Australian Childhood Foundation
Protecting Children

SMART
Strategies for Managing Abuse Related Trauma

Discussion Paper 18

Polyvagal Theory and its implications for Traumatised Students

Introduction

The Polyvagal Theory is the product of decades of research by Dr Stephen Porges and his team at the Brain-Body Center in the University of Illinois, Chicago. Adopted by clinicians around the world, the Polyvagal Theory has provided exciting new insights into the way our autonomic nervous system unconsciously mediates social engagement, trust, and intimacy, and how these may be influenced by our interactions with others.

This paper will seek to summarise the theory and promote discussion around how this revolutionary perspective might alter, affirm or contradict current treatment, educational and therapeutic responses to children and young people who have experienced trauma.

A Brief overview of Polyvagal Perspective

It was whilst studying the evolution of the nervous system that Porges first made an important discovery concerning the vagus nerve which alters the way we understand autonomic nervous system functions. Before this time it was widely understood that our autonomic nervous system operated in a balanced sympathetic/parasympathetic manner, but Porges research changed this through two discoveries; firstly that the vagus nerve in mammals has not one but two branches, and secondly that the newest branch is able to inhibit other nervous system activity. It is these discoveries that gave his theory its name; the term “polyvagal” combines “poly,” meaning “many,” and “vagal,” referring to the “vagus nerve”.

Porges research showed that in the process of evolution, animals first developed immobilised defense responses (innervated by the vagus/parasympathetic system) –where they would adaptively collapse, shut down or feign death when faced with threats. Over time, the nervous

system evolved to enable mobilised responses to threat through the activation of a sympathetic nervous system. This mobilised circuitry was able to speed up the heart and lungs, and act on the same visceral organs as the parasympathetic system, in order to promote adaptive fight, flight and active freeze responses to threat. The third stage of evoluntionary development saw the addition of a newer branch of the vagus nerve which is also able to slow the heart and lungs and which links the innervation of these two with the use of facial nerves involved in social engagement. For this reason, Porges theory proposes that this newer Vagal 'brake' evolved in order to make social engagement possible. Without this branch, our hearts would race at around 110 beats per minute. This enables mobilised responses to threat with ease but makes natural conversation very difficult.

The theory proposes that the two branches of the vagus are related to different behavioural strategies, and work in concert with the sympathetic nervous system.

Hierarchy	Vagus Branch	ANS Involvement	Involved in	Looks like
1	Newer (Ventral Vagal brake on)	Social Engagement	regulating physiological state during social interactions	Variable vocalization pitch, ability perceive human voice, changing facial expressivity, eye contact, head turning, tears and eyelid movement
2	Older (Ventral vagal brake off)	Mobilised – Sympathetic Mediated	regulating adaptive mobilised responses to life threat fight/flight/active freeze	Hyper-vigilant, action-orientated, impulsive, emotionally flooded, reactive, defensive, self-destructive, increased heart rate and sweat, inhibited gastrointestinal function, limited blood flow to extremities, striated musculature, frozen body
3	Older (Dorsal vagal Surge)	Immobilised – Parasympathetic Mediated	regulating adaptive immobilised responses to life threat dissociative/ collapse/shut down	Collapsed body posture, loose musculature, weak, defeated, flat affect, numb, empty, helpless, hopeless, difficulty engaging with eye contact or in a calm social manner

One branch – the newer ventral one – is involved in regulating the heart and lungs during social interactions in safe environments (our most evolved system) and the other branch- the older dorsal one – is involved in regulating adaptive physiological states in responses to life threat including mobilised and immobilised responses. Activation of the newer vagus simultaneously

calms the viscera and regulates facial muscles, enabling and promoting positive social interactions in safe contexts.

This system is an open system, altered by our interactions with others. Transitions between stages in the hierarchical system as we manage and adapt to our environment are described by Porges as neural exercises. The ability to easily transition between stages is important both when we are safe (facilitating play and sexual intimacy) as well as unsafe (enabling adaptive defensive states) and is normatively learnt in the early years of life through our experiences with our primary caregiver.

As shown below, humans are biologically driven to respond to distress first by social engagement. If we are unsuccessful (our parent, care giver, partner or friend is unresponsive or uninterested) our newer vagus shuts off and mobilisation takes over. If our attempts to defend ourselves through mobilised fight, flight or active freeze responses are also unsuccessful (we are not quick enough, loud enough, strong enough to protect ourselves or engage protection) we drop down the hierarchy again and our dorsal vagus initiates immobilised defence responses, shutting us down and diverting energy to preservation of life on the inside, whilst potentially even feigning death on the outside.

The biology behind this model helps us to understand that the use of these responses in children is in fact hierarchical, dependant on the success of more evolved responses. The immobilised (hypoarousal) set of responses can be adaptive, but are less evolved and potentially more dangerous than the mobilised (hyper arousal) responses.

Children can develop a kind of 'hard-wired' autonomic nervous system response to trauma and its triggers due to the ongoing need to utilise the circuitry to promote adaptive defence strategies. Over time they decrease their capacity to access their social engagement system (since this has not been used successfully in great amounts), and as more and more of the world is perceived as unsafe, they come to rely on their defensive states to negotiate their environments, making social engagement very difficult.

Porges research has revealed that how our nervous system interacts with our environment depends on not just the absence of threat, but the absence of nervous system perceived threat. He has developed the term 'neuroception' to describe our perception of safety not just consciously but also – and often exclusively - at a below cognitive level (Porges 1998, 2001, 2003). It is this neuroception of safety that promotes the ability to utilise our newer system and circuits, whilst conversely, the lack of safety promotes a return to using older circuits to mobilise or immobilise in the face of neuroceived danger.

