

The Why Toolkit® Evidence-Based Brief

Understanding Behaviors as Stress Responses

Connie Persike, M.S. SLP/CCC | Supportable Solutions
1-844-765-4255 | connie@supportablesolutions.com
<https://supportablesolutions.com/>



Behaviors as a Stress Response

Why is it important to shift our view away from behaviorism and look at behaviors from a neurological perspective as a stress response?

Viewing behaviors from a neurological perspective is crucial for understanding how trauma and stress affect the autonomic nervous system (ANS). Research by Doan et al. suggests that externalizing behaviors, while often seen by society as problematic, may actually function as coping mechanisms for children managing physiological dysregulation linked to early life adversity. These behaviors can provide a form of adaptation, helping children mitigate the impacts of stress on their nervous system.¹

Additionally, traditional approaches to behavior management often rely on punitive or exclusionary practices, but research suggests that these methods may reinforce negative outcomes rather than address the underlying factors driving such behaviors.² In *Addressing the Wicked Problem of Behavior in Schools*, Armstrong advocates for approaches that move beyond seeing behaviors as isolated issues within the child. Instead, he emphasizes the importance of inclusive, relational responses that recognize the developmental and environmental factors influencing behavior.

Finally, the Polyvagal Theory aims to redefine our understanding of the ANS by highlighting its adaptive

1. Doan et al., "Externalizing Behaviors Buffer the Effects of Early Life Adversity on Physiologic Dysregulation."

Armstrong, "Addressing the Wicked Problem of Behaviour in Schools."

2. Doan et al., "Externalizing Behaviors Buffer the Effects of Early Life Adversity on Physiologic Dysregulation."

Understanding Behaviors as Stress Responses

responses to environmental stimuli ranging from social engagement to defensive reaction.³ Central to this theory is the concept of the vagal paradox, which describes how the vagus nerve can promote both calm, social engagement states, and defensive survival responses.⁴ This dual role is explained by the presence of two distinct branches of the vagus nerve: the myelinated ventral vagal pathway, which supports social engagement and calm states, and the unmyelinated dorsal vagal pathway, which is associated with survival responses like shutdown or freeze.⁵

A key concept in the Polyvagal Theory is neuroception, the subconscious ability of the nervous system to detect safety or threat in the environment.⁶ This process influences whether an individual remains in a state of social engagement or shifts to a protective state. Interventions that focus on enhancing felt safety can prevent the escalation of stress responses and support emotional regulation. This highlights the importance of creating environments that foster felt safety, particularly in trauma-sensitive contexts.⁷

Neuroception drives the activation of the autonomic pathways in response to perceived threats or cues of safety, which means students' behaviors are often automatic reactions to how safe or unsafe they feel.⁸ By understanding neuroception, educators can create environments that reduce perceived threats and encourage a state of safety, thereby supporting students in reaching a regulated, engaged state.

By understanding behaviors through this neurological lens, educators can offer timely supports that restore felt safety before the individual moves into more defensive states.

The Vagal Brake

The Polyvagal Theory also introduces the concept of the vagal brake, which refers to the influence of the vagus nerve on the heart's natural pacemaker, allowing for rapid increase and decrease of heart rate. The vagal brake describes how the ventral vagal pathway regulates heart rate by slowing it down under safe conditions. This brake can be released to allow for rapid increases in heart rate during physical activity or stress.⁹

3. Porges, "Orienting in a Defensive World: Mammalian Modifications of Our Evolutionary Heritage. A Polyvagal Theory."

4. Porges, "The Vagal Paradox: A Polyvagal Solution."

5. Porges, "The Polyvagal Perspective."

6. Porges, "The Polyvagal Theory: Phylogenetic Contributions to Social Behavior."

7. See note 5 above.

8. See note 6 above.

9. See note 4 above.

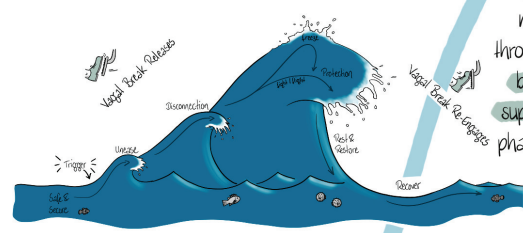
Understanding Behaviors as Stress Responses

