THE MASTER Series

THE MASTER SERIES: TRAUMA EDITION -PROFESSOR STEPHEN PORGES

Professor Stephen Porges is a Distinguished University Scientist at Indiana University, where he is the Founding Director of the Traumatic Stress Research Consortium. He is the Professor of Psychiatry at the University of North Carolina at Chapel Hill, and Professor Emeritus at both the University of Illinois at Chicago and the University of Maryland.
Stephen has published more than 400 peer-reviewed papers across several disciplines, including anesthesiology, biomedical engineering, critical care medicine, ergonomics, and exercise physiology among others. In 1994, he proposed the Polyvagal Theory, a theory that links the evolution of the mammalian autonomic nervous system to social behavior, and emphasizes the importance of physiological state, and the expression of behavioral problems and psychiatric disorders. Steven, it's a pleasure to be sharing this with you, and welcome.

THE BACKGROUND

Over the decades, I started to understand that there was something very special about being a social mammal; and that we had a physiology that gave us an onboard toolkit to down-regulate threat reactions. And through my interactions that actually started with Peter Levine in the trauma world, in the 1970s, late 1970s, early 1980s. And then later with Bessel van der Kolk, I learned a lot about what was happening to the individual who experienced trauma; and that their nervous system re-tuned, so that threat reactions were no longer easily ameliorated, or mitigated by social behavior, which was the go-to strategy that we all have. And when we start to understand our evolutionary heritage, we start realizing that the social behavior that mammals have requires a nervous system that could turn off threat, and they had to signal and cue each other.

But for individuals with trauma history, those cues of safety now often become cues of threat. And this will become the theme running through this presentation. They become cues of threat, because they're now associated with violation of trust and injury. So what this whole talk is about, is about our personal journey to claim that evolutionary heritage as a social species. And that theme is what therapy is about, in terms of dealing with people who have experienced severe trauma. It's the experience of the trauma, and not the event. It's the re-tuning of the nervous system to the event, and not the event. And I'll be going through this, and emphasizing this throughout the three modules that I'll be presenting.

So, first of all, for Polyvagal Theory, we need a new vocabulary. And the first module is really kind of an introductory level, where I'll talk about reciprocity, co-regulation and connectedness. And what that means, is role-playing or role-sharing, and the notion of a biological imperative is that our species required so that we could co-regulate with each other. We could be safe with another. We could trust, and we could feel connected. It was part of our journey. And when people have difficulty in this, they really express this as a violation of what their dreams and, in a sense, their neural or evolutionary motivation is.

To enable us to survive, the autonomic nervous system changed during evolution, this gives us the clues of both understanding the problems that occur following trauma, and also portals of intervention. In the second module, I'll focus on how the autonomic nervous system changed, and how it created a hierarchical system that paralleled our evolution from a social vertebrae to social mammals; that literally, as a function of challenges, we unfold, and start using older and older circuits.

And so, that concept of our reaction to challenges is really based upon a neurologist's principles. John Hughlings Jackson, who in 1884, coined the term dissolution, which is evolution in reverse. So in a sense, the product of trauma is evolution in reverse; we lose our mammalian heritage. The social engagement system, which is this integrated system that regulates the muscles of our face and head with a Vagal regulation of our viscera, is how we regulate our bodies, through cues of safety and intonation of voices, facial expressivity. And the real emphasis here, is that trauma re-tunes that autonomic nervous system, compromising our ability to feel safe enough to connect with others, although the desire to connect remains.

Throughout this presentation, I will also introduce another term that's unique to the Polyvagal Theory, and that is neuroception. And what that does, is it describes our nervous system's reaction to features in the environment, whether they are safe or dangerous or life-threatening. And this occurs outside the realm of awareness. So it shifts the model of how we react to the world, from an intentionality and an awareness model with responsibility and guilt, to a reaction that our nervous system is doing. It's wired into us. And we, as mammals, can respond to cues of safety; but we, as mammals, like all other vertebrates, can react to cues of threat. But mammals, uniquely, in this evolutionary journey, are different. They can cue each other for safety. And this is the important clue to what Polyvagal Theory gives to therapists.

So the autonomic nervous system is literally this intervening variable between the treatment or the input, and the client's reaction. So we are really emphasizing that your underlying physiological state biases, how you respond to the world; intuitively we understand that, but we'll get a greater, a more detailed discussion as you continue reading.

