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An Interview with Dr. Stephen W. Porges

Christina Devereaux[1]

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Abstract During the 51st American Dance Therapy Association conference, Dr. Stephen W. Porges, Distinguished University Scientist at the Kinsey Institute at Indiana University Bloomington and Research Professor in the Department of Psychiatry at the University of North Carolina at Chapel Hill, gave the keynote address, *Connectedness as a Biological Imperative: Understanding the Consequences of Trauma, Abuse, and Chronic Stress through the Lens of the Polyvagal Theory*. Post-conference, Dr. Porges spoke with this author in an audio-recorded interview, summarized portions of his address, and described the supporting neural mechanisms involved in optimizing mental and physical health. This unique interdisciplinary collaboration aids the profession of dance/movement therapy in understanding the principles for establishing safety and stabilization of the Autonomic Nervous System and, in particular, reciprocal movements with social engagement behaviors—a core mechanism in dance/movement therapy. This article is an edited transcription of the original audio.

Keywords Dance · Dance/movement therapy · Polyvagal theory · Social engagement · Stephen W. Porges

An Interview with Dr. Stephen W. Porges

Interviewee: Stephen W. Porges, PhD, Distinguished University Scientist at the Kinsey Institute at Indiana University Bloomington and Research Professor in the Department of Psychiatry at the University of North Carolina at Chapel Hill. He is

✉ Christina Devereaux
cdevereaux1@antioch.edu

[1] Dance/Movement Therapy and Counseling Program, Department of Applied Psychology, Antioch University New England, 40 Avon St., Keene, NH 03431, USA

Emeritus Professor of Psychiatry at the University of Illinois at Chicago and Emeritus Professor of Human Development at the University of Maryland, College Park.

Interviewer: Christina Devereaux, PhD, LCAT, LMHC, BC-DMT, NCC, Associate Professor in the Department of Applied Psychology at Antioch University New England and Adjunct Associate Professor in the Department of Creative Arts Therapy at Pratt Institute. She is international faculty member for Dance Therapy New Zealand, and on the senior faculty for Inspirees Institute for Creative Arts Therapy in China.

CD: To start, the Polyvagal theory emphasizes that "connectedness is a biological imperative" for all humans and that we are wired to connect to others and also to protect the self. Could you begin with a brief overview introducing what the Polyvagal theory says about the neural circuits that support social engagement behaviors and defensive strategies?

SP: To understand the Polyvagal theory you need a brief summary of the changes in the autonomic nervous system (ANS) that occurred during the evolution of vertebrates–the animals with backbones. The ANS includes the neural circuits that regulate the organs within our body. The neural regulation of our heart is a primary function of the ANS, since survival is dependent on the maintenance and distribution of oxygenated blood throughout the body. Through the process of evolution the neural regulation of autonomic state was modified to enable social behavior to occur. To be social a vertebrate had to turn off defenses. This process of inhibiting defenses included both a down regulation of the autonomic state that supported aggressive behaviors and the emergence of spontaneous social behavior. This process illustrated two important features of the evolutionary transition from the ancient extinct reptiles to the early mammals. Mammals are social and need to interact with other conspecifics to reproduce and to nurture their young. In order to be social, mammals had to turn off their defense systems. Thus, we need to appreciate that the ANS that mammals inherited was a protective system. The ancient ANS system supported two behavioral defensive strategies: one, which was manifested as fight/flight or mobilization behaviors and, second, a phylogenetically old strategy, which was manifested as shutting down, or immobilization behaviors. Mammals were dependent on each other and early in life couldn't survive as solitary creatures. To be social and to engage conspecifics, they had to turn down their defensive systems. This tuning down of the defensive system was linked in mammals to a myelinated vagal pathway that was integrated with the nerves that regulated the muscles of the face and the head. This integration of face and heart became the core of what I labeled as the "social engagement system." The social engagement system enables engagement with others through facial expressivity, intonation of the voice, and head gesture. The neural mechanisms mediating these engagement behaviors are regulated in an area of the brainstem that also regulates the heart. The social engagement system is bidirectional. On one level we express our physiological state in our face and our voice, and on the other level the facial and vocal cues that we detect in others enables us to calm our physiological state.