Understanding Behaviors as Stress Responses

Traditional approaches to behavior management often rely on punitive or exclusionary practices, but research suggests that these methods may reinforce negative outcomes rather than address the underlying factors driving behaviors. [1]

[1] Doan et al, "Externalizing Behaviors Buffer the Effects of Early Life Adversity on Physiologic Dysregulation."
 [2] Doan et al, "Externalizing Behaviors Buffer the Effects of Early Life Adversity on Physiologic Dysregulation." Armstrong, "Addressing the Wicked Problem of Behaviour in Schools."
 [3] Porges, "The Vagal Paradox: A Polyvagal Solution."
 [4] Alvarez, Gonzalez-Panera, and Manero, "The Role of Emotions in Classroom Conflict Management: Case Studies Geared Towards Improving Teacher Training."
 [5] Polyvagal Institute, 2021, used with permission

Viewing behaviors from a neurological perspective is crucial for understanding how trauma and stress affect the autonomic nervous system (ANS). [2]

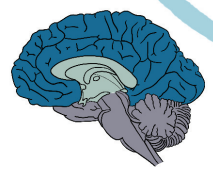


The Why Toolkit™ incorporates the Wave of Distress metaphor to describe how individuals progress through a stress response. This framework evaluates behaviors, gathers baseline data, and maps out supports for staff to provide students during each phase of distress, with the goal being de-escalation.

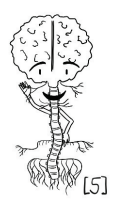
Assessing how individuals look as they escalate provides crucial insights into their state of regulation and distress. Recognizing these signs allows educators to intervene early.

It is important for teachers to reflect on significant emotional experiences. Such reflective practices help staff recognize patterns in their responses, identify triggers, and develop strategies to prevent future conflict escalation. [4]

The vagus nerve can promote both calm, social engagement states, and defensive survival responses. [3]



For students, educators play a crucial role in co-regulation by offering calm and supportive presence during moments of distress. This interaction can help students shift from defensive states into felt safety and connection, facilitating better engagement and emotional regulation.



The efficiency of the vagal brake is critical for maintaining calm states and social engagement, and its dysfunction is linked to various health issues, including stress and trauma-related conditions.¹⁰

Vagal Tone

While we do not have voluntary control over our autonomic responses, there are practices that can influence vagal tone—the activity of the vagus nerve. High vagal tone enables modulation of heart rate to foster calm, social states, while a reduction in tone can activate defensive responses as part of the autonomic system’s adaptive functions.¹¹ In a classroom setting, practices like slow, deep breathing

10. Noble, Souza, and McIntyre, "Vagus Nerve Stimulation as a Tool for Enhancing Extinction in Exposure-Based Therapies."
 11. Anisman, Hayley, and Kusnecov, "Multiple Pathways Linked to Mental Health and Illness."

Understanding Behaviors as Stress Responses

exercises, guided mindfulness activities, and creating opportunities for positive social interactions can enhance vagal tone, promoting a sense of calm and regulation in students.¹²

For instance, incorporating brief, regular breathing breaks throughout the day or starting the day with a mindfulness exercise can help prepare students' nervous systems to remain calm and focused. Additionally, fostering a supportive classroom culture that encourages kindness, positive peer interactions, and teacher-student connection further supports vagal tone, building students' resilience to stress.

Gottman and Katz found that children with higher basal vagal tone exhibit faster recoveries from stress-induced physiological arousal, which supports more effective emotion regulation.¹³ This suggests that high vagal tone may act as a buffer during moments of stress, helping children return to a calm state more quickly and effectively. For educators, this highlights the value of incorporating practices that bolster vagal tone as part of daily routines, ultimately helping students build emotional resilience.

Co-Regulation

Another essential concept in the Polyvagal Theory is co-regulation, where individuals rely on interactions with others to maintain a regulated, calm state.¹⁴ For students, educators can play a crucial role in co-regulation by providing a calm and supportive presence during moments of distress. This interaction can help students shift from defensive states into felt safety and connection, facilitating better engagement and emotional regulation.

Porges also suggests that chronic exposure to perceived threats or unsafe environments can lead to long-term dysregulation, diminishing an individual's ability to maintain vagal tone and remain calm.¹⁵ For students, this highlights the need for a consistently supportive and safe environment to build and sustain emotional resilience. Consistent cues of safety in school settings are essential to help students develop the capacity for self-regulation and positive social engagement over time.