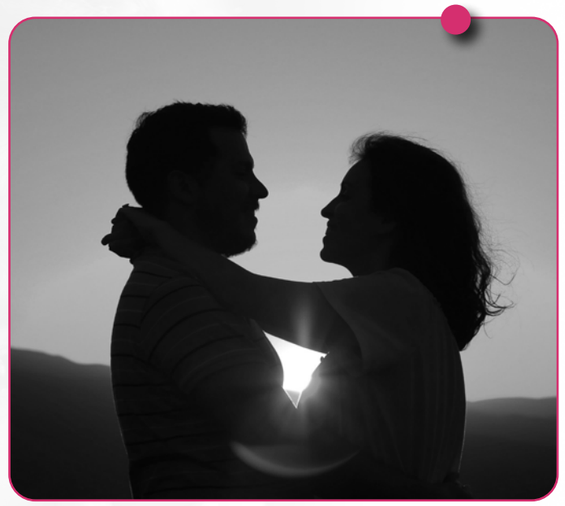
And the final module discussed will be an application module. And that is, treating the autonomic nervous system as this intervening variable, which will determine how effective and how accessible that client is to your interventions. And finally, a model of what I call Polyvagal Informed Therapies, which target the intervention as shifting that intervening variable, the physiological state, and then seeing if the client is now more accessible to other forms of intervention in therapy.

RECIPROCITY, CO-REGULATION, AND CONNECTEDNESS

So, to start with, we're going to talk about reciprocity, co-regulation, and connectedness. A biological imperative is what a living organism needs to perpetuate their existence. So we have literally been indoctrinated, and have grown up with a Darwinian concept of survival of the fittest; but we have often corrupted what that means. We tend to think that survival of the fittest is survival of the strongest; and this results in bullying behavior. It results in a sense, on our political platforms, of dealing with threats. But that's not what our nervous system wants. Our nervous system doesn't like threat, but it really wants cues of safety. So removal of threat is always going to be good, but it's not going to solve everything... It's not going to be the solution to what our bodies want.

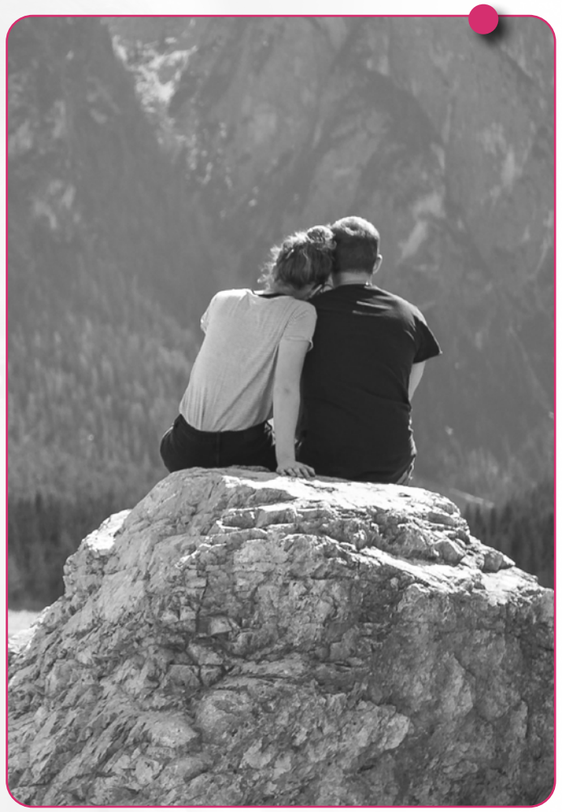
So there's another perspective, and this was presented by Theodosius Dobzhansky, an evolutionary biologist. And he said that fittest may also be the gentlest, because survival often requires mutual help and cooperation. And I think, in our background, we need to think, "That is what success is." And in your clinical practices, you'll meet people who appear to present themselves as successful, but they are not successful human beings. And that's why they're in therapy; they don't feel good about their lives. And it's not that they haven't acquired enough stuff; it's that they haven't fulfilled their biological imperative, and that is to connect with others, and feel safe in the relationship.

We can see this biological imperative early in life. We can see the reciprocal interaction between mother and infant; and the cues are bidirectional. The cues are not solely from mother to infant. The infant is conveying to the mother that the infant is, in a sense, accepting the support and the love. And if the infant isn't, if the infant is fussy and difficult and rigid, then the mother, and the father in many cases, feels that the child doesn't love them. They're not getting that reciprocity. Similarly, if a parent is rigid in their ability to hold the infant, and doesn't make good facial expressivity or intonation of voice, the cues of safety are not coming to the infant; and the infant will withdraw from that interaction.



