneous breath (Porges, 2011). Porges noted the importance of quantifying RSA within his PVT and stated that it is typically used in combination with measures of heart rate. By looking at heart rate and RSA together after various challenges, researchers have gained a better understanding of the regulation of the vagal brake as an individual

responds to the environment and other people. Asutin et al. (2007) found that high measures of RSA, which correspond with increased vagal influence on the heart, support the spontaneous social engagement that is associated with the VVC. Additionally, lower measures RSA and shorter heart period seem to be indicative of withdrawal of the vagal brake (Austin et al., 2007).

In order to collect measures of RSA and heart rate, researchers typically rely on several electrodes placed on the participants which connect to an electrocardiogram (ECG) (Austin et al., 2007; Rottenberg, Salomon, Gross, & Gotlib, 2005). The electrodes collect data on heart rate continuously, and that data is then sent to a vagal tone monitor for conversion RSA amplitude (Austin et al., 2007; Calkins et al., 2008) or downloaded into another program for processing and analysis (Dale et al., 2018; Rottenberg et al., 2005). If a vagal tone monitor is not available, RSA can be quantified by using a detailed method of calculation available in Porges (1985). Some researchers (Austin et al., 2007; Rottenberg et al., 2005) have examined the role of vagal withdrawal and emotion regulation in clinical populations, and others have looked at vagal withdrawal in those with trauma histories (Dale et al., 2017). It seems that researchers interested in vagal regulation have primarily been in the fields of psychiatry, psychology, and human development, and have been interested in collecting RSA before and after a time-limited emotional, physical, or cognitive challenge rather than throughout a counseling session (Austin et al., 2017; Calkins et al., 2008; Porges, 2011). As such, there is limited precedent set for researchers hoping to measure vagal regulation within counseling sessions.

Trauma Counseling and PVT

Critique of the Literature

There is support within the literature that common factors in effective trauma counseling include a strong positive therapeutic relationship and the intentional use of grounding to help clients regulate autonomic arousal (e.g., Gentry et al., 2017), and both of these elements are incorporated into evidence-based practices for trauma treatment (Cohen et al., 2005; Murray, 2016). There is also support that establishing safety with clients with trauma history is imperative for effective treatment (Iwakabe, 2018). What is not present within the literature, to the author's knowledge, is the lens of PVT connecting relating with others, grounding exercises, and establishing safety as being expressions of a single variable: autonomic regulation. The disconnect seems to be that many of those who have researched the counseling relationship (Berry & Danquah, 2016; Diener & Monroe, 2011; Knox et al., 2012) have not done so through a physiological lens.

One subsection within the literature that does seem to tie in mention of regulatory processes, patterns of relating to others, and trauma is centered around attachment. Researchers of attachment have documented that those who experience trauma tend to develop insecure attachment strategies (Swain et al., 2007) and attachment strategies have been examined as functions of autonomic regulation (Brubacher, 2018, Loman & Gunnar, 2010). Thomson and Jaque (2017) found that establishing a strong therapeutic alliance with a survivor of interpersonal trauma can be a very lengthy process, and suggested that difficulty in relating to others may be indicative of a link between trauma and attachment strategies.

Attachment has been described as an indicator of one's ability to regulate emotions and self-sooth (Schore & Schore, 2008), which are both difficulties associated with trauma exposure (Brubacher, 2018; Quadrio & Haas, 2014). Porges (2011) noted that development of the myelinated vagus is of critical importance for adaptive functioning of the autonomic nervous system, and that the development of the vagal brake happens in relation to others (Wagner, 2015). Researchers of attachment strategies have explored autonomic regulation (Poole et al., 2017; Schore & Schore, 2008), sensing safety (Brubacher, 2018), and patterns of relating to others (Calkins et al., 2007; Corter & Fleming, 2002). As such, the author suggests that the closest links of applying PVT to trauma counseling is found within attachment literature because it incorporates critical components of PVT. There is some support of this connection within the literature, as Diamon and Hicks (2005) have found that vagal tone has an inverse relationship with attachment anxiety and is correlated with perceptions of security in adult attachment relationships. It seems that secure attachment is associated with effective vagal regulation, and insecure attachment is associated with a disruption in effective vagal regulation.

Another subsection within the literature that is helpful to explore is related to the therapeutic relationship in counseling. The importance of a secure therapeutic relationship in client outcomes is well documented within the counseling literature (e.g., Sandberg et al., 2017), yet according to PVT, social engagement is not always an option for clients who have experienced trauma. Berry and Danquah (2016) noted that difficulties in engaging with the counseling process often occur for those with insecure,

disorganized attachment strategies. It may be that these clients commonly experience inaccurate neuroception and find it difficult to feel safe in relationships with others. As such, it may be that a precondition for experiencing a positive therapeutic relationship is an accurate neuroception of safety to the client's social engagement system to function and contribute towards a secure relationship within the context of therapy. It seems that clients are able to access social engagement only if the vagal brake remains in place and the ANS can correctly determine no immediate or ongoing danger for the client through accurate neuroception. Both ANS dysregulation and attachment insecurity can result from exposure to trauma (Quadrio & Haas, 2014), and it seems that they both are reflective of vagal regulation. In contrast, those with secure attachment may experience an accurate neuroception of safety with others and more readily form bonds in relationships.

It seems that, within and outside of attachment literature, researchers are talking about safety, therapeutic relationships, and regulation in a more disconnected way than is suggested through PVT. The notion of hierarchical response options of social engagement, fight, flight, and freeze outlined in PVT is relevant to counseling because it suggests that an individual's capacity to relate to others is influenced by implicit processes outside of their awareness. Porges (2011) hypothesized that the social engagement system (SES) developed as a defense mechanism largely due to evolutionary demands that humans be in relation with one another for survival. The counseling relationship is well-supported as a critical change factor for counseling outcomes (Diener & Monroe, 2011; Gentry et al., 2017; Iwake, 2018; Knox et al., 2012), yet researchers

have seldom examined the physiology related around when therapeutic relationship is deemed helpful versus unhelpful.

For example, Knox et al., (2012) explored client perspectives of therapeutic relationships that were found to be helpful across cognitive behavioral, humanistic, and psychodynamic approaches. They did not indicate that they screened for clients with trauma histories, but the data collected can still be meaningful for the present exploration. They found that positive outcomes in therapy where generally associated with strong therapeutic relationships and client engagement. Clients reported that feeling safe with their therapist was also a positive element in their relationship that strengthened it. The authors also suggested that, from their data, it seems that a positive therapeutic relationship is necessary for successful treatment outcomes, and that future research was needed to better understand why corrective experiences do not happen within all counseling relationships.

These authors' data seem to take on a different light when considered within the framework of PVT and vagal regulation. A neuroception of safety indicates that the vagal brake is in place, dampening survival responses in the client and allowing for social engagement. This idea that sensing safety allows for social engagement supports Knox et al.'s (2012) findings that positive relationships included a sense of safety with the counselor. Their suggestion that a positive relationship may be necessary for effective treatment makes sense given that, if the vagal brake is removed, the client does not have access to spontaneous social engagement, which then hinders their ability to engage in ways that could form a positive relationship. Additionally, with the vagal brake removed,

the client is necessarily in a state of defense, which could certainly impact the efficacy of treatment.

Gentry et al. (2017) also explored the role of the therapeutic relationship, this time within effective trauma counseling. They found that positive therapeutic relationships and self-regulation and relaxation techniques are active ingredients in all effective evidence-based practices for trauma counseling. Like Knox et al. (2012), they did not consider the possible overlap of these seemingly separate variables of relationship and regulation. They did suggest that counselors normalize client symptoms as predictable reactions to autonomic dysregulation that can follow trauma exposure, but did not consider the ways in which relating to others can also be a function of autonomic regulation.

Berry and Danquah (2015) reported that difficulties in engagement are found in those with disorganized attachment styles, and Knox et al. (2012) found that disengagement and withdrawal were antecedents for the absence of corrective relational experiences. These findings may be reflective of the disengagement that follows the removal of the vagal brake that mobilizes or shuts down clients as they respond to real or perceived threat. Put another way, these findings may be reflective of the absence of the social engagement response option that trauma survivors could experience. Taken together, these studies illustrate that researchers within the counseling field are talking about variables such as safety, relating with others, and dysregulation, but they are not yet explicitly connecting those variables with the physiology that unites them: vagal regulation.

One pitfall of relying on the attachment literature for connecting PVT to trauma counseling is that attachment styles are often written about as discrete types. This may lead one to suppose that a person develops a default way of relating to others that is fixed rather than flexible. Such an idea may minimize the flexibility of the vagal brake that is suggested by Porges (2011). However, a more accurate extension of regular attachment strategies may be found in considering the role of neuroception (Geller & Porges, 2014). Because those who experience repeated exposure to threatening stimuli may develop inaccurate neuroception, their vagal brake may impede the extent to which they can connect with others even when no real threat is present. It seems this learned pattern or faulty neuroception could correlate with attachment strategies, but this extension is absent within the literature to the author's knowledge. Regardless, ANS regulation and relating to others seem interwoven for trauma survivors through vagal regulation, and current attachment literature seems to be the closest place where these concepts of PVT have been applied to counseling, although perhaps unknowingly or unintentionally. Knowledge of these variables is imperative for counselors working with trauma, because these variables not only offer explanation of the client's response to trauma, but also offer possible insight on how best to treat the client's response to trauma.

Need for Screening Tool

To the author's knowledge, there are no empirical studies examining vagal tone across a trauma counseling session or counseling relationship, yet vagal regulation seems to be a crucial factor in emotion regulation (Austin et al., 2007; Calkins et al., 2008; Dale et al., 2018) and relating to others (Austin et al., 2007; Porges, 2011), and difficulties in

emotion regulation are common following trauma (Austin et al., 2007; Flores & Porges, 2017). Given the ubiquity of clients with trauma histories in counseling, it is imperative that counselors are aware of the wide variety of influences their selected interventions and their clients' trauma can have on treatment. However, counselors may not routinely assess for in-session indicators of autonomic regulation, yet the efficacy of the interventions they select could depend greatly on states of autonomic regulation and positioning of the vagal brake. Consider the following case example to better understand the benefits of assessing in-session autonomic regulation.

Bruce is a counselor working with a male client who has a history of interpersonal trauma and emotional abuse. The client presents to counseling to work through severe depression and urges to self-harm. Bruce's preferred modality for working with trauma is TF-CBT, and his early sessions with his client are focused on teaching positive coping skills and building rapport. Bruce typically teaches relaxation skills to clients as a part of positive coping skills, and works with his client on deep breathing, mindful coloring, and meditation. His client participates in these activities during session and practices them outside of session, but still reports urges to self-harm, lack of desire to go to work, and social isolation. Bruce decides that because the client seems familiar with the practices for relaxation that he is ready begin the trauma narrative component of TF-CBT. He provides psychoeducation around the purpose and construction of the narrative. The client participates in deep breathing before beginning the narrative construction, as Bruce hopes this will prepare his client to move to the narrative. The next few sessions take on a similar structure, with relaxation techniques preceding work with the narrative. The client

begins to increasingly disengage with the narrative creation, stating he does not remember details, or yawning and saying he's too tired to work with the content. Bruce interprets these responses as a gentle resistance, and defaults to work more with types of relaxation for the client to practice. Their progress stalls and they are unable to work through the narrative. They terminate with a referral for his client to continue practicing relaxation techniques like yoga or meditative practices to prepare him to work through his trauma narrative.

If Bruce had awareness of how to assess for his client's autonomic regulation, his treatment decisions could have taken a different course. From a PVT lens, the client seems to default to parasympathetic shutdown, or the DVC. The client's depression may be reflective of a dorsal vagal freeze response, and his urge to self-harm may be his own attempt at upregulating into a sympathetic dominant state. Although certainly other variables could be involved in his depression and self-harm, this information could have informed Bruce's choices during the initial phases of rapport building and teaching positive coping. This client may have been overwhelmed by relaxation processes that put him further into a parasympathetic freeze state, and therefore rendering him unable to socially engage because he did not have access to his vagal brake. That inability to engage socially with the therapist for the narrative component may have been a reiteration of a survival response that was formed as a result of trauma exposure. Furthermore, the dorsal shutdown could limit higher order cognitive processes that impeded the client's ability to construct and process a narrative account of his trauma history. With this knowledge, Bruce may have tried a more active type of positive coping

like exercise in order to help the client upregulate into a sympathetic state before working with the narrative. It seems possible that this upregulation would have helped the client be able to engage more fully in the counseling process and could have changed the course of his treatment in a really helpful way.

The above example is intended to highlight how principles within PVT and knowledge of autonomic regulation could be beneficial to clients – and counselors – in trauma counseling. Unfortunately, these concepts have mostly been applied conceptually within the literature (Dana, 2018; Porges & Geller, 2014; Wagner, 2015). Such studies would require a means for identifying autonomic regulation in a noninvasive way. Thus, it seems one barrier for empirically evaluating the application of PVT within trauma counseling is that currently is not a way to accessibly screen for vagal tone (as a part of autonomic regulation) during counseling sessions. The use of electrodes and EKGS typically used to measure vagal regulation in studies (Austin et al., 2007; Dale et al., 2018) are not practical to employ during counseling sessions. The time-limited nature of the measurements lend themselves more to discrete tasks, such as periods of exercise or completing a logic puzzle, than to entire counseling sessions.

It seems what is needed first is a set of observational guidelines that help counselors collect information about a client's autonomic state and vagal regulation during session. In her exploration of corrective experiences in trauma counseling, Iwakabe (2018) advocated that, in order to fully understand how and when corrective emotional experiences occur in trauma counseling, future researchers would need to examine how in-session actions of the counselor influence post-session outcomes and

interpersonal relationships for the client. Additionally, in their research around patterns of relating in counseling, Berry and Danquah (2016) called for researchers to more intentionally examine the degree to which counselors adjust their interventions based on in session behaviors of clients. Further, they suggested that this be done through process research using actual session material (Berry & Danquah, 2016). Though the present study will not examine corrective experiences or the therapeutic relationship specifically, these suggestions highlight the importance of counselor intervention on client outcomes. It seems that one stepping stone to effective outcomes in trauma counseling is truly meeting clients where they are – *physiologically* – in order to better select in-session interventions.

Because physiological presentation directly influences one's capacity to benefit from a therapeutic relationship and engage in higher order processing, which are two common factors of effective trauma counseling regardless of modality (Gentry et al., 2017), trauma counselors need a set of guidelines to help them determine their client's physiological capacity. Fortunately for the field of trauma counseling, many signs of vagal regulation are accessible through visual observation (Geller & Porges, 2014). These observations can fit seamlessly into trauma counseling sessions, perhaps allowing for more effective intervention. Such a set of guidelines could then be used to evaluate how counselors can appropriately and effectively respond to and intervene with in-session presentations of clients.

Potential Influence of Measure

One way observational guidelines might be useful in trauma counseling is through intervening directly with the client's defense responses. This approach serves as the premise of SE (Levine, 1997), in which clinicians are trained to work directly with the ANS through identifying incomplete defense response(s) and helping clients complete their activation-deactivation cycles related to that response. Before doing this, the clinician helps guide the client through smaller cycles of activation and deactivation to allow for the client's system to practice the cycle on a smaller stage. It may be that neuroception and one's sense of safety is practiced during these smaller cycles, as the intention behind this part of treatment is to allow the client to resource and identify instances of regulation and release. By working directly with the ANS, the therapist can aid in "trauma resolution" (Levine, 1997) and subsequent symptom reduction. Based on PVT, it may follow that trauma resolution and symptom reduction coincide with improved autonomic regulation and attention to autonomic needs during counseling sessions.

Summary

The ubiquity of trauma symptoms seen in counseling clients is ever-present. In order to best address those symptoms, clinicians and clients alike may benefit from counseling approaches which focus on conceptualizing trauma symptoms as outgrowths of autonomic dysregulation. PVT offers a unique conceptualization of autonomic processes that could be exceptionally useful for counselors in their work with clients, yet it is mostly conceptual (rather than empirical) research which explicitly connects PVT to

counseling. One difficulty in directly applying PVT to counseling may be the difficulty in measuring autonomic regulation within counseling sessions. It may be that counselors could more readily incorporate elements of PVT within their work if they had a tool to help them notice regulatory states in their clients, and in theory, counselors could be missing out on really healing work with their clients if they are not correctly assessing their clients' regulatory states in session. If counselors had a way that they could accessibly and reliably notice regulatory states in their clients, they may be able to better meet the physiological needs of their clients and be more effective in their work. The aim of the present study was to create a screening tool counselors can use, based in PVT, that could help them correctly identify regulatory states by making simple visual observations in session. The methods for creating that screening tool are outlined in Chapter III.

CHAPTER III

METHODS

Despite its clinical relevance outlined in Chapters 1 and 2, screening tools for signs of autonomic regulation based on direct observation in counseling sessions are lacking. The present study was meant to fill the gap between the conceptual connection of PVT to counseling and the existing empirical research related to PVT. The rationale for the study was outlined in Chapter 1, which highlighted the need for counselors to be able to reliably assess for autonomic regulatory states in session. I expanded on this in my review of the literature in Chapter 2. Chapter 3 will include my research questions and corresponding hypotheses, and information related to participants, instruments, procedures, analyses, and limitations. Additionally, a report of my pilot study is included to highlight initial steps in the development of the ARSTC, refined through expert review.

Research Questions and Hypotheses

1. **Research Question 1.** What is the factor structure of the ARSTC?
    a. ***Hypothesis:*** I hypothesize that the ARSTC will have a three-factor structure, and based on PVT and existing literature, I predict these factors will be social engagement, fight/flight, or freeze/dorsal shutdown.
2. **Research Question 2.** Is the ARSTC a valid indicator, based on heart rate variability (HRV), as measured by HeartMath Inner Balance output of HRV

a. ***Hypothesis:*** I hypothesize that the ARSTC will be a valid indicator of HRV when comparted with HeartMath measures of HRV based on existing literature and PVT. More specifically, I predict that items which may be considered indicative of a freeze state will correspond with the individual's lowest HRV measurement, and those indicative of a fight/flight state will correspond with a moderate HRV score. I anticipate that items which are considered indicative of a social engagement state will correspond with the individual's highest levels of HRV.

Participants

Purposive sampling was used to recruit participants. Clients being seen in the UNCG Vacc Counseling and Consulting Clinic during the Fall 2019 semester over the age of 18 were eligible to be included in this study. The clients of the Clinic are most often undergraduate students at UNCG; occasionally graduate students as well as community members are seen as well. The clients range widely in their demographics in terms of race, age, cultural identities, gender identities, and presenting concerns. Clients seen in the Clinic are referred to appropriate resources if they are in crisis or have safety concerns. Common types of presenting concerns clients include life transition to college, relationship concerns, family difficulties, and trauma histories. A minimum of 10 clients was needed to achieve the requisite number of clips for data analysis (see Data Analysis section for explanation and rationale).

Variables and Measures

ARSTC

The Autonomic Regulation Screening Tool for Counselors (ARSTC; Appendix S) was created by the PI to assist counselors in tracking visual cues of autonomic regulatory states of their clients within counseling sessions. The screening tool was created based on concepts from PVT (Porges, 2011) and the PI's clinical training in and experience implementing Somatic Experiencing®, a body-based trauma treatment modality which emphasizes tracking of autonomic regulation to inform therapy interventions (Levine, 1997). The ARSTC contains observational markers that counselors can visually notice in their clients that are meant to help counselors screen for autonomic regulatory states in their clients. The final version includes 34 items organized into three categories of regulatory states: social engagement, sympathetic arousal/fight or flight, and dorsal shutdown/freeze. As a reminder, the sympathetic nervous system is what mobilizes the body for fight or flight behaviors, and the dorsal portion of the vagus nerve (according to PVT) is the last resort defense response in which the parasympathetic nervous system shuts the body down in an attempt to to survive (refer back to Chapter 2 for more detail on these processes). The "score" or result of the ARSTC is a single label of one of the aforementioned categories indicating that the client is predominantly in one of those regulatory states for the duration of the observation. Further information about the development of the ARSTC is included in the Pilot Study subsection.

HRV

As described in Chapter 1, heart rate variability (HRV; Appendix A) is a measure of the time interval between heartbeats, and it is indicative of ANS activity. HRV can be calculated through *pulse rate variability* (PRV) and is influenced by both PNS and SNS activity. There are several metrics used for capturing HRV that are categorized as time domains and frequency domains, and the metric used in the present study was a time domain called the Root Mean Square of Successive Differences (RMSSD). Time domains capture the variability in the measurements of the interbeat intervals (IBI). RMSSD "reflects the beat-to-beat variance in HR [heartrate] and is the primary time-domain measure used to estimate the vagally mediated changes reflected in HRV" (Shaffer & Ginsberg, 2017).

HRV was collected using the HearthMath Inner Balance Lightning sensor designed for use with iPads and iPhones in the present study. This technology was developed by Doc Childre and colleagues in 1991 and is meant to be accessible for use by the general public (Edwards, 2016). The HearthMath Inner Balance units utilize a single pulse sensor that connects to the user's earlobe, and the Inner Balance application can be used to track real-time changes in HRV as well as a construct known as physiological coherence (The Science of HeartMath, 2019). The HeartMath Inner Balance unit can be used to practice paced breathing. Using the pulse sensor connected to the user's ear, the technology provides feedback to users, via an iPad or iPhone, on how to better regulate their breathing in a way that allows for optimal HRV and increased coherence.

