Polyvagal Theory – A New Model

Jeffrey E. Hansen, Ph.D.
Center for Connected Living, LLC

The greatest thing then, in all education, is to make our nervous system our ally as opposed to our enemy

- William James

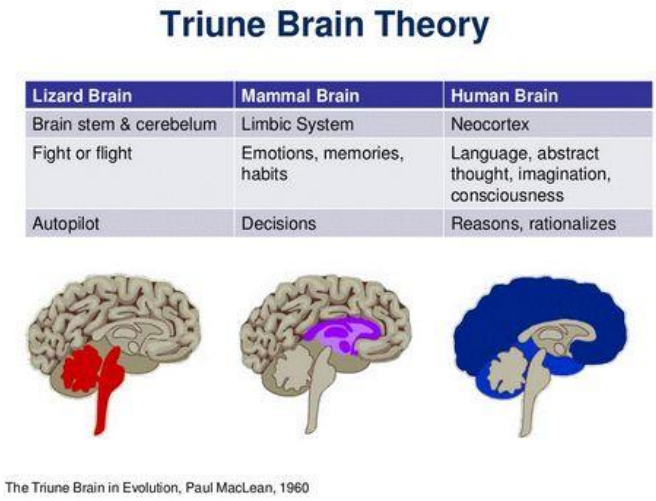
Tornadoes ravage the land, hurricanes the sea – leaving paths of destruction wherever they go, but nothing compares to the tempest within, the one that tears at the soul and robs one of peace. This is a story of the pain of searing emotional dysregulation, one that does not respect age, gender, race, or station in life. It can start in infancy and, left unmanaged, has the potential for damaging or even destroying your life, and possibly even the lives of those around you. It almost destroyed mine and I will risk sharing some of my story in hopes that it might help you or the ones you care about and love.

Many years ago, I went through a totally unexpected storm that clipped me at my knees. Happily, I emerged though the storm in better shape than before, but not without much pain and suffering and a long journey of healing. After I was back in the swing of things, it became important to me to understand more fully what brought me to this breaking point in my life and what specifically I (and the many who supported me) did to navigate through it. This became a personal mission. First, because the long experience was so awful that I wanted to never repeat it (wanted to buy a psychological insurance policy), and second, I desired to help those who might possibly be facing their own similar struggles. So, let's walk this together.

Emotional self-regulation or **emotion regulation** as defined by Wikipedia "is the ability to respond to the ongoing demands of experience with the range of **emotions** in a manner that is socially tolerable and sufficiently flexible to permit spontaneous reactions as well as the ability to delay spontaneous reactions as needed. Emotion regulation is a complex process that involves initiating, inhibiting, or modulating one's state or behavior in a given situation – for example, the subjective experience (feelings), cognitive responses (thoughts), emotion-related physiological responses (heart rate or hormonal activity), and emotion-related behavior (bodily actions or expressions). Functionally, emotion regulation can also refer to processes such as the tendency to focus one's attention on a task and the ability to suppress inappropriate behavior under instruction. Emotion regulation is a highly significant function in human life" (Wikipedia, 2020a). As this definition suggests, emotional regulation is a really big deal and involves our thoughts, our bodies, and our feelings.

In the last 10 years, new and exciting neuroscience has emerged that helps us map out our physical, emotional, and cognitive responses to the world around us and provides us a way through the ensuing tempest within ourselves. Dr. Barta (2018) proposes a model that demonstrates how the brain and the nervous system work together to fuel emotional dysregulation. In his model, which he calls TINSA (Trauma Induced Sexual Addiction), he pairs some of the greatest minds in neurology and psychology, to include Dr. Stephen Porges' **Polyvagal Theory** and Dr. Paul Maclean's **Triune Brain Theory**.

Triune Brain Theory:



MacLean (2009) proposed that there are three distinct formations in our brain which are used in different situations for everyday survival purposes. These specific structures developed sequentially on top of each other at different times during the evolution of the brain for the purposes of giving the organism the ability to survive during that period of time. Even though the brain became more advanced and adaptive, the older more primitive structures of the brain still play an especially important role in thought, process, and behavior.


Dr. Paul MacLean

(For my Christian friends who might worry about this model contradicting sensitivities about creationism – not to worry. As explained by Dr. Andy Doan, M.D. Ph.D., ophthalmology surgeon and neuroscience researcher, and paraphrased by me, "God is very efficient, and He included in our more developed brain substructures that He already designed for lower life forms/animals. No need to re-do what was already perfect and efficient").

As described by Barta (2018) the three regions are noted below:

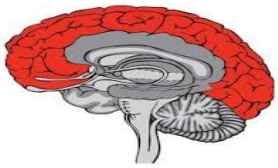
The Reptilian Brain (or Reptilian Complex):

As the name suggests, this is the most primitive brain and it developed about 500 million years ago in fish and later, reptiles. Its roles include sensation, instinctual reaction, breathing, temperature regulation. TINSA holds that the reptilian complex promotes certain survival functions as well, most specifically, immobilization or freeze. We often see lizards, for example, freeze in the face of danger such as a lunch-starved predator in an instinctive reaction that can be life-saving (sadly for the lizard, it doesn't always work, and he sometimes ends up being a snack anyway). We also see this in humans in the face of terrifying situations. Like our lizard friends, it sometimes works, and other times, gets us killed.

The Mammalian Brain (or Limbic System):

Later, about 150 million years ago, the limbic system first appeared in small animals. This system developed as critters were able to move more freely about as they were now equipped with extremities. As such, it often became necessary to either fight off or flee from would-be predators. In addition, the capacity to have memory and emotions developed. This enabled the animal to control the body's response to danger and to remember that danger as well as the ability to be vigilant and scan the surrounding environment for potential dangers. Like critters, we often revert to this neurological system when we act instinctively.

The Frontal Lobe (or Neocortex):



According to Maclean (1990), the frontal lobes came on board only about 2 or 3 million years ago. As in the reptilian brain and the limbic system, the purpose of this brain formation is to react to and protect us from danger. But unlike our more primitive neighbors, this system reacts **consciously**. Very importantly, there was a need to develop a system that made possible more "civilized" responses to threats and at the same time one that offered the possibility to *connect* to others for safety. Therefore,

the frontal lobe allows us to access a new way of surviving based on **socialization**. This makes it possible for us to use analysis, logic and decision-making, and this is what specifically separates us from other lower-ordered animals that rely on instincts alone for survival.