CD: This is a great segue into the concept of *neuroception*. Can you talk about this further?

SP: Where does the intelligence come from that enables our nervous system to detect cues of safety, danger, or life threat? We can conceptualize this intelligence as a neural process involving higher brain structures that is not dependent on awareness or a conscious cognitive process. I needed a word to describe this process. Initially I wanted to use "perception" as the process involved in detecting risk in the environment. However, I realized that perception would be linked to conscious awareness. If I used the term perception of risk, it would imply a conscious evaluation of whether features in the environment were actually dangerous or innocuous. This internal evaluation would be difficult and slow to resolve and any delay in resolving the validity of risk may place the individual at risk. In contrast, we note that our responses to risk are often immediate and virtually reflexive. To be functionally adaptive this process evolved outside the realm of conscious awareness. Because neuroception can either turn on or turn off ancient evolutionary primitive defense systems, it needed to be dependent upon higher brain structures that were not constrained by conscious awareness. I needed a new word to describe the process, which emphasized that the nervous system was implementing the process of risk evaluation, but implementing the process independent of perception or any other process dependent on awareness. Thus, I coined the word *neuroception*.

Theoretically neuroception is dependent on neural circuits located in and near the temporal cortex. This area of our brain has the capacity to detect the intentionality of biological movement including body movements, gestures, facial expressions, and vocalizations. When we discuss dance/movement therapy, we focus on the physics and physiology of the movement. We also emphasize the intentionality of movement. Our nervous system, through neuroception, focuses on interpreting the intentionality of the movement. When neuroception interprets the movement as being safe, then the higher brain structures inhibit and down regulate our defensiveness. But, if neuroception interprets the movement as being unsafe, we immediately become defensive. Neuroception is like a high-level reflex that is unconscious and able to down regulate defenses reflexively.

CD: The Polyvagal theory discusses that individuals might struggle to successfully engage in voluntary social behaviors such as those with autism or those that experienced trauma may have "faulty neuroception"? Could you describe this concept further?

SP: Faulty neuroception detects risk when there is no risk. For the clients with faulty neuroception, their nervous systems may have been retuned to lower their threshold for detecting risk. If this occurs they detect risk when there is no risk and virtually all movements towards them may be interpreted, via neuroception, as dangerous. Faulty neuroception is associated with the client's history. For example, if a client experienced a traumatic event and was injured, the probability of the nervous system detecting movements towards them as dangerous is high. The

nervous system has been retuned with a bias towards detecting cues of danger and not detecting cues of safety,

This shift in bias towards detecting risk, influences how neutral and often positive cues are interpreted. Frequently neutral cues and even positive cues may be interpreted via 'faulty' neuroception as if they were dangerous or hurtful.

CD: You suggested that clients with difficulties with social engagement might manifest somatic disorders—specifically that this is a response to atypical neuroregulation becoming manifested in organs below the diaphragm. Could you talk more about this from the perspective of the Polyvagal theory?

SP: Moving into autonomic states that support defensive behavioral strategies, it's not a free option. We pay a price in shifting neurophysiological state to support defense by interfering with our normal homeostatic processes. We interfere with the ability of autonomic nervous system to support health, growth, and restoration. When we are in a state of chronic defensiveness our muscles are tense, our bodies are defensive and reactive, our voices are higher pitched and lack prosody, and our faces lack affect. Underlying these behavioral manifestations, our physiological state has changed reflecting the dampened positive influences of the neural circuits that enable our body to heal, grow, and restore. These negative effects are due to the retraction of the evolutionarily newer mammalian vagal circuit.

Unfortunately, we live in a world in which environmental demands frequently require behaviors dependent upon a physiological state dominated by an activated sympathetic nervous system. For some people, sympathetic activation is not effective in regulating feelings of safety and they respond by shutting down through an older neural pathway traveling through the vagus. Immobilizing, defecation, and fainting may accompany the behavioral shut down. The older vagal circuit is shared with the evolutionary ancestors of mammals and manifested in most vertebrate species. This older circuit, when not recruited in defense is critical for supporting digestion and other functions of the organs located below our diaphragm. It's important not to recruit this vagal circuit for defense. However, if the 'old' vagal circuit is recruited for defense, especially if chronically recruited, disorders, such as irritable bowel and fibromyalgia may be manifested.