12. See note 5 above.

13. Gottman and Katz, "Children's Emotional Reactions to Stressful Parent-Child Interactions."

14. See note 6 above.

15. See note 6 above.

Understanding Behaviors as Stress Responses

It's important to note that the prefrontal cortex does not function optimally under significant stress.¹⁶ This emphasizes the need for early support once the wave of distress is activated, to help maintain access to the prefrontal cortex and prevent further escalation. Effective supports at this stage can help de-escalate stress behaviors before the prefrontal cortex goes “offline.”

The ANS Pathways

The Polyvagal Theory further explains that the ANS operates in a hierarchical sequence, engaging different neural pathways based on the level of perceived threat. This hierarchy reflects the evolutionary development of the nervous system, where newer systems, like the ventral vagal pathway, inhibit older systems, like the dorsal vagal pathway, under normal conditions.¹⁷

Understanding which pathway an individual is primarily in can provide valuable insights into their level of stress and guide appropriate support and interventions. In addition, externalizing behaviors—too often viewed as problematic—can be reframed as coping mechanisms for children managing physiological dysregulation associated from the stress of early life adversity.¹⁸ This reframing can help educators understand that these behaviors are adaptive responses to stress and provide a more compassionate approach to addressing them. However, the primary goal across all states—whether an individual is in the ventral vagal (social engagement), sympathetic (fight/flight), or dorsal vagal (freeze) state—is to help them feel safe.

When individuals are in a ventral vagal state, they feel safe, calm, and connected. This is the ideal state for learning, social interaction, and problem-solving. The focus here should be on maintaining felt safety and connection to prevent escalation into more defensive states.¹⁹

If an individual perceives a threat, they may shift into the sympathetic nervous system, triggering the fight/flight response.²⁰ In our experience, as students progress through the wave of distress and one of the protective pathways—fight, flight, or freeze—becomes primarily activated, their ability to access learned strategies diminishes. At this stage, prompting them to use these strategies may unintentionally

16. Arnsten, “Stress Signalling Pathways That Impair Prefrontal Cortex Structure and Function.”

17. See note 5 above.

18. See note 1 above.

19. See note 5 above.

20. Chu et al., “Physiology, Stress Reaction.”

Understanding Behaviors as Stress Responses

heighten their distress, leading to further escalation rather than calming. Instead, the immediate priority should be to reduce the perceived threat and create an environment that feels safe, using a calming presence and reassurance, rather than direct techniques that require cognitive engagement.

In cases of overwhelming threat, the dorsal vagal complex may become active, leading to a shutdown or freeze response. This state indicates a more significant level of distress, where the individual may appear withdrawn or unresponsive. Support here should be gentle and focused on slowly re-establishing felt safety and connection, recognizing that the individual is in a state where they are less capable of engaging with their environment.²¹

The Importance of Safety Across All Pathways

Regardless of which autonomic pathway is primarily active, the primary goal must be to help the individual feel safe. Understanding the sequence of responses helps educators recognize the severity of the individual's stress and tailor their approach accordingly. However, creating felt safety must always be the first and most crucial step.

For those primarily in a sympathetic state, this might mean avoiding strategies that require complex cognitive engagement and instead focusing on reducing sensory input and providing a calm, non-threatening presence.

For those primarily in a dorsal vagal shutdown state, supports should be particularly sensitive and gradual, aiming to slowly bring the individual back to a state where they can feel safe and connected again.

Why is Understanding the ANS Important?

Kolacz et al. explain that the Polyvagal Theory provides insight into how the autonomic nervous system reacts to perceived threats through neuroception—the subconscious detection of safety and danger. This theory highlights the need to understand behaviors as stress responses rather than simply problematic actions.²²

21. See note 5 above.

22. Kolacz, Kovacic, and Porges, "Traumatic Stress and the Autonomic Brain-gut Connection in Development: Polyvagal Theory as an Integrative Framework for Psychosocial and Gastrointestinal Pathology."