To bring it home, on topside we have the cortical brain consisting of the frontal lobe which is the most recently developed portion of the brain, i.e., **the conscious, thinking brain**. At the bottom, we have our subcortical, unconscious brain, which is made up of the **reptilian and limbic complexes** and is directed largely by raw instinct and emotions which often results in immediate knee-jerk reactions that happen in a split second. Barta (2018) informs us that, in the best of worlds, we try to lead with our frontal lobe and remain socially engaged if something threatening confronts us and in order think our way out of it, smile, and/or stay calm. But in times of intense stress or in situations that remind us of past trauma, this survival mechanism is quickly overrun by earlier, more primitive survival strategies of our mammalian/limbic brain and our reptilian brain structures. As such, when our frontal cortex fails us, the limbic system takes command and we are then rapidly sent into our fight-or-flight response and if this does not work and we cannot run away or fight our way out of it, the most primitive line of defense is deployed and we simply freeze, become immobilized, or completely collapse. This hijacking process can occur whether the threat is real or merely perceived (Barta, 2018).

In order to move forward in our understanding of what drives emotional dysregulation, we must understand Steven Porges' Polyvagal Theory and then integrate this knowledge with Triune Brain Theory. So, first a little anatomy. The Autonomic Nervous System is a control system that acts largely unconsciously and regulates bodily functions such as heart rate, digestion, respiratory rate, pupillary response, urination, and even sexual arousal. It has two main subdivisions: Sympathetic and Parasympathetic.

Autonomic Nervous System

Sympathetic	Parasympathetic	
Activated, anxiety, fear, terror, anger		
	Ventral Vagal	Dorsal Vagal
	Connected, calm, safety	Shut-down, depressed

The autonomic nervous system is our **personal surveillance system**. In an effort to keep us out of danger, it is always on guard; asking the question, "Is this safe?" Its dedicated goal is to protect us by sensing safety and risk. It achieves this by listening moment by moment to what is happening in and around our bodies and in the connections we have to others (Dana, 2018).

This listening happens far below awareness and far away from our conscious control. Dr. Porges, understanding that this is not awareness that comes with perception which is conscious, coined the term **neuroception** to describe the way our autonomic nervous system scans for cues of safety, danger, and life threat, without involving the thinking parts of our brain or the unconscious parts of the brain (Porges, 2017).

Briefly stated, our response to threat will move us toward one of **three defensive responses**. Two of which keep us in perpetual defense and one of which moves us toward health and restoration.

- Sympathetic Division: Prepares the body for stressful or emergency situations – fight or flight. The sympathetic nervous system originates in spinal nerves (nerves that arise from the spinal cord) and is our system of mobilization. The sympathetic nerves are found in the middle of our backs in the thoracic and lumbar regions of the spinal cord. There are two mobilization systems in our sympathetic nervous system.

  Sympathetic Adrenal Medullary (SAM): The SAM system is activated very quickly, within 100 milliseconds and brings up a burst adrenaline for a fast response to a stressor. SAM activation triggers a short-term and rapid response to a stressor which is followed by a return to regulation (Dana, 2018).

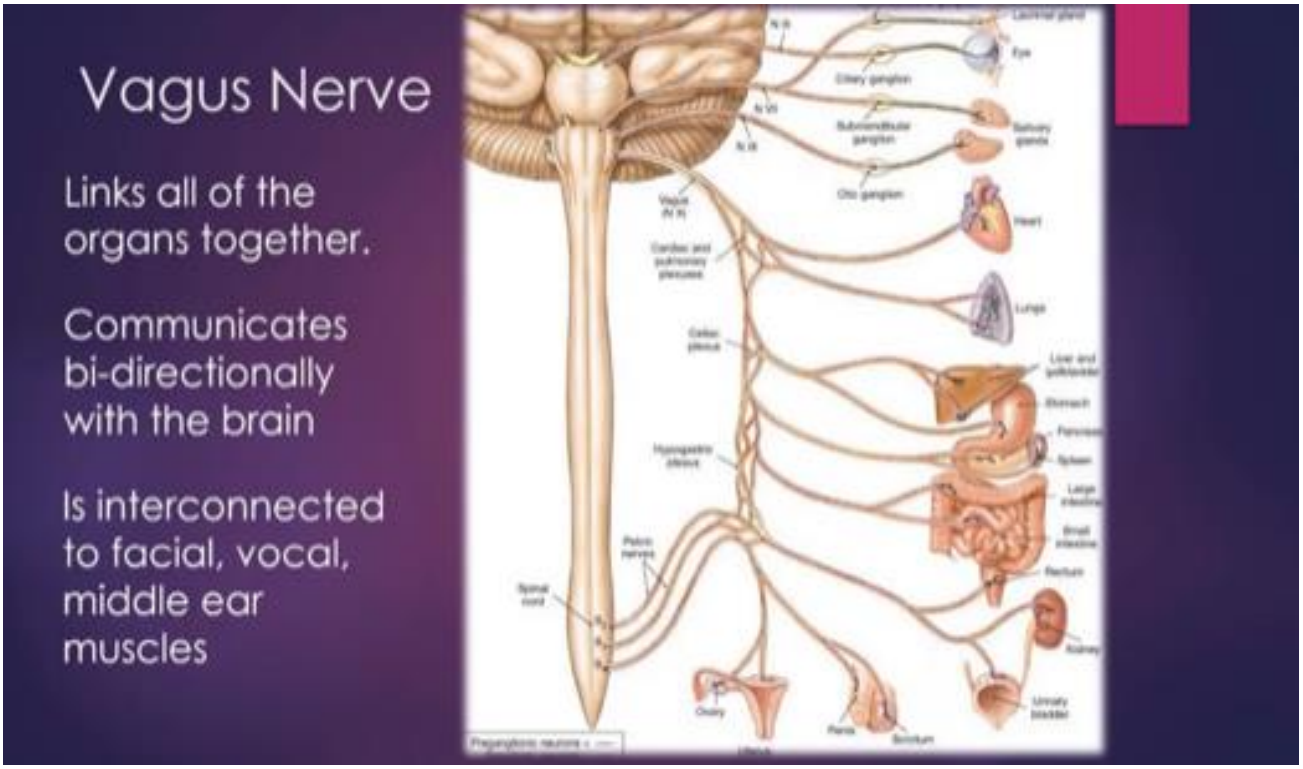
  Hypothalamic-Pituitary-Adrenal (HPA) Axis: The HPA axis takes over when the quick, adrenaline surge of energy of the SAM does not resolve the distress. The HPA releases cortisol (AKA stress hormone). This release takes longer and is much slower in taking effect, requiring minutes to take effect rather than seconds (Dana, 2018).