Though the technology provides both HRV and coherence outputs, only HRV will be used for the present study. Coherence is a construct that refers to a sense of balance and connectedness that is reflective of physiological processes working flexibly with one another (McCraty & Zayas, 2014). Because HRV has ample support within the literature for being used to empirically research vagal regulation and autonomic processes (Heather, 2013; Laborde, Mosley, & Thayer, 2017; Utsey, Abrams, Hess, & McKinley, 2017), HRV was used for the present study rather than coherence. The HeartMath output is a graph with HRV quantified on the y axis and time on the x axis (see Appendix A for an example HeartMath HRV output). For this study, the PI planned to average the peaks and troughs of the HRV over 1-minute segments to arrive at an average HRV for the time duration. Instead, the PI used Kubios software to convert the IBI data from the HeartMath pulse sensor into various HRV metrics, and RMSSD was used as the metric for HRV in the present study. HRV was used in the present study as an indicator of autonomic regulation, specifically the balance/interplay of the PNS and SNS, as supported in (Blanck, Stoffel, Bents, Ditzen, & Mander, 2019; Edwards, 2016; Heathers, 2013; Laborde et al, 2017).

Client Information Form

This pencil-paper form (Appendix B). was created by the PI and was issued to clients at the conclusion of their session. The questions were adapted from the intake form that is used at the Vacc Clinic. Participants were asked demographic questions about their racial, ethnic, and gender identifies, along with a question how long they have seen their counselor and whether or not they have a history of trauma. If they indicated

they did have a history of trauma, they were asked to briefly describe their trauma history. They checked all that applied in a list of concerns/symptoms for which they were presenting to counseling. Finally, they were asked if they were taking any medications and listed names and dosages of those medications, as applicable. This information was used to describe the contextual information within the discussion of the results.

Counselor Reflection Form

This pencil-paper (Appendix C) form was created by the PI and was completed by counselors after their counseling sessions are completed. Counselors were asked demographic questions about their racial, ethnic, and gender identifies. They indicated how long they have seen their client and wrote down the IVS label used to for their recorded session. Finally, they were asked to reflect on the presentation of clients during the session and comment on if the clients' presentation was consistent with previous sessions.

Procedures

Counselor Recruitment

The PI reached out to counselors seeing clients in the Vacc Clinic during the Fall 2019 semester and request their participation in data collection. These counselors included The University of North Carolina at Greensboro (UNCG) Counseling and Educational Development (CED) first year doctoral cohort in Advanced Practicum (AP), as well as several master's and doctoral students completing their internship requirements. All sessions occurred within the counseling department's training Clinic and all clients consented to be video-recorded per policy of the Clinic. The counselor

experience level varied due to the nature of recruitment for the program's doctoral and master's students. Because the main focus of this study was to validate a screening tool for counselors to use to track autonomic regulation in their clients, the PI did not control for counselor experience or trauma-specific training. Although the actions and interventions of the counselor can certainly influence the regulation states of the clients, they were not the main focus of the present study.

To recruit counselors to participate in data collection, the PI visited one of the first-year doctoral cohort classes and met with the three Vacc Clinic interns individually or as a group (depending on scheduling). When meeting with all potential counselor participants, the PI provided a verbal summary of the study (see Appendix U) and highlighted what would be required of counselors who consented to participate. To do this, the PI summarized the procedures and steps that the counselor would complete (giving informed consent to client at end of one session so that clients can think about if they'd like to participate until their next session; if client consents, collecting their signed consents, or giving them a new one for their signature, at start of next session counselor visits front desk to get equipment and paperwork packet described in detail below, and then proceed as outlined below in the Data Collection subsection). After summarizing these steps with the class of doctoral students, the PI provided a demonstration of the steps with a volunteer student to act as the client; this included setting up the HeartMath Inner Balance sensor. Before obtaining counselor consent (Appendix E), the PI allowed for questions the counselors had about the sensor, or questions they anticipated their clients may have had. For the Clinic interns, the PI demonstrated these steps and allowed

time for questions with the individual/group intern meetings, unless a common time was be scheduled in which case a single volunteer sufficed as done with the doctoral students. After providing information to the counselors about the study and steps for data collection (outlined below), the PI had a meeting with the Clinic staff and shared procedures for data collection and requested assistance in that process, as outlined below. Once counselors and Clinic staff were briefed, client recruitment began.

Client Recruitment

Clients being seeing in the Clinic during the Fall 2019 semester were recruited by their counselors to consent to participate in the study until 10-15 (a minimum of 10) agreed to participate. Recruitment involved the counselors giving their clients the Informed Consent form for the study (Appendix D) at the end of their sessions to inquire if clients would like to participate in the study during their subsequent session, and playing a recruitment video created by the author to provide information about the study, per IRB request. Counselors reminded clients that all sessions recorded in the Clinic could be used for research purposes (according to the Consent and Contract form all clients sign at intake), and then they demonstrated using the HeartMath sensor on their own ear and ensured the client that no physical discomfort was involved with sensor use. Counselors let clients know they could opt out of the study if they did experience any pain with the sensor, and clients asked any remaining questions they had about the study at that time. Clients were given the Informed Consent to look over until their next session. Additionally, counselors let clients know if are still being seen by their counselors when the data has been analyzed, they can request the HeartMath information.

Data Collection

When clients arrived to their next session and were still in the waiting area, counselors asked if clients were interested in participating. If so, the counselor stopped at the front desk on the way to their Clinic room for their session. The front desk staff distributed one iPad (equipped with the Inner Balance application downloaded from the Apple App Store) and one HeartMath Inner Balance Lightning sensor to counselors with clients who had consented to participate in the study. With each iPad and sensor was a packet of forms required for the data collection at the end of the session. The packet consisted of one client consent form (Appendix D), one Client Information Form (Appendix B), one Counselor Reflection Form (Appendix C), and a sheet to log the details of the tape (client initials; counselor last name; date and time of counseling session; length of Inner Balance session that corresponded with the tape; and the label used by the counselor for that particular tape; see Appendix F) so the PI could connect the HeartMath HRV output to the corresponding tape.

Once in session, the counselors allowed clients to ask questions they had about the study and then obtained signatures from their clients on the Informed Consent form found in the packet. The informed consent highlighted that the tape recording would be started as it was every session, and the client was reminded of their Consent and Contract form signed at intake per Clinic policy that tapes can be used for research purposes. The informed consent noted that clients would clip a pulse sensor to their ear for the duration of the session. Counselors explained the purpose of the sensor and assured clients that no pain or other bodily sensations should be involved. The informed consent noted that if

clients experienced painful sensitivity to the sensor, they could opt out of participation at any time. Counselors demonstrated clipping the sensor to their own ear to demonstrate this for clients, and answered any other questions clients may have about the sensor.

When there were no further questions, clients clipped the HeartMath Inner Balance Lightening sensor to either of their ears. The counselors connected the cord of the sensor to a Clinic iPad, opened the Inner Balance Application on the iPad, hit the "start" button on the app, and allowed several moments for the sensor to calibrate. A message appeared on the screen once the sensor was calibrated, and the counselors placed the iPad face down somewhere near the clients, so clients were not distracted by the technology or screen and could remain seated in a comfortable position without pulling the cord to the sensor. The counselors then conducted the session as normal, continuing to work towards the clients' goals in whatever way they deemed appropriate.

At the end of the session, counselors instructed clients to remove the sensor from their ear. Counselors pushed the "stop" button on the Inner Balance app and concluded their session as usual. Before leaving, clients completed the brief Client Information Form (Appendix B) and gave it to the front desk staff in order to collect their $15 cash incentive for participating in the study from the staff person at the front desk. After distributing the incentive, the front desk staff obtained the client's signature to document who has received incentive for participation. After the client left, the front desk staff placed the Client Information Form and the Incentive Documentation form (see Appendix G) in the file folder with the PI's name on it within a secure filing cabinet. The file folder was kept secure within a 3-lock system when the Clinic was closed.

After their clients had left, counselors documented the client initials, counselor last name, date and time of counseling session, and length of Inner Balance session that corresponded with the tape on a log form provided by the PI, along with the label used by the counselor for that particular tape (per Clinic policy- Counselor Last Name Client Initials Session [#]; see Appendix F). This process was reviewed during the counselor recruitment sessions. The length of the HeartMath session was found under the "Review" tab within the app. The log form was used by the PI and coders to match up the HeartMath output to the recorded sessions within the recording system used by the Clinic. Counselors then completed the Counselor Reflection Form (Appendix C) to briefly reflect on the presentation of the client that day and whether the client presented in familiar ways this session. After tagging the PI in the tape through the IVS system (so that the PI could access the tape), the counselor placed the client's research consent form, the log form, and the Counselor Reflection Form in a file folder with the PI's name on it within a secure filing cabinet before leaving the Clinic. The PI was accessible to counselors by phone call, text, or email in case data collection issues arose or counselors needed clarifications.

Procedures for Research Question 1

Data Preparation. Once 10-15 tapes (a minimum of 10) were collected, the primary coder created clips of 1-minute sections of the video recordings every two minutes for the duration of each tape (i.e., minute 0:00 to 1:00, then 3:00-4:00, 6:00-7:00, etc.). These individual clips were named with a "Clip ID" assigned by the PI (i.e., CL1,

AB2) and stored within the IVS recording system. The clips were randomized and sent to the coders to rate using the screening tool.

Coders and Training. The PI observed all randomized clips and completed ARSTC for each clip. The PI has extensive training in somatic-based psychotherapy and visually tracking autonomic regulation.

Two doctoral students were trained to use the screening tool and assisted with coding the randomized clips of counseling sessions. The inclusion criteria for the coders was that they had a master's degree in counseling and that they did not have extensive training (evidenced by credentials and self-report) in tracking autonomic nervous system patterns (such as training in SE or Sensorimotor Psychotherapy, for instance). The training included a meeting with the PI in which a single existing tape (not a part of the study) was clipped into 1-minute segments by the PI to be used for practice. The PI described the screening tool by distributing copies of the ARSTC and the descriptor list (Appendix T) and reviewing the items and their descriptors. After the PI reviewed how to "score" or label the clip after completing the screening tool, the coders were given blank copies of the screening tool and used it to label several clips of the practice tape together. Following discussion around any questions regarding the items/scoring, the remaining segments were coded five at a time by the PI as well as the secondary coders independently to check interrater reliability. The PI and two coders engaged in discussion around use of the screening tool and the PI offered clarifications as needed. Training concluded when ten clips of tape are separately labeled the same by all three individuals

and a .75 interrater reliability was achieved. Finally, the a priori limitations outlined at the end of this chapter were relayed to coders during the initial training.

Labeling Clips with the ARSTC. The PI tagged each coder in separate halves of the all clips and the second coder in the remaining clips so they had access to the clips. The PI divided the clips so that the secondary coders were coding different clips. They completed the ARSTC for each clip and, due to the nature of the Clinic's recording system, tape clips were viewed on site in the Clinic. Coders were given paper copies (see Appendix H) of the screening tool to complete and labeled the individual forms with client initials, counselor last name, and clip identification (which is the IVS label assigned to the clip when created by the PI). As they finished screening the clips, the secondary coders submitted the completed hard copies of the screening to the PI's Clinic file folder. The file folder was kept secure within a 3-lock system when the Clinic is closed.

When coders completed their first five ratings, they submitted them to the PI to compare with her ratings for inter-rater reliability. After the first five clips, the PI checked the next 10 at a time and so on until all clips were coded. This timeline was used as an effort to space out the ratings of the clips to avoid coder fatigue.

When the ratings of the PI and the coder differed, the other coder was asked to code the clip based on the screening (e.g., if PI and Coder 1 had different results using the screening tool on a particular clip, Coder 2 reviewed the clip and arrived at a decision on how they would code/label the clip according to the screening tool). If the second coder agreed with either of the labels suggested by the PI or other coder, that was the

agreed upon label. If by chance the second coder labeled the clip differently from both the PI and the other coder, all three individuals reviewed the clip together and talked through their rationale for labeling the clip as they did. Following this discussion, they reached an agreement/consensus on how to label the clip when at least two of the three individuals agree on a label. As needed throughout this process, the PI retrained the coders on the screening tool to refresh them of the descriptions of the items and how to use the tool.

Procedures for Research Question 2

Once there was agreement on the labeling (social engagement, fight/flight, freeze/dorsal shutdown) of the clips via the screening tool, the PI compared the screening results with the HRV output (scores) from the HeartMath sessions that corresponded with the client clips using a chart (see Appendix I). To do this, the PI planned to average HRV from the 1-minute clip and documented that number to correspond with the clip's screening label in a table to organize the data.

The PI then went through the clips and grouped them back into their individual client sessions. Once they were regrouped, the PI determined the average HRV for the particular session. This step was taken to provide context for interpreting the individual clip HRV averages, given that resting/average HRV varies across individuals (i.e., one person's HRV of 70 may be considered elevated or low only compared to their own system; so, in order to have a context for interpreting the data in Chapters 4 and 5, this step was taken to provide context for how the average HRV in each clip compared to the client's average HRV for that session). The PI documented the average of the clients in a

separate column in the table (see Appendix I) used for organizing data to be revisited after the analyses. Once the data were organized into the table, the PI sent the counselors notice that if they or their clients wanted more information about the results of their HeartMath session, the PI could debrief the results with the counselor to relay to the client.

Data Analysis

The counseling session clips were the unit of analysis for data analyses. The PI needed to collect between 233 (minimum) and 300 units of data (counseling session segments/ 1-minute clips), as these numbers were adequate for the planned analyses involving factor analysis and ANOVA (Wang et al., 2017). Additionally, Laborde, Mosley, and Thayer (2017) noted there are certain considerations that should be accounted for within research using HRV as a variable. They highlighted that effect sizes in studies using HRV are often underpowered, and suggested that researchers "should interpret 0.25, 0.50, and 0.90 as representing, respectively, small, medium, and large sizes" (p. 5). They recommend a sample size of 233 is required to obtain a power of 80% in research using HRV. For this study, all statistics for data analyses were based on the compiled data for all of the individual clips (*N*).

The PI planned to collect between 10-15 tapes (a minimum of 10) during data collection, to result in an *N* of 200-300 segments for coding, once the tapes were divided into 1-minute clips as described in the procedures above. The choice not to count the total number of participants as *N* for this study was based in the premise that autonomic regulatory states are constantly changing (Dana, 2018; Levine, 1997; Porges, 2011;

Sylvae, 2018), and theoretically, there would be enough variation within a single client's session to represent several shifts into and out of regulatory states (Sylvae, 2018). Similar studies for the development and validation of screening tools have used a wide range of *N*s, depending on availability of participants and the focus of the screening tool. Numbers for *N* in such studies have ranged between 32 and 524 participants as units of data (George, Page, Hooke, & Stritzke, 2016; Turnell, Fassnacht, Batterham, Calear, & Kyrios, 2019; Tuteur, Ewigman, Peterson, & Hosokawa, 1995). The use of participants as the *N* in these studies was appropriate given that ratings were based on observations of the entire tape as opposed to variations in observations within a tape/session.

Research Question 1

All analyses were conducted through SPSS statistical software. Factor analysis was used to address the first research question to determine the factor structure of the ARSTC. To the author's knowledge, there are no studies which organize observational markers into categories of autonomic regulatory states, and so exploratory factor analysis was used to test for the hypothesized factors of social engagement, fight/flight, or freeze/dorsal shutdown emerge. This analysis assessed to what extent the items group together as one might anticipate based on PVT.

Research Question 2

An ANOVA was used to address the second research question and explore the external validity of the ARSTC items against HRV data collected concurrently through HeartMath. This analysis was used to compare the categorical results/scores (i.e., name of groups) of the ARSTC with the continuous data on HRV from HeartMath.

Pilot Study

Rationale

There were two main goals of the pilot study: 1) to develop an initial draft of the ARSTC and 2) to receive expert review of the draft for content validity. Because the aim of the full study is to create a screening tool for visual markers that accurately reflect autonomic regulation, it was an important first step to draft the screening and then check the it for content validity using expert review.

Research Questions

The following research questions informed the pilot study:

RQ_1: Based on the literature, the PI's training, and the expert reviewer feedback, what visual markers of autonomic regulation should be included in the ARSTC?

RQ_2: Are the items on the ARSTC comprehensive and clearly defined?

Procedures

Research Question 1: Item Development and Initial Use of ARSTC. Based on the literature and the PI's SE training and clinical experience, an initial list of visual markers indicative of autonomic regulation, along with their definitions, was developed (Appendix J). The initial list included 26 items which could be scored as present/not present within the client's presentation; based on PVT and the PI's training, these behaviors were categorized conceptually under the labels of social engagement, fight/flight/sympathetic arousal, or freeze/ parasympathetic shutdown. The PI practiced using the screening tool by watching a tape with a former client who was video recorded in the Clinic. The PI practiced using the screening tool with one-minute clips of tape

throughout the duration of the session, watching and screening from 0:00 to 1:00, skipping two minutes, then from 3:00-4:00 and so on. In doing this, the PI decided not to create a "total score" or to quantify gradations of the items. In trying to quantify possible gradation of the items (e.g., under the item eye contact - scoring the item as 1 = *not present*, 2 = *somewhat present,* or 3 = *fully present*), the PI noticed that, conceptually, scoring these items did not seem in line with the theoretical underpinnings used to create them (Sylvae, 2018). Arriving at a total score for the screening tool would include items from all possible categories, but the items are representative of different physiological processes. For example, perhaps a user of the screening tool were to score eye contact as a three, as outlined above, and combine that score with a three for an item related to collapsed posture (so the client displayed both fully present eye contact and fully present collapsed posture). In theory, these items are related to social engagement parasympathetic processes and dorsal shutdown/freeze processes, respectively. A total score of six for the observation or clip would not capture the differentiation of the processes behind the items.

As such, after consulting with the dissertation chair, the decision was made to group the items by conceptual categories (social engagement, fight/flight/sympathetic arousal, or freeze/parasympathetic shutdown) and score/label the clip using the screening tool by noting all items that were present (present/not present) within the clip across the categories. The clip was labeled as whichever category had the highest number of items checked; thus, the "scores/results" of the screening tool are the labels for the observation clip.

Research Question 2. ***Participants***. The PI used convenience sampling to obtain expert review of the initial version of the screening too. Of the seven participants who indicated interest in and a willingness to participate, three returned the feedback request document (Appendix K). Each expert reviewer was credentialed as a Somatic Experiencing® Professional (SEP), indicating that they had completed the three-year training in Somatic Experiencing® (SE) and utilized it in their clinical practice. All three reviewers also had served as assistants in the PI's SE training cohort, attending the training a second time to help new trainees learn the concepts and practice of SE. All three reviewers were mental health professionals; one of the expert reviewers was a Licensed Marriage and Family Therapist, one was a Licensed Associate Professional Counselor, and the third was a Licensed Professional Counselor. Two reviewers practiced in Georgia and the third practiced in North Carolina.

Content Validation and Item Refinement through Expert Review. After testing the initial draft of the ARSTC and determining the response state label would be the "score" for the screening, the PI drafted a request for feedback from expert reviewers. The PI obtained feedback from the dissertation chair and another committee member on the final draft of the ARSTC and request for feedback document (Appendix K). The request for feedback included a brief overview of the full study, included the initial list of 27 items for the ARSTC, and asked the expert reviewers several questions around the comprehensiveness of the items, how they might be categorized (social engagement, fight/flight/sympathetic arousal, or freeze/parasympathetic shutdown), and if any items

should be added. Expert reviewers were also asked for feedback on the observability of the cues and the clarity of the proposed descriptors for each item.

Upon receiving an IRB exemption (Appendix V) to complete the pilot study, the PI sent an email recruitment letter (Appendix L) and request for feedback document (Appendix K) to five potential participants. After two weeks, only one participant had returned the feedback form. Two more individuals were contacted as potential expert reviewers, and both agreed to participate and submitted feedback on the ARSTC.

Results

The PI collected the results and reviewed the feedback that was given. The PI created a table to show how each reviewer labeled the markers (Appendix M). There was agreement in categorizing 16 of the 26 original markers, meaning approximately 58% of the items were labeled the same by all three reviewers. Additionally, all 15 of these items were categorized by the reviewers in the same way as the PI labeled them (see Appendix N for the markers that all reviewers and PI agreed on labeling). For nine of the remaining items (36%), two of the three expert reviewers labeled the items in the same way as the PI (see Appendix O for the markers labeled the same by two reviewers and PI). The remaining 2 items ("client expressing downward movement of sensation or energy" and "pupil constriction") were missing labels from one reviewer each. One contributing factor is that one reviewer chose not to code two items; for these items, the one reviewer and the PI agreed on the assigned label for these items, and the other reviewer used a different label (see Appendix M for how each reviewer labeled the markers). Overall, it seemed that the most agreement in labeling was within the social engagement and

sympathetic arousal/ fight or flight categories, and the most variation was in the freeze category. It may be that freeze responses are even more context and client dependent in their expression than the other categories of responses. Because HRV will be used to test the validity of the markers and the states they suggest, no adjustments were made to the ARSTC after this observation was made.

Two of the three reviewers suggested added items, and there was some overlap in their suggestions (see Appendix P for their suggested items). Both suggested the screening tool include more markers for social engagement, and they both suggested adding smiling and laughter. There were other suggestions made by those reviewers for adding items which are summarized below. Some of the suggested added items overlapped with the original items but were described differently (for example, "cold hands or feet, or cold in another part of the body" from Reviewer 3 paralleled the original item of "client expressing feeling cold"). Other suggestions were made about client report and things the client might say in session which could indicate a regulatory state (such as client expressing emotionality, or client being curious and open, from Reviewer 3). Though client report is certainly important, the PI is hoping to test observable behaviors with HRV physiodata and limit the amount of phrases or client expressions in the screening tool.

Beyond those suggestions, the narrative components of the expert feedback were also very helpful. All three expert reviewers emphasized how important context is when observing and "labeling" these items. They all reiterated the nuance that can be wrapped into client presentation, and one reviewer made a useful point that all of these states

happen on a continuum. Two of three reviewers noted the difficulty involved in noticing markers of freeze responses, and that seemed to show in some of the variation of categorizing items within that category across reviewers as mentioned above (see Appendix M for how each marker was labeled across reviewers). One reviewer elaborated on her difficulty in categorizing items as representative of freeze by stating there are two types of freeze (i.e., high freeze and low freeze) and that can influence how client's show signs of freeze.