We see this in friendships; and I want you to start looking at the faces, and to look at the upper part of the face. And there's an orbital muscle around the eye, called the orbicularis oculi; and that upper part of the face is going to convey a lot. And when you see exuberance in the face, it's the upper part of the face; because the lower part of the face can also be a organ of aggression: biting, growling. But the upper part of the face is linked in the brain stem, to the regulation of our autonomic state, our heart. So when our faces become exuberant, we're basically in calm physiological states, which means we are physiologically accessible. And when you look at these pictures, you feel and sense this accessibility between the two individuals. We feel and sense the proximity, the comfort, in the presence of each other. And we can look at this when we see a mother and an infant, we see peers, we see another primate with her infant; but we can also see, not trans-generational, but a trans-species relationship.

There are other social mammals that are not humans: dogs, and horses and cats, which fulfill this co-regulatory function for many individuals. So, we see that there are social engagement behaviors that include face-to-face behaviors. And these, functionally within Polyvagal Theory, can be viewed as neural exercises. And they are facial gestures, they are prosodic intonation of voice, even listening. But the underlying part of it is also there's reciprocity. So when there's listening, there's also vocalizations, but there's role reversals. You talk, I listen; I talk, you listen. And these face-to-face interactions are often used, a feature of therapy, they're a feature of education, and they're a feature of successful activity in the workplace.



But we also know that when there is no reciprocity: when we don't have our voice, when we're not being witnessed, the relationship doesn't do well. And we can see that there's another dimension that is not just face-to-face interaction, but there's an immobilization without fear, in which bodies conform to each other without the need to have social interaction through looking at the person, but they can be near the person. Often it's initiated by vocalizations which don't require eye contact. And then the bodies feel safe enough to give up their defenses. And we can see this, of course, also, in our trans-species relationships.

But the interesting part, is that the dog in this picture and the woman, are having a similar physiological experience in their body. And we see this again, in a sense, moments of intimacy and feeling safe in the arms of another. And this is from Calvin and Hobbs, and you get the same feeling from the cartoon. And you get the same feeling looking at this picture of close friends, or mates; and their bodies conforming to each other. And you can see that even Hallmark cards use this same image for their Valentine's Day cards. So you can see that there's iconic imaging about bodies conforming to each other, without muscle tension, without becoming tense or pulling away.

So, physical contact while immobilizing without fear, is this phase two of our engaging others. It's the phase two of how we co-regulate with one another. And this results in maintaining a physiological state that supports health, growth, and restoration. It optimizes our body, our ability to relax, rest, sleep, digest, and perform bodily processes. Basically, it optimizes the homeostatic functions that our body needs to do for growth, health, and restoration. It enables feelings of trust, safety, and love.

So now we have the psychological overlay to homeostasis, and that is to co-regulate with another, and which enables trust, safety, and love. And this does not require face-to-face interactions, but it's a challenge for mammals, because it requires a giving up of vigilance. And for mammals, giving up vigilance is often risky. And we find that following a trauma or severe adversity, this ability to give up that hyper-vigilance is extremely difficult.

So the fittest may also be the gentlest, because survival often requires mutual help and cooperation; it enables us to connect with others. And mammals need the signal that they are safe to approach or be approached. And this connectedness is what enables co-regulation.

Now, we can also look at other relationships, like this is a mammal-reptile interaction. I want you to take these slides as if they're a metaphor for some of the interactions that you may have observed, or may have been in. So, this is an adolescent hippopotamus who's attached itself to a large land tortoise following a tsunami. So there's a type of bonding that this mammal has established with this reptile. But what happens as we look at this, the mammal is safe and comfortable with the reptile. And you see, even in looking at the face of this mammal, that the upper part of face is providing something very similar that you see in humans and in dogs. The upper part of face is relaxed and glowing.

Now, there's an interesting point here: and that is, that face of the reptile is not involved with any expression. So what do we see in the mammal? We see that the mammal has immobilized without fear, because important to our nervous system, is predictability. And the reptile in this situation, is extraordinarily predictable. So it provides a neural metaphor for the mammal's nervous system, a metaphor of safety, but what is missing? Reciprocity. What is missing? Face-to-face interactions.

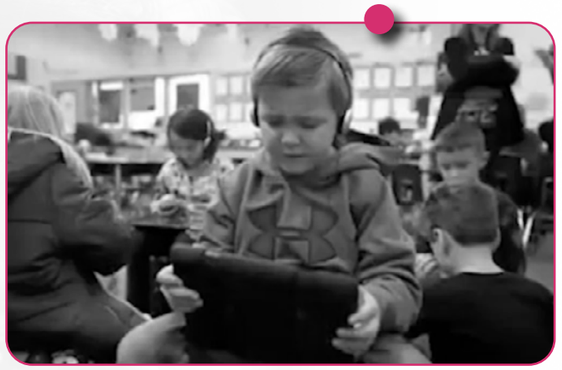
So, what you can see, is that in some relationships, individuals are in reptilian-mammalian-like relationships. And there's, in a sense, an advantage, or let's say a use; a facility or utility of that relationship, that it's predictable. And so, they feel safe in that predictability, but it's not challenging, and it doesn't have reciprocity, and the-face-to face interactions are limited.