Understanding Behaviors as Stress Responses

Additionally, Porges elaborates on how the COVID-19 pandemic has exacerbated stress responses, emphasizing the necessity of creating environments that foster felt safety to help individuals regulate their stress responses.²³ Siciliano et al., also reinforce the importance of trauma-sensitive approaches, which consider the autonomic responses to stress.²⁴

Finally, practical applications of the Polyvagal Theory are extensive, particularly in understanding and treating trauma, anxiety, and other stress-related experiences. The theory emphasizes the role of the ventral vagal complex in supporting the social engagement system, which is crucial for co-regulation and maintaining a calm autonomic state. Positive social interactions that enhance vagal tone are essential for promoting well-being and resilience in individuals, especially in trauma-sensitive environments.²⁵

Why is it important to assess how individuals' behavior progresses as they escalate?

Learning how to assess individuals as they escalate provides crucial insights into their state of regulation and distress. Observable physiological and behavioral cues, such as changes in facial expressions, body posture, and vocal tone, can be indicators of an individual's neuroception—how their nervous system detects safety or threat.²⁶ Recognizing these signs allows educators to intervene early, offering support that can help individuals return to a regulated state, thus preventing further escalation and promoting felt safety.²⁷ Furthermore, Accinni et al. highlight the importance of understanding these autonomic responses to predict and manage behavioral escalations effectively.²⁸

Additionally, the American Academy of Pediatrics (AAP) advocates for a trauma-informed approach to school discipline, recognizing that exclusionary practices like suspensions and expulsions not only fail to improve behavior but also disproportionately harm marginalized students.²⁹ By addressing the underlying stress responses through trauma-sensitive supports, schools can better support emotional regulation and prevent further escalation of behaviors.

23. Porges, "The Covid-19 Pandemic Is a Paradoxical Challenge to Our Nervous System: A Polyvagal Perspective."

24. Siciliano, Anderson, and Compas, "Autonomic Nervous System Correlates of Posttraumatic Stress Symptoms in Youth: Meta-Analysis and Qualitative Review."

25. See note 4 above.

26. See note 4 above.

27. See note 22 above.

28. Accinni, Papadogiannis, and Orso, "De-Escalation Techniques in Various Settings."

29. Jain, Beers, and Padrez, "School Suspension and Expulsion: Policy Statement."

Understanding Behaviors as Stress Responses

How will knowing this impact the support individuals receive and the mindset of others?

Understanding behaviors as stress responses and recognizing escalation cues significantly impacts the support individuals receive, the mindset of those providing support, and the approach educators take. This understanding supports a trauma-sensitive approach that prioritizes creating felt safety and connection, targeting the underlying causes of distress behaviors. Such a perspective can foster empathy and patience among educators and students, leading to more positive interactions and outcomes.

According to Doan et al., prohibitive or punitive responses to externalizing behaviors may unintentionally remove a coping mechanism that some adolescents rely on to manage stress.³⁰ Rather than focusing solely on reducing these behaviors, interventions should seek to understand the purpose these behaviors serve in a child's life and expand their repertoire of coping skills. Techniques like confidence-building exercises, mindfulness-based stress reduction, and structured physical activities can offer healthier alternatives, equipping adolescents with more positive ways to navigate high-stress situations. This approach not only addresses the behavior but also supports more positive, lasting outcomes by acknowledging the 'why' behind it.

Additionally, understanding the role of the vagal brake in regulating stress responses helps educators apply supports that enhance social engagement and regulation. By supporting the vagal brake, educators can help individuals stay in or return to a regulated state, reducing the need for more intense interventions in the future. When educators understand the neurobiological basis of stress responses, they are more likely to provide compassionate and supportive interventions that enhance the individual's capacity for regulation and resilience.