Implications for Main Study

The feedback from the three expert reviewers resulted in several changes to the initial item list in the ARSTC. As suggested by two of the three reviewers (see Appendix P for suggested added items), the three items of *full-face smiling, turning head/noticing surroundings, nodding* and *laughter* were added and categorized as indicative of social engagement. *Pronounced hand movements* (making fists, making a pushing motion or stop sign), *furrowed brow/constricted facial expressions*, as well as *increased volume in voice/angry tone* were suggested by two reviewers and the items were added into the fight/flight category based on their recommendation. Finally, as suggested by two reviewers, three items of *slumped posture, low tone/difficult to hear*, and *pauses in speech/unfocused speech* were added to the dorsal shutdown/freeze category. (Refer to Appendix Q for the list of added items and their categories, and Appendix R for the total list of items and their categories.) Thus, the final ARSTC (Appendix S) to be used in the main study is composed of 34 items, with nine items in the Social Engagement category,

14 items in the Sympathetic Arousal/Fight or Flight category, and 11 items in the Dorsal Shutdown/Freeze category.

The PI chose not to distinguish between two suggested levels of freeze (high and low freeze) from one reviewer; based on the literature, it is uncertain if there is a physiological difference between the two concepts of a high and low freeze. It may be that the results of the full study suggest two levels of freeze, both in observable cues and in HRV data, but for now the PI will only include one level of freeze in the ARSTC, which is referred to as dorsal shutdown.

Given that all three reviewers emphasized the importance of context, the PI will reiterate this information when discussing the results of the full study. There can be such variation in physiological responses depending on context, but that variation should not deter research from being done to try to better understand patterns of regulation that could be particularly influential within counseling sessions.

A Priori Limitations

One notable limitation of the current study was the use of HRV to index autonomic regulation. HRV is known to be influenced by factors outside of ANS activity (Porges, 2011), such as respiration, athleticism, age, and time of day (Laborde, 2017), but it has been used by previous researchers to gain information about vagal regulation and overall autonomic functioning (e.g., Blanck et al., 2019; Laborde et al., 2017). Despite its limitations, HRV can be accessibly measured through noninvasive methods with HearthMath Inner Balance technology, which utilizes a pulse rate monitor, and there is empirical support for its utility in better understanding autonomic and vagal regulation

(Blanck et al., 2019; Laborde et al., 2017). The author expected another possible limitation is that clients who have seen their counselors for several sessions may develop habituation to experimental conditions, including the Clinic room and counselor, and their HRV may be influenced by their comfort with the setting or counselor. Because this was a novel and exploratory study, the PI choose to collect sessions from clients at any stage in their counseling process for preliminary validation of the ARSTC, with the intention of initiating additional research using HRV in counseling. However, this and the other documented limitations of using HRV were considered in interpreting results.

With regards to the observational screening tool, limitations may involve the visibility of the items. For example, one visual marker thought to be indicative of sympathetic arousal is pupil dilation (Sylvae, 2018); this subtle sign was difficult to view from the recorded session which uses overhead cameras to record. Because there was difficulty in observing some of the items of the ARSTC via the tape recording, there are numerous items in each category in hopes that the other, more visible/observable signs, can be used to correctly categorize the regulatory state seen in each clip.

One particularly useful consideration made by an expert reviewer from the pilot study was that two items related to flushing/reddening of the face and neck will be more difficult to notice in clients with darker skin tones. As such, it will be important that users of the screening tool consider the many other items related to fight/flight responses to determine the state of the client. In other words, skin tone should not be considered the only indicator of state, and the users of the ARSTC should consider how client skin tone could influence the visibility and implications of this item. Additionally, the level of eye

contact a client is comfortable with may be influenced by cultural norms as well as autonomic regulation, so that will be a consideration when labeling eye contact items. If any of the clips did not match up well with the HRV scores associated with them, the PI looked back at the clips to see if any of these limitations might have been at play.

Finally, the decision not to have trauma history be the inclusion criteria for this study may have resulted in less nuanced responses. The decision not to narrow the population to a self-report of a particular traumatic experience is that, in theory, a physiological stressor will call upon the same systems to self-regulate after the stressor no matter the classification of the stressor (Porges, 2011). The aim of this study was to develop and validate a screening tool that counselors can use during session to visually track the autonomic processes of their clients. Thus, a preliminary screening tool tested with clients with a variety of regulation patterns was an important first step to better understanding regulation in counseling in general, with hopes that it can be extended and fine-tuned to be applied specifically to trauma counseling. This study was intended as a stepping stone for later helping clients with trauma histories re-regulate or process trauma.

CHAPTER IV

RESULTS

In Chapter 3, I outlined the proposed methodology for this study and described the steps taken to create the ARSTC. I summarized the pilot study and implications for the main study regarding edits to the final version of the ARSTC. I outlined my research questions, hypotheses, and plan for data analysis. In this chapter, I will describe preliminary considerations for data analyses, provide descriptive statistics of the participants, report the data analyses, and summarize the results.

Preliminary Considerations

Once data were collected, procedures related to coder training, clipping the tapes, and HRV measurement deviated from what was proposed in Chapter 3. Training on the ARSTC began with both secondary coders and the PI watching example video clips and practicing with the screening tool, as proposed in Chapter 3. Training was to end when .75 interrater reliability was reached, and that took several trainings to reach. The group met several times and the ARSTC Item Descriptions were refined over the course of those meetings in order to be more objective and specific so that all coders could accurately recognize them and reach the required interrater reliability. The PI underestimated the amount of time it would take to train the secondary coders, and so coding proceeded with the PI and one coder meeting in the Clinic, watching 5 clips at a time separately and labeling them according to the ARSTC, and coming together to

assess interrater reliability. For the clips that did not achieve .75 interrater reliability on the items marked on the ARSTC, the PI and secondary coder would rewatch the clip and come to consensus on differing items, until the required reliability was reached. From start to finish, the coding process took about 7 weeks.

From the 17 recorded client sessions, the PI created 1-minute clips on a schedule of every third minute of the tapes. This approach was different than the proposed schedule of every 2 minutes in Chapter 3 because more participants allowed for taking fewer clips from each session. The greater time schedule was also intended to allow for more variation in the client presentation within the sessions. From the 17 recorded sessions, 257 1-minute clips were created and coded for the present study. The PI also clipped the HeartMath data on HRV on the same time schedule as the video clips, and so there were 257 data points for average HRV of the client during those video clips.

Lastly, in Chapter 3 the PI proposed to analyze the HRV data by averaging the differences between the peaks of the graphic output for the time point selected. However, the PI was able to get more precise data on HRV from HeartMath by uploading the session data into Kubios HRV Standard software (version 3.3.1 Biosignal Analysis and Medical Imaging Group). This software is used often in HRV analyses (Heathers, 2013; Laborde, Mosley, & Thayer, 2017), and provided both time- and frequency-domain metrics for HRV. The PI chose to record the data on the root mean square of successive differences (RMSSD) as the metric for HRV in the analyses. RMSSD is commonly reported in the literature related to HRV (Dues et al., 2019; Heathers, 2013; Utsey, Abrams, Hess, & McKinley, 2015), and is typically thought to be one metric of HRV that

is most reflective of vagal influence on HRV (DeGiorgio et al., 2010l Laborde et al., 2017). For those reasons, and because its calculation is most similar to the method proposed in Chapter 3, RMSSD is reported as the measure of HRV for the data here and in Chapter 5.

Descriptive Statistics

After receiving IRB approval for the full study (see Appendix W), the PI recruited counselor participants to then recruit client participants. Data collection yielded more than the required number of participants (10-15), as 18 clients were willing to participant in this study. An IRB modification was submitted and approved (see Appendix X) to collect more data than the originally proposed 15 clients, and data were collected from 18 clients. The HeartMath sensor malfunctioned on one client's session, and so this participant's data were not complete and are not reported. Video-recording of the sessions and HeartMath data were collected for the other 17 participants, who were all reimbursed with the $15 cash incentive for their participation. The final sample (N = 17) consisted of 13 female-identified clients (76.5%) and 4 male-identified clients (23.5%). Their ages ranged between 19 and 27 years old (M = 22, SD = 2.74). Based on self-identification, there were 7 Caucasian participants, 6 African American participants, two Mexican-American participants, one Irish-American participant, and one Caucasian/Latinx participant. All clients had previous sessions with their counselors, ranging from 3 to 20 (M = 9.29, SD = 6.28). Clients self-reported their presenting concerns in counseling on the Client Information Form; of these, 11 clients (64.7%) reported history of traumatic experiences.

Data Analyses and Results

Research Question 1

To examine the factor structure of the ARSTC, a factor analysis was performed using SPSS. Of the 34 original items on the screening tool, only 28 were used in coding the clips, as some items (such as flushed face, absence of color, or client expressing warmth) were never observed (perhaps due to recording limitations, which are discussed in Chapter 5). The Kaiser-Meyer-Olkin (KMO) measure (KMO = .589) was low as expected, given that dichotomous variables were used. Bartlett's Test of Sphericity ($\chi^2(378) = 991.462$, $p < 0.001$) indicated sampling adequacy for a factor analysis. The oblique (promax) rotation was used in the analysis for the best interpretation of the results (R. Henson, personal communication, January 29, 2020)

Several methods were used to determine how many factors to retain. The initial factor analysis with oblique rotation yielded 11 components with eigenvalues greater than 1, and together they explained 59.292% of the variance (see Table 1). However, the scree plot (see Figure 1) indicated an elbow that would suggest retaining 2-3 factors.

Table 1. Total Variance Explained by 11 Components in Initial Factor Analysis

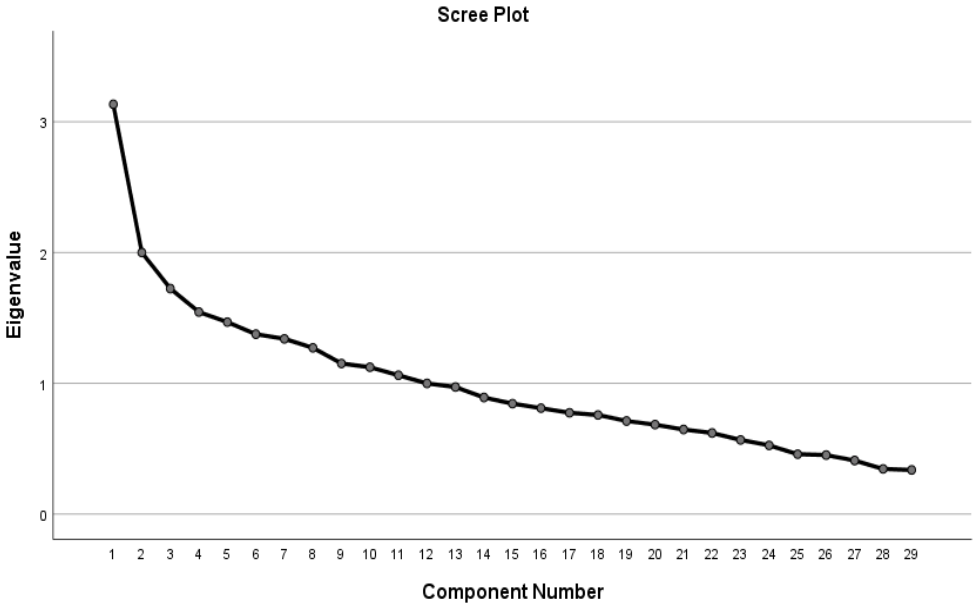
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	3.133	10.805	10.805	3.133	10.805	10.805	2.422
2	2.000	6.897	17.702	2.000	6.897	17.702	2.137
3	1.724	5.946	23.648	1.724	5.946	23.648	1.962
4	1.546	5.329	28.977	1.546	5.329	28.977	1.854
5	1.468	5.062	34.039	1.468	5.062	34.039	1.682
6	1.376	4.744	38.783	1.376	4.744	38.783	1.714
7	1.340	4.621	43.404	1.340	4.621	43.404	1.712
8	1.271	4.384	47.788	1.271	4.384	47.788	1.401
9	1.152	3.971	51.759	1.152	3.971	51.759	1.711
10	1.123	3.872	55.632	1.123	3.872	55.632	1.453
11	1.061	3.660	59.292	1.061	3.660	59.292	1.402
12	.999	3.445	62.737				
13	.971	3.349	66.087				
14	.891	3.074	69.161				
15	.844	2.912	72.072				
16	.810	2.793	74.865				
17	.775	2.671	77.536				
18	.758	2.613	80.150				
19	.712	2.455	82.604				
20	.684	2.358	84.963				
21	.647	2.231	87.194				
22	.620	2.138	89.332				
23	.567	1.954	91.286				
24	.525	1.812	93.098				
25	.458	1.580	94.677				
26	.451	1.556	96.233				
27	.410	1.413	97.646				

28	.345	1.190	98.836				
29	.337	1.164	100.000				

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

Figure 1. Scree Plot for Initial Factor Analysis



As such, a second factor analysis with oblique rotation was conducted, with instructions to extract 3 factors through the Principal Component Extraction method in SPSS. This decision was based on the scree plot results of the initial factor analysis as well as the PVT principles that informed the development of the ARSTC. Once again, the KMO measure (KMO = .586) was low as expected, and Bartlett's Test of Sphericity ($\chi^2(406) = 1019.515$, $p < 0.001$) indicated sampling adequacy for a factor analysis.

The three extracted factors explained 23.648% of the total variance (see Table 2). Once again, the scree plot suggested retaining 2-3 factors (see Figure 2). However, when looking at the component matrix (see Table 3), the first two components seemed easier to interpret than the third component. Additionally, the first two components had some overlap with the third one.

Table 2. Total Variance Explained by 3 Extracted Factors in Second Factor Analysis

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	3.133	10.805	10.805	3.133	10.805	10.805	2.747
2	2.000	6.897	17.702	2.000	6.897	17.702	2.470
3	1.724	5.946	23.648	1.724	5.946	23.648	1.935
4	1.546	5.329	28.977				
5	1.468	5.062	34.039				
6	1.376	4.744	38.783				
7	1.340	4.621	43.404				
8	1.271	4.384	47.788				
9	1.152	3.971	51.759				
10	1.123	3.872	55.632				
11	1.061	3.660	59.292				
12	.999	3.445	62.737				
13	.971	3.349	66.087				
14	.891	3.074	69.161				
15	.844	2.912	72.072				
16	.810	2.793	74.865				

17	.775	2.671	77.536				
18	.758	2.613	80.150				
19	.712	2.455	82.604				
20	.684	2.358	84.963				
21	.647	2.231	87.194				
22	.620	2.138	89.332				
23	.567	1.954	91.286				
24	.525	1.812	93.098				
25	.458	1.580	94.677				
26	.451	1.556	96.233				
27	.410	1.413	97.646				
28	.345	1.190	98.836				
29	.337	1.164	100.000				

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

Figure 2. Scree Plot for Second Factor Analysis

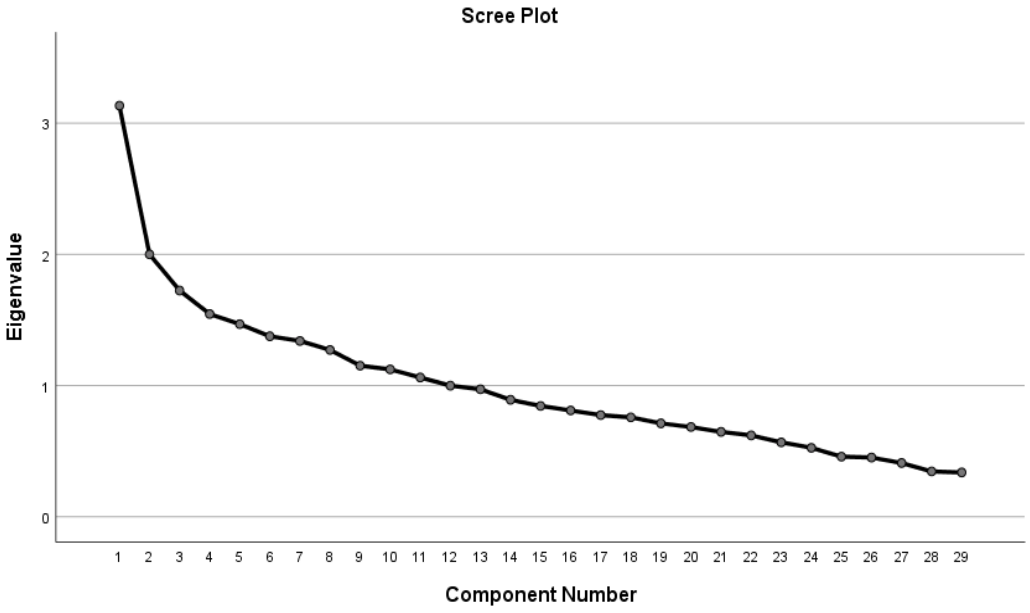


Table 3. Component Matrix[a] for Second Factor Analysis with 3 Extracted Components

	Component		
	1	2	3
EvnBreath	-.485	-.342	
Eyecontact			
Prosody	-.518		
Relposture	-.415		-.368
Laughing	-.483		.399
Fullsmiling	-.514		.375
Turnhead			
Nodding			
FeetAg		.452	
RpdBreath			
Rgdposture			
Quickpace		.466	
HandsAg			
Twitching			-.431
UpSens			
BroadEyes		.633	
HandMvmts	-.318	.518	
IncrVolume		.312	-.314
FurrowBrow			-.372
ShallBreath	.457	.402	
DecBreathMvmt			
ExpCold			.411
CollPosture			
SlowPace	.436		
FixedStare	.433		
EyesClosed	.354	.357	
SlmpdPosure	.341		.490
PauseInSpeech	.513		
LowTone	.615		

Extraction Method: Principal Component Analysis.

a. 3 components extracted.

After seeking consultation (R. Henson, personal communication, January 29, 2020), the PI conducted a third factor analysis and extracted 2 factors using the Principal Component Analysis extraction method in SPSS. The KMO measure (KMO = .589) was low as expected, and Bartlett's Test of Sphericity ($\chi^2(378) = 991.462$, $p < 0.001$) indicated sampling adequacy for a factor analysis. The cumulative variability explained by the two factors was 18.251%, which did not differ between the initial solution and the rotated solution. The scree plot (see Figure 3) for this analysis seemed to more clearly suggest retaining 2 factors, and the component matrix (see Table 5) for this analysis yielded the most interpretable results. The first factor was interpreted and labeled parasympathetic processes (both social engagement and dorsal shutdown/freeze responses), and the second factor was interpreted and labeled sympathetic processes (fight/flight responses).

Table 4. Total Variance Explained by Third Factor Analysis with 2 Extracted Factors

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings [a]
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	3.127	11.168	11.168	3.127	11.168	11.168	3.068
2	1.983	7.083	18.251	1.983	7.083	18.251	2.090
3	1.706	6.092	24.343				
4	1.543	5.509	29.852				
5	1.465	5.234	35.086				

6	1.350	4.823	39.909				
7	1.290	4.606	44.514				
8	1.264	4.515	49.029				
9	1.140	4.071	53.101				
10	1.104	3.941	57.042				
11	1.061	3.791	60.833				
12	.987	3.526	64.359				
13	.892	3.186	67.545				
14	.875	3.126	70.671				
15	.838	2.992	73.662				
16	.780	2.787	76.449				
17	.763	2.725	79.174				
18	.716	2.556	81.730				
19	.700	2.500	84.230				
20	.648	2.313	86.543				
21	.639	2.281	88.824				
22	.567	2.025	90.849				
23	.533	1.903	92.752				
24	.481	1.717	94.468				
25	.456	1.629	96.097				
26	.410	1.464	97.561				
27	.345	1.234	98.795				
28	.338	1.205	100.000				

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

Figure 3. Scree Plot for Third Factor Analysis

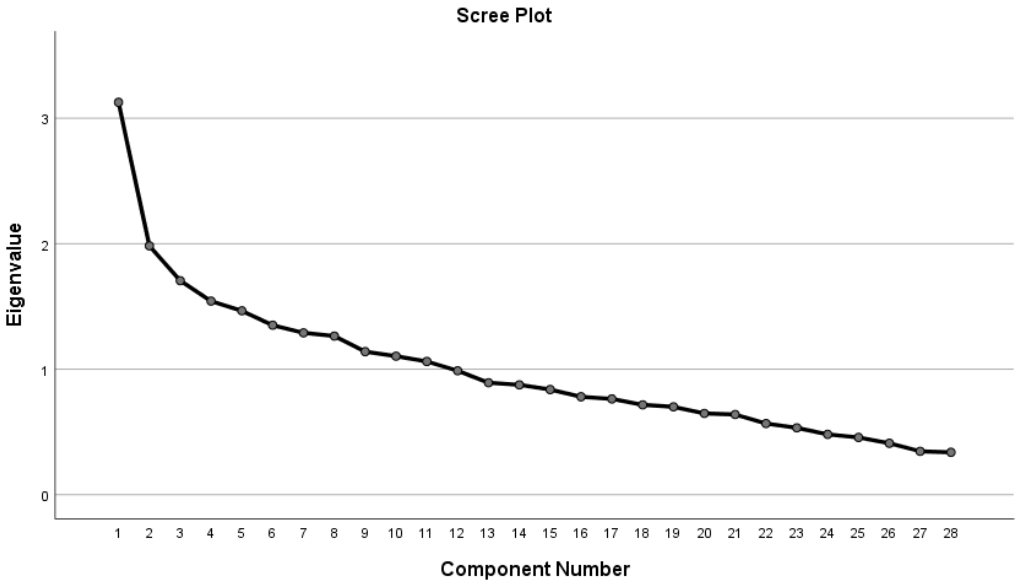


Table 5. Component Matrix[a] for Third Factor Analysis with 2 Extracted Components

	Component	
	1	2
EvnBreath	-.484	-.355
Eyecontact		
Prosody	-.519	
Relposture	-.411	
Laughing	-.481	
Fullsmiling	-.513	
Turnhead		
Nodding		
FeetAg		.458
RpdBreath		
Rgdposture		
Quickpace		.477
HandsAg		
Twitching		

BroadEyes		.621
HandMvmts	-.325	.506
IncrVolume		.322
FurrowBrow		
ShallBreath	.457	.423
DecBreathMvmt		
ExpCold		
CollPosture		
SlowPace	.438	
FixedStare	.432	
EyesClosed	.353	.366
SlmpdPosure	.339	
PauseInSpeech	.512	
LowTone	.616	

Extraction Method: Principal Component Analysis.
a. 2 components extracted.