So, what happens when there's a disruption in co-regulation? What happens when this occurs, is a disconnect in face-to-face interactions; this disrupts opportunities for co-regulation, and potentially triggers bio-behavioral states and defense.

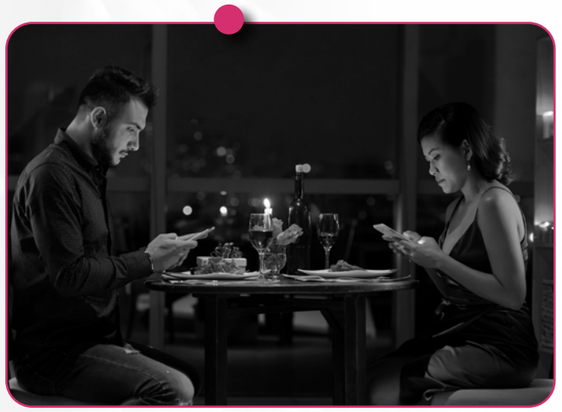
Because once you violate that neural expectancy, that predictability, your nervous system interprets it as a potential threat. And acute disconnectedness disrupts opportunities to co-regulate. So what you have is that initially we react as if it's a trigger of threat; and if it's chronic, it starts to disrupt our ability to co-regulate.

And we can see this appear in our culture. For example, in a doctor's office, if the physician is focusing on the monitor, how do you think that makes the patient feel? The patient feels in a state of threat, because there's no co-regulatory cues coming from the physician in this setting.

If we see a picture of a mother on a smartphone while carrying her baby, what's the baby doing to co-regulate? The baby can't co-regulate in that setting, so instead starts putting the hand in the mouth, sucking and chewing on their own hand, as a way of regulating their physiology. And later, we'll get into what sucking, swallowing is all about. It's linked in the brain stem to the area that controls the Ventral Vagus, our calming system. So we can actually see the use of sucking, swallowing as a way of trying to self-regulate state.



We can see this child in the classroom, and all we need to do is look at the forehead of this child, to realize this is not a relaxed setting. But if we look to the rear, and we see the teacher is standing up, they're in a social, co-regulatory state.



And this is a couple at dinner, and you can see the... Looking at the small screen of the smartphone, you can see in the upper part of the face, it's a stressed look; is not a relaxed one. If we start looking at larger screens, our faces don't have that same type of tension in them. But you wonder, if you go out to eat, and you're in a social setting, why are people using these devices, as opposed to interacting with others?

This is the image I always find amusing because this is a couple that is in an intimate situation. And what is the woman doing? She's texting. And apparently, according to a webpage I found, younger people, let's say the 20-30 year range, about 20% of them text while having intimate relationships. This, to me, is just... It just doesn't... It's hard for me to understand.

POLYVAGAL THEORY: MAMMALS CO-REGULATE (BIOLOGICAL IMPERATIVE)

So, Polyvagal Theory is about the fact that mammals have this capacity to co-regulate, because it's part of their evolutionary heritage. And for them to co-regulate, it's the pathway for them to connect with one another, which is their biological imperative. So, humans are social mammals, and they need relationships with others to regulate their physiology, because the regulators of physiology are embedded in relationships. And we can see this in looking at mothers and infants. And that quote about social regulators of physiology being embedded in relationships, was coined and said by Myron Hofer, oh, probably 30 years ago. Myron Hofer was a psychiatrist who studied mother-infant interactions. And we can see the co-regulation in this family unit of apes.

So, what happens is that connectedness, as a biological imperative, elevates our social behavior from a psychological concept to a neuromodulator. So social behavior is a portal to regulate the neural regulation of our autonomic nervous system, our physiological state. Social behavior calms us down, which means, it is a neuromodulator.

Cues of safety have to mutually and synchronously, down-regulate threat reactions to bode accessibility and proximity.

So we have accessibility that we talk about in psychological space, but have physical proximity, which is in measurable, physical space. The body has a need to co-regulate bio-behavioral state through engagement with others. And what we're doing during the pandemic, is attempting, heroically, to co-regulate our states through Zoom, through video conferencing. Now it's not perfect; it's not bad, but it's not perfect.

So, connectiveness is this ability to mutually, synchronously, and reciprocally regulate the physiological and behavioral state. Synchronous means it's in the same time; it's not offset. So we can just start asking questions like, if you text someone, and they don't respond rapidly enough, what happens to your visceral? You start getting upset. And that's because we want to have our social interactions in real time, in a synchronous way, so that when I say something, you hear me, and then you can respond back to me, and I can create this reciprocity. That's what's wired into our nervous system. Connectedness provides that neuro-biological mechanism, to link social behavior and both mental and physical health.