When our nervous system detects safety our system adjusts and makes it possible to enjoy closeness without fear, and keeps us from entering defensive physiological states of mobilised hyper arousal and immobilised hypo arousal, whilst still enable the use of these circuits in safe ways.

Implications

The Polyvagal model assumes that for many children with social communication deficits, including those diagnosed with autism, the social engagement system is intact. Yet these children struggle to successfully engage in voluntary social behaviours and engage the newer circuitry due to their nervous systems neuroceiving threats in their environment. Over time these children have lost muscle tone in the face and head also – especially in the middle ears and from the middle of the face upwards around the eyes.

To improve spontaneous social behaviour, researchers at the University of Illinois in Chicago working alongside of Porges have reasoned an intervention must stimulate the neural circuits that regulate the muscles of the face and head. Polyvagal Theory predicts that "once the cortical regulation of the brain-stem structures involved in the social engagement are activated, social behaviour and communication will spontaneously occur as the natural emergent properties of this biological system" (Porges, 2004). They have successfully piloted a 'listening project' showing successful outcomes of this hypothesis, giving us a basis from which we now know that neuroception of safety is essential for social engagement, and that neuroception can be altered given the right environments and understanding of nervous system function.

It is worth noting that for some individuals – in particular those on the autism spectrum or with complex developmental trauma histories, Porges highlights that social engagement itself is

perceived as threatening, and in these cases, clients have an extremely limited capacity to access this circuitry. In these cases, face to face engagement or eye contact will not be appropriate means of initial work since these will trigger stress responses in the child. The circuitry can however be re-accessed by utilising other facial nerves (such as the inner ear muscles and vocal prosody), Music Therapy, as well as Body Therapies promoting breathing and movement.

By establishing safety and stabilisation of the ANS responses, we increase the capacity for meaningful relational engagement – thus paving the way for more traditional forms of therapeutic response. And, using the principles of neuroplasticity, these exchanges might then begin the reparation process, compensating for that which has been missed in early childhood.

Since engagement is considered essential in all educational settings, and the skills to socially engage are considered essential to success in life, the neuroception of safety becomes an essential starting point in any approach. Being mindful of the child or young person's neuroception will have implications on building design, sensory inputs and spaces, models of engagement and therapy and on consultation with families, carers, schools and other places in which our clients/students are regularly involved.

A child's (or an adult's) nervous system may detect danger or a threat to life when the child enters a new environment or meets a new or strange person – and this is a particularly important consideration for school staff attempting to engage these children, potentially in new environments.

In assessing and building environments for the education of these children, this might mean considering things that can activate the brain stem structures involved in the social engagement circuitry. Reducing background noise is an important step. Children who have had little successful use of their social engagement are likely to have little tone in their middle ear muscles which are used to filter out background noise and focus in on human voice. Ordinarily, the switch in ear muscle function happens spontaneously when our nervous systems detect safety and thus allow us to 'tune in' to conversations or the human voice.

Sensory stimulation, light and vestibular movement (rocking in a forward-backward manner), or proprioceptive movement, posture and the introduction of calming spaces are further activities that have been shown to promote sensory integration and which influence neuroception of safety (Porges, 2011). One might also need to increase the child or young person's sense of control over their environment – considering what sensory options could be offered such as changeable lighting and noise, colour and texture. These are interventions which have been being applied in the field of occupational therapy for some time, which are easily transferred to trauma work.

Quick lower cost introductions could include sound deadening tiling, rugs on non-carpeted floors, controllable lighting switches, room adjusted heating and cooling, creation of music of different varieties using the pitch requiring middle ear muscles, availability of head phones to promote safety where necessary, colour, texture and smell options for sensory stimulation.

Importantly, Porges theory also reinforces the importance of predictable and consistent adults and caregivers. Familiar caregivers are considered be essential to children's neuroception of safety—which, in turn, are essential for the promotion of appropriate social behaviour. Specifically, a child's ability to recognize a caregiver's face, voice, and movements (the features that define a safe and trustworthy person) should set in motion the process of subduing the limbic system and allowing the social engagement system to function.

For schools then, consistency in staffing is important in promoting safety and social engagement. This fits with current SMART PRACTICE promoting consistency and predictability as platforms for response, and reinforces the value of minimal changes for children in educational contexts.

Questions for consideration

You may like to use the following questions as meeting topics, discussion starters, prompts for sharing of ideas/resources, or reflections, for staff working with children & young people.

- *How does polyvagal theory connect with or reflect the observations you make regarding the presentations of traumatised children?*

(When children and young people feel unsafe, we are likely to see manifestations in the areas the social engagement system usually regulates including; avoidant gaze, non-responsiveness to human voice, reduced facial affect and vocal prosody, and atypical or lack of head gesture.)

- *In what ways does Polyvagal Theory change, alter or support your interpretations of the behaviours present in these children?*

Polyvagal theory helps us understand that we discharge high arousal through adaptive transitioning back to our social engagement system and through co-regulation – a neural skill formed normatively through experiences of good co-regulation and of play in the early years of life.

- *In what ways could your school, staff group, classrooms and individual teachers attend to cues in the environment of the child that may trigger a neuroception of safety?*

These children and young people have often missed out on vital experiences of co-regulation.

- *How can your school support and develop experiences of attuned relational exchanges including repair and build capacity and experience in play?*

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