  Thus, the sympathetic division increases heart rate and the force of heart contractions and widens (dilates) the airways to make breathing easier. It causes the body to release stored energy. Muscular strength is increased. This division also causes palms to sweat, pupils to dilate, and hair to stand on end. It slows body processes that are less important in emergencies, such as digestion and urination (Merck Manual). When we are in this physical state, we can feel

emotions such as fear and/or rage and, if extremely activated, absolute terror (Rothschild, 2017).

- Parasympathetic Division: Generally, the parasympathetic division conserves and restores calm/homeostasis. It slows the heart rate and decreases blood pressure. It stimulates the digestive tract to process food and eliminate wastes. Energy from food is processed and used to restore and build tissues (Merck Manual).

Dr. Porges discovered that the parasympathetic division of the Autonomic Nervous System consists of two branches which lead to two different responses. The main nerve in the parasympathetic nervous system is the 10th cranial nerve, aka **vagus nerve,** which is the largest of the 12 cranial nerves and has huge implications for our well-being and health. The name vagus comes from the Latin word *vagary* which means *wanderer,* and this nerve is definitely a vagabond. The vagus travels downward from the brainstem to the heart and stomach and then back upward to the face and its connection with other cranial nerves. This amazing wandering nerve is a mixed nerve which communicates bidirectionally between the body and the brain. 80% percent of its fibers are sensory (afferent) sending information from the body to the brain, and 20% are motor (efferent), sending action information from the brain to the body (Dana, 2018).



The vagus nerve has two very distinct branches**: Dorsal vagal nerve** and the **ventral vagal nerve**.

- **Dorsal Vagal Nerve:** Barta (2018) notes that the most primitive form of defense occurs when the dorsal vagal nerve is activated. It is not sophisticated in that it is unmyelinated and slow. When activated, the dorsal vagal nerve promotes shutdown, freeze, and collapse. An example of this shutdown is when a gazelle, for example, is being stalked by a lion and when trapped with no possible way to flee, drops down and appears to be deader than a doornail. This is not a conscious process but is, rather, a very primitive and unconscious one. When we are in this physical state, we can feel emotions such as sadness, depression, grief, shame and/or disgust (Rothschild, 2017).

- **Ventral Vagal Nerve:** Barta (2018) writes that the second response of our parasympathetic nervous system (the first being freeze and collapse as noted above) is responsible for our ability to engage socially and to handle social relationships. According to Barta, the social engagement system is controlled by our ventral vagus nerve which is a very smart myelinated nerve with a rapid response time. As such, it allows us to "know" if we are safe enough so we can calm our defenses through a process of "neuroception" which, as noted earlier, is translated as the brain's ability to sense safety. This serves not only bonding needs but allows us to shift out of sympathetic arousal and move into parasympathetic calm or to downshift from activation to calm. When we are in this emotional state, we can feel emotions such as calm, pleasure, love, sexual arousal, and "good" grief (Rothschild, 2017).

Through the marriage of MacLean's Triune Brain Theory with Porges' Polyvagal Theory, we can explain how each part of the triune brain is correlated with the three responses of the autonomic nervous system (Barta, 2018). The key concepts are summarized below:

Sympathetic
Limbic System (Mammalian Brain)
Developed 150 million years ago
Fight or Flight
Unconscious

Social Engagement (Parasympathetic – Ventral Vagal)
Frontal Lobe (Neocortex)
Developed 2 to 3 million years ago
Ventral Vagal
Present/Safe/Aware
Conscious

Parasympathetic (Dorsal Vagal)
Reptilian Brain (Reptilian Complex)
Developed 500 million years ago
Freeze
Unconscious

Dr. Steven Porges

As previously noted, our autonomic nervous system, serving as our **personal surveillance system,** listens far below awareness and far away from our conscious control. Neuroception, or the unconscious monitoring for safety and threat, launches a cascade of embodied events that eventually become a story. When we enter into an autonomic state, the information about that state travels up the automatic pathways to the brain where a story is drafted to make sense of the embodied experience/sensations. In other words, the physiological state produced by the autonomic nervous system creates a psychological story. Dana (2020) describes this as a metaphor of a river where we can imagine the flow of experience. At the river's source is neuroception and at the river's mouth is the story, In between lie perception, autonomic state, feelings, and behavior. We are accustomed to entering in the river downstream with feeling and behavior, or story. However, neuroception takes place at the furthest point upstream. In order to understand this, we need to make our way back to the starting point, leaving behind the story, behavior, and feelings in order to identify the state and bring perception or awareness to neuroception (Dana, 2020). This has implications for treatment which we will discusse "downstream" in this paper.

So, our neurosystem, left on autopilot will, when we are faced with stress and threat, move us to sympathetic fight or flight which equates to (a) extreme anxiety, anger, rage, and or terror or to **(b) dorsal vagal shutdown which leads to slowing down, withdrawal, and possibly even depression.** If these modes of coping become excessive, we are at risk for potentially using maladaptive strategies such as addictions to quell the pain of negative physical symptoms, associated negative emotions, and/or complete withdrawal and possibly self-destructive behavior.

The best response is to activate our **social engagement system of the ventral vagal pathway** of the parasympathetic branch. In this state, our heart rate is regulated, our breath is full, we take in the faces of friends, and we can tune in to conversations and tune out distracting noises.

The chart below adapted by Dr. Rothschild nicely demonstrates the shifting in body sensations, physiological symptoms and emotions as we move between autonomic states (Rothschild, 2017).

The chart below adapted by Dr. Rothschild nicely demonstrates the shifting in body sensations, physiological symptoms, and emotions as we move between autonomic states (Rothschild, 2017).