Integrating the Wave of Distress into The Why Toolkit®

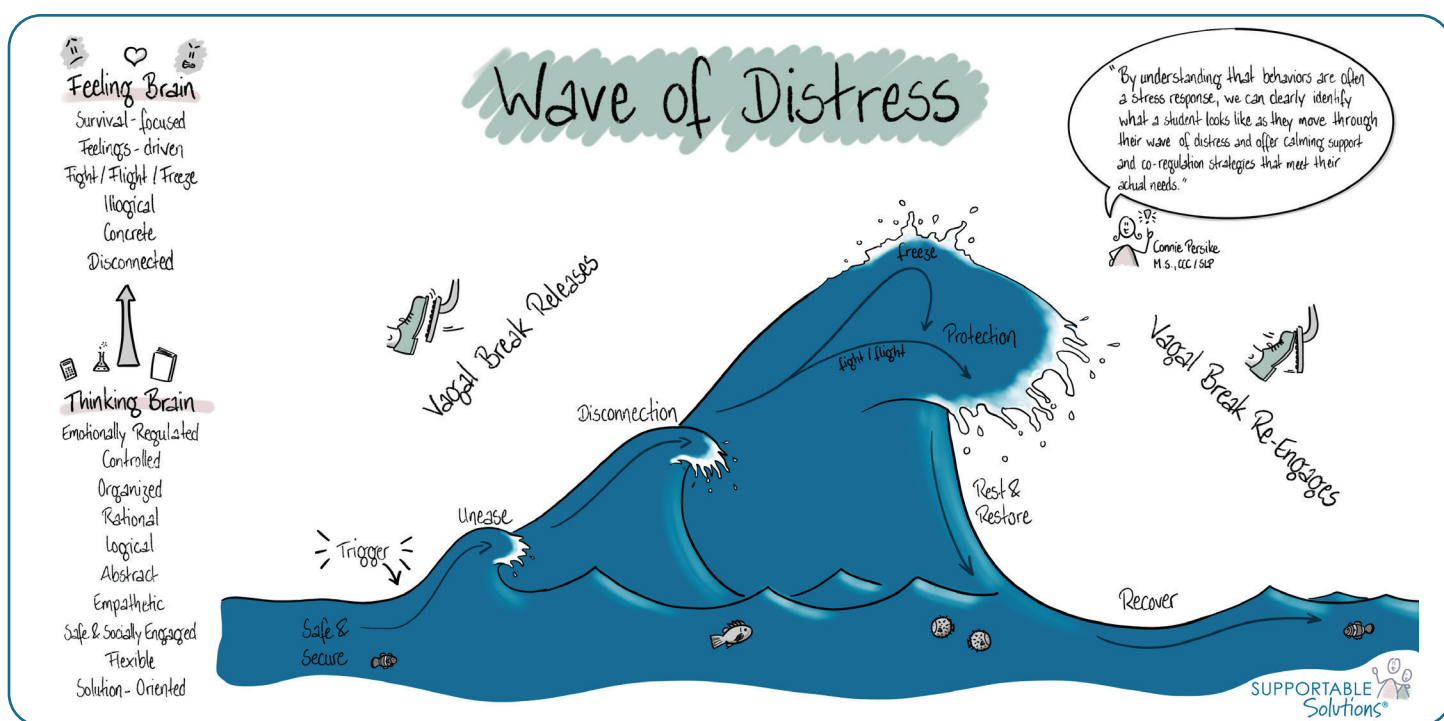
The Why Toolkit® is a web-based resource for educators, providing an approach to assessment and support of behaviors that interfere with learning. It transcends outdated models and embraces the complexities of modern neuroscience. The Why Toolkit® incorporates the Wave of Distress metaphor to describe how individuals progress through a stress response. This framework describes behaviors, gathers baseline data, and maps out supports for staff to provide students during each phase of distress,

30. See note 1 above.

Understanding Behaviors as Stress Responses

with the goal of de-escalation. This integration aligns with a neurobiological understanding of stress responses, fostering a compassionate and effective approach to behavior support.

The hierarchical nature of autonomic responses, as described by the Polyvagal Theory, is reflected in the Wave of Distress framework. By understanding the sequence of autonomic responses—starting from social engagement and potentially regressing to fight, flight, or freeze—staff can better tailor their support to the student’s current state.



Description of Behaviors

The Wave of Distress metaphor breaks down the escalation and de-escalation cycle into distinct phases. Each phase is characterized by specific behaviors and physiological responses, which are critical for accurate assessment:

- **Safe & Secure:** Behaviors indicative of felt safety, emotional regulation, and social engagement.
- **Unease:** Early signs of distress such as physical restlessness and changes in vocal volume.
- **Disconnection:** More intense behaviors like clenching fists and difficulty following directions.

Understanding Behaviors as Stress Responses

- Protection: Intense behaviors as the individual seeks to protect themselves, including aggression or fight responses.
- Rest & Restore: Gradual de-escalation with soothing activities and reduced intensity of behavior.
- Recovery: Full recovery with re-engagement and calm behaviors.