Overall, the results of this analysis did not support the PI's hypothesis of a 3-factor structure for the ARSTC. However, the 2 factor-structure seemed to suggest factors related to the two nervous system branches (parasympathetic and sympathetic) that are captured within PVT. These results, as well as drawbacks of using factor analysis with dichotomous variables, will be discussed further in Chapter 5.

Research Question 2

Is the ARSTC a valid indicator, based on heart rate variability (HRV), as measured by HeartMath Inner Balance output of HRV?

To examine the external validity of the ARSTC, the author ran a one-way analysis of variance (ANOVA). In order to run an ANOVA, the data set must meet two

assumptions: the data must be independent, and the data must have equal variances. In order to meet the first assumption, several steps were taken. After the data were coded, the author transferred the raw interbeat interaval (IBI) HeartMath data into Kubios software (version 3.3.1 Biosignal Analysis and Medical Imaging Group) to determine the root mean square of successive differences (RMSSD) for all 257 clips. RMSSD was used as the metric in this study for HRV [there are several metrics commonly reported in the literature for HRV, but RMSSD is thought to be most indicative of vagal influences on heart rate (Utsey et al., 2015)]. The author recorded the Kubios output for RMSSD of each full session, which was used as the baseline for each client. Next, the RMSSD for each 1-minute clip was recorded by subtracting the baseline (full-session) measurement from the individual clip measurement. The author subtracted the baseline RMSSD from the clip average RMSSD to eliminate the dependence of the data, which allowed for the first assumption of the ANOVA to be met. Descriptive statistics for the adjusted RMSSD values are presented in Table 6. As a reminder, the author hypothesized that the lowest HRV values would correspond with freeze, moderate HRV values would correspond with fight/flight, and the highest HRV values would correspond with social engagement. The results of the study differ from the author's hypothesis that the greatest HRV mean would be associated with social engagement, moderate HRV mean would be associated with fight/flight, and the lowest HRV mean would be associated with freeze. However, it seems that looking at the ranges for each category more closely lines up with what the author intended to capture with the hypothesis, and that the range might be a better reflection of the "flexibility of response" than the mean.

Table 6 shows the client's adjusted RMSSD measures, which correspond to how much the clip's varied from the clients' baseline RMSSD for the duration of the session. As such, the greater the range, the more flexibility in the PNS and SNS and the more likely the measurement corresponded with social engagement. In Table 6, the greatest range did indeed correspond with the social engagement category, and one can also see that the mean and standard deviation of RMSSD were greatest for the freeze category. It is important to note that, from the author's understanding, these numbers suggest that the RMSSD associated with freeze responses was consistently farther away/pulled away from the baseline measures, as compared with the social engagement and fight/flight responses.

Though a two-factor structure seemed to be the best fit for the ARSTC items, three factors were used in the analysis for RQ2. Statistically, there was not a significant difference between the two parasympathetic processes of social engagement and freeze, but conceptually, these processes still function separately. The items intended to represent social engagement and freeze did not load separately when considered statistically, yet theoretically they are separate processes occurring within the same branch of the ANS (Porges, 2011). Though the processes are thought to be functions of the same nerve (the vagus nerve), Porges hypothesized they are related to separate parts of the nerve: the dorsal part and the ventral part. The ventral vagal complex (defined in Chapter 1 and described in Chapter 2) allows an individual to engage in self-soothing by connecting with others in safety, and the dorsal vagal complex (defined in Chapter 1 and described in Chapter 2) allows an individual to engage in self-soothing by conserving

energy and disconnecting from others in life-threatening experiences. As such, an ANOVA was used to analyze the external validity of the three ARSTC labels compared to measures of RMSSD (HRV), to account for the theoretical and biological differences that informed the development of the ARSTC.

To address the second assumption required for ANOVA, a Levene's test of homogeneity of variances was conducted (see Table 7). This test failed to reject the null hypothesis (p = .097). With both assumptions met, the author proceeded with the ANOVA (see Table 8). There was a statistically significant difference between groups (F (2, 254) = 3.31, p = .038). The author was advised to run a bootstrap approach to ANOVA in SPSS to better understand between group differences (see Table 9; R. Henson, personal communication, February 19, 2020). A Tukey post hoc test revealed that the HRV associated with clips labeled as Social Engagement (1) differed significantly from those labeled Freeze (3), and the HRV associated with clips labeled as Fight/Flight (2) differed significantly from those labeled Freeze (3). There was no statistically significant difference between HRV associated with clips labeled as Social Engagement (1) and Fight/Flight (2) (see Table 9 for confidence interval results for each category comparison from the bootstrap analysis). The bootstrap method in SPSS does not provide an overall significance value, and so that value is not reported in Table 9.

Table 6. Descriptive Statistics for Adjusted RMSSD Values

	Social Engagement	Fight/Flight	Freeze
Mean	29.71	21.53	37.12
Standard Deviation	29.72	20.30	43.37
Range	.25-195.1	.82-110.90	1.5- 146.89
N	164	63	30

Table 7. Test of Homogeneity of Variances within Dataset for ANOVA

		Levene Statistic	*df*1	*df*2	Sig.
adjusted mean	Based on Mean	2.356	2	254	.097
	Based on Median	1.860	2	254	.158
	Based on Median and with adjusted df	1.860	2	222.607	.158
	Based on trimmed mean	2.203	2	254	.113

Table 8. ANOVA

adjustedmean

	Sum of Squares	*df*	Mean Square	*F*	Sig.
Between Groups	10907.122	2	5453.561	3.314	.038

Within Groups	418007.992	254	1645.701		
Total	428915.114	256			

Table 9. Bootstrap for Multiple Comparisons

Dependent Variable: adjustedmean
Tukey HSD

			Bootstrap[a]			
					95% Confidence Interval	
(I) Label	(J) Label	Mean Difference (I-J)	Bias	Std. Error	Lower	Upper
1	2	-.33	.045	4.96	-10.21	9.83
	3	20.19	-.70	9.99	.75	40.76
2	1	.33	-.045	4.96	-9.83	10.21
	3	20.52	-.75	10.23	.71	40.34
3	1	-20.19	.70	9.99	-40.76	-.75
	2	-20.52	.75	10.23	-40.34	-.71

a. Unless otherwise noted, bootstrap results are based on 1000 bootstrap samples

Conclusion

In summary, a 2-factor structure (one related to parasympathetic processes, and one related to sympathetic processes) seemed to be the best first for the ARSTC items. The component matrix for the factor analysis showed that several items on the ARSTC overlapped into both factors, and that the parasympathetic factor was comprised of items with negative and positive correlations. Though a two-factor structure seemed to be the best fit for the ARSTC items, three factors were used in the analysis for RQ2. Statistically, there was not a significant difference between the two parasympathetic

processes of social engagement and freeze, but conceptually, these processes still function separately. The items intended to represent social engagement and freeze did not load separately when considered statistically, yet theoretically they are separate processes occurring within the same branch of the ANS (Porges, 2011). Though the processes are thought to be functions of the same nerve (the vagus nerve), Porges hypothesized they are related to separate parts of the nerve: the dorsal part and the ventral part. The ventral vagal complex (defined in Chapter 1 and described in Chapter 2) allows an individual to engage in self-soothing by connecting with others in safety, and the dorsal vagal complex (defined in Chapter 1 and described in Chapter 2) allows an individual to engage in self-soothing by conserving energy and disconnecting from others in life-threatening experiences. As such, an ANOVA was used to analyze the external validity of the three ARSTC labels compared to measures of RMSSD (HRV), to account for the theoretical and biological differences that informed the development of the ARSTC. The ANOVA results suggested a significant difference between groups, and a Tukey's post hoc test showed significant difference between the RMSSD for clips labeled social engagement from freeze, and fight/flight from freeze. Interpretations and implications of these results are discussed in detail in Chapter 5.

CHAPTER V

DISCUSSION

In Chapter 4, I reviewed the preliminary considerations related to data coding and necessary deviations from the methods proposed in Chapter 3. I provided descriptive statistics about the sample of client participants, restated the two guiding research questions, and described the analyses used and their results. In this final chapter, I will review the purpose of the study and the guiding research questions, provide an overall discussion of the results, identify limitations of the study, and discuss implications of the results. Lastly, I will explore suggestions for future directions in research on ANS regulation and counseling and end with concluding thoughts.

Purpose of the Study and Research Questions

The over-arching goal of the present study was to explore the ways in which PVT (Porges, 2011) might be applied empirically to counseling sessions. Specifically, the purpose of this study was to develop and validate a screening tool to help counselors track client body language and nonverbals that might relate to shifts in autonomic regulatory states outlined in PVT. As discussed in Chapter 2, there is conceptual support for the application of PVT to counseling (Dana, 2018; Porges & Geller, 2014; Wagner, 2015) but, to the author's knowledge, there is limited empirical exploration of PVT and autonomic regulation within counseling sessions (see Chapter 2). Many trauma counseling theories emphasize the importance of establishing safety and increasing

emotion regulation with clients (Cohen et al., 2005; Gentry et al., 2017) but overlook the role of the ANS and intentionally intervening with it during session (see Chapter 2). Common trauma treatment modalities used in trauma counseling (e.g., TFCBT) assume clients are operating in a state of social engagement when this is may not be the case. If counselors had a tool to screen for behaviors indicative of autonomic response state, they could cater interventions to truly meet the clients where they are (physiologically). Unfortunately, a barrier to exploring the concepts of PVT within counseling is that measuring physiodata related to ANS regulation is often inaccessible and impractical for counselors to use in session (see Chapter 2).

Based on PVT (Porges, 2011), existing literature, the author's extensive clinical training in Somatic Experiencing®, and feedback from expert reviewers during the pilot study, the author created the Autonomic Response Screening Tool for Counselors (ARSTC). During data collection, a total of 17 video-recorded counseling sessions with different clients wearing HeartMath Inner Balance sensors were collected. The author created 257 1-minute video clips from those 17 sessions, which were coded according to the ARSTC labels by a team of coders. Corresponding data on heart rate variability (HRV) was collected through the HeartMath sensor and recorded to reflect the time points represented by the 257 video clips.

The first research question informing the data analyses was to determine the factor structure of the ARSTC. The author hypothesized that a factor analysis of the 34 ARSTC items would yield three factors, based on the three autonomic states described in PVT (social engagement, fight/flight, and freeze). The second research question was

whether or not the ARSTC was a valid indicator of shifts in autonomic state when compared with HRV data collected through the HeartMath sensor.

Discussion

Summary of the Results

Research Question 1. The factor analysis of the ARSTC items resulted in a two-factor structure as the best fit for the data, though several considerations came up when running the analysis. The biggest consideration was that the items were scored as present or not present within the 1-minute clip of video (see Revised Coding Form in Appendix Y), resulting in dichotomous variables for the analysis. The challenging use of dichotomous variables in a factor analysis is discussed in the limitations section.

Though the author proposed a three-factor structure (social engagement, fight/flight, and dorsal shutdown/freeze) for the ARSTC, a two-factor structure seemed to be the best fit with the data conceptually, with items grouping onto nervous system branches of one sympathetic factor and one parasympathetic factor. The results indicated strong negative correlations between the items that the author intended to represent social engagement and dorsal freeze, grouping them into one parasympathetic factor. Items included in this factor were evenly paced breaths, prosody, relaxed posture, laughing, full-face smiling, pronounced hand movements, shallow breaths, slow pace in speech, fixed stare on object in the room, eyes closed, slumped posture, paused in speech/unfocussed speech, and low tone. The first five items in this factor were intended to represent social engagement, pronounced hand movements was intended to represent fight/flight (sympathetic state), and the last six were intended to represent dorsal

shutdown/freeze. The first six items were negatively correlated with the last six items, leading the author to interpret the results as reflective of the two functions of the parasympathetic nervous system according to Porges (2011): social engagement and freeze. Statistically, this factor indicated that items the author intended to represent social engagement would be strongly correlated with the absence of items the author intended to represent dorsal freeze (see Chapter 4, Table 5). This factor seems to make sense in light of PVT, as Porges (2011) theorized that social engagement and dorsal freeze symptomology are regulated by the same branch - just opposite ends - of the ANS: the parasympathetic nervous system (PNS). In line with the theory, then, the strong negative correlations might be interpreted as being representative of the same process or construct, just in opposite directions.

A second factor was comprised of items the author intended to represent fight or flight, which is considered the sympathetic factor. Items in this factor included psychomotor agitation in feet, quick pace of speech, broadening of eyes/pupil dilation, pronounced hand movements, increased volume in speech, shallow breaths, and eyes closed. These seven items were positively correlated with one another and negatively correlated with an eighth item: evenly paced breaths. Within the data collected, an absence of evenly paced breaths was associated with the presence of the other seven items in this sympathetic (flight/flight) factor.

Conceptually, Porges (2011) described the ANS responses as occurring hierarchically and exclusively, meaning one cannot be in a state of engagement at the same time as being in a state of dorsal freeze. The results from the factor analysis seem to

support Porges's idea that the states governed by the PNS are distinct and mutually exclusive from the states governed by the SNS. In other words, the items intended to represent freeze and those for social engagement did not occur simultaneously within the data (i.e., if items like prosody and full-face smiling were checked in the same clip of tape, items like low tone and pauses in speech were not checked - see Chapter 4, Table 5), and for the most part the items did not overlap frequently with those items in the sympathetic factor.

Though overlap was not frequent, several items from the ARSTC may be indicative of more than one physiological state, as shown by some items being present in both factors. From the 2-factor component matrix, it seems shallow breaths and closed eyes (Appendix T, Items 24 and 31) could represent parasympathetic or sympathetic processes. Within the first factor, the negatively correlated items are interpreted as being indicative of social engagement (one function of the vagus nerve within the parasympathetic nervous system, according to Porges, 2011) and the positively correlated items represent a dorsal freeze state (the second function of the vagus nerve within the parasympathetic nervous system, according to Porges, 2011). As such, shallow breaths and closed eyes were seen in both dorsal freeze states and fight/flight states. Pronounced hand movements were seen in both social engagement states and fight/flight states.

The overlap of items within the factor analysis (e.g., shallow breaths, closed eyes, pronounced hand movements) could have several meanings conceptually and practically for counselors and researchers. The results seem to indicate that the autonomic response options outlined in PVT (Porges, 2011) are not as discrete as the author originally

believed. Porges (2011) emphasized that social engagement allows for the most flexibility in responding to one's environment, and it seems that flexibility might include a degree of sympathetic (fight/flight) response. This idea of flexibility might be better illustrated by thinking of the vagal brake as a dimmer switch on a light, rather than an on/off switch. As a reminder, Porges (2011) hypothesized that the vagal brake dampens sympathetic dominance of the autonomic nervous system. With the vagal brake in place, a person can access social engagement. However, the vagal brake may come up slightly to allow for some degree of sympathetic activity when needed. For example, consider play behavior of children. Play behavior, such as a game of tag, can illustrate the dynamic role of the vagal brake on the nervous system. The children connect and laugh, while also mobilizing to chase one another and flee when dictated by the game. Though they may demonstrate behaviors associated with fight and flight states, they remain in social engagement and parasympathetic dominance, thanks to the titration of the vagal brake.

Practically, the overlap between items in the factor analysis further highlights the importance of context and the uniqueness of the client. If counselors are aware of items that loaded in both sympathetic (fight/flight) and parasympathetic (social engagement and freeze) factors, they might make a special point to think carefully about *how* and *when* those behaviors show up in session. For example, the counselor might ask, "Does my client make pronounced hand gestures only when talking about frustrating interactions with an ex-partner, or does my client simply have a tendency to be animated and 'talk with their hands' as a habit?" In other words, the overlap of the items listed above in both

factors can be thought of as areas for specific attention and further assessment on the counselor's end for interpretation.

Interestingly, some of the most frequently coded items (such as eye contact, nodding, psychomotor agitation in hands, furrowed brow), didn't load onto either factor, perhaps indicating they aren't helpful for distinguishing between sympathetic and parasympathetic dominant states. An alternative perspective may be that the interpretation of those items is also very context- and client-dependent, similar to the items that loaded onto both factors. These later items were seen often among the data collected, but that may not have been the case if the sample had been limited with inclusion criteria of trauma history. For example, if a client typically presents in a dorsal shutdown/freeze state, a furrowed brow and agitation in hands could be a significant place for attention in a session. Alternatively, eye contact may be something a client has learned to offer socially regardless of their physiological state, and so it does not mean much for interpretation in session. As such, it may not be as solid of an indicator of state as other ARSTC items seen in the client, based on the data in this study.

A final point of discussion is related to the nature of the items used to create the ARSTC (see Appendix T) and the frequency with which they were observed. These items, selected by the author and refined by the expert reviewers in the pilot study, relate to observable cues of external orientation through one's senses. Put another way, the items were selected as markers of how people orient to their environment (or externally). It may be that external orienting behaviors are most observable in states of social engagement and fight or flight (Keen & Blakeslee, 2020), and that internal orienting

behaviors (such as collapsed posture or eyes closed) are most indicative of dorsal shutdown/freeze responses. Other signs of internal orientation (or even disorientation) such as reduced blood flow to extremities, conservation of energy to vital organs, and reduced energy for digestion, are much more difficult to observe visually. Interestingly, the most agreement on items for the ARSTC by the expert reviewers who participated in the pilot study were for items representing social engagement and fight/flight, perhaps further suggesting that these items are more observable. The reviewers had they most variation in how they labeled items representing freeze, perhaps because those items (such as eyes closed, slumped posture, pauses in speech/unfocused speech, low/flat tone – see Appendix T items 31, 32, 33, and 34) could be indicative of external or internal orienting. In other words, the ARSTC may be biased towards identifying cues of external orientation, more associated with social engagement and flight/flight responses, than those of internal orientation/disorientation associated with dorsal shutdown/freeze responses. Of the 257 clips of tape used in data analysis, 165 were coded as Social Engagement, 62 were coded as Fight/Flight, and 30 were coded as Dorsal Shutdown/Freeze.

Research Question 2. The second research question related to the external validity of the ARSTC compared with the HRV output from the HeartMath. As a reminder, root mean square of successive differences (RMSSD) was the metric used in this study for HRV, because it is thought to be most representative of vagal influences on heartrate and less impacted by respiration when compared to other metrics of HRV (Laborde, Mosley, & Thayer, 2017). RMSSD was determined through analysis of the raw

interbeat interval (IBI) data (collected through the HeartMath sensor) in a free program called Kubios (version 3.3.1 Biosignal Analysis and Medical Imaging Group; described in Chapter 4). After adjusting the mean RMSSD for each clip to reduce the dependence of the data, there was a significant difference between groups (social engagement, fight/flight, freeze) in HRV. After extensive consultation with Dr. Robert Henson (personal communication, February 21, 2020), the author was advised to use a bootstrap method through SPSS to look more closely at group differences. Using this approach, there was a significant difference in RMSSD measurements between clips labeled as Social Engagement and Freeze through the ARSTC, and there was a significant difference in RMSSD measurements between clips labeled as Fight/Flight and Freeze through the ARSTC. There was not a significant difference in RMSSD measurements between clips labeled Social Engagement and Fight/Flight (see Chapter 4, Table 9 for the Bootstrap of Multiple Comparisons).

One interesting consideration for these results is that the author chose to use RMSSD as the metric for HRV specifically because it is thought to be representative of vagal influences on the heart. In Chapter 2, the author explored the idea that respiratory sinus arrythmia (RSA) is suggested by Porges (2011) to be the most indicative metric of the influence of the vagus on the heart (or in other words, the state of the vagal brake). Given the difficulty of accessibly measuring RSA in counseling sessions, HRV (through RMSSD) was chosen as an alternative measurement to explore vagal regulation in the ANS. It may be that, because RMSSD was selected to be most representative of the state of the vagal brake (parasympathetic activity), sympathetic influences on heart rate were

not as evident. As such, it may have been more difficult for differences in RMSSD between clips labeled as Social Engagement and those labeled Fight/Flight to be observed in the analysis.

The differences in RMSSD found between clips labeled Social Engagement and Freeze support the author's interpretation of the first factor determined through the factor analysis and interpreted as indicative of parasympathetic processes. Though the single factor seems to suggest that the items are indicative of the same phenomenon (parasympathetic processes), there was indeed a significant difference in RMSSD between the social engagement and freeze labels. It may be that this difference supports the idea suggested by Porges (2011) that social engagement and freeze responses represent different psychological processes within the parasympathetic nervous system. The results of the ANOVA analysis give initial evidence of validity that the ARSTC may capture differences in HRV related to social engagement and freeze states.