So, Polyvagal Theory provides an explanation, an understanding of how trauma re-tunes autonomic state, compromising the ability to feel safe enough to connect with others. So, one of the themes that therapists often are aware of, is that when someone is coming in for therapy, they're just not feeling safe enough to create relationships. They may describe the fact that when they start a relationship, they're very excited and optimistic; but suddenly the body says, "Can't do this." And this is what trauma does. Trauma can re-tune our autonomic state, moving it from a state of feeling safe, to now, a state of being on high alert for danger, for threat. Trauma re-tunes or changes or diminishes our opportunities to co-regulate.

This is a picture of a young man giving his girlfriend a rose; but if we look at the faces, you can see that this face does not look accessible, it's not making good eye contact and it looks disassociative; and even the positioning of the rose is in too close proximity. It's pushed into the face, especially for a person who is not projecting cues of accessibility.

So, trauma creates a chronic disruption of connectedness. It shifts our autonomic state. It distorts our social awareness. It displaces our social engagement behaviors with defensive reactions of fight-or-flight or immobilization; and we'll start introducing this concept shortly.

For many of us, we learned only about a fight-flight defensive system. We did not learn about an immobilization, dissociative defense system. And Polyvagal Theory identifies that from our physiology. Trauma interferes with the healthful, reciprocal co-regulation of physiological state, and disrupts our more optimal neuro-physiological regulation, that would lead to better mental and physical health. Trauma disrupts connectedness; trauma and abuse lower the threshold to trigger the defensive behaviors, of being that of an aggressor or in a sense, being a victim; that disrupt connectedness and the ability to co-regulate.

Social behaviors are neural exercises that promote neuro-physiological states, supporting mental and physical health, exercising the Vagal break, and what we'll be learning about, the integrated social engagement systems. So, trauma disrupts our pathway to our evolutionary birthright of being a social species.

Our society doesn't help, because does our culture dampen access to our social engagement system? We showed these illustrations of social media, or smartphones, or computers, or i-pads, that interfere with our normal, let's say evolutionary, way of regulating our physiology through social interaction.

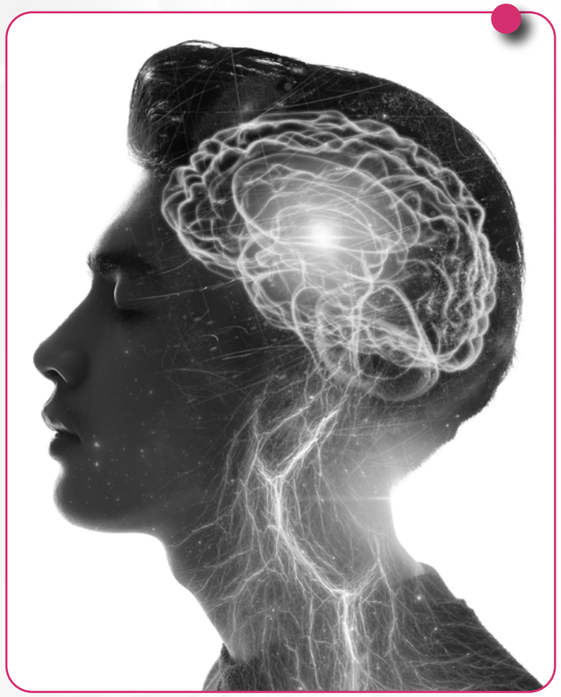
Do we have sufficient opportunities to exercise our social engagement system? And this is an interesting dialogue; because we don't need to be socially engaged all the time, but we need opportunities to socially engage, to help us regulate our physiological state. And that, we have to learn: "What does your nervous system need to feel safe? What is the impact of email, texting, and other virtual social interactions, on our social engagement system? And what has been the impact of the pandemic on the system?"

Because the pandemic is a threat; it's here, it's real. But also, our reaction to the pandemic has been social isolation. So we have placed our nervous system in a paradoxical situation. We have placed it under threat, and we have minimized the opportunities for it to co-regulate through portals and pathways, that have historically been part of how we functioned.

And the other part is that the pandemic has also forced certain risky environments; it's forced people into risky environments. Not all homes are safe, not all relationships are supportive, and appropriately co-regulatory. And so, as we socially isolate, we not only lose the opportunity for more diverse options of co-regulation, but we may also be put into risk environments of being injured or under great threat. And this is true of children, who now frequently are being homeschooled during this pandemic.