Early Identification of a Stress Response

Conducting a thorough assessment to map out how students look as their stress response is activated is critical in supporting early identification of distress. By carefully observing and documenting the specific signs of dysregulation, such as changes in facial expressions, body posture, or vocal tone, educators and staff can become attuned to the earliest indicators of a stress response. This detailed understanding allows them to recognize the very first signs of dysregulation, enabling them to offer support quickly and effectively.

We posit that when supports are provided at the onset of a stress response—before the prefrontal cortex (aka the “thinking brain”) is fully offline—there is a greater chance of successful de-escalation.³¹ The prefrontal cortex is responsible for rational thinking, decision-making, and impulse control, and therefore when it remains engaged, students are more receptive to calming strategies and supports.³² By intervening early, educators and staff can help prevent the escalation of distress behaviors, making the process of de-escalation smoother and more effective. This proactive approach not only minimizes the intensity of the response but also helps in maintaining felt safety and regulation for the student.

Collection of Baseline Data

By documenting behaviors at each phase, baseline data is systematically collected. This data provides a comprehensive picture of an individual’s typical stress response cycle, allowing for pattern identification and progress tracking. This baseline is essential for determining growth and making necessary adjustments to needed supports.

31. Kolk and Bessel, *The Body Keeps the Score: Brain, Mind, and Body in the Healing of Trauma*.

32. Funahashi, “Prefrontal Contribution to Decision-Making Under Free-Choice Conditions.”

Kenwood, Kalin, and Barbas, “Correction: The Prefrontal Cortex, Pathological Anxiety, and Anxiety Disorders.”

Mapping Supports for Each Phase

The Why Toolkit® provides a structured framework for staff to deliver appropriate supports during each phase of the Wave of Distress, enabling responses that are intentional, not reactive. By equipping staff with strategies for emotional awareness and cognitive preparation, The Why Toolkit® helps prevent the escalation of conflict that often arises from reactive or punitive responses, aligning with Alvarez, González-Parera, and Manero’s recommendation that teachers develop both emotional awareness and cognitive strategies.³³

1. Safe & Secure: Establish predictable routines, engage in intentional strategies to strengthen relationships, and provide positive feedback.
2. Unease: Implement calming strategies like deep breathing or quiet spaces and provide empathy and validation.
3. Disconnection: Model a calming presence while reducing sensory input.
4. Protection: Ensure safety, use de-escalation techniques, and minimize stimuli.
5. Rest & Restore: Provide rest opportunities and engage in soothing activities.
6. Recovery: Encourage re-engagement through positive interactions and meeting basic needs.

Reflective Practice for Continuous Improvement

Alvarez, González-Parera, and Manero highlight the importance of teachers reflecting on significant emotional experiences.³⁴ Such reflective practices help staff recognize patterns in their responses, identify triggers, and develop strategies to prevent future conflict escalation. This focus on reflection, combined with the structured supports provided by the Why Toolkit®, empowers staff to respond more effectively and thoughtfully to students’ needs.

Visual Aids and Tools

The Why Toolkit® also includes visual aids, such as single-page handouts, that depict the Wave of Distress and how individuals appear in each phase. These tools were designed to help staff quickly identify the

33. Alvarez, González-Parera, and Manero, “The Role of Emotions in Classroom Conflict Management. Case Studies Geared Towards Improving Teacher Training.”

34. See note 32 above.

Understanding Behaviors as Stress Responses

distress phase and respond effectively. The individualized response plans offer practical steps for each phase, ensuring timely and effective support tailored to the student's specific needs.

In summary, the Wave of Distress provides a framework for:

1. Evaluation: Staff use the Wave of Distress framework when assessing behaviors, noting specific indicators at each phase.
2. Baseline Data: Baseline data is collected, showing patterns in stress responses and providing an effective method for progress monitoring.
3. Support Mapping: Based on the data, staff develop a response plan with specific supports and calming strategies for each phase.