AUTONOMIC NERVOUS SYSTEM: PRECISION REGULATION
**** WHAT TO LOOK FOR ****

	LETHARGIC Parasympathetic I (PNS I)	CALM Parasympathetic II (PNS II) *Ventral Vagus*	ACTIVE/ALERT Sympathetic I (SNS I)	FLIGHT/FIGHT Sympathetic II (SNS II)	HYPER FREEZE Sympathetic III (SNS III)	HYPO FREEZE Parasympathetic III (PNS III) *Dorsal Vagus* Collapse
		"Normal" Life			Threat to Life	
PRIMARY STATE	Apathy, Depression	Safe, Clear Thinking, Social Engagement	Alert, Ready to Act	React to Danger	Await Opportunity to Escape	Prepare for Death
AROUSAL	Too Low	Low	Moderate	High	Extreme Overload	Excessive Overwhelm Induces Hypoarousal
MUSCLES	Slack	Relaxed/toned	Toned	Tense	Rigid (deer in the headlights)	Flaccid
RESPIRATION	Shallow	Easy, often into belly	Increasing rate	Fast, often in upper chest	Hyperventilation	Hypo-ventilation
HEART RATE	Slow	Resting	Quicker or more forceful	Quick and/or forceful	Tachycardia (very fast)	Bradycardia (very slow)
BLOOD PRESSURE	Likely low	Normal	On the rise	Elevated	Significantly high	Significantly low
PUPILS, EYES, EYE LIDS	Pupils smaller, lids may be heavy	Pupils smaller, eyes moist, eye lids relaxed	Pupils widening, eyes less moist, eye lids toned	Pupils very dilated, eyes dry, eye lids tensed/raised	Pupils very small or dilated, eyes very dry, lids very tense	Lids drooping, eyes closed or open and fixed
SKIN TONE	Variable	Rosy hue, despite skin color (blood flows to skin)	Less rosy hue, despite skin color (blood flows to skin)	Pale hue, despite skin color (blood flow to muscles)	May be pale and/or flushed	Noticeably pale
HUMIDITY Skin	Dry	Dry	Increased sweat	Increased sweat, may be cold	Cold sweat	Cold sweat
HUMIDITY Mouth	Variable	Moist	Less moist	Dry	Dry	Dry
HANDS & FEET (TEMPERATURE)	May be warm or cool	Warm	Cool	Cold	Extremes of cold & hot	Cold
DIGESTION	Variable	Increase	Decrease	Stops	Evacuate bowel & bladder	Stopped
EMOTIONS (LIKELY)	Grief, sadness, shame, disgust	Calm, pleasure, love, sexual arousal, "good" grief	Anger, shame, disgust, anxiety, excitement, sexual climax	Rage, fear	Terror, may be dissociation	May be too dissociated to feel anything
CONTACT WITH SELF & OTHERS	Withdrawn	Probable	Possible	Limited	Not likely	Impossible
FRONTAL CORTEX	May or may not be accessible	Should be accessible	Should be accessible	May or may not be accessible	Likely inaccessible	Inaccessible
INTEGRATION	Not likely	Likely	Likely	Not likely	Impossible	Impossible
RECOMMENDED INTERVENTION	Activate, Gently Increase Energy	Continue Therapy Direction	Continue Therapy Direction	Put on Brakes	*Slam on Brakes*	*Medical Emergency* CALL PARAMEDICS

The Autonomic Nervous System Precision Regulation Chart is Available for purchase on Amazon for $8.99 (a very high recommend):
Babette Rothschild (2017) https://www.amazon.com/Autonomic-Nervous-System-Table-Laminated/dp/039371280X/ref=sr_1_15?dchild=1&keywords=deb+dana&qid=1590326813&s=books&sr=1-15

The Autonomic Nervous System Precision Regulation Chart is Available for purchase on Amazon for $8.99 (a very high recommend):
Babette Rothschild (2017) https://www.amazon.com/Autonomic-Nervous-System-Table-Laminated/dp/039371280X/ref=sr_1_15?dchild=1&keywords=deb+dana&qid=1590326813&s=books&sr=1-15

Now that we have a new understanding of how our autonomic nervous system works, we can use this knowledge to restore to emotional, psychological, and physical health. Never before has a breakthrough in neuroscience offered such a paradigmatic shift of hope.

Neuroception → Perception → State → Feelings → Behavior → Story

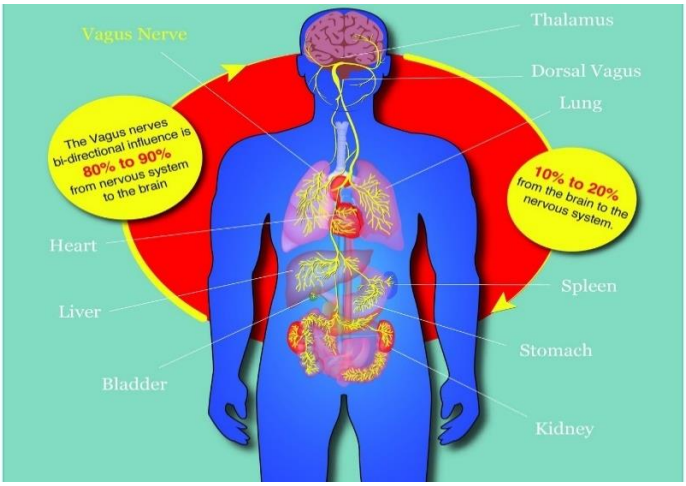
So, the first step in healing is to move our neuroception - what our autonomic nervous system is automatically sensing regarding safety and danger without our awareness to perception to awareness or perception. We can then appreciate what our physiological state is causing us to feel emotionally and subsequently change the behaviors that we then engage in. The ensuing story or narrative we give to this process in an effort to make sense of what we are sensing and feeling, if positive and healthy, helps us correct our autonomic state. On the other hand, if our narrative is false, as it often is (e.g., we often shame and blame ourselves or we catastrophize the situation), then our autonomic state becomes even more activated or shut down and our subsequent emotions become more anxious or depressed,

respectively, and we enter into a negative feedback loop, a process that leads to emotional problems/illness and/or physical problems.

There are two basic approaches to healing: Bottom up and Top Down.

Bottom up entails working with the body more directly. It is important to appreciate that, as previously noted, 80 percent of the fibers in the vagus nerve are sensory in that they go from the organs to the brain and 20 percent are motor in that they travel from the brain to various body organs. (Porges, 2017). This suggests that what our bodies tell us is indeed very important and we must make every effort to listen and heal on that level. Top down strategies which involve our thinking and hopefully more rational brain require a certain level of cognitive development and maturity so very young children will not be able to benefit from this approach (e.g., Cognitive Behavioral Therapy aka CBT)

.



As previously noted by Deb Dana, it is in a ventral vagal state and a neuroception of safety that brings the possibility for connection, curiosity, and change. She nicely presents a polyvagal approach which she calls the four R's (the first three and bottom up and the last is bottom down (Dana, 2018):

The Four R's

- Recognize the autonomic state
- Respect the adaptive survival response
- Regulate or co-regulate in a ventral vagal state
- Re-story

Recognize the autonomic state

I recommend that we make the **Autonomic Nervous System Precision Regulation Chart** our companion as we use it to recognize where we, our children, and/or others are on that continuum. In so doing, we become able to make what is **implicit** (under the table and outside of our awareness) **explicit** (on the table an in our awareness). We can use the color codes to describe for ourselves and for others where we and others are with just one neutral and non-judgmental word. This is particularly helpful for

children as well as this helps to give them a physical and emotional language that connect the mind with the body.