So, the autonomic nervous system changed during evolution. I start to put this together into an understanding of my research; and I've been doing research since the mid-1960s. And the theory came out after about 30 years of my work. And what it really was arguing, was that our physiological state enabled us to be social, because it provided the ability for us to down-regulate our defenses. So the title of the initial presentation of the theory was Orienting in a Defensive World: Mammalian Modifications of our Evolutionary Heritage, a Polyvagal Theory. And what the theory emphasized, was that there was a modification to our vagal, our parasympathetic nervous system, that linked the regulation of the vagus to the muscles and nerves, or say the nerves that control the muscles of the face and head. So our autonomic regulation got tied into reacting to other people's social cues.

So, when I started in the area that was called psychophysiology, it was all about measuring physiology as a peripheral indicator of what was going on in the brain; what was going on emotionally, what was going on intentionally, what was going on cognitively. But by the time I got into this for about 30 years, I realized, it wasn't a correlative system; it was an integrative system. Our physiology was deeply integrated into our experiences of being a human being; and that it worked in a bidirectional way, meaning from our body to our brain, and from our brain to our body. And we cannot think of things as being top-down or bottom-up; things are going in both directions, and they're integrated. And that's where Polyvagal Theory entered the story.

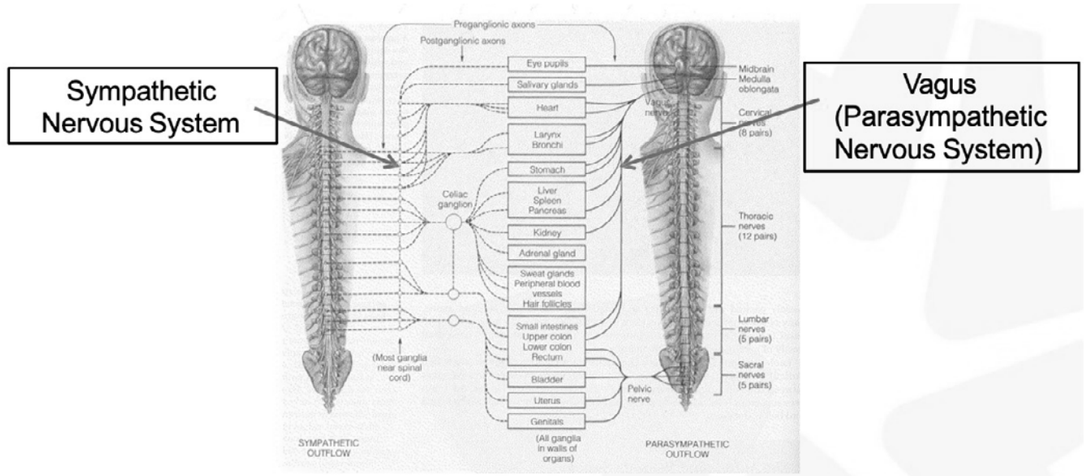


And then, in 2007, I expanded it. And from what I was calling a theory, to what I was really emphasizing as a perspective now; to start look at human behavior and human physiology, and even therapeutic models. And what the perspective is, really is, to emphasize that the physiological state that we're in, biases how we react to the world; and the physiological state that we're in can literally be a target portal for interventions. So the Polyvagal perspective emphasizes how an understanding of neurophysiological mechanisms, and those phylogenetic shifts in neuro-regulation, lead to different questions, paradigms, explanations, and conclusions, regarding autonomic function in bio-behavioral processes, rather than peripheral models.

And when we look at the autonomic nervous system, this is the way that people initially saw it. They saw it as a paired antagonistic system that was, you had a sympathetic nervous system, which was functionally the accelerator; it increased activity of the heart, enabled sweat glands to be more active. And it was thought about as being, in a sense, like stepping on the gas pedal. And you can see the sympathetics form a series of ganglia. They come off the spine, and then go to a variety of organs.