Conclusion

Understanding behaviors as stress responses rather than intentional and purposeful actions is crucial for creating compassionate and effective support systems, particularly in trauma-sensitive environments. The shift from a behaviorist to a neurological perspective allows educators to recognize the underlying causes of distress behaviors and respond in ways that promote regulation and safety. By integrating the Wave of Distress metaphor and the principles of the Polyvagal Theory into The Why Toolkit®, Supportable Solutions offer a structured approach to assess and support individuals through their stress responses. The Polyvagal Theory provides the scientific foundation for understanding the autonomic pathways activated during stress. The Wave of Distress reflects this hierarchical model, with individuals moving through states of social engagement, fight, flight, and freeze in response to perceived threats.³⁵ By mapping out the behaviors associated with each phase, the Wave of Distress allows educators to provide targeted supports that address the underlying autonomic response, ensuring a compassionate and effective approach. This approach not only aligns with current neuroscience but also fosters environments where individuals can thrive despite the challenges posed by stress and trauma.

Effective support systems in educational settings require a move away from punitive models toward approaches that address the full context of student behavior. Armstrong underscores the importance of systemic changes that foster environments centered on understanding and inclusion, which complement

35. See note 5 above.

Understanding Behaviors as Stress Responses

trauma-informed approaches that promote regulation and emotional resilience.³⁶ The case study by Alvarez, González-Parera, and Manero emphasizes that empathetic and collaborative strategies are more effective classroom interactions than punitive, reactive responses.³⁷ Teachers who approach conflicts with empathy and perspective-taking create more supportive classroom environments, helping to prevent conflict escalation and enhancing students' self-regulation. In contrast, punitive approaches often lead to increased tension and disruption.

In summary, substantial research supports the integration of the Wave of Distress into the Why Toolkit®, emphasizing the importance of shifting from punitive approaches to viewing behaviors as stress responses. This perspective aids educators in creating environments that prioritize de-escalation and prevent escalation, fostering felt safety and connection for more effective support.

36. Armstrong, "Addressing the Wicked Problem of Behaviour in Schools."

37. Alvarez, González-Parera, and Manero, "The Role of Emotions in Classroom Conflict Management. Case Studies Geared Towards Improving Teacher Training."

References

Alvarez, Ibis M., Montserrat González-Parera, and Borja Manero. "The Role of Emotions in Classroom Conflict Management. Case Studies Geared Towards Improving Teacher Training." *Frontiers in Psychology* 13 (March 16, 2022). <https://doi.org/10.3389/fpsyg.2022.818431>.

Accinni, Tommaso, Georgios Papadogiannis, and Luigi Orso. "De-escalation Techniques in Various Settings." In *Springer eBooks*, 65–91, 2021. https://doi.org/10.1007/978-3-030-65106-0_5.

Anisman, Hymie, Shawn Hayley, and Alexander Kusnecov. "Multiple Pathways Linked to Mental Health and Illness." In *Elsevier eBooks*, 1–36, 2018. <https://doi.org/10.1016/b978-0-12-811351-6.00001-2>.

Armstrong, David. "Addressing the Wicked Problem of Behaviour in Schools." *International Journal of Inclusive Education* 22, no. 9 (February 2, 2018): 997–1013. <https://doi.org/10.1080/13603116.2017.1413732>.

Arnsten, Amy F. T. "Stress Signalling Pathways That Impair Prefrontal Cortex Structure and Function." *Nature Reviews. Neuroscience* 10, no. 6 (May 20, 2009): 410–22. <https://doi.org/10.1038/nrn2648>.

Belsky, Melvin. "The Deepest Well: Healing the Long-Term Effects of Childhood Adversity." *The Permanente Journal* 23, no. 2 (February 22, 2019). <https://doi.org/10.7812/tpp/18-075>.

Chu, Brianna, Komal Marwaha, Terrence Sanvictores, Ayoola O. Awosika, and Derek Ayers. "Physiology, Stress Reaction." StatPearls - NCBI Bookshelf, May 7, 2024. <https://www.ncbi.nlm.nih.gov/books/NBK541120/>.

Doan, Stacey N., Nadya Dich, Thomas E. Fuller-Rowell, and Gary W. Evans. "Externalizing Behaviors Buffer the Effects of Early Life Adversity on Physiologic Dysregulation." *Scientific Reports* 9, no. 1 (September 20, 2019). <https://doi.org/10.1038/s41598-019-49461-x>.

Funahashi, Shintaro. "Prefrontal Contribution to Decision-Making Under Free-Choice Conditions." *Frontiers in Neuroscience* 11 (July 26, 2017). <https://doi.org/10.3389/fnins.2017.00431>.