If we find ourselves in the **Orange Zone** to **Red Zone,** we are overly activated and are prone to experience:

- Rapid heartrate
- Hyperventilation
- Panic attacks
- Inability to focus or follow through
- Distress in relationships
- Emotions of fear, terror, rage, anger
- Possible health consequences to include heart disease, high cholesterol, high blood pressure, weight gain, memory impairment, headaches, chronic neck shoulder and back tension, stomach problems, and increased vulnerability to illness (lower immune response) (Dana, 2018).

If we find ourselves in the **Yellow Zone,** we are under activated or shutdown and re prone to experience:

- Slow heartrate
- Shallow breathing
- Withdrawal from others
- Emotions of sadness, depression, shame, disgust
- Possible health consequences to include chronic fatigue, fibromyalgia, stomach problems, low blood pressure, type 2 diabetes, and weight gain (Dana, 2018)

If we find ourselves in the **Green Zone,** we experience safety and connection and we are prone to experience:

- Regulated heart rate (vagal brake lowers heartrate by 20 beats per minute)
- Breath is full
- Feeling regulated
- We take in the faces of others
- We can “tune in” to conversations and “tune out” distractions
- We can see the “big picture”
- We can connect with the world and the people in it
- Able to reach out to others
- Able to play and take time to enjoy life and others
- Able to be productive in work
- Able to organize and follow-through
- Able to heal emotionally and physically
- Emotions of happiness, joy, love, peace, calm
- Possible health consequences include a healthy heart, regulated blood pressure, a healthy immune system, decreased vulnerability to illness, good digestion, quality sleep, and an overall sense of well-being (Dana, 2018)

Respect the adaptive survival response

One of the beautiful aspects of Polyvagal Theory is that it removes shame from the equation. Dr. Porges kindly states in reference to clients, "I was going to say that depending on the age of my client, but actually, regardless of age, the first thing to convey to the client that they did not do anything wrong… If we want individuals to feel safe, we don't accuse them of doing something wrong or bad. We explain to them how their body responded, how their responses are adaptive, how we need to appreciate this adaptive feature and how the client needs to understand that this adaptive feature is flexible and can change in different contexts."(Porges, 2017, p. 121 - 122). So, rather than shaming a woman for shutting down in dorsal vagal freeze when being molested or raped which will only fuel her shame, guilt, and emotional pain, we must compassionately inform her that her autonomic nervous system was brilliant and that, in reading the cues, immobilized her in a situation where fighting or fleeing could have possibly cost her her life. Many a judge have literally ruined survivors of abuse by blaming them for not running or fighting and invalidated their trauma and thus failed to honor their day in court.

- Regulate or co-regulate in a ventral vagal state

Once we recognize that we are dysregulated and we have pinpointed which defensive physiological state we are in and where we are on the emotional regulation continuum (see emotional regulation chart above) i.e., activation or slowing/shutting down, we can take action by using bottom-up self-regulation strategies and co-regulation strategies

As Herman Melville once wrote, "*We cannot live for ourselves, a thousand fibers connect us.*" Connection is a biological imperative according to Porges (2015). Our autonomic nervous system longs for connection and it is as though our biology that we are wired to connect. It is by means of co-regulation Dr Porges' co-regulation is the mutual regulation of physiological states between individuals. In life, it occurs first between mother and infant, but later extends to friends, partners, co-workers, and groups such as families, to name a few (Porges, 2017).

We humans are social creatures and "our nature is to recognize, interact, and form relationships" with others (Cacioppo & Cacioppo, 2014, p. 1). As we know, low birthweight babies need to connect for survival and positive co-regulation and connection and, when connected, these babies experience improved heart rate and temperature, breathing stabilization, more organized sleep, rapid improvement in state regulation, and reduced mortality, severe illness, and infection (Jefferies, 2012).

Connection is a wired-in biological necessity and isolation or even the perception of social isolation can lead to a compromised ability to regulate our autonomic state which diminishes our physical and emotional well-being (Porges & Furman, 2011). We can all appreciate that when we feel alone, we suffer. In a Ted Talk presentation, Cacioppo (2013) reported a rather shocking meta-analysis study of over 100,000 participants which found increased risks of dying early due to the following:

- Air pollution: 5% increased risk of dying early
- Obesity: 20% risk of dying early
- Alcoholism: 30% risk of dying early
- Loneliness: 45% risk of dying early

Deb Dana notes that when there is ongoing misattunement, when ruptures aren't recognized, and repaired, the autonomic experience of persistent danger ends up moving the system away from connection into patterns of protection and loneliness is the subjective experience (Dana, 2018).

So, when we recognize that we are suffering and dysregulated it is very helpful and sometimes lifesaving to seek safe others. Conversely, when we are emotionally regulated ourselves, we can offer our safe regulation to others, be they adults or children. This is a particularly important and essential component to good parenting. We can gift our safe regulation to ourselves and to others by choosing the following strategies below. Remember, through the process of neuroception others read our cues of safety just as we read theirs. Quid pro quo, we receive back what we give and vice versa. We would do well to practice these strategies, so they become automatic whenever we move out of the **green zone** and want to return.

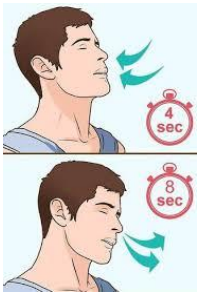
Below are strategies to regulate and co-regulate:

Kind eyes: As they say, the eyes are the window to the soul.

Melodious voice: Speak with a more melodious voice, full of prosody and life.

Smiling mouth and eyes: Smile not only with your mouth, but with your eyes. Whether or not we are aware, our neuroception scans for congruence between the smiling mouth and smiling eyes. Crow's feet wrinkles are testament to someone who lives a more joyful life. So maybe reconsider that Botox.