When the old vagal circuit is recruited in defense, it may interfere with the enteric nervous system's function. In a way the vagus is like the gut's guard or sentry. When there is no threat, it tells the gut to do its job. If there is danger, it triggers that gut to stop functioning (i.e., constipation). If there is life threat, it triggers the gut to evacuate its content (i.e., diarrhea). The gut also sends signals back to the brain through the sensory pathways embedded in the vagus. The sensory signals confirm that the gut is being challenged.

If your clients have trauma histories, they may talk about a trauma gut—a situation in which they their gut reacts to virtually everything they eat. Under these conditions, they might have to eat very bland foods. Behaviorally these same clients may also be "emotionally labile" and appear very temperamental. The emotions and the gut are parts of the same system, with the gut telling the brain it is having

problems and the brain concurring to the gut and the entire body that the individual is not in a good place.

Polyvagal theory provides a map to get out of this cycle. Polyvagal theory emphasizes the hierarchical nature of how our ANS reacts to challenges and focuses on how signals of safety through the social engagement system can retune the ANS from a state that supports defensive reactions into physiological states that support health, growth, and restoration.

When cues of safety are detected, the newest circuit of the ANS (i.e., the myelinated mammalian vagus) buffers the evolutionarily older circuits and keeps them out of states of defense. The Polyvagal theory respects the role that sympathetic nervous system and the older unmyelinated vagus have in maintaining physiological health, but proposes that those circuits optimally function, only during states of safety. If the sympathetic nervous system or the unmyelinated vagal pathway is recruited for defense all bets regarding a positive mental and physiological health outcome are off.

CD: You suggest that interventions that improve the neural regulation of the social engagement system hypothetically should enhance spontaneous social behavior and state and affect regulation. Staying in a state supporting social engagement with the client through attuned movement interactions is a focus in dance/movement therapy. You have referred to this as a "neural exercise." Could you talk more about what you mean by this and why this might be important??

SP: Movement and especially reciprocal movements with a partner are critical for dance/movement therapy. But it is not just movement. It is movement *with* social engagement. Dance/movement therapy integrates the power of the social engagement system with movement. In doing this it keeps the sympathetic nervous system contained, restricting it from going into defense. Movement coupled with social engagement is a feature of children's games, such as "Simon says" and "peek-a-boo." Within the context of play, immobilization without fear requires that the cues of immobilizing are associated with contextual feelings that do not trigger defense. For immobilization to occur without fear it needs not to be associated with restraint. For mobilization to occur without fear, it needs not to be with fight or flight behaviors. To enable mobilization and immobilization to occur without fear, these behavioral states need to be modulated or functionally contained by features of the social engagement system such as facial expressions, prosodic voices, and positive hand and head gestures.

What is dance? What is play? Both are "neural exercises" that shift affective states within a safe context. Once the context changes from cues of safety, there is a shift in physiological state. This may occur if the therapist moves too close to the client or if the client feels evaluated or threatened. In the therapeutic setting the therapist is also sending subtle cues to the client. For example, if your mind wonders, a client may feel threatened, because your face went flat and the client wasn't getting the reassuring cues. Your reaction to the client, who yells at you, will change as well. Your face would become sterner and more critical, and you might

want to know why the client was being hurtful or angry. Hypothetically, as we watch a therapist-client dyad interacting, we can imagine parallels in how children play, spouses interact, and colleagues work. These interactions function as a dynamic 'dance,' illustrating the reciprocal impact of cues outside our consciousness, although implicitly understood by our body.

CD: Dance/movement therapist might use music as a co-facilitator to some degree to support the tone of the session. Based on your work with the *Listening Project* and also what the Polyvagal theory discusses about prosodic vocalizations through music, what suggestions might you make for dance/movement therapists in using music as an intentional tool to support social engagement and states of safety?