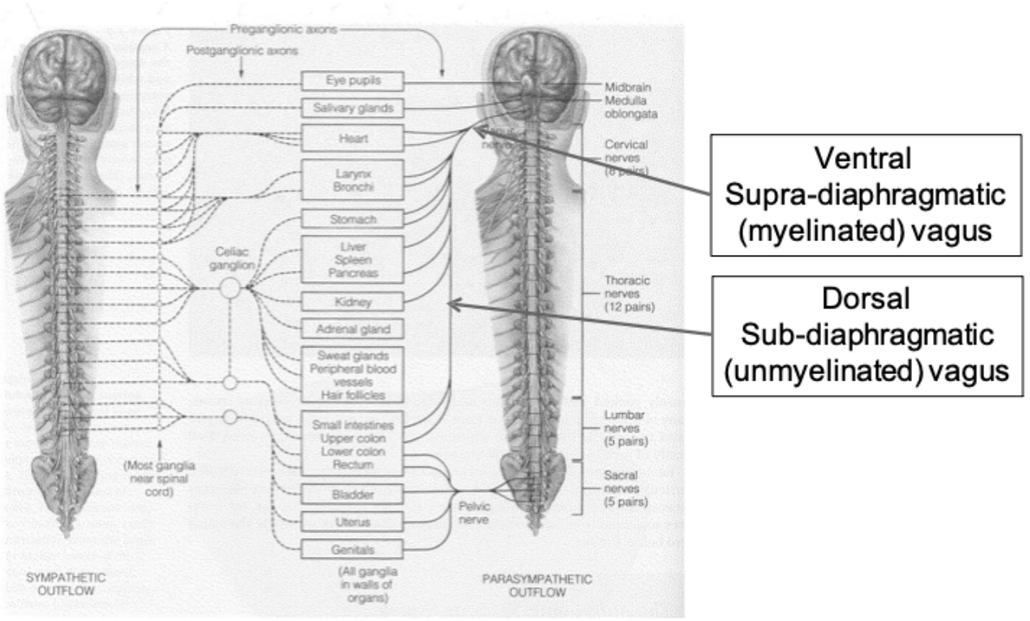
And in parallel to the impact of the sympathetic nervous system, was a parasympathetic nervous system, which in general, served as a break, or a calming of that system. So, the parasympathetic nervous system was viewed as a homeostatic system, while the sympathetic nervous system was used as the energetic system, the system of fight-flight.

THE AUTONOMIC NERVOUS SYSTEM: A PAIRED ANTAGONISM PERSPECTIVE



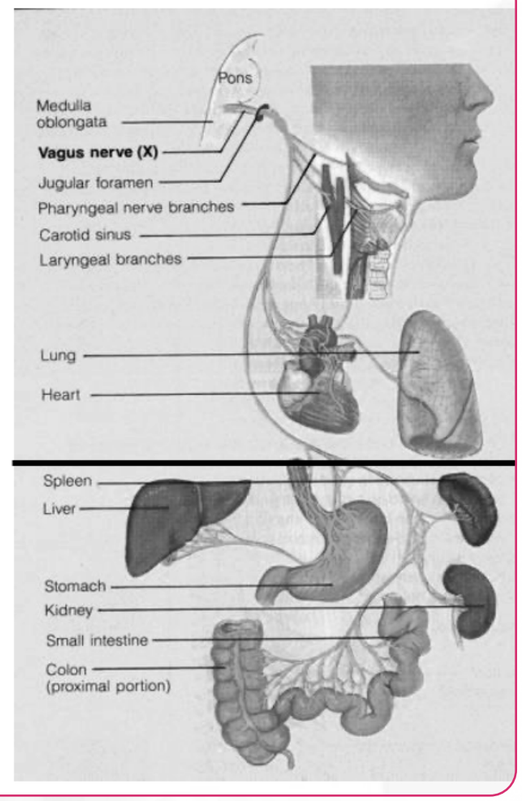
However, when Polyvagal Theory came on, it identified that there were two evolutionarily different, or two different branches of the Vagus that were there neuro-anatomically in mammals, and they had different evolutionary histories; that the Ventral Vagal pathway, which regulates primarily the organs above the diaphragm, therefore the word supra-diaphragmatic, comes from a myelinated pathway. And this pathway is a unique change from the reptilian ancestors. And the Dorsal Vagal pathway, which emerges more dorsal in the brains stem; mammals still have this. And this goes primarily to the organs below the diaphragm.

It doesn't mean that both pathways may influence organs above or below, but it means that the primary connections are supra-diaphragmatic for the Dorsal Vagus, and supradiaphragmatic for the Ventral Vagus. The Ventral Vagus in the brainstem is connected with the neural regulation of the muscles of the face and head, while the Dorsal motor Nucleus is primarily the Vagal pathway regulating organs below the diaphragm, and much more related to constructs like homeostasis.



Supra-diaphragmatic vagus

Sub-diaphragmatic vagus



And we can start seeing that in this Polyvagal terminology, we have is supra-diaphragmatic and a supra-diaphragmatic and you can see the dotted or the dash line represents the diaphragm, and if we look at this figure, we see that there's certain portals to that ventral vagus. One is the lungs through breathing. One is through vocalizations because laryngeal and pharyngeal nerves are vagal nerves, and the other one is through posture, and suddenly we are in the world of yoga because what is yoga about?