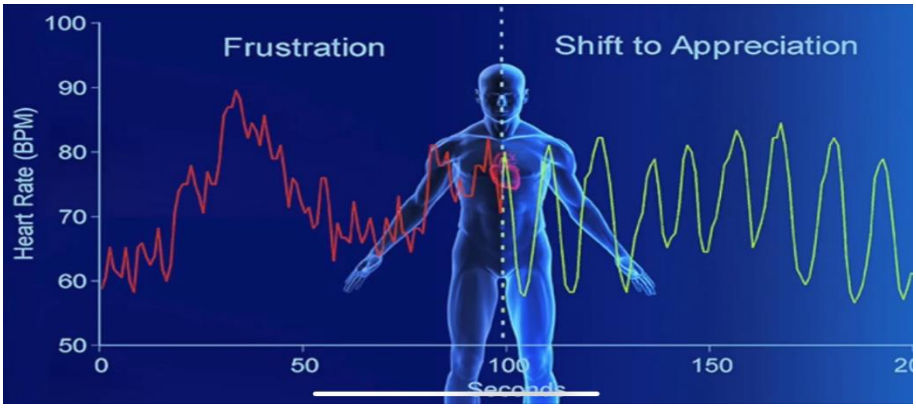
Avoid leaning in: Leaning in can be perceived as very threatening. Most of don't like it when others enter into our personal space, particularly in western cultures, and the end result is typically defensive activation moving us toward fight or flight or less typically, occasional freeze responses.



Slow and low Breathing: Our lungs are the only internal body organ that we can directly control, and proper breathing has a huge impact our health. Breathe slowly with exhalations longer than inhalations – breathing out slowly accentuates relaxation and actually can slow our heart rate by 20 beats per minute (vagal brake).

Heartfelt positive emotions: As we breathe, we should try to bring positive emotions such as gratitude, joy, and love, or any positive experience or memory into our heart. The importance of positive emotions in the heart is now supported by the latest neuroscience. For example, researchers at the HeartMath Institute have been studying the impact of positive emotions on heart health among other things since their foundation in 1991. The electromagnetic field of the heart can now be measured and extends outward to a distance of about three to five feet as compared to that of the brain which extends only 2 to 4 inches. When we focus on positive emotions, our heart radiates a nicely coherent wave as compared to a dysregulated wave when our emotions are negative. This has impact on not only our emotional and physical health but the health of others (not to overlook that we become more attractive to others for those playing the dating game, wink wink) (HeartMath Institute, 2020). Moreover, the heart has over 40,000 cells called sensory neurites which are very similar to the cells in the brain and there is evidence that the heart has a certain capacity for some types of memory as well as a gut level wisdom that guides us (Dispenza & Braden, 2019).

HeartMath® Institute
A Nonprofit Organization



HeartMath Institute (2020)

S
HeartMath Institute (2020

- Re-story

Now that we or ourselves and our loved ones are in a more regulated state by use of the bottom-up strategies discussed above, we should be more settled and thus, more able to use top-down strategies and correct the narrative or re-story the situation, be it a current event or something in our distant past (Dana, 2018, 2020; Kain, 2018). We humans by nature are meaning-making machines, autonomically pulled to the story (Dana, 2020). Sadly, our narrative is often negative as there is a bias toward the negative (Hanson & Mendius, 2009). Although this tendency to see the negative in things and in ourselves might have a survival advantage in that we will be vigilant for the tiger, expecting him to eat us when we are in the wild, it works against us when there is no threat. Additionally, victims of shock or acute trauma are particularly vulnerable to creating false narratives about themselves and the world around them (Porges, 2017; Dana, 2018, Kain & Terrell, 2018). In a more regulated state, we are safe to possibly do a Ctrl-Alt-Del or deletion of the old story and rewrite a new or revised version that better reflects our past or current autonomic adventure, one that allows us to accept and appreciate the heroic nature of our autonomic nervous system that enabled us to survive though the pain and/or trauma of the past and embrace the beauty and joy of what we now have and the bright future that lies ahead.

As Drs. Kain and Terrell eloquently write, “As our capacity increases, our narratives are likely to change, to include the sense of success at meeting challenges, of developing curiosity, or of a willingness to explore. Eventually, our narratives may also include access to a sense of safety and connection. Rather

than *I am constantly afraid and unhappy*, a client will begin tell himself a different story: *I am stronger than I thought and able to meet challenges with greater balance and success"* (Kain & Terrell, 2018, pgs. 101-192). They add, "At the same time, our somatic narratives will begin to change. We may literally experience changes in our symptoms – decreased inflammation, less pain, fewer migraines. Our illness narratives may alter to include the possibility of being free of pain and free of symptoms that have beleaguered us for most of our lives" Kain & Terrell, 2018, p 192).

Final Thoughts

We all struggle with managing and regulating our emotions. It is just part of the human condition. For some lucky few, who have inherited healthy genes and epigenomes, enjoyed the best of secure attachment early in life, experienced few Adverse Child Experiences while growing up, and lived connectedly, emotional regulation comes much easier. But most of us, to some degree, have taken on damage which has impacted on our ability to manage the emotional tempest within us and we are instead managed by it. No matter how bad our lives previous to this moment might have been, we can heal, we can restore our mind, body, and soul. Keep looking up, keep learning, keep persevering. You can do it, connected with all good things.

Jeff

References

Ainsworth, M.D. S. (1973). "The Development of Infant-Mother Attachment." In *Review of Child Development Research,* edited by B. Cardwell and H. Ricciuti, 1-94. Chicago, IL: University of Chicago Press.

Ainsworth, M. D., et al. (1978). Patterns of Attachment A Psychological Study of Strange Situation. Hillsdale, NJ: Lawrence Erlbaum.

Andreassen, C., and Fletcher, P. (2007). Early Childhood Longitudinal Study, Birth Cohort (ECLS–B) Psychometric Report for the 2-Year Data Collection (NCES 2007–084). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.

Barta, M. (2018). *TINSA: Trauma Induced Sexual Addiction*. North Charleston, SC: CreateSpace Independent Publishing Platform.

Berman et Al., Interacting with Nature Improves Cognition and Affect for Individuals with Depression." *Journal of Affective Disorders* 140, no. 3 (Nov. 2012): 300 – 305.

Bowlby, J (1960). Attachment. Vol 1 of Attachment and Loss. New York: Basic Books.

Briere J, Rickards S. (2007). Self-awareness, affect regulation, and relatedness: differential sequels of childhood versus adult victimization experiences. *J Nerv Ment Dis*. 195(6):497–503. doi: 10.1097/NMD.0b013e31803044e2. [PubMed] [CrossRef] [Google Scholar]

Cacioppo, J. et al., "Day-to-Day Dynamics of Experience-Cortisol Associations in a Population-Based Sample," *PNAS* 103 no. 45 (October 2006): 17058-17063.

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/17075058
doi link: https://doi.org/10.1073/pnas.0605053103

Cacioppo, J. et al., (2008). *Loneliness: Human Nature and the Need for Social Connections*. New York, NY: W. W. Norton & Company.