The results of the ANOVA also offer initial evidence of validity that the ARSTC may be a valid tool for capturing differences in HRV related to fight/flight and freeze states, as there was a significant difference in RMSSD between those clips labeled as Fight/Flight and those labeled Freeze. However, there was not a significant difference in RMSSD between clips labeled as social engagement and those labeled as fight/flight. A possible explanation for the lack of significant difference may be that there is less of a shift in RMSSD respective to states of social engagement and flight/flight. Within the curriculum of Somatic Experiencing®, social engagement and fight/flight responses have been described as having the potential for overlap, meaning at times they can co-occur, or

that a person can cycle quickly through moments of each (Keen & Blakeslee, 2020). Consider once more the example given above of two children playing tag, demonstrating both social engagement and fight/flight responses. It seems that the results of this study suggest that the possible overlap seen in those responses may be reflective of a lack of significant difference between the HRV associated with those states, for this sample. As noted earlier, these results suggest that the categories of social engagement and fight/flight may not be as discrete as the author originally believed.

Not every label was seen in every client, and the impact of this on the analyses is discussed in the limitations section. However, it was particularly interesting to the author to explore how different clients were labeled across their clips. Of the 17 clients, three only had one label given to all of their clips, eight had two labels given to their clips, and six had all three labels given to their clips. Of the six clients who had three labels given across their clips, 83% self-reported experiences of trauma (of note: the sixth person self-disclosed trauma history in their session, but did not report it on their Client Information Form; if they had, 100% of clients with all three labels would have reported trauma histories). Of the eight clients who had two labels given across their clips, 63% self-reported experiences of trauma, and of the clients who had one label given across their clips, 33% reported experience of trauma.

For those clients who displayed a range of behaviors allowing for all three labels with the ARSTC, it seems their trauma histories influenced their regulation patterns as expected. Those clients who only received 2 labels across their clips reported less trauma, and those with only one label reported the fewest levels of trauma. It may be, then, that

the wide range of experiences of client participants in this study influenced which labels occurred most frequently in the data, and that more variation in body language according to the ARSTC is seen in those who have trauma histories. Clients who have histories of trauma may spend more time in fight/flight and freeze states in session and their daily lives, and so those clients cycled through these states, along with social engagement, more frequently during their sessions as compared to those without trauma histories.

Benefits and Limitations of the Sample

As the author noted in Chapter 2, a decision was made to collect data from a random sample of clients rather than only collecting from clients with self-identified trauma history. Clients were able to self-report trauma history on the Client Information Form (see Appendix B), and 11 of the 17 clients (65%) reported trauma histories. Those histories ranged from experiencing sexual assault, growing up in poverty, witnessing car accidents, enduring emotional abuse, and making past suicide attempts. The diversity of the sample was intentional by the author, in order to collect data from a variety of nervous systems rather than those that may have experienced a baseline of dysregulation, as might be expected from only collecting data from those with trauma histories. It seems that this approach allowed for more observation of social engagement behaviors, as discussed later, though it was intended to allow for a greater range of the observed states within the data. One set back of not using trauma history as inclusion criteria for the study may have been the limited frequency of observing fight/fight and dorsal shutdown/freeze states. As explored in the previous section, 100% of those who reported trauma histories either within session or on their Client Information Form, had clips

labeled as all three response options. This may support future decisions to use the ARSTC with only clients who report trauma histories, as it may be most helpful with these clients.

Additionally, the author chose not to control for number of sessions the clients had seen their counselor (or experiences of previous counseling). This was beneficial in order to get a wider variety of data because, in theory, the longer the clients had worked with the counselors, the greater the possibility they would be better regulated and benefit from coregulation in social engagement (Sylvae, 2018). However, there were five clients who had seen their counselors for 15 or more sessions, and their session clips were some of the most difficult for the coders to independently reach the required interrater reliability. Each of those clients had reported a history of trauma, and the coding difficulty seemed to result from these clips having many items checked in multiple categories, thus resulting in equal scores across categories. In those cases, the primary and secondary coders met to discuss the items marked, re-watch the clip, and agree on a label for the clip. From the author's observation, a trend seemed to emerge that this group of clients demonstrated body language and nonverbals indicative of social engagement, perhaps related to their enduring relationship with their counselor, but they also consistently demonstrated the body language and nonverbals of fight/flight and freeze. It may be that their systems were in states of dysregulation (fight/flight or freeze), but the familiarity with their counselors helped them demonstrate behaviors associated with social engagement. Based on the author's clinical experience and training, this seems to be a learned experience, in that many people are able to mimic behaviors of social

engagement to get past or through their experiences of dysregulation. Another way of thinking about this trend could be that the clients were attempting to better regulate by engaging in social engagement with their counselor, somewhat similar to behavioral activation (i.e., a person feels depressed, so she goes for a walk to exercise and be outside, in hopes that the action of walking outside can help improve her mood). So, in noticing their own dysregulation, perhaps these clients became accustomed to trying to connect with others (or their counselors) in an attempt to better regulate.

One lens for interpreting the trend of how those with trauma histories showed signs of social engagement is attachment theory. In Chapter 2, the author noted that literature on attachment is perhaps the closest connection for PVT within counseling literature, in that attachment principles outline patterns of connecting and disconnecting from others and self in times of safety and times of stress (Brubacher, 2018). It may be that clients in this study with secure attachment to their counselors were able to demonstrate body language indicative of social engagement, because the secure attachment with their counselor allowed for a nuanced expression of the ventral vagal complex. As a reminder, the ventral vagal complex develops in infancy (alongside critical periods for developing attachment patterns to caregivers), and its development allows infants to benefit from coregulation with their primary caregivers. Even in times of stress or dysregulation, an attuned and present caregiver can offer a platform of coregulation to soothe the infant. An adjusted version of this process may occur with clients in counseling. Though the clients who exhibited body language indicative of all three regulatory states, it may be that though their default may have been fight/flight or freeze,

their therapeutic relationship and rapport with their counselors may have allowed the ventral vagal complex to remain engaged (or flicker on and off) and as a result, have moments of social engagement more regularly throughout their session.

One might suggest that collecting data from intake sessions only would allow for a better baseline of regulation in terms of reducing the noise that the therapeutic relationship might contribute, although other factors like the client's anxiety about the process, uncertainty of the environment, and preoccupation with intake paperwork might then influence the client's physiological state. This study provides a foundation for noticing trends in how the counseling relationship might influence a client's nonverbals and physiological state, though those trends emerged from observation rather than statistical analyses. Future researchers may consider controlling for presence of trauma history, type of trauma history, and number of sessions with the counselor, and design a study that allows those variables to be more systematically observed or statistically controlled or analyzed.

Coding

Necessary deviations from the proposed procedures for coding were reviewed in Chapter 4, but several limitations are worth mentioning in regard to the coding process after data were collected. One involves limitations of the recording equipment in the counseling rooms. Several items on the ARSTC were more difficult to observe in the video recordings than expected. Specifically, no data were collected for the following six items: digestive sounds, flushed face, flushed neck, absence of color, client expressing feeling warm or hot, and client expressing upward movement of sensation or energy.

Even with standardizing the recording procedures, zooming the camera in on the client, closing the window blinds, and turning on the overhead lighting, color of and changes in skin tone were not observable in any client, regardless of race. Coders were not able to observe or hear any digestive sounds, which may have been impeded by the quality of the sound recording and background noises that were captured in the recording. Though these items were not observed within the 257 video clips, their absence may be more reflective of recording limitations than irrelevance. These items related to skin tone and digestive sounds are taught within Somatic Experiencing® as important indicators of shifts in physiological state (Sylvae, 2018), and seem well supported in literature as important cues of physiological processes, given that the vagus enervates the gut and digestive system (Keen & Blakeslee, 2020), and that the increased blood flow that results in flushed skin tone is tied to sympathetic activation (Sylvae, 2018). Future researchers might consider live observation of these items rather than recorded observations, as these items are indeed observable in clients based on the author's clinical experience and training. Another option future researchers might consider is to intentionally select recording equipment that can offer clearer video and audio recordings to capture clearer images of the client and reduce interference of background noise.

None of the clients expressed upward movement of sensation or feeling warm or hot within the 257 clips. Those items seem less related to the recording limitations and perhaps are just more unique than originally hypothesized by the author. These two items, though supported by the author's clinical training and endorsed by the expert

reviewers in the pilot study, might be appropriate to remove from a final version of the ARSTC.

In addition to items never coded, a final consideration related to the coding process is that some items were difficult for coders to identify consistently. Specifically, interpreting breath and posture was exceptionally difficult for all coders throughout the entire coding process. It proved difficult to capture and objectively describe in writing the various postures (relaxed, rigid, slumped, collapsed), although the item descriptions were revised several times (see Appendix Z for the final revised ARSTC Item Descriptions). In general, primary and secondary coders varied most often on items related to breath and posture, and regularly had to talk about those items and re-watch the given clip several times to reach consensus on how to describe the client's behavior. All coders agreed that live observation of breath and posture would likely lead to more consistency in coding those items.

Lastly, it seemed that coders occasionally had different interpretations of breath and posture based on how long coding lasted on any given day. Coding on those items were most inconsistent in the first few sets and the last sets of clips for the day after about 3 hours of coding. It seemed the most consistency occurred between 1-3 hours of coding, perhaps indicating that it took some time for coders to refamiliarize themselves with the items and their definitions, as well as how to agree on posture and breath, and then, eventually, coding fatigue set in and impeded consistency in coding those items. Because of this, future researchers might consider using live coding with the ARSTC in sessions. Although live coding potentially could impede part of the counseling process and be

accompanied by other limitations (e.g., increased client discomfort and subsequent shifts in autonomic regulation due to having an observer present in counseling session, changes in client behavior due to presence of live coder, or changes in client disclosure due to live coder), live coding could be a way to collect fuller and more consistent data related to shifts in autonomic states within counseling sessions.

The difficulty of coding for an observational screening tool experienced in this study is echoed in Tutuer et al. (1995). Tutuer et al. coded verbal comments and behaviors of mother-child dyads and ran into similar difficulties around items not being recorded because of limited observability (e.g., mothers' whispering to children was inaudible for coders to document, perhaps similar to digestive sounds in the present study). Tutuer et al. also emphasized that their observational instruments were meant to be screening tools rather than diagnostic tools, and that same perspective applies to the ARSTC. Rather than "diagnosing" the physiological state of the client, the ARSTC can provide counselors with information about the possible physiological underpinnings of their clients' presentation that can guide their continued assessment and intervention choices throughout their clinical work together.

Statistics

The collected data proved difficult to fit into statistical analyses familiar to the author. As mentioned previously, the first research question regarding the factor structure of the ARSTC was analyzed with an exploratory factor analysis. However, the items on the ARSTC for each clip were scored as present or not present, and the dichotomous variables may have influenced the analysis by inflating the factors that showed up in the

initial analysis, which yielded 11 factors. After consulting with Dr. Robert Henson (personal communication, January 31, 2020), the author ran several other analyses with two and three extracted factors (described in Chapter 4), in order to obtain the most interpretable two-factor structure. Though the first factor, which the author is interpreting as representing parasympathetic activity, had opposite correlations with the items hypothesized to represent social engagement and freeze (see Chapter 4, Table 5), the author was advised not to reverse code the items so that the interpretation was more logical. Reverse coding would result in strong positive correlations between the items for social engagement and freeze and would not represent the items as opposite ends of the spectrum of the same nervous system process.

Though the results of the ANOVA indicated significant differences in HRV between ARSTC groups, several challenges within the data are worth mentioning. To begin, all three categories (social engagement, fight/flight/, and freeze) were not observed in every client. As discussed above, this may be due to the fact that there were no inclusion criteria related to presenting concern or history for this study. Additionally, to the author's knowledge, there is no literature on normed HRV measurements that could be used in this study as a measure of anticipated baseline. As such, the decision was made to subtract off the session average RMSSD from the clip measurements to allow for independence in the data. The session average for some clients could have been significantly skewed by outliers, and increased HRV "baselines" for clients could have reduced power in the analysis. As a reminder, every third minute of the client's session was coded with the ARSTC, and the client's baseline HRV was their RMSSD for the

entire session, including the uncoded minutes. The outliers in the data that could potentially have skewed that average could have been from things like sneezing, or the client dropping a water bottle, or other random events that weren't intended to be captured but could have resulted in large increases or decreases in HRV that skewed the session average. It seems one way to remedy this might be to observe more minutes of the full session, rather than every third minute, or watch the tape to identify where those outlier events could have taken place and remove measurements from that time point from the full session average.

Another limitation within the data is that there were different numbers of observations across clients and across groups (social engagement, fight/flight, freeze). Because every third minute was observed in the sessions, the number of observations for each client varied by how long the session lasted. An average of 14.23 clips were observed with every client, and the fewest clips for one client was 9 and the most clips for one client was 20. The differing amount of observations and the difference in how often the labels from the ARSTC were observed complicated the structure of the data and analyses. A final limitation within the data is that there may have been an autocorrelation within the natural structure of the data set, even though efforts were taken to limit the influence of autocorrelation by observing every third minute of the tape. This may have inflated Type 1 error rates and resulted in a rejection of a true null hypothesis for the ANOVA analysis of RQ2. One way to explore these limitations in future projects would be to code more minutes of the sessions and clean up the outliers to get a more accurate baseline measurement.

Limitations

Several limitations have been alluded to in the discussion section, and they are summarized here for clarity. With regards to data collection, limited recording quality and lack of inclusion criteria for the sample influenced what was observed in the data. Some items, like digestive noises and flushed skin, were not able to be observed with the sound and video quality of the cameras used for recording, and the range of client experiences may have limited the ability for all three category states to be seen across all clients. Interpreting some items, such as laughing, during coding was challenging because that item could represent connection in social engagement, or nervousness in fight/flight.

Another challenge occurred with coding items intended to represent freeze. The author described above that one reason for this was perhaps the freeze items were characterized by internal orienting as opposed to external orienting associated with social engagement and fight/flight. As such, they may have been less visible/outwardly observable during the coding process. It may be that fight and flight responses allow for protection through action, social engagement responses allow for protection through connection, and freeze responses allow for protection by disappearance, thus body language related to freeze responses are functionally less visible and outwardly observable. . One suggestion to lessen the impact of this limitation may be to prompt clients to report on what's happening for them when they show signs of freeze, but this may be difficult given the limited higher order thinking and capacity to communicate that is associated with freeze responses. As such, it may be that other types of biofeedback (in

addition to HRV) would be more reliable for interpreting freeze responses rather than nonverbal behavior.

Additionally, coder training might be considered a limitation of the study, in that the users of the ARSTC may benefit from increasingly objective descriptions of the items, and ample time is suggested for training and coding to reduce fatigue. Occasionally, the same number of items occurred in two or more categories, and so coders met to agree on the label for the clip by rewatching it and discussing it. Finally, the use of a pulse-sensor for collecting HRV data proved to be the most convenient and non-invasive way to collect the data for this study, but occasionally it malfunctioned and resulted in data that had to be removed from the final analysis. For example, for one client, the HeartMath sensor malfunctioned and so the author had the full taped session ready for coding, but no data on HRV for that client. As such, that tape had to be removed from the total data collection.

Implications

For Practitioners. The purpose of this study was to develop and validate a screening tool for counselors to accurately assess the in-session physiological states of their clients, as outlined in PVT (Porges, 2011), based on body language and nonverbals. Based on how the coding process unfolded, however, it seems that the full ARSTC might be best suited as a research tool rather than a tool that is easily accessible to counselors. The author underestimated how long training would take for the coders, and it seems that accurately noticing nuances in body language and nonverbal behaviors takes time and practice. The coding process was generally quickest and easiest for the author as

compared to the other coders, and this ease was likely due to the author's clinical training in tracking body language and nonverbals. The accuracy of the coding process improved by the end of coding, but it seemed that every time a clip with a new client was introduced, interrater reliability dropped. After coding several clips of the same client, however, interrater reliability was higher and more consistently met the required reliability without follow-up discussion. This observed trend supports importance of becoming familiar with the client's nervous system and presentation in order to have context for interpreting body language and nonverbals, which was emphasized by all expert reviewers included in the pilot study.

Counselors may consider using a shorter version of the ARSTC to screen for the items which occurred most often in the data and those with the strongest factor loadings. In the first factor, which has been interpreted as representing parasympathetic responses of social engagement and freeze, counselors pay attention to the strongest negative values as social engagement cues and to the strongest positive values as freeze cues. In other words, counselors could consider the three strongest items in each category as the basis of their in-session screening. Prosody (-.519), full-face smiling (-.513), and evenly-paced breaths (-.484) seem to be the strongest indicators of the parasympathetic process of social engagement. Low tone (.616), unfocused pauses in speech (.512), and slow pace of speech (.438) could be used to screen for freeze states among clients. Broadening of eyes (.621), quick pace of speech (.477), and psychomotor agitation in feet (.458) can be used by counselors to screen for fight/flight states. Counselors should be curious when they notice pronounced hand movements, however, as that item loaded onto both factors and

could be interpreted as a cue of either social engagement (-.325) or fight/flight (.506). Pronounced hand movements was one of the top three strongest loadings for the sympathetic factor, but it also showed up in the parasympathetic factor and should be interpreted with curiosity and in context with other cues. Shallow breaths was another item with stronger loadings onto both factors, and can be interpreted as indicative of freeze states (.457) or fight/flight states (.423). This item was one of the top three strongest items in the freeze category, but should be interpreted with curiosity, similar to pronounced hand movements, due to being seen in both factors (see Table 5 in Chapter 4 for item values).

As shown by the loadings for pronounced hand movements and shallow breaths, context and familiarity with the client are important. Objectively describing the range of body language and nonverbals that can be present in counseling sessions proved difficult. Nevertheless, based on results of this study, it seems that there are key behaviors counselors can expect to group together that indicate physiological states described in PVT (Porges, 2011). For example, from the study's results, counselors can assume that fight and flight behaviors like psychomotor agitation in hands and feet, rapid speech, absence of eye contact, broadening of eyes, and pronounced hand movements will occur together. As such, if a client is demonstrating pronounced hand movements but none of the other behaviors listed above, the counselor might continue assessing nonverbals to see if the other ARSTC behaviors might suggest the client is in a state of social engagement or perhaps freeze. As stated earlier, the ARSTC is best suited for use as a screening tool rather than a diagnostic one. The involved process of training and using

the ARSTC may indicate that it is best suited for researchers for now, though the clusters of items may still be relevant and more accessible to counselors for use than the full 34-item ARSTC.

Considering the strongest three items in each category and the expected groupings of items described above, counselors could be encouraged by supervisors and/or counselor educators to consider that several key factors can cue them in to the autonomic physiological state of their clients. In particular, based on the results of this study, the author suggests that counselors pay attention to the 1) cadence and pace of client speech, 2) the breath patterns evident in session, and 3) the qualities of movement in hands and feet (how and when that movement occurs). Interpreting these cues will depend on the client's typical presentation, narrative, and other cues that are present, but these general categories of cues proved to be the most salient in the data for this study.

The bias towards external orienting behaviors and imbalance in proportion of coded categories does not necessarily limit the utility of the screening tool for counselors, based on how Porges (2011) described the autonomic responses. If a clinician can use the ARSTC to make an informed decision about their client being in a state of social engagement, they can safely assume that client is not predominantly in fight/flight or dorsal shutdown states. If enough items are checked in the social engagement or fight/flight categories, the clinician can assume accurately that the client is not in freeze, based on Porges's (2011) assumption that these responses occur hierarchically. Put another way, if counselors notice enough items on the ARSTC to label their clients as in states of social engagement or fight/flight, they can safely determine those clients are

displaying enough external orienting behaviors to not be categorized as being in a state of dorsal shutdown/freeze. Then, they can proceed with interventions that assume social engagement, such as cognitive or relational interventions.

For the average counselor, correctly determining the physiological state of the client has far-reaching implications for intervention. Consider the illustration provided in Chapter 1 with Sadie. Had Nala correctly identified Sadie's trauma response state early in the session, she could have made more informed decisions on how to work with her client (Dana, 2018). At the training level, counselors like Nala need to be taught a functional working knowledge of PVT in order to understand the importance of intervening based on the client's physiological state. With that working knowledge and the ARSTC, the average counselor might be better equipped to recognize the importance of the client's physiological state and recognize key indicators of each state, such as qualities of speech, breath, and movement in hands and feet. As explored in Chapter 1, if Nala had noticed Sadie's freeze state, she could have chosen to use an active grounding technique, such as jumping jacks, to get her client's heart rate elevated, thus initiating sympathetic activation and pulling the client up out of her freeze response during the session.

Instruction on how specifically to intervene based on physiological state is beyond the scope of this study, as intervention was not a variable of interest for this initial study. However, the author's clinical training and understanding of the literature may be helpful in offering some general thoughts on how counselors can intervene. For clients in social engagement, counselors can use interventions that rely on the therapeutic relationship (e.g., gentle confrontation, rapport building, or Gestalt interventions that rely

on immediacy related to the interpersonal processes at play in counseling) and interventions that utilize higher order cognition (e.g., creating a trauma narrative or applying cognitive behavioral techniques such as thought stopping and reframing maladaptive cognitions). For clients in fight or flight, counselors can use interventions that will help the client downregulate, such as grounding skills of deep breathing or meditation, or they might use interventions that help heighten the fight/flight response so that it can naturally deescalate after being completed (Levine, 1997). For clients in freeze, counselors can use interventions that help the client upregulate and mobilize, such as using jumping jacks or running in place to get the client's heart rate up. All of these options for intervention depend on the counselor's tracking of the nonverbal behavior of the client, the goal/intention in the moment of intervention, and the counselor's theoretical orientation and training. For clearer guidance on how to intervene based on physiology, the author recommends specialized training in somatic approaches to counseling that teach ways to notice shifts in physiology and intervene accordingly, such as Somatic Experiencing® or Sensorimotor Psychotherapy.