SP: Several features of music influence physiological state. These features include rhythm and the frequencies defining the acoustic stimulation that constitute music. The Polyvagal theory focuses on the modulation of frequencies that define the intonations associated with both vocal music and the acoustic features of vocalizations that convey information about content and intent. Based on the Polyvagal theory, I developed an acoustic intervention that functionally amplifies the features of intonation that convey positive engaging cues of safety. This intervention initially known as the *Listening Project Protocol* was recently launched commercially through Integrated Listening Systems (iLs) as the *Safe and Sound Protocol*. This was an important event for me, since it has taken more than 30 years to translate the ideas embedded in the intervention into an accessible product.

Therapists intuitively understand that a prosodic voice can support their clients and enable their clients to relax. They know when this strategy works, when the client orients towards the therapist and begins to make spontaneous eye contact.

The intervention leverages knowledge of our evolutionary history in understanding our biobehavioral responses to vocalizations. Our nervous system evolved to startle and become vigilant in response to the low frequency bass sounds associated with an aggressive male's vocalizations. In contrast, our nervous system evolved to be comforted and to feel calm in response to melodic female voices. An infant's unlearned and spontaneous response to a mother's lullaby provides an example of this heritage. I suspect that many dance/movement therapists intuitively use prosodic voices with their clients and use melodic music in their therapy sessions.

These positive calming effects of music function through a passive pathway and trigger a neuroception of safety. The passive pathway triggers the nervous system without any active demand on the client. This is contrasted by an active pathway, in which the client is involved in an activity in which reciprocal behaviors are required, such as dancing with a partner. The initial task in therapy is to make the client feel safe. Feeling safe shifts the ANS to a state that supports spontaneous social engagement behaviors. Once the client starts spontaneously engaging, then therapists can engage the client through the active pathway. In the active pathway the therapist involves the client in movement exercises such as dance involving reciprocal movements that are rhythmically organized.

Drum circles are powerful not because of the acoustic frequencies generated while drumming, but because the participants emit spontaneous interactive social engagement behaviors through gaze and facial expressivity. Even if you do not know the other people in the drum circle, by the time the drumming session ends, the participants feel connected and familiar. These feelings are due to the spontaneous shifts in physiological state that dynamically occur due to the combined effects of the physical demands of drumming and the neurophysiological impact of social engagement behaviors on our ANS. Drum circles share two features common to several forms of movement therapy: reciprocity and synchronicity. These features form the constraints that create intersubjective moments in which client has an opportunity to share a subjective state with another.

CD: What advice might you have to the profession of dance/movement therapy in developing evidence-based research?

SP: Therapists are intuitive. By delivering interventions, they provide important opportunities for clients to experience moments of safety and to re-discover personal resources that support resilience. Therapists frequently have outstanding outcomes, while facilitating neural regulation of their client's ANS. Dance/movement therapists play an important role in the management of several disorders, but, in general, these therapists are not researchers. Conducting research to evaluate and to understand the mechanisms underlying clinical treatments is difficult and the treatment models applied by dance/movement therapists may not easily conform to the tight experimental designs used in clinical trials to document the effects of pharmaceuticals. While clinicians tailor their treatment model to the dynamically changing features of their clients, researchers attempt to determine cause and effect relationships by applying experimental designs that exert a systematic control of treatment parameters. In addition, research and therapists often ask different questions. Therapists want to know if their treatments work, while researchers are far more interested in the mechanisms and processes through which therapy may work.

This difference in perspective makes it difficult to apply research techniques to document efficacy. I would suggest two steps in developing a research program for dance/movement therapy. As an initial step, I would develop a theory statement that would propose a plausible explanation of the mechanisms through which dance/movement therapy works. I think Polyvagal theory would be useful in for developing explanations and mechanisms. Once a theoretical model is developed, plausible hypotheses can be tested. As an example, let's propose that dance/movement therapists want to test the efficacy of their therapies. From my perspective the test of efficacy cannot be evaluated in a tightly controlled study, because the treatment clients will vary, some will need more sessions than others and the content of the sessions will also vary both across sessions and among clients.