Cacioppo, J. (2013). "The Lethality of Loneliness," Ted Talk 2013, https://www.youtube.com/watch?v=_0hxl03JoA0

Cacioppo, J. et al. (2014). "Perceived Social Isolation Makes Me Sad: 5-Year Cross-Lagged Analyses of Loneliness and Depressive Symptomatology in the Chicago Health, Aging, and Social Relations Study," *Psychology and Aging* 25, no.2, 453-463.

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/20545429
doi link: https://doi.org/10.1037/a0017216

Cacioppo, J. T., & Cacioppo, S. (2014). Social Relationships and Health: The toxic effects of perceived social isolation. *Social and Personality Psychological Compass, 8(2), 58-72.*

PubMed link: *http://doi.org/10.1111/spc3.12087*

Cohen S. et al., The McGill Quality of Life Questionnaire: a measure of quality of life appropriate for people with advanced disease. A preliminary study of validity and acceptability. *Palliative Medicine* 9, no. 3 (1995): 207–219.

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/7582177
doi link: https://doi.org/10.1177/026921639500900306

Dana, D. (2018). *The Polyvagal Theory in Therapy: Engaging the Rhythm of Regulation.* New York, NY: W.W. Horton & Company.

Dana, E. (2020). *Polyvagal Exercises for Safety and Connection*. New York, NY: W. W. Norton and Company.

Delahooke, M. (2019). *Beyond Behaviors: Using Brain Science and Compassion to Understand and Solve Children's Behavioral Challenges*. Eau Claire, SI: PESI Publishing>

Dispenza, G. & Braden, G. (2019). Brain and Heart Gratitude. https://www.youtube.com/watch?v=znOZ-peRiY0 (Accessed June 6, 2020).

Doan, A. (2012). *Hooked on Games.* Coralville, IA: F.E.P. International, Inc.

Dunn E., Nishimi K, Gomez S., Powers A., & Bradley B. (2018). Developmental timing of trauma exposure and emotion dysregulation in adulthood: Are there sensitive periods when trauma is most harmful? *J Affect Disord.* Feb;227:869-877. doi: 10.1016/j.jad.2017.10.045. Epub 2017 Oct 28.

Felitti, V. and Anda, R. (2009). "The Hidden Epidemic: The Impact of Early Life Trauma on Health and Disease." https://www.theannainstitute.org/LV%20FINAL%202-7-09.pdf (accessed 3 August 2019).

Felitti, V. et al., (2014) "Chadwick's Child Maltreatment: Sexual Abuse and Psychological Maltreatment," Volume 2 of 3, Fourth Edition.

Felitti, V.J., Anda, R.F., Nordenberg, D, Williamson, D.F., Spitz A.M., Edwards, V.K., Koss, M.P., and Marks, J.S., (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The Adverse Childhood Experiences (ACE) Study. *American Journal of Preventative Medicine*, vol 14 (4), 245-258.

Felitti, V. "Adverse Childhood Experiences and the Risk of Depressive Disorder in Childhood," *Journal of Affective Disorders* 82 (November 2004): 217-225.

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/
doi link: http://doi.org/

Fraga, M. F., et al. (2005). Epigenetic differences arise during the lifetime of monozygotic twins. Proceedings of the National Academy of Sciences 102, 10604–10609.

GoodTherapy https://www.goodtherapy.org/blog/psychpedia/ace-questionnaire. (accessed May 5, 2020)

Hanson, R. & Richard M. (2009). *Buddha's Brain: the practical neuroscience of happiness, love & wisdom*. Oakland, CA: New Harbinger Publications.

Hari, J. (2015) "Everything You Think You Know about Addiction Is Wrong." TED Global London, 14:42. June2015.
https://www.ted.com/talks/johann_hari_everything_you_think_know_about_addiciton_is_wrong?language=en

Hari, J. (2018). *Lost Connections: Uncovering the Real Causes of Depression – And the Unexpected Solutions.* Berryville, VA: Berryville Graphics, Inc.

Heijmans, B. T., Tobi, E. W., Putter, A., Blauw,G. J., Susser, E. S. Slagboom, P. E., Lumeye, L. J. (2008). Proc Natl Acad Sci U S A. 2008 Nov 4; 105(44): 17046–17049.
Published online 2008 Oct 27. doi: 10.1073/pnas.0806560105
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2579375/

HeartMath Institute 2020 https://www.heartmath.org/about-us/ (Accessed June 6. 2020).

Jefferies, A. L. Canadian Paediatric Society, Fetus and Newborn Committee. Kangaroo care for the preterm infant and family. *Paediatrics & Child Health, 17*(3), 141-6.

PubMed link: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3287094/ (Accessed June 3, 2020).

Kain, K.L. & Terrell, S.J. *Nurturing Resilience: Helping Clients Move Forward from Developmental Trauma.* Berkeley, CA: North Atlantic Press.

Kanter, J. (2007). John Bowlby, Interview with Dr. Milton Senn. Beyond the Couch: The Online Journal of the American Association for Psychoanalysis in Clinical Social Work, Issue 2. Retrieved from: http://www.beyondthecouch.org/1207/bowlby_int.htm

Kasser, T. (2003). *The High Price of Materialism.* Cambridge: MIT Press.

Koenig H. et al., "Attendance at religious services, interleukin-6, and other biological parameters of immune function in older adults," *International Journal of Psychiatry Medicine*, no. 27 (1997): 233–250.

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/9656726
doi link: https://doi.org/10.2190/40NF-Q9Y2-0GG7-4WH6

Laible, D. (2011). "Does it matter if preschool children and mothers discuss positive versus negative events during reminiscing? Links with mother reported attachment, family, emotional climate, and socioemotional development." *Social development*, 20(2), 394-411.

Langevin R, Hebert M, Allard-Dansereau C, & Bernard-Bonnin AC (2016). Emotion Regulation in Sexually Abused Preschoolers: The Contribution of Parental Factors. *J Trauma Stress*. 29(2):180–184. doi: 10.1002/jts.22082. [PubMed] [CrossRef] [Google Scholar]

Laura, B. (2008) Epigenomics: The new tool in studying complex diseases. *Nature Education* 1(1):178 https://www.nature.com/scitable/topicpage/epigenomics-the-new-tool-in-studying-complex-694/ (accessed June 11, 2020).

Levine, P. (2008). *Healing Trauma.* Boulder, CO: Sounds True, Inc.

Lewis-Morrarty, E., Degnan, K.A., Chronis-Tuscano, A., Henderson, H.A., Pine, P.S., & Fox, N.A. (2015). Infant attachment security and early childhood behavioral inhibition interact to predict adolescent social anxiety symptoms. *Child development*, 86(2), 598-613.