For Researchers. The present study has many exciting implications for future researchers. Future researchers might consider replicating this study with more advanced equipment that could improve observations. Better recording equipment (for both audio and video as well as HRV) could allow for reduced limitations within the observations. With improved recording equipment or the use of live coding, researchers might also consider coding both client and counselor body language, and explore the interplay of the dyad by noticing how often both counselor and client appear to be in the same state

versus different states. For other research questions, researchers might consider revising the ARSTC to a 'short-form' (see above) or one that excludes the items that did not load onto either factor (such as facial twitching or rapid breaths). In terms of using the ARSTC for additional data collection, researchers might consider revising the coding process by incorporating a longer time for training on the measure. Giving ample time for the coders to understand the items and identify them in a variety of clips will be important. The author's training in Somatic Experiencing® lasted three years, and it seems that practice with observing nuances in body language over time and over multiple clients was exceptionally helpful in using the ARSTC for coding. Future researchers should also consider coding fatigue, and perhaps could schedule coding sessions in a way that works best for their team. As mentioned earlier, interrater reliability was improved after about one hour of coding, and coding fatigue for this team occurred after about three hours. As such, flexibility in the training and timeline of the project is important.

Future researchers might also consider case study-based research with the ARSTC. The data collected in this study were rich in diversity and content, though a deeper dive into that diversity was beyond the scope of the present study. One session was collected of a client during a safety assessment, and a deeper exploration of that particular client and session, including more detailed information about the client's perception and awareness during the session, could be a wonderful contribution to the counseling literature. Case study research could also allow for individual client differences to be more meaningfully captured. For example, clients might be able to elaborate on their internal process and code their own body language based on the

ARSTC, which could provide invaluable context for nonverbal behaviors and body language. Additionally, baseline trends and changes in HRV (which are expected to vary by person) could also be more closely considered with a case study approach.

Future researchers may also want to narrow their sample by using specific trauma history as inclusion criteria for participation. This could potentially allow for bigger observable shifts in autonomic state, given that autonomic dysregulation is associated with trauma exposure (Flores & Porges, 2017). This may be a useful way to collect more data on fight/flight and dorsal shutdown/freeze states, and thus better capture data related to better understanding the presentation of these states. Also, whether or not researchers choose to control for trauma exposure or not, it may be interesting to control for the number of sessions the clients have with their counselors. This could allow for a clearer understanding of the impact of the therapeutic relationship in trauma counseling and possible influences of coregulation that might influence ARSTC coding.

Conclusion

The development and validation of the ARSTC is an important first step for better understanding practical applications of PVT within counseling and for attending to the physiological processes at play within counseling sessions. As stated in Chapter 2, knowledge of physiological mechanisms and how to track them within a counseling session encourages a bottom-up, body-based approach to complement the myriad of top-down traditional counseling theories, and has the potential to more effectively cater to clients' therapeutic needs (Grabbe & Miller-Karas, 2018). To the author's knowledge, this study represents one of the earliest attempts to empirically analyze the relationship

between physiological trends and associated body language within multiple counseling sessions.

Although it certainly seems that the ARSTC can help the counseling field improve its attention to these processes in session to better meet the needs of clients, it feels important in this conclusion to widen the context for understanding this study. Counselors are in the business of helping, healing, and honoring clients. Although nervous system processes have been argued as exceptionally important to consider in counseling, one must be reminded that clients are much more than nervous systems: they have swelling hearts, timeless wisdom, remarkable resilience, and incredible capacity for healing themselves. The present study has been motivated and inspired by the wish to help counselors better understand and assess for areas in which they can support clients in their own healing. Attention to physiology offers a unique way to support clients in resolving their presenting concerns and symptoms, yet it will always be important not to limit or reduce the dynamic beauty inherent in humans through detailed analysis and research. Rather, future research and analyses could be intended to complement and amplify that beauty. The aim for this study has been to expand counselors' understanding of their clients and their ability to meet them where they are more accurately and helpfully, in an attempt, at the broadest level, to improve our shared world.

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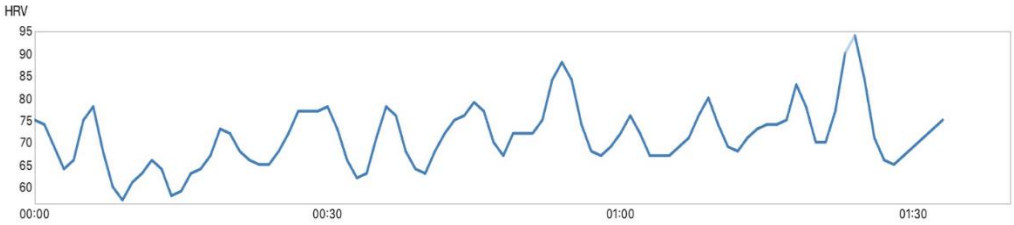
APPENDIX A

EXAMPLE HEARTMATH HRV OUTPUT



Personal Heart Rave Variability Output. (2019). *HeartMath Inner Balance* [Data file]. Retrieved from Inner Balance iPhone application.

APPENDIX B

CLIENT INFORMATION FORM

Thank you for participating in this study! As your final step, please answer the following questions. After you complete this form, please return it to the front desk Clinic staff. After you have turned in your completed form, the Clinic staff will issue your **$15 cash compensation**. Thank you again for your time!

Today's date: _____ Your Initials: _____

What is your current age? _____ What is your racial identity? _____

What is your ethnic identity? _____ What is your gender identity? _____

Approximately how many sessions have you had with your counselor? _____

Do you have ANY history of potentially traumatic experience (e.g., physical, emotional, and/or sexual abuse; family trauma; crime victimization, rape or sexual assault; disasters)? □Yes □No

If yes, please explain (based on your own level of comfort with disclosing details).

_____
_____
_____
_____
_____
_____
_____
_____
_____

Are you currently on any prescribed medications? ☐ **Yes** ☐ **No** ☐ **NA**

Medications:

Please list current prescribed and/or over-the-counter drugs/medications (if none, check this box):

Medication	Dosage

Which of the following symptoms brought you into counseling or seem relevant to your current reasons for coming to counseling? (Check all that apply)

☐ Sadness
☐ Hopeless/Helpless
☐ Sleep Too Much
☐ Sleep interrupted
☐ Fatigue/No Energy
☐ Poor Memory
☐ No Motivation
☐ Lack of Interest
☐ School refusal
☐ Guilt
☐ People Watching Me
☐ Feel Worthless
☐ Not Hungry
☐ Prefer Being Alone
☐ Irritable/Angry
☐ Can't Sleep
☐ Too Much Energy
☐ No Need for Sleep
☐ Talk Too Fast
☐ Impulsive
☐ Fearful
☐ Cannot Concentrate
☐ Nightmares/sleep difficulties
☐ Restless/Cannot Sit Still
☐ Suspicious
☐Panic Attacks
☐ Feeling Nervous
☐Avoidance problems
☐ Have Special Powers
☐ Increased thoughts of death
☐ People Out to Get Me

☐ Poor verbal skills
☐ Memory problems/issues

☐ Display excessive temper
☐ Exhibit aggressive behaviors
☐ Develop learning disabilities
☐ Demand attention through positive/negative behaviors
☐ Act out in social situations
☐ Imitate abusive/traumatic event
☐Verbally abusive/aggressive
☐ Scream or cry excessively
☐ Startle easily
☐ Unable to trust others/make friends
☐ Self-blame for traumatic event(s)
☐ Cannot be in Crowds
☐ Fear being separated from
☐ Parent/caregiver/guardian
☐ Anxious and fearful and avoidant
☐ Irritability, sadness, and anxious
☐ Act withdrawn/self-isolate
☐ Lack self-confidence
☐Poor appetite/low weight/digestive
☐ Re-occurring Nightmares
☐ Wet the bed or self after Being toilet trained/ other regressive bxs

If results are ready while I am still seeing my counselor, I would like my counselor to explain to me the summary of the HeartMath information of my session when it is available. □Yes □No

Thank you again for your time! Please take this sheet to the front desk staff to **collect your $15.**

APPENDIX C

COUNSELOR REFLECTION FORM

Thank you for your help with this study! Please complete the following form after conducting your session using the HeartMath with your client.

Today's date: _____ Your Initials: _____

What is your current age? _____ What is your racial identity? _____

What is your ethnic identity? _____ What is your gender identity? _____

Approximately how many sessions have you had with your client? _____

IVS Label used for this session: _____

Please take a moment to reflect on the session you just completed with your client and comment on the presentation of your client. Was the client presenting in a similar way or different way from other sessions you've had with them before today? Please explain.

_____
_____
_____
_____
_____
_____
_____
_____
_____

Thank you again for your time! Please return this form **and** your log form to the Clinic filing room cabinet. In the top drawer labeled "doctoral students" you will see a folder labeled "Morris" in which you can place your forms. Please return the iPad and HeartMath sensor to the Clinic front desk.

APPENDIX D

CLIENT PARTICIPANT INFORMED CONSENT

UNIVERSITY OF NORTH CAROLINA AT GREENSBORO

CONSENT TO ACT AS A HUMAN PARTICIPANT

Project Title: The Development and Validation of the Autonomic Response Screening Tool for Counselors (ARSTC)

Principal Investigator and Faculty Advisor (if applicable): Madeleine Morris Lowman and Dr. L. DiAnne Borders

Participant's Name: _____

What are some general things you should know about research studies?
You are being asked to take part in a research study. Your participation in the study is voluntary. You may choose not to join, or you may withdraw your consent to be in the study, for any reason, without penalty.

Research studies are designed to obtain new knowledge. This new information may help people in the future. There may not be any direct benefit to you for being in the research study. There also may be risks to being in research studies. If you choose not to be in the study or leave the study before it is done, it will not affect your relationship with the researcher or The University of North Carolina at Greensboro.
Details about this study are discussed in this consent form. It is important that you understand this information so that you can make an informed choice about being in this research study.

You will be given a copy of this consent form. If you have any questions about this study at any time, you should ask the researchers named in this consent form. Their contact information is below.

What is the study about?
This is a research project. Your participation is voluntary. The purpose of this study is to develop a screening tool that could help counselors better meet their clients' needs. Autonomic regulation refers to the ways our bodies keep us calm, help us relate to others, and also get us ready to respond to threatening situations. Regulation is something that our bodies are doing always, even in counseling sessions. This research study is about getting more information about how counselors can notice regulation patterns of their clients, in hopes that they can better help their clients with this information.

Why are you asking me?
You are being asked to participate in this study as a client above the age of 18 being seen in the Nicholas A. Vacc Clinic during the Fall 2019 semester.

What will you ask me to do if I agree to be in the study?
If you agree to participate in this study, I will ask several things of you, outlined below:

- You will allow the researcher above (Madeleine Morris Lowman) to access 1 recorded session that you have with your counselor. As a reminder, as a client at the Vacc Clinic, you have signed a Consent and Contract document that informs you all sessions are recorded and can be used for research purposes. The purpose of the present consent form is for you to state that your tape can be used for this specific research study.
- You will be asked to wear a small pulse sensor (called HeartMath Inner Balance) that clips to your earlobe in your next session. The sensor should not be painful, and you will be allowed to opt out of the study if you experience any physical discomfort with the ear sensor.
- You will be asked to complete a brief Client Information Form, in which you will provide some basic information about you (race, age, etc.), note symptoms that you are experiencing, and indicate if you have a history of trauma. You will **not** be asked to write your name on that form.

Outside of these three things, your session should take place with your counselor as it normally would, so that your counselor works with you to help you reach goals you have set together. If you agree to participate, you will do the bulleted steps above for just **one** of your sessions. Afterwards, your sessions will continue as you and your counselor see fit.

Is there any audio/video recording?
Audio/video recording is a requirement of the Vacc Clinic, and all sessions are routinely recorded. Your counselor reviewed recording polices at the start of your counseling relationship. During your first appointment, you signed a Consent and Contract document that informed you all sessions are recorded and can be used for training and research purposes. Consenting to this study would mean that you give permission for the session during which you wear the HeartMath sensor to be shared with the research team through the secure recording system that the Clinic uses. The research team will make every effort to protect your information, as outlined below. However, because your voice will be potentially identifiable by anyone who hears the recording, your confidentiality for things you say on the recording cannot be guaranteed although the researcher will try to limit access to the recording as described below.

What are the risks to me?
The Institutional Review Board at The University of North Carolina at Greensboro has determined that participation in this study poses minimal risk to participants. You may experience physical discomfort when clipping the HeartMath sensor to your ear, though that is not expected. If that does occur, you are welcome to opt out of participating in the study.

You will be asked about your trauma history and current symptoms on the Client Information Form, and you might experience discomfort disclosing those details. On the form, you will notice that you are encouraged to disclose details only to the extent you feel comfortable. If you experience distress as a result of that form, please let your counselor know before you leave (if possible), by calling them after you leave (if you are not experiencing a crisis), or in your next session. You can ask the front desk staff to give you a list of crisis resources should you need them.

If you experience a crisis after leaving the Clinic and need immediate assistance, please call 911 or Moses Cone Behavioral Health at 336-832-9700. This number is for a 24-hour Helpline staffed with registered nurses and master's level clinicians. The UNCG Counseling Center also offers walk-in crisis appointments (336-334-5874), and you can also call UNCG Police at 336-334-4444.

If you have questions, want more information, or have suggestions, please contact Madeleine Morris Lowman at mgmorri2@uncg.edu or L. DiAnne Borders at borders@uncg.edu.

If you have any concerns about your rights, how you are being treated, concerns or complaints about this project or benefits or risks associated with being in this study, please contact the Office of Research Integrity at UNCG toll-free at (855)-251-2351.

Are there any benefits to society as a result of me taking part in this research?
As mentioned above, the goal of this study is to help create a tool that counselors can use to notice regulation patterns in their clients, with hopes that they can later learn how to work even more effectively with their clients. This research could result in better outcomes for clients who come to counseling, as counselors could learn how to support helpful regulation tendencies in their clients. This research is motivated by the researcher's desire to help clients who are suffering and seeking help from their counselors.

Are there any benefits to *me* for taking part in this research study?
A potential direct benefit to you for taking part in this study is that when the research has been analyzed and if you are still seeing your counselor, your counselor can relay information about your regulation patterns from the HeartMath during the session used for this research. Additionally, if you enjoy using the HeartMath equipment, you can request to use it in future sessions with your counselor. Though you will not use this

feature in the current study, HeartMath is a great tool designed to help people practice deep breathing and relaxation. If you do not experience discomfort with the ear sensor, you are welcome to request to use the equipment in your counseling sessions at any point.

Will I get paid for being in the study? Will it cost me anything?
After you complete your session wearing the HeartMatch sensor and turn in your completed Client Information Form to the front desk staff, you will be paid ***$15 in cash*** for your help with this study! If you decide in your session that the HeartMath sensor is not comfortable and you chose to take it off, you will opt out and not be paid for participating in this study.

How will you keep my information confidential?
Your consent form and Client Information Form will be stored in a file cabinet in the Clinic. At the end of the day the file cabinet is locked, the door of the room with the cabinet is locked, and the Clinic doors are locked. Your recorded session is stored in the Clinic recording system that requires an approved username and password to access, and the system requires that recordings can only be accessed on the Clinic network (so your session cannot be viewed on a computer outside of the Clinic). Your HeartMath data will be stored in a secure, password-protected online system called Box; your HeartMath data will not include any identifying information (e.g., your name).

Only the principal investigator and the faculty advisor will have access to your Client Information Form and your full recorded session. The principle investigator will divide your full tape into multiple 1-minute clips of tape, which will then be randomized and sent to the research team. The research team have to be inside the Clinic in order to access those clips. All information obtained in this study is strictly confidential unless disclosure is required by law.

If you report any suspected or confirmed child or elder abuse or any plan to harm yourself or others to your counselor during your session, your counselor will follow procedures for consulting with an on-call supervisor and make a report as needed, as your counselor outlined with you in your intake session.

Will my de-identified data be used in future studies?

Your de-identified data will be kept indefinitely and may be used for future research without your additional consent.

What if I want to leave the study?
You have the right to refuse to participate or to withdraw at any time, without penalty. If you do withdraw, it will not affect you in any way. If you choose to withdraw, you may request that any of your data which has been collected be destroyed unless it is in a de-identifiable state. The investigators also have the right to stop your participation at any

time. This could be because you have had an unexpected reaction, or have failed to follow instructions, or because the entire study has been stopped.

What about new information/changes in the study?
If significant new information relating to the study becomes available which may relate to your willingness to continue to participate, this information will be provided to you.

Voluntary Consent by Participant:
By signing this consent form (used for an IRB-approved waiver of signature) you are agreeing that you read, or it has been read to you, and you fully understand the contents of this document and are openly willing consent to take part in this study. All of your questions concerning this study have been answered. By signing this form, you are agreeing that you are 18 years of age or older and are agreeing to participate, in this study described to you by your counselor.

Signature: _____ Date: _____

APPENDIX E

COUNSELOR PARTICIPANT INFORMED CONSENT

UNIVERSITY OF NORTH CAROLINA AT GREENSBORO

CONSENT TO ACT AS A HUMAN PARTICIPANT

Project Title: The Development and Validation of the Autonomic Response Screening Tool for Counselors (ARSTC)

Principal Investigator and Faculty Advisor (if applicable): Madeleine Morris Lowman and Dr. L. DiAnne Borders

Participant's Name: _____

What are some general things you should know about research studies?
You are being asked to take part in a research study. Your participation in the study is voluntary. You may choose not to join, or you may withdraw your consent to be in the study, for any reason, without penalty.

Research studies are designed to obtain new knowledge. This new information may help people in the future. There may not be any direct benefit to you for being in the research study. There also may be risks to being in research studies. If you choose not to be in the study or leave the study before it is done, it will not affect your relationship with the researcher or the University of North Carolina at Greensboro.
Details about this study are discussed in this consent form. It is important that you understand this information so that you can make an informed choice about being in this research study.

You will be given a copy of this consent form. If you have any questions about this study at any time, you should ask the researchers named in this consent form. Their contact information is below.

What is the study about?
This is a research project. Your participation is voluntary. The purpose of this study is to develop a screening tool that could help counselors better meet their clients' needs. Autonomic regulation refers to the ways our bodies keep us calm, help us relate to others, and also get us ready to respond to threatening situations. Regulation is something that our bodies are doing always, even in counseling sessions. This research study is about getting more information about how counselors can notice regulation patterns of their clients, in hopes that they can better help their clients with this information.

Why are you asking me?
You are being asked to participate in this study because you are a counselor seeing clients in the Nicholas A. Vacc Clinic during the Fall 2019 semester.

What will you ask me to do if I agree to be in the study?
If you agree to participate in this study, I will ask several things of you, outlined below:

- You will attend an informal information session to review the procedures. The goal of this session will be to help you feel clear about the steps and use of the HeartMath equipment. You will also be able to ask questions and practice with the equipment, as well as prepare for questions your clients may have about the study.
- You will allow the researcher above (Madeleine Morris Lowman) to access 1 recorded session that you have with your client when they wear the HeartMath sensor.
- You will be asked to help your client put on the sensor. After that, you will be asked to "start" the HeartMath session on a clinic iPad.
- You will be asked to complete a Counselor Reflection Form, in which you will provide some basic information about yourself (race, age, etc.) and how you feel the client presented in their session as compared to previous sessions you've had.
- You will be asked to log information about your session (date, time, how it's labeled in the recording system) and the HeartMath session information (duration and date) on a log form.

Outside of these things, your session should take place with your client as it normally would, where your work with your client to reach goals you have set together. If you agree to participate, you will do the bulleted steps above for at least one of your sessions. If you have multiple clients consent to participate, you will complete these steps with each client only once (a client will not participate beyond one session).

Is there any audio/video recording?
Audio/video recording is a requirement of the Vacc Clinic, and as a counselor there, you know all sessions are routinely recorded. Consenting to this study would mean that you give permission for the session during which your client(s) wears the HeartMath sensor be shared with the research team through the secure recording system that the Clinic uses. The research team will make every effort to protect your information, as outlined below. However, because your voice will be potentially identifiable by anyone who hears the recording, your confidentiality for things you say on the recording cannot be guaranteed although the researcher will try to limit access to the recording as described below.

What are the risks to me?
The Institutional Review Board at The University of North Carolina at Greensboro has

determined that participation in this study poses minimal risk to participants.

If you have questions, want more information or have suggestions, please contact Madeleine Morris Lowman at mgmorri2@uncg.edu or L. DiAnne Borders at borders@uncg.edu.

If you have any concerns about your rights, how you are being treated, concerns or complaints about this project or benefits or risks associated with being in this study please contact the Office of Research Integrity at UNCG toll-free at (855)-251-2351.

Are there any benefits to society as a result of me taking part in this research?
As mentioned above, the goal of this study is to help create a tool that counselors can use to notice regulation patterns in their clients, with hopes that they can later learn how to work even more effectively with their clients. This research could result in better outcomes for clients who come to counseling, as counselors could learn how to support helpful regulation patterns in their clients. This research is motivated by the researcher's desire to help clients who are suffering and seeking help from their counselors.

Are there any benefits to *me* for taking part in this research study?
A potential direct benefit to you for taking part in this study is that when the research has been analyzed, if you are still seeing your client, the principle investigator can relay information about your client's regulation patterns. Additionally, if you enjoy using the HeartMath equipment, you can request to use it in future sessions with any of your clients. Though you will not use this feature in the current study, HeartMath is a great tool designed to help people practice deep breathing and relaxation.

Will I get paid for being in the study? Will it cost me anything?
There are no costs to you and no payments will be made to you for participating in this study.

How will you keep my information confidential?
Your consent form and Counselor Reflection Form will be stored in a file cabinet in the Clinic. At the end of the day the file cabinet is locked, the door of the room with the cabinet is locked, and the Clinic doors are locked. Your recorded session is stored in the Clinic recording system that requires an approved username and password to access, and the system requires that recordings can only be accessed on the Clinic network (so your session cannot be viewed on a computer outside of the Clinic).