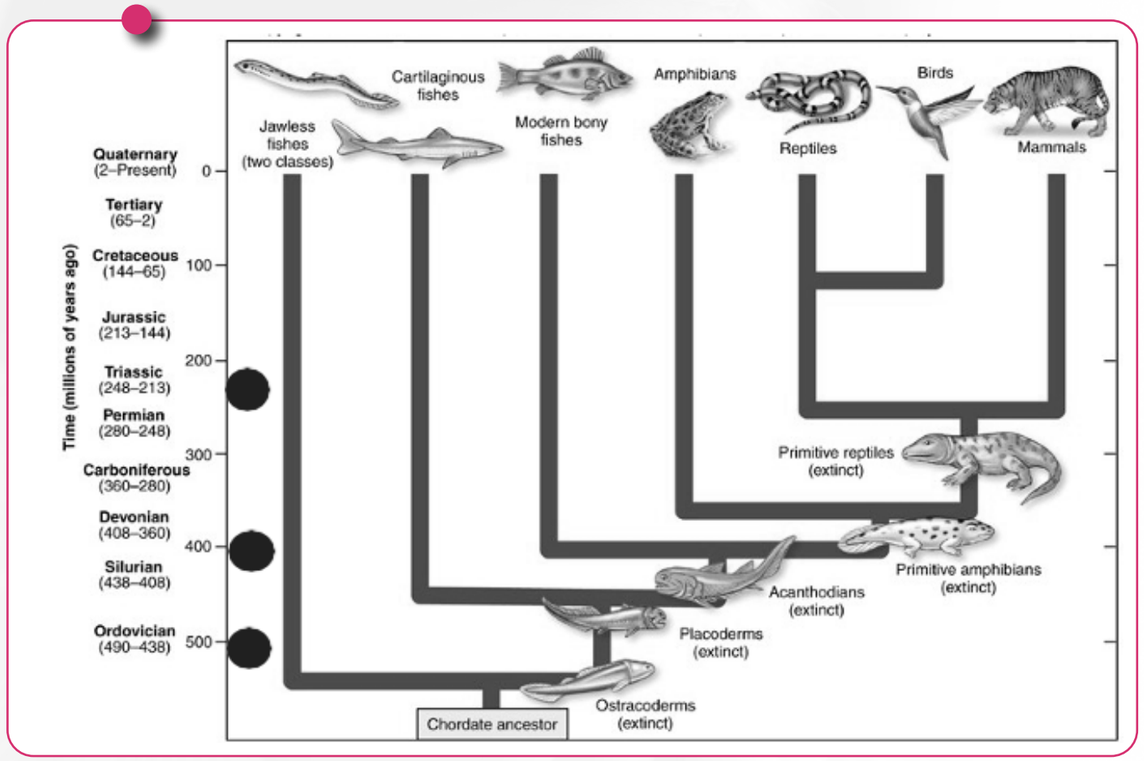
It's about posture, it's about vocalizations, and about breath or it uses those tools, and it uses those tools as neural exercise, recruiting vagal pathways that are associated with the supra-diaphragmatic vagus, and when you get that vagus on board, it basically calms our body down and constrains our defenses and literally mitigates our defense reactions. So polyvagal theory, emphasized that evolution provides an organizing principle to understand neuro regulation of the human autonomic nervous system as an enabler of social behavior.

And it identified that there were three neuro circuits that formed a phylogenetically ordered response hierarchy that regulate behavioral and physiological adaptation to safe, dangerous, and life threatening reactions. This type of model is not saying we have intentional agency to make these changes. These are wired in, and our nervous system reacts sequentially in this phylogenetically ordered response hierarchy using our newer circuits first, and when they don't promote us into, or put us into a safe context, our nervous system will then degrade and use more primitive and more primitive structures. So if we're safe, we become social and engaging spontaneously, no one has to teach us to be social. It's part of our evolutionary heritage.

If our nervous system is locked into a state of chronic threat, and we use terms like anxiety we take away the parsimonious understanding of our physiological state, meaning we're now in a state that supports threat reactions, and we overlay psychological constructs like anxiety and stress. They're not necessary constructs. We can say that my nervous system is in a state of threat and these are it's very, when it's in a state of threat, it's a wonderful defensive system, but what if I'm in that state the threat and the environment is really engaging and supportive.

Is there a mismatch in my physiology? Within the world of trauma, people are aware that this is a mismatch between how they are and how they feel in the world that they have to interact in. So we have to understand that these reactions are not intentional. We can't say, it's not where the control system is. It doesn't come from our conscious awareness, and that becomes part of this journey that I have been on to try to understand how this system can be recruited and can be helpful for those who have histories of trauma.

EVOLUTION AS AN ORGANIZING PRINCIPLE