Understanding Behaviors as Stress Responses

Gottman, John Mordechai, and Lynn Fainsilber Katz. "Children's Emotional Reactions to Stressful Parent-Child Interactions." *Marriage & Family Review* 34, no. 3-4 (June 1, 2002): 265-83. https://doi.org/10.1300/j002v34n03_04.

Grosser, and Spivack. "An Early Study of the Autonomic Nervous System and Behavioral Responses." *Journal of Psychoeducational Assessment*, 1976.

Hanazawa, Hisashi. "[Polyvagal Theory and Its Clinical Potential: An Overview]." *PubMed* 74, no. 8 (August 1, 2022): 1011-16. <https://doi.org/10.11477/mf.1416202169>.

Jain, Susanna K., Nathaniel Beers, and Ryan Padrez. "School Suspension and Expulsion: Policy Statement." *PEDIATRICS* 154, no. 4 (October 1, 2024). <https://doi.org/10.1542/peds.2024-068466>.

Kenwood, Margaux M., Ned H. Kalin, and Helen Barbas. "Correction: The Prefrontal Cortex, Pathological Anxiety, and Anxiety Disorders." *Neuropsychopharmacology* 47, no. 5 (February 2, 2022): 1141. <https://doi.org/10.1038/s41386-021-01216-x>.

Kolacz, Jacek, Katja K. Kovacic, and Stephen W. Porges. "Traumatic Stress and the Autonomic Brain-gut Connection in Development: Polyvagal Theory as an Integrative Framework for Psychosocial and Gastrointestinal Pathology." *Developmental Psychobiology* 61, no. 5 (April 5, 2019): 796-809. <https://doi.org/10.1002/dev.21852>.

Kolk, Van Der, and A Bessel. *The Body Keeps the Score: Brain, Mind, and Body in the Healing of Trauma*, 2014. <https://ci.nii.ac.jp/ncid/BB19708339>.

Morton, Liza, Nicola Cogan, Jacek Kolacz, Calum Calderwood, Marek Nikolic, Thomas Bacon, Emily Pathe, Damien Williams, and Stephen W. Porges. "A New Measure of Feeling Safe: Developing Psychometric Properties of the Neuroception of Psychological Safety Scale (NPSS)." *Psychological Trauma Theory Research Practice and Policy* 16, no. 4 (July 18, 2022): 701-8. <https://doi.org/10.1037/tra0001313>.

Noble, Lindsey J., Rimenez R. Souza, and Christa K. McIntyre. "Vagus Nerve Stimulation as a Tool for Enhancing Extinction in Exposure-based Therapies." *Psychopharmacology* 236, no. 1 (August 8, 2018): 355-67. <https://doi.org/10.1007/s00213-018-4994-5>.

Understanding Behaviors as Stress Responses

Porges, Stephen W. "Orienting in a Defensive World: Mammalian Modifications of Our Evolutionary Heritage. A Polyvagal Theory." *Psychophysiology* 32, no. 4 (July 1, 1995): 301–18. <https://doi.org/10.1111/j.1469-8986.1995.tb01213.x>.

———. "The Covid-19 Pandemic Is a Paradoxical Challenge to Our Nervous System: A Polyvagal Perspective." *PubMed* 17, no. 2 (April 1, 2020): 135–38. <https://doi.org/10.36131/cn20200220>.

———. "The Polyvagal Perspective." *Biological Psychology* 74, no. 2 (October 18, 2006): 116–43. <https://doi.org/10.1016/j.biopsycho.2006.06.009>.

———. "The Polyvagal Theory: Phylogenetic Contributions to Social Behavior." *Physiology & Behavior* 79, no. 3 (August 1, 2003): 503–13. [https://doi.org/10.1016/s0031-9384\(03\)00156-2](https://doi.org/10.1016/s0031-9384(03)00156-2).

———. "The Vagal Paradox: A Polyvagal Solution." *Comprehensive Psychoneuroendocrinology* 16 (August 9, 2023): 100200. <https://doi.org/10.1016/j.cpnec.2023.100200>.

Siciliano, Rachel E., Allegra S. Anderson, and Bruce E. Compas. "Autonomic Nervous System Correlates of Posttraumatic Stress Symptoms in Youth: Meta-analysis and Qualitative Review." *Clinical Psychology Review* 92 (January 18, 2022): 102125. <https://doi.org/10.1016/j.cpr.2022.102125>.