Only the principle investigator and the faculty advisor will have access to your Counselor Information Form and your full recorded session. The research team will only have access to your tape in 1-minute segments made and randomized by the principle investigator and again, those segments of tape can only be accessed in the Clinic. All information obtained in this study is strictly confidential unless disclosure is required by law.

Will my de-identified data be used in future studies?

Your de-identified data will be kept indefinitely and may be used for future research without your additional consent."

What if I want to leave the study?
You have the right to refuse to participate or to withdraw at any time, without penalty. If you do withdraw, it will not affect you in any way. If you choose to withdraw, you may request that any of your data which has been collected be destroyed unless it is in a de-identifiable state. The investigators also have the right to stop your participation at any time. This could be because you have had an unexpected reaction, or have failed to follow instructions, or because the entire study has been stopped.

What about new information/changes in the study?
If significant new information relating to the study becomes available which may relate to your willingness to continue to participate, this information will be provided to you.

Voluntary Consent by Participant:
By signing this consent form/completing this survey/activity (used for an IRB-approved waiver of signature) you are agreeing that you read, or it has been read to you, and you fully understand the contents of this document and are openly willing consent to take part in this study. All of your questions concerning this study have been answered. By signing this form, you are agreeing that you are 18 years of age or older and are agreeing to participate, in this study described to you by Dr. Borders.

Signature: _____ Date: _____

APPENDIX F

LOG FORM

Please complete this form with the details of your session ***and tag "Madeleine Morris" in this tape through IVS.***

Client initials: _____

Counselor last name: _____

Date: _____

Time of session: _____

Length of Inner Balance session that corresponds with this counseling session: _____

Label you used for this IVS recording: _____

iPad ID number: _____

Affirm - I tagged Madeleine Morris into this session: _____

Thank you again for your time! Please return this form **and** your Counselor Reflection form to the Clinic filing room cabinet. In the top drawer labeled "doctoral students" you will see a folder labeled "Morris" in which you can place your forms. Please return the iPad and HeartMath sensor to the Clinic front desk.

APPENDIX G

INCENTIVE DOCUMENTAION FORM

My signature below indicates that I have received my $15 cash incentive for participation in the research study.

Printed Name	Signature	Date

APPENDIX H

CODER FORM TO LABLE CLIPS ONCE DATA IS PREPARED

Coder name: _____
Client initials: _____
Counselor last name: _____

Instructions: Please complete the information above (coder name, etc.). Next, using the ARSTC Item Description List for clarity, put an X next to the items that occur in each clip. You can use this form to screen multiple clips. To do this, document the Clip ID (which is how the clip is labeled in IVS) at the top of the column. Then, mark all items that occur in the clip. At the end of the clip, count how many X's are in each Autonomic State Category. The category with the highest number of X's will be the label you assign to the clip in the bottom row of the column you have used. Proceed accordingly with subsequent clips.

Autonomic State	Item	Clip ID						
Social Engagement	Evenly paced breaths							
	Eye contact with counselor							
	Prosody of voice							
	Relaxed posture							
	Digestive sounds							
	Laughing							
	Full face smiling							
	Turning head, noticing surroundings (periphery)							
	Nodding							
Sympathetic Arousal/ Fight or Flight	Flushed face							
	Flushed neck							
	Psychomotor agitation in feet (involuntary motion in feet)							
	Rapid breaths							
	Client expressing feeling warm or hot							
	Rigid posture							
	Quick pace of speech							
	Psychomotor agitation in hands (involuntary motion in hands)							
	Facial twitching							

	Client expressing upward movement of sensation or energy							
	Pupil dilation, broadening of eyes							
	Pronounced hand movements							
	Increased volume in voice/angry tone							
	Furrowed brow/constricted facial expressions							
Dorsal Shutdown/ Freeze	Constricted shallow breaths							
	Pronounced decrease in breathing related movement							
	Client expressing feeling cold							
	Collapsed posture							
	Slow pace of speech							
	Absence of color							
	Fixed stare on object or space in room, not on counselor							
	Eyes closed							
	Slumped posture							
	Paused in speech/unfocused speech							
	Low tone of voice							
Clip Label								

APPENDIX I

LOG FORM FOR ARSTC AND HRV DATA

Clip ID	ARSTC Label	HRV Average for Clip	HRV Average for Client from Session

APPENDIX J

INITIAL ARSTC DRAFT

Marker/ Visual Cue	Description
Skin:	
1. Flushed face	Even or splotchy red/pink coloration in cheeks, forehead, nose that is not regularly present in client
2. Flushed neck	Even or splotchy red/pink coloration in neck that is not regularly present in client
3. Absence of color	Paleness in face that is not regularly present in client
Motor:	*not applicable in case of tics or medical conditions/injuries
4. Psychomotor agitation of hands (involuntary motor action in hands)	Frequent movement of hands and/or fingers during disclosure or throughout session. Could look like biting or picking at fingernails, tense/release of hands into fists, holding object, "talking" with hands
5. Psychomotor agitation of feet (involuntary motor action in feet)	Frequent movement of feet and/or legs during disclosure or throughout session. Could look like foot shaking, repeatedly crossing/uncrossing legs, foot kicking
6. Facial twitching (mouth, eyes)	Involuntary and repeated movement of muscles under eyes or near corners of mouth
7. Constricted/shallow breaths	Breath indicated by more clavicular movement than belly movement
8. Evenly paced breaths	Relaxed, even rise and fall of breaths
9. Rapid breaths	Quick, possibly short/shallow breaths
10. Pronounced decrease in breathing related movement	Shift in movements related to breathing such as rise and fall of chest, belly, and clavicular area
Client report:	
11. Client expressing feeling cold	Verbally stated or could be observed if client grabs blanket or coat during disclosure or session, requests change in room temperature

12. Client expressing feeling warm or hot	Verbally stated or could be observed if client removes coat or blanket in session, requests change in room temperature
13. Client expressing upward movement of sensation or energy	Verbally stated
14. Client expressing downward movement of sensation or energy	Verbally stated
Eyes:	
15. Eye contact with counselor	Client's gaze is directed to counselor's eyes and naturally breaks and rejoins over time
16. Pupil constriction	Pupils becoming smaller or narrower
17. Pupil dilation, broadening of eyes	Pupils becoming larger
18. Fixed stare on object or space in room, not counselor	Client's gaze is directed to a particular object or space in the room, rather than being directed to counselor's eyes
19. Eyes closed	Client closes eyes rather than making eye contact with counselor or gazing at object or space in room
Posture:	
20. Relaxed posture	Shoulders back, legs loosely crossed or uncrossed, hands loosely folded or open
21. Rigid posture	Shoulders elevated towards ears, stiffness in arms, legs, hands, neck
22. Collapsed posture	Shoulders curve in, head hanging down, minimal energy in arms, legs, hands, neck
Sound:	
23. Prosody of voice	Rhythmic cadence to voice and full range of intonation
24. Quick pace of speech	Pace of speech increases or remains faster than conversational pace

25. Slow pace of speech	Pace of speech is delayed or remains slower than conversational pace
26. Digestive sounds	Stomach grumbling, burping, or gas

APPENDIX K

EXPERT FEEDBACK REQUEST FOR INITIAL VERSION OF ARSTC

Expert Review of Basic Regulatory States Assessment

Hello!

It's been so great to learn from and with you during our SE training modules. My training in SE has been transformative in my development as a clinician, supervisor, and educator. One thing that is quite clear from our training is that visually tracking the body and nervous system supports an amazing capacity for change and healing that is inherent in all people.

In my work supervising beginning counselors, I've noticed how eager they are to help their clients and be effective in their work. I often realize that some of the SE basic skills, such as visually tracking clients' autonomic states, could really benefit these new counselors and their clients. So, I've been experimenting with creating a basic assessment tool they could use to help them loosely identify the physiological capacity of their clients, and then use that information to make clinical decisions or make an appropriate referral for their clients. While we each have invested a great deal of time into learning the intricacies of intervening directly with the nervous system, my aim here is to simply help beginning counselors recognize the importance of the regulatory states of their clients and respond in ways that are appropriate for their level of training. For example, this awareness could help them choose more appropriate grounding techniques to use in session or other basic responses that beginning counselors often use to build rapport or begin the counseling process.

To illustrate my goal in this work, you might think of this assessment tool as similar to informal suicide assessments. For example, while new counselors do not have extensive training in working with suicidal ideation, they will all encounter it in their work. So, new counselors are taught one of several brief tools, such as SIMPLESTEPS or the SAFE-T, that leads them through a basic assessment of a client's safety. They use this information to seek consultation with their supervisors about how to proceed. I am wondering if a basic regulatory state assessment guide, much like those for suicide assessment, could serve a similar purpose for new counselors: tell them what to observe and how to make decisions about next steps based on their assessment. In other words, even though new counselors will not have extensive training in body-based therapeutic approaches, many of their clients will be impacted by their regulatory states in session in ways that are fairly easily observed. Being able to observe even the most obvious behavioral cues of those states would allow beginning counselors to respond as they do in

suicide assessments – gain important information about their clients, seek consultation, and perhaps make a referral for somatic-based therapy if needed.

So, that's what I'm trying to do for my dissertation research: create (and validate) a basic assessment tool to help new counselors identify several key client behavioral cues ("markers") that can be visually tracked and that could help them generally assess their clients' autonomic regulatory states and determine appropriate action. Of course, the first step is to determine which markers are the most crucial for new counselors to observe. That's why I'm reaching out to ***you***, specifically, as an expert trained in Somatic Experiencing and skilled in visually tracking nervous system regulation with clients. Your knowledge and input are invaluable in this first step toward creating a basic regulatory states assessment tool for new counselors.

Below you will find seven questions and a list of markers or behavioral cues that could be indicative of autonomic regulatory states. I ask that you use that list to answer the prompts. This exercise should take roughly 30 minutes of your time. You can type your answers into this document, then save and return your new file to me by email (mgmorri2@uncg.edu) as an attachment.

I would greatly appreciate receiving your response by **September 30, 2019,** so that I can integrate your input and move toward testing the efficacy of the assessment. Feel free to reach out with any questions about the Expert Review of Basic Regulatory States Assessment.

I'm so grateful for your input and look forward to fine-tuning this assessment tool with your help.

Thank you for your time!

Your fellow learner,

Maddy Morris Lowman

Marker/ Visual Cue	Description
Skin:	
1. Flushed face	Even or splotchy red/pink coloration in cheeks, forehead, nose that is not regularly present in client
2. Flushed neck	Even or splotchy red/pink coloration in neck that is not regularly present in client
3. Absence of color	Paleness in face that is not regularly present in client
Motor:	*not applicable in case of tics or medical conditions/injuries
4. Psychomotor agitation of hands (involuntary motor action in hands)	Frequent movement of hands and/or fingers during disclosure or throughout session. Could look like biting or picking at fingernails, tense/release of hands into fists, holding object, "talking" with hands
5. Psychomotor agitation of feet (involuntary motor action in feet)	Frequent movement of feet and/or legs during disclosure or throughout session. Could look like foot shaking, repeatedly crossing/uncrossing legs, foot kicking
6. Facial twitching (mouth, eyes)	Involuntary and repeated movement of muscles under eyes or near corners of mouth
7. Constricted/shallow breaths	Breath indicated by more clavicular movement than belly movement
8. Evenly paced breaths	Relaxed, even rise and fall of breaths
9. Rapid breaths	Quick, possibly short/shallow breaths
10. Pronounced decrease in breathing related movement	Shift in movements related to breathing such as rise and fall of chest, belly, and clavicular area
Client report:	
11. Client expressing feeling cold	Verbally stated or could be observed if client grabs blanket or coat during disclosure or session, requests change in room temperature

12. Client expressing feeling warm or hot	Verbally stated or could be observed if client removes coat or blanket in session, requests change in room temperature
13. Client expressing upward movement of sensation or energy	Verbally stated
14. Client expressing downward movement of sensation or energy	Verbally stated
Eyes:	
15. Eye contact with counselor	Client's gaze is directed to counselor's eyes and naturally breaks and rejoins over time
16. Pupil constriction	Pupils becoming smaller or narrower
17. Pupil dilation, broadening of eyes	Pupils becoming larger
18. Fixed stare on object or space in room, not counselor	Client's gaze is directed to a particular object or space in the room, rather than being directed to counselor's eyes
19. Eyes closed	Client closes eyes rather than making eye contact with counselor or gazing at object or space in room
Posture:	
20. Relaxed posture	Shoulders back, legs loosely crossed or uncrossed, hands loosely folded or open
21. Rigid posture	Shoulders elevated towards ears, stiffness in arms, legs, hands, neck
22. Collapsed posture	Shoulders curve in, head hanging down, minimal energy in arms, legs, hands, neck
Sound:	
23. Prosody of voice	Rhythmic cadence to voice and full range of intonation

24. Quick pace of speech	Pace of speech increases or remains faster than conversational pace
25. Slow pace of speech	Pace of speech is delayed or remains slower than conversational pace
26. Digestive sounds	Stomach grumbling, burping, or gas

1. Please reflect on the markers listed in the chart above and categorize them as being indicative of *social engagement*, *sympathetic arousal/fight or flight*, or *dorsal shutdown/freeze*. Please type the number of the marker in the appropriate box to indicate which regulatory state you believe each marker represents. (For example, if you think that a 'flushed face' indicates *social engagement*, you will put a "1" under the social engagement column. Alternatively, you could cut/paste the name of the marker into the category chart below if that's more convenient than using the numbers.)

Social Engagement	Sympathetic Arousal/ Fight or flight	Dorsal Shutdown/ Freeze

2. Are the descriptions of the markers accessible or clear enough for beginning practitioners to use?

    a. Do you have suggestions for refining or expanding the descriptions of any of the markers? Feel free to edit the descriptions in the chart if that's easiest for you, just use track changes or a different color font than black so I can see what you've added or edited. You can also type your suggestions here if that's more convenient (just be sure to tell me which marker you are talking about).

3. Is this list complete for each of the categories of regulatory states (of social engagement, sympathetic fight/flight, for dorsal shutdown/freeze)? If there are items you would add for any of the categories of regulatory states, please list and define them below.

Marker/ Visual Cue	Description	Autonomic Regulatory State

4. Please select the top 3 most important/useful markers that you believe are indicative of the autonomic states listed below and briefly describe why you chose those three. Feel free to list any markers you may have added in Question 3.

   Social Engagement State:

   1.
   2.
   3.

Sympathetic State/Fight or Flight:

1.
2.
3.

Dorsal Shutdown State/Freeze:

1.
2.
3.

5. Take a moment to reflect on your responses to Question 4. Would your top 3 most useful/important markers indicative of autonomic regulation differ for *new counselors*? Why or why not?

6. Also regarding your responses to Question 4, are there some really important markers that would be really hard for beginners to readily notice? If so, please explain, and indicate whether you would still include these in a list of markers for a new counselor to do a basic assessment of a client's regulatory state.

7. What other considerations can you think of that might be relevant in creating a basic assessment tool for markers/visual cues of autonomic regulatory states?

APPENDIX L

EMAIL RECRUITMENT FOR EXPERT REVIEWERS

Hello!

I'm reaching out to see if you might be able to help me with part of my dissertation. I'm creating an assessment tool for beginning counselors to visually track some basic cues of autonomic regulatory states, similar to those we have learned through SE training. Once I have the assessment tool created, I'll be testing it against biofeedback measures to see if the visual tracking can be used to gain accurate information on vagal regulation.

Attached you will find a document with several components. You will find a brief overview of my dissertation study, my initial list of visual cues, or "markers," for the assessment tool, and several questions about the clarity and thoroughness of the markers listed. You will notice that I am not requesting any personal details from you or collecting any demographics; the purpose of this step is simply to fine-tune the assessment tool.

Your input is going to be such a great help to me, and I sincerely thank you for considering my work and offering your time and expertise. My hope is that responding to the questions should take you no longer than **35 minutes** or so to complete. To allow me to move forward on my dissertation in a timely manner, I'm asking for the responses to be returned by Friday 9/30/19.

If you have any questions or need clarification, please don't hesitate to reach out to me.

Thank you for your help!

Best,
Maddy Morris Lowman

APPENDIX M

TABLE OF MARKER LABELS ACROSS EXPERT REVIEWERS AND PI

Marker/ Visual Cue	Expert 1	Expert 2	Expert 3	PI
Skin:				
1. Flushed face	Fight/flight	Fight/flight	Fight/flight	Fight/flight
2. Flushed neck	Fight/flight	Fight/flight	Fight/flight	Fight/flight
3. Absence of color	Fight/flight	Freeze	Freeze	Freeze
Motor:				
4. Psychomotor agitation of hands (involuntary motor action in hands)	Fight/flight	Fight/flight		Fight/flight
5. Psychomotor agitation of feet (involuntary motor action in feet)	Fight/flight	Fight/flight	Fight/flight	Fight/flight
6. Facial twitching (mouth, eyes)	Fight/flight	Fight/flight		Fight/flight
7. Constricted/shallow breaths	Freeze	Freeze	Fight/flight Freeze	Freeze
8. Evenly paced breaths	Social eng.	Social eng.	Social eng.	Social eng
9. Rapid breaths	Fight/flight	Fight/flight	Fight/flight Freeze	Fight/flight
10. Pronounced decrease in breathing related movement	Freeze	Freeze	Freeze	Freeze
Client report:				
11. Client expressing feeling cold	Freeze	Freeze	Freeze	Freeze
12. Client expressing feeling warm or hot	Fight/flight	Fight/flight	Fight/flight	Fight/flight

13. Client expressing upward movement of sensation or energy	Fight/flight		Fight/flight	Fight/flight
14. Client expressing downward movement of sensation or energy	Fight/flight		Freeze	Freeze
Eyes:				
15. Eye contact with counselor	Social eng.	Social eng.	Social eng. Fight/flight	Social eng
16. Pupil constriction	Freeze	Social eng.		Freeze
17. Pupil dilation, broadening of eyes	Fight/flight	Fight/flight	Social eng.	Fight/flight
18. Fixed stare on object or space in room, not counselor	Freeze	Freeze		Freeze
19. Eyes closed	Freeze	Freeze		Freeze
Posture:				
20. Relaxed posture	Social eng.	Social eng.		Social eng
21. Rigid posture	Fight/flight	Fight/flight	Fight/flight Freeze	Fight/flight
22. Collapsed posture	Freeze	Freeze	Freeze	Freeze
Sound:				
23. Prosody of voice	Social eng.	Social eng.	Social eng.	Social eng
24. Quick pace of speech	Fight/flight	Fight/flight	Fight/flight	Fight/flight
25. Slow pace of speech	Freeze	Freeze	Social eng. Freeze	Freeze
26. Digestive sounds	Social eng. Fight/flight	Social eng.		Social eng

APPENDIX N

LIST OF MARKERS LABELED THE SAME BY REVIEWERS AND PI

Social Engagement:

- Evenly paced breaths
- Eye contact with counselor
- Prosody of voice

Sympathetic Arousal/ Fight or Flight

- Flushed face
- Flushed neck
- Psychomotor agitation in feet (involuntary motion in feet)
- Rapid breaths
- Client expressing feeling warm or hot
- Rigid posture
- Quick pace of speech

Dorsal Shutdown/ Freeze

- Constricted shallow breaths
- Pronounced decrease in breathing related movement
- Client expressing feeling cold
- Collapsed posture
- Slow pace of speech

APPENDIX O

LIST OF MARKERS LABELED THE SAME BY 2 REVIEWERS AND PI

Social Engagement:

- Relaxed posture
- Digestive sounds

Sympathetic Arousal/ Fight or Flight

- Psychomotor agitation in hands (involuntary motion in hands)
- Facial twitching
- Client expressing upward movement of sensation or energy
- Pupil dilation, broadening of eyes

Dorsal Shutdown/ Freeze

- Absence of color
- Fixed stare on object or space in room, not on counselor
- Eyes closed

APPENDIX P

SUGGESTIONS FOR ADDED ARSTC ITEMS FROM EXPERT REVIEWERS

Reviewer 1:

Marker/ Visual Cue	Description	Autonomic Regulatory State
Smiling		Social Engagement
Furrowed Brow/Constricted Facial Expressions	Flashes of fear, anger, sadness, grief, squelched expressions	Fight/Flight
Slouched/Slumped Posture		Freeze
Low tone of voice	Tone of voice difficult to hear	Freeze
Loud/animated tone of voice		Fight/Flight
Pronounced hand gestures	Fists, pushing away, creating a distraction	Fight/Flight
Ability to have casual conversation, verbalize plans for remainder of day/week	Client able to engage around the here and now	Social Engagement
Laughter/Joking	When appropriate within context of conversation in session	Social Engagement
Excessive blinking		Fight/Flight
Sleepiness/fatigue	Client reported	Freeze
Curious and open		Social engagement
Nodding	As appropriate to thought and content of conversation with client	Social engagement

Emotional expression	Either per client report or via emoting	Social engagement
Extensive pauses in train of thought or speech		Freeze
Thoughtful/reflective		Social Engagement
Holding breath/gasping while talking		Freeze

Reviewer 2: none

Reviewer 3:

Marker/ Visual Cue	Description	Autonomic Regulatory State
Eyes floating, unfixed, staring off into space		May indicate freeze
Reports of feeling floaty or disconnected		Freeze
Hands as stop sign or in fists		Likely to come with a sympathetic fight/flight charge
Smiling (full face smile), banter		Social engagement
Turning head, noticing surroundings (broader periphery)		Social engagement
Increased volume of voice or angry tone		Sympathetic fight/flight
Self report of feeling angry		Sympathetic fight/flight
Speech becomes unfocused, unfinished		Freeze
Cold hands or feet, or cold in another part of the body		Freeze

APPENDIX Q

LIST OF ITEMS ADDED BASED ON REVIEWER SUGGESTIONS

Social Engagement:

- Laughing
- Full face smiling
- Turning head, noticing surroundings (periphery)
- Nodding

Sympathetic Arousal/ Fight or Flight

- Pronounced hand movements
- Increased volume in voice/angry tone
- Furrowed brow/constricted facial expressions

Dorsal Shutdown/ Freeze

- Slumped posture
- Paused in speech/unfocused speech
- Low tone of voice/difficult to hear

APPENDIX R

FINAL LIST OF ITEMS IN EACH CATEGORY

Social Engagement:

- Evenly paced breaths
- Eye contact with counselor
- Prosody of voice
- Relaxed posture
- Digestive sounds
- Laughing
- Full face smiling
- Turning head, noticing surroundings (periphery)
- Nodding

Sympathetic Arousal/ Fight or Flight

- Flushed face
- Flushed neck
- Psychomotor agitation in feet (involuntary motion in feet)
- Rapid breaths
- Client expressing feeling warm or hot
- Rigid posture
- Quick pace of speech
- Psychomotor agitation in hands (involuntary motion in hands)
- Facial twitching
- Client expressing upward movement of sensation or energy
- Pupil dilation, broadening of eyes
- Pronounced hand movements
- Increased volume in voice/angry tone
- Furrowed brow/constricted facial expressions

Dorsal Shutdown/ Freeze

- Constricted shallow breaths
- Pronounced decrease in breathing related movement
- Client expressing feeling cold
- Collapsed posture
- Slow pace of speech
- Absence of color
- Fixed stare on object or space in room, not on counselor
- Eyes closed
- Slumped posture

- Paused in speech/unfocused speech
- Low tone of voice/difficult to hear

APPENDIX S

FINAL VERSION OF ARSTC

The Autonomic Response Screening Tool for Counselors (ARSTC)

Instructions: Using the ARSTC Item Description List, put an X next to the items that occur in each clip. You can use this form to screen multiple clips. To do this, document the Clip ID (which is how the clip is labeled in IVS) at the top of the column. Then, mark all items that occur in the clip. At the end of the clip, count how many X's are in each Autonomic State Category. The category with the highest number of X's will be the label you assign to the clip in the bottom row of the column you have used. Proceed accordingly with subsequent clips.