Louv, R. (2005). *Last Child in the Woods.* New York: Workman Publishing.

Lyons-Ruth K. (1996). Attachment relationships among children with aggressive behavior problems: the role of disorganized early attachment patterns. *J Consult Clin Psychol*. 64(1):64-73. doi: https:10.1037/0022-006X.64.1.64

MacLean, P. (1990). *The Brain in Evolution.* New York, NY: Plenum Press.

Main, M., & Solomon, J. (1986). Discovery of an insecure-disorganized/disoriented attachment pattern. In T. B. Brazelton & M. W. Yogman (Eds.), *Affective development in infancy* (p. 95–124). Ablex Publishing.

Marmot et al. (2002). "When reciprocity fails: effort-reward imbalance in relation to coronary heart disease and health functioning within the Whitehall II study," *Occupational and Environmental Medicine,* 59

McLaughlin KA, Koenen KC, Hill ED, Petukhova M, Sampson NA, Zaslavsky AM, Kessler RC (2013). Trauma exposure and posttraumatic stress disorder in a national sample of adolescents. *J Am Acad Child Adolesc Psychiatry*. 2013;52(8):815–830 e814. doi: 10.1016/j.jaac.2013.05.011. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

McLaughlin KA, Kubzansky LD, Dunn EC, Waldinger R, Vaillant G, Koenen KC (2010). Childhood social environment, emotional reactivity to stress, and mood and anxiety disorders across the life course. *Depression and Anxiety*. 2010;27(12):1087–1094. [PMC free article] [PubMed] [Google Scholar]

Merck Manual. https://www.merckmanuals.com/home/brain,-spinal-cord,-and-nerve-disorders/autonomic-nervous-system-disorders/overview-of-the-autonomic-nervous-system (accessed August 20, 2019).

Monbiot, G. (2014). "The Age of Loneliness is Killing Us," *Guardian,* October 14, 2014. https://www.theguardian.com/commentisfree/2014/oct/14/age-of-loneliness-killing-us (accessed September 8, 2019).

NIH (2020). https://ghr.nlm.nih.gov/primer/howgeneswork/protein. (accessed June 10, 2020).

New York Times (2018). https://www.nytimes.com/2018/01/31/science/dutch-famine-genes.html (accessed 9 June 2020).

Newman, Ashiko E. (2017). "Poor Attachment and the Socioemotional Effects During Early Childhood." Electronic Theses, Projects, and Dissertations. 554. https://scholarworks.lib.csusb.edu/etd/554

Porges, S. W. (2017). The Pocket Guide to Polyvagal Theory: The Transformative Power of Feeling Safe. New York. NW: W. W. Norton & Company Ltd.

Porges, S. W., & Furman, S. A. (2011). The Early Development of the Autonomic Nervous System Provides a Neural Platform for Social Behavior: A Polyvagal Perspective. *Infant and Child Development* 20(1):106 - 118 · DOI: 10.1002/icd.688

Rothschild, B. (2017). Autonomic Nervous System: Precision Regulation Chart. (I highly recommend for purchase).
https://www.amazon.com/Autonomic-Nervous-System-Table-Laminated/dp/039371280X/ref=sr_1_15?dchild=1&keywords=deb+dana&qid=1590326813&s=books&sr=1-15

Sapolsky, R. (2002). *A Primate's Memoir.* London: Vintage.

Schaffer H.R, Emerson P.E. (1964). "The Development of Social Attachments in Infancy." Monogr Soc Res Child Dev. 29:1-77. doi:10.2307/1165727

Shields A, & Cicchetti D. (1997). Emotion regulation among school-age children: The development and validation of a new criterion Q-sort scale. *Developmental Psychology*. 1997;33(6):906–916. doi: 10.1037/0012-1649.33.6.906. [PubMed] [CrossRef] [Google Scholar]

Shonkoff, J.P. (2015). https://developingchild.harvard.edu/media-coverage/take-the-ace-quiz-and-learn-what-it-does-and-doesnt-mean/ (Accessed May 6, 2020).

Strawbridge, W. et al., Frequent attendance at religious services and mortality over 28 years. *American Journal of Public Health*, No. 87 (1997): 957–961.

PubMed link: https://www.ncbi.nlm.nih.gov/pubmed/9224176

Strahl, B., Allis, C. (2000). The language of covalent histone modifications. Nature 403, 41–45 (2000). https://doi.org/10.1038/47412

Suitable my Nature (2014).
https://www.nature.com/scitable/topicpage/epigenomics-the-new-tool-in-studying-complex-694/ (accessed July 11, 2020).

Thompson KL, & Hannan SM, Miron LR. (2014). Fight, flight, and freeze: Threat sensitivity and emotion dysregulation in survivors of chronic childhood maltreatment. Personality and Individual Differences. 69:28–32. doi: 10.1016/j.paid.2014.05.005. [CrossRef] [Google Scholar]

University of Lancaster

https://www2.le.ac.uk/projects/vgec/highereducation/epigenetics_ethics/Introduction (Accessed June 9, 2020).

VeryWellMind (2019). https://www.verywellmind.com/what-is-attachment-theory-2795337#citation-8 (accessed May 2, 2020).

VeryWellMind (2019). https://www.verywellmind.com/mary-ainsworth-biography-2795501 (accessed May 2, 2020).

VeryWellMind (2020). https://www.verywellmind.com/ (accessed May 3, 2020).

Vettese LC, Dyer CE, Li WL, Wekerle C. (2011). Does self-compassion mitigate the association between childhood maltreatment and later emotion regulation difficulties? A preliminary investigation. *International Journal of Mental Health and Addiction.* 9(5):480–491. doi: 10.1007/s11469-011-9340-7. [CrossRef] [Google Scholar]

What is Epigenetics (2019). https://www.whatisepigenetics.com/what-is-epigenetics/ (accessed June 10, 2020).

Vincent, V. (2009). https://www.youtube.com/watch?v=KEFfThbAYnQ (accessed February 17, 2020).

Wikipedia (2020a). Epigenetics https://en.wikipedia.org/wiki/Epigenetics

Wikipedia (2020b). https://en.wikipedia.org/wiki/Emotional_self-regulation. (accessed April 29, 2020).

Yehuda, R. et al. (1998). "Vulnerability to Posttraumatic Stress Disorder in Adult Offspring of Holocaust Survivors," *American Journal of Psychiatry* 155(9) (September): 1163-71. doi: 10.1176/ajp.155.9.1163.

Edited 17 August 2020