Researchers could take a pragmatic approach and focus on pre-post changes. For example, research might evaluate whether the underlying principles embedded in dance/movement therapy have specific neurophysiological effects. Polyvagal theory provides a structure to develop these types of hypotheses. Specifically, research

could ask whether there are changes in the features and function of the social engagement system following dance/movement therapy. I assume that dance/movement therapy includes methodologies that efficiently elicit and exercise the neurophysiological circuits involved in the social engagement system.

The evaluation of any intervention requires an agreement on the measures used to assess outcome. There are two strategies here that reflect the different biases of researchers and therapists. The first focuses on mechanisms. This is the path my research has been on for decades. This a path in which treatments are deconstructed in mechanisms, which may be neurophysiological, behavioral, or psychological. The second focuses on clinical outcome and requires a consensus among dance/movement therapists to identify the features of their clients that improve due to their therapies. This step will be necessary before a research program could be established. Once there is documentation of specific improvements, then research evaluating mechanisms could be initiated.

CD: How do you see your work with the Polyvagal theory influencing psychotherapy, mental health, or clinical practice?

SP: This is occurring on several levels. First, Polyvagal theory is influencing clients by providing them with a plausible explanation of their experiences. The theory has helped clients understand the adaptive biobehavioral responses of shutting down in response to life threat. It provides a better understanding that their inability to mobilize and fight off a perpetrator is not equivalent to being complicit. This understanding of an involuntary immobilization reaction is having a major impact on the survivors of trauma. The theory provides a new understanding of why a person might not aggressively protect themselves. This knowledge provides an opportunity for a top down healing process in which the personal narrative acknowledges the wisdom and heroic actions of the body. This change in self-understanding has positive effects.

Second, clinicians now have a better understanding of the adaptive biobehavioral reactions experienced by their clients and have hints of how to provide their clients with supportive cues of safety. We all require cues of safety to enable our nervous system to support our mental and physical health.

The third influence focuses on a better understanding that the mechanisms involved in optimal social behavior are disrupted by trauma. As I observed various clinical disorders I ask myself, "How can I trigger reversals? How can optimize the mental and physical health of the individual? My research with the *Listening project* highlights one of those "ah-ha" moments, when I asked myself, "can I tell the body unambiguously that it is in the place of safety?" At that moment many features of our evolutionary heritage started to make sense. I started to understand the power of a mother's voice, gesture, and cues in calming the tantrums of the baby. I also understood how the lower pitch and less prosodic voice of a father could be disruptive to the child. As I deconstructed how cues of safety calmed and cues of danger disrupted, I could visualize an active dynamic "biobehavioral dance" between individuals as they try to co-regulate each other.

CD: Do you have anything more that you would like to add for our dance/movement therapy readers?

SP: I think the important point for dance/movement therapists is to understand the power of their treatment models and their intuition in manipulating cues of safety to manage the behavioral state of their clients during treatment. By implementing reciprocal movements with social engagement behaviors, dance/movement therapists support the neural mechanisms involved in optimizing mental and physical health. Please keep doing your good work!

Compliance with Ethical Standards

Conflict of interest This author declares that she is the co-editor of the *American Journal of Dance Therapy* and conducted this interview as a supplement to the conference material published in this issue.

Christina Devereaux
Ph.D., LCAT, LMHC, BC-DMT, NCC is an Associate Professor in the Dance/Movement Therapy and Counseling program at Antioch University New England and an Adjunct Associate Professor at Pratt Institute. She serves on the senior faculty at Inspirees, a training program for DMT in China, and an international faculty member for Dance Therapy New Zealand. She is co-editor of the *American Journal of Dance Therapy* and 2008 President's Award recipient from the American Dance Therapy Association (ADTA). She was featured on CCTV, the largest television station in China, and as a presenter for the 2014 ADTA Talks series focusing on DMT and autism. In addition to authoring many chapters and journal publications, she has a blog with *Psychology Today* "Meaning in motion: Dancing with the mind in mind."