Autonomic State	Item	Clip ID						
Social Engagement	Evenly paced breaths							
	Eye contact with counselor							
	Prosody of voice							
	Relaxed posture							
	Digestive sounds							
	Laughing							
	Full face smiling							
	Turning head, noticing surroundings (periphery)							
	Nodding							
Sympathetic Arousal/ Fight or Flight	Flushed face							
	Flushed neck							
	Psychomotor agitation in feet (involuntary motion in feet)							
	Rapid breaths							
	Client expressing feeling warm or hot							
	Rigid posture							
	Quick pace of speech							
	Psychomotor agitation in hands (involuntary motion in hands)							
	Facial twitching							
	Client expressing upward movement of sensation or energy							
	Pupil dilation, broadening of eyes							
	Pronounced hand movements							

	Increased volume in voice/angry tone							
	Furrowed brow/constricted facial expressions							
Dorsal Shutdown/ Freeze	Constricted shallow breaths							
	Pronounced decrease in breathing related movement							
	Client expressing feeling cold							
	Collapsed posture							
	Slow pace of speech							
	Absence of color							
	Fixed stare on object or space in room, not on counselor							
	Eyes closed							
	Slumped posture							
	Paused in speech/unfocused speech							
	Low tone of voice							
Clip Label								

APPENDIX T

FINAL ARSTC ITEM DESCRIPTIONS

Autonomic State	Item	Description
Social Engagement	Evenly paced breaths	Relaxed, even rise and fall of breaths
	Eye contact with counselor	Client's gaze is directed to counselor's eyes and naturally breaks and rejoins over time
	Prosody of voice	Rhythmic cadence to voice and full range of intonation
	Relaxed posture	Shoulders back, legs loosely crossed or uncrossed, hands loosely folded or open
	Digestive sounds	Stomach grumbling, burping, or gas
	Laughing	When appropriate within context of conversation in session
	Full face smiling	Could look like teeth showing, eyes engaged, cheeks raised
	Turning head, noticing surroundings (periphery)	Client looking around room, able to notice surroundings
	Nodding	As appropriate to thought and content of conversation with client
Sympathetic Arousal/ Fight or Flight	Flushed face	Even or splotchy red/pink coloration in cheeks, forehead, nose that is not regularly present in client
	Flushed neck	Even or splotchy red/pink coloration in neck that is not regularly present in client
	Psychomotor agitation in feet (involuntary motion in feet)	Frequent movement of feet and/or legs during disclosure or throughout session. Could look like foot shaking, repeatedly

		crossing/uncrossing legs, foot kicking
	Rapid breaths	Quick, possibly short/shallow breaths
	Client expressing feeling warm or hot	Verbally stated or could be observed if client removes coat or blanket in session, requests change in room temperature
	Rigid posture	Shoulders elevated towards ears, stiffness in arms, legs, hands, neck
	Quick pace of speech	Pace of speech increases or remains faster than conversational pace
	Psychomotor agitation in hands (involuntary motion in hands)	Frequent movement of hands and/or fingers during disclosure or throughout session. Could look like biting or picking at fingernails, tense/release of hands into fists, holding object, “talking” with hands
	Facial twitching	Involuntary and repeated movement of muscles under eyes or near corners of mouth
	Client expressing upward movement of sensation or energy	Verbally stated
	Pupil dilation, broadening of eyes	Pupils becoming larger
	Pronounced hand movements	Could look like fists, pushing away, creating a distraction
	Increased volume in voice/angry tone	Notable increase in volume within the observation
	Furrowed brow/constricted facial expressions	Could appear like flashes of fear, anger, sadness, grief, squelched expressions

Dorsal Shutdown/ Freeze	Constricted shallow breaths	Breath indicated by more clavicular movement than belly movement
	Pronounced decrease in breathing related movement	Shift in movements related to breathing such as rise and fall of chest, belly, and clavicular area
	Client expressing feeling cold	Verbally stated or could be observed if client grabs blanket or coat during disclosure or session, requests change in room temperature
	Collapsed posture	Shoulders curve in, head hanging down, minimal energy in arms, legs, hands, neck
	Slow pace of speech	Pace of speech is delayed or remains slower than conversational pace
	Absence of color	Paleness in face that is not regularly present in client
	Fixed stare on object or space in room, not on counselor	Client's gaze is directed to a particular object or space in the room, rather than being directed to counselor's eyes
	Eyes closed	Client closes eyes rather than making eye contact with counselor or gazing at object or space in room
	Slumped posture	Not quite collapsed, client's back remains in seated position but shoulders may slouch, head may hang
	Paused in speech/unfocused speech	Notable breaks in speech, appears as lack of focus or frequent unfinished thoughts or words
	Low tone of voice	Voice difficult to hear

APPENDIX U

SUMMARY OF COUNSELOR PROCEDURES FOR IN-PERSON COUNSELOR RECRUITMENT

Hello! Thank you for your time today. I'm happy to meet with you today to let you know of an exciting opportunity to participate in data collection for my dissertation research. The goal of the study is to create a tool for counselors like you to use to track some of the regulatory patterns that your clients present with in session. What we know from the literature is that regulatory patterns play a large role in emotion regulation, relating to others, and overall wellness. Unfortunately, counselors don't have great resources for looking for signs of regulation to use to later help their clients and "meet them where they are" physiologically. So, that's what I'm hoping to do with the present study.

In short, your first step will be to sign an informed consent form to participate in data collection. After that, your tasks will be to give informed consent forms to clients at end of their sessions and review it with them; if your clients consent, at the start of your next session you will collect their signed Informed Consent (or give them a new one for their signature) and visit front desk to get equipment and paperwork for the session (described below). Next, I will ask several things of you, outlined below:

- You will "tag" me to in the sessions that you have with your clients when they wear the HeartMath sensor.
- You will be asked to help your client put on the sensor. After that, you will be asked to "start" the HeartMath session on a clinic iPad (which I will demonstrate today).
- You will be asked to complete a Counselor Reflection Form, in which you will provide some basic information about you (race, age, etc.) and how you feel the client presented in their session as compared to previous sessions you've had.
- You will be asked to log information about your session (date, time, how it's labeled in the recording system) and the HeartMath session information (duration and date) on a log form.

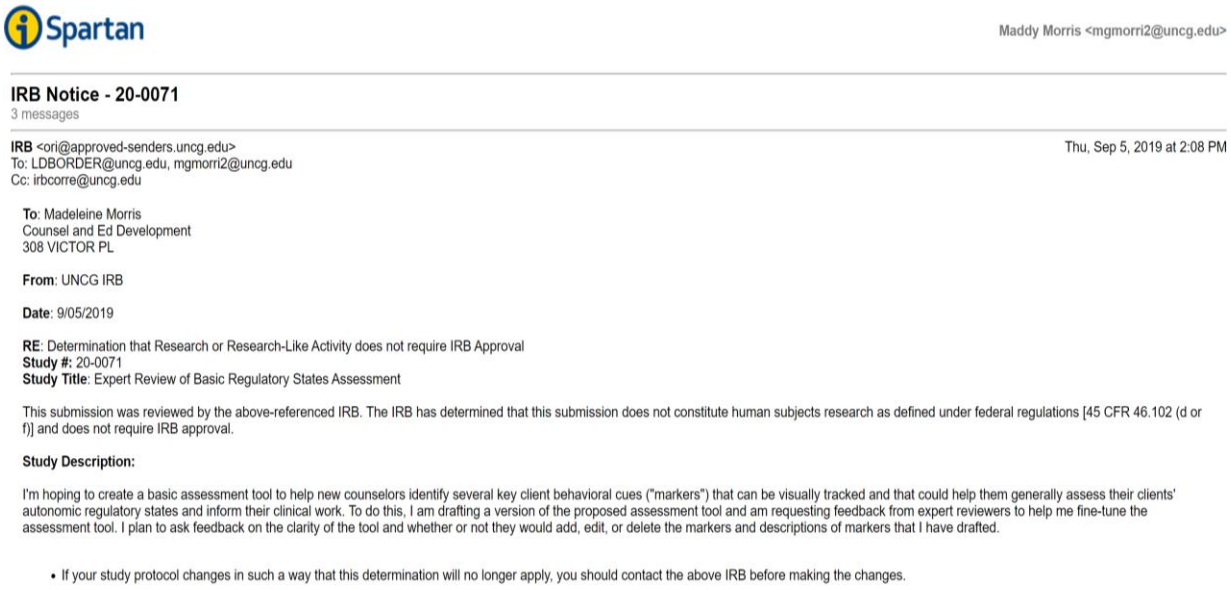
Outside of these things, your counseling sessions should take place with your clients as they normally would, where your work with your clients to reach goals you have set together. If you agree to participate, you will do the bulleted steps above for at least one of your sessions. If you have multiple clients consent to participate, you will complete these steps with each client only once (a client will not participate beyond one session).

I need a minimum of 11 tapes for my data collection, and I will let you know via email when that number has been reached. I plan to collect no more than 15 tapes, and will let

you know when/if I reach that number and data collection has ended. So, some of you may collect several sessions of data (with multiple clients, because each client will "go" once), depending on how many of your clients consent to participate. I really appreciate your consideration in helping me with this project, so truly thank you again for your time. Any questions?

APPENDIX V

IRB EXEMPTION FOR PILOT STUDY



Spartan

Maddy Morris <mgmorri2@uncg.edu>

IRB Notice - 20-0071
3 messages

IRB <ori@approved-senders.uncg.edu> Thu, Sep 5, 2019 at 2:08 PM
To: LDBORDER@uncg.edu, mgmorri2@uncg.edu
Cc: irbcorre@uncg.edu

To: Madeleine Morris
Counsel and Ed Development
308 VICTOR PL

From: UNCG IRB

Date: 9/05/2019

RE: Determination that Research or Research-Like Activity does not require IRB Approval
Study #: 20-0071
Study Title: Expert Review of Basic Regulatory States Assessment

This submission was reviewed by the above-referenced IRB. The IRB has determined that this submission does not constitute human subjects research as defined under federal regulations [45 CFR 46.102 (d or f)] and does not require IRB approval.

Study Description:

I'm hoping to create a basic assessment tool to help new counselors identify several key client behavioral cues ("markers") that can be visually tracked and that could help them generally assess their clients' autonomic regulatory states and inform their clinical work. To do this, I am drafting a version of the proposed assessment tool and am requesting feedback from expert reviewers to help me fine-tune the assessment tool. I plan to ask feedback on the clarity of the tool and whether or not they would add, edit, or delete the markers and descriptions of markers that I have drafted.

- If your study protocol changes in such a way that this determination will no longer apply, you should contact the above IRB before making the changes.

APPENDIX W

IRB APPROVAL OF FULL STUDY

To: Madeleine Morris
Counsel and Ed Development
Counsel and Ed Development

From: UNCG IRB

Authorized signature on behalf of IRB

Approval Date: 11/03/2019
Expiration Date of Approval: 11/02/2020

RE: Notice of IRB Approval by Expedited Review (under 45 CFR 46.110)
Submission Type: Initial
Expedited Category: 4.Noninvasive clinical data,5.Existing or non-research data,6.Voice/image research recordings,7.Surveys/interviews/focus groups
Study #: 20-0124
Study Title: Noticing Trauma Responses: Development and Validation of the Autonomic Response Screening Tool for Counselors (ARSTC)

This submission has been approved by the IRB for the period indicated. It has been determined that the risk involved in this research is no more than minimal.

Study Description:

Because autonomic regulation is tied to which trauma response a client experiences (and exhibits in counseling sessions), it is important for counselors to have a way to screen for it. In the current study, I will identify visual markers indicative of autonomic regulation related to the fight/flight, freeze, and social engagement responses that counselors can readily, and reliably, use during sessions. I will create a screening tool of items indicative of autonomic regulation, explore whether those items categorize into the trauma responses suggested in Polyvagal Theory, and examine if those items reflect physiodata on autonomic regulation.

Investigator's Responsibilities

Signed letters will be scanned to you in a separate email. **Please utilize the the consent form/information sheet with the most recent version date when enrolling participants.** Please be aware that any changes to your protocol must be reviewed by the IRB prior to being implemented.

Please be aware that valid human subjects training and signed statements of confidentiality for all members of research team need to be kept on file with the lead investigator. Please note that you will also need to remain in compliance with the university "Access To and Retention of Research Data" Policy which can be found at http://policy.uncg.edu/university-policies/research_data/.

APPENDIX X

IRB APPROVAL OF FULL STUDY MODIFICATION

From: UNCG IRB

Approval Date: 12/03/2019
Expiration Date of Approval: 11/02/2020

RE: Notice of IRB Approval by Expedited Review (under 45 CFR 46.110)
Submission Type: Modification
Expedited Category: 4.Noninvasive clinical data,5.Existing or non-research data,6.Voice/image research recordings,7.Surveys/interviews/focus groups,Minor Change to Previously Reviewed Research,Minor Change to Previously Approved Research
Study #: 20-0124
Study Title: Noticing Trauma Responses: Development and Validation of the Autonomic Response Screening Tool for Counselors (ARSTC)

This submission has been approved by the above IRB for the period indicated. It has been determined that the risk involved in this modification is no more than minimal.

Submission Description:

- I am requesting to extend my data collection beyond my 15 client participants to collect any who would like to participate for the remainder of the Fall 2019 semester. I received a positive response from counselor participants and they have clients who would like to participate if I am approved to continue collection until the Clinic closes for the semester. Increased client participants will improve my overall data collection and help with the proposed stats that I plan to run. The new total number is 18 participants.

Investigator's Responsibilities

Please utilize the the consent form/information sheet with the most recent version date when enrolling participants. Please be aware that any changes to your protocol must be reviewed by the IRB prior to being implemented.

Please be aware that valid human subjects training and signed statements of confidentiality for all members of research team need to be kept on file with the lead investigator. Please note that you will also need to remain in compliance with the university "Access To and Retention of Research Data" Policy which can be found at http://policy.uncg.edu/university-policies/research_data/.

APPENDIX Y

REVISED CODING FORM

Autonomic State	**Item**	**Clip (write client initials and clip # in top box of the row)**				
Social Engagement	Evenly paced breaths					
	Eye contact with counselor					
	Prosody of voice					
	Relaxed posture					
	Digestive sounds					
	Laughing					
	Full face smiling					
	Turning head, noticing surroundings (periphery)					
	Nodding					
Sympathetic Arousal/ Fight or Flight	Flushed face					
	Flushed neck					
	Psychomotor agitation in feet (involuntary motion in feet)					
	Rapid breaths					
	Client expressing feeling warm or hot					
	Rigid posture					
	Quick pace of speech					
	Psychomotor agitation in hands (involuntary motion in hands)					
	Facial twitching					
	Client expressing upward movement of sensation or energy					
	Pupil dilation, broadening of eyes					
	Pronounced hand movements					
	Increased volume in voice/angry tone					
	Furrowed brow/constricted facial expressions					
	Constricted shallow breaths					
	Pronounced decrease in breathing related movement					
	Client expressing feeling cold					
	Collapsed posture					

Dorsal Shutdown/ Freeze	Slow pace of speech					
	Absence of color					
	Fixed stare on object or space in room, not on counselor					
	Eyes closed					
	Slumped posture					
	Paused in speech/unfocused speech					
	Low tone of voice					
Clip Label						

Clip labels: SE= social engagement

F/F= fight or flight

D= freeze/dorsal shutdown

Coder name: _____

APPENDIX Z

FINAL ARSTC ITEM DESCRIPTIONS - REVISED

Autonomic State	Item	Description
Social Engagement	Evenly paced breaths	(as compared to baseline) Relaxed, even rise and fall of breaths
	Eye contact with counselor	Client's gaze is directed to counselor's eyes and naturally breaks and rejoins over time
	Prosody of voice	Rhythmic cadence to voice and full range of intonation for majority of clip
	Relaxed posture	Shoulders back, legs loosely crossed or uncrossed, hands loosely folded or open
	Digestive sounds	Stomach grumbling, burping, or gas
	Laughing	When appropriate within context of conversation in session; eye contact present at some point during laughter; connecting laugh
	Full face smiling	Could look like teeth showing, eyes engaged, cheeks raised (full face smile meant to connect/seems spontaneous as opposed to nervous laughter)
	Turning head **and** noticing surroundings (periphery)	Client looking around room, able to notice surroundings (orienting)
	Nodding (affirming nod, nod in affirmation)	As appropriate to thought and content of conversation with client
	Flushed face	Even or splotchy red/pink coloration in cheeks, forehead, nose that is not regularly present in client

Sympathetic Arousal/ Fight or Flight	Flushed neck	Even or splotchy red/pink coloration in neck that is not regularly present in client
	Psychomotor agitation in feet (involuntary motion in feet)	Frequent movement of feet and/or legs during disclosure or throughout session. Could look like foot shaking, repeatedly crossing/uncrossing legs, foot kicking
	Rapid breaths	Quick, possibly short/shallow breaths
	Client expressing feeling warm or hot	Verbally stated or could be observed if client removes coat or blanket in session, requests change in room temperature
	Rigid posture	Shoulders elevated towards ears, or stiffness in arms, legs, hands, neck
	Quick pace of speech	Pace of speech increases or remains faster than conversational pace
	Psychomotor agitation in hands (involuntary motion in hands)	Frequent movement of hands and/or fingers during disclosure or throughout session. Could look like biting or picking at fingernails, tense/release of hands into fists, holding object, "talking" with hands (fine motor)
	Facial twitching	Involuntary and repeated movement of muscles under eyes or near corners of mouth
	Client expressing upward movement of sensation or energy	Verbally stated
	Pupil dilation, broadening of eyes	Pupils becoming larger (or widening of eyes)
	Pronounced hand movements	Could look like fists, or pushing away, or creating a distraction (gross motor/larger movements; typically includes involvement of elbows; not self-soothing movements like

		rubbing ones arm or leg, more of movements like those described above where hands do not remain in contact with ones body)
	Increased volume in voice/angry tone	Notable increase in volume within the observation (or more expressive/animated that previous tone)
	Furrowed brow/constricted facial expressions	Could appear like flashes of fear, anger, sadness, grief, or squelched expressions
Dorsal Shutdown/ Freeze	Constricted shallow breaths	Breath indicated by more clavicular movement than belly movement (could be indicated by bracing motion, perhaps followed by pronounced exhale)
	Pronounced decrease in breathing related movement	Shift in movements related to breathing such as rise and fall of chest, belly, and clavicular area
	Client expressing feeling cold	Verbally stated or could be observed if client grabs blanket or coat during disclosure or session, requests change in room temperature
	Collapsed posture	Shoulders curve in, or head hanging down, or minimal energy in arms, legs, hands, neck
	Slow pace of speech	Pace of speech is delayed or remains slower than conversational pace
	Absence of color	Paleness in face that is not regularly present in client
	Fixed stare on object or space in room, not on counselor	Client's gaze is directed to a particular object or space in the room, rather than being directed to counselor's eyes (greater than 3 seconds)
	Eyes closed	Client closes eyes rather than making eye contact with

		counselor or gazing at object or space in room
	Slumped posture	Not quite collapsed, client's back remains in seated position but shoulders may slouch, **head may hang** (could also look like bracing posture, or a slump with some stiffness/rigidity in the body)
	Paused in speech/unfocused speech	Notable breaks in speech, could appear as lack of focus or frequent unfinished thoughts or words; or could appear as frequent stops and starts in speech (independent of counselor dialogue)
	~~Low~~ Flat tone of voice	Voice could be difficult to hear; or could sound soft or deep/low; absence of inflection/monotone for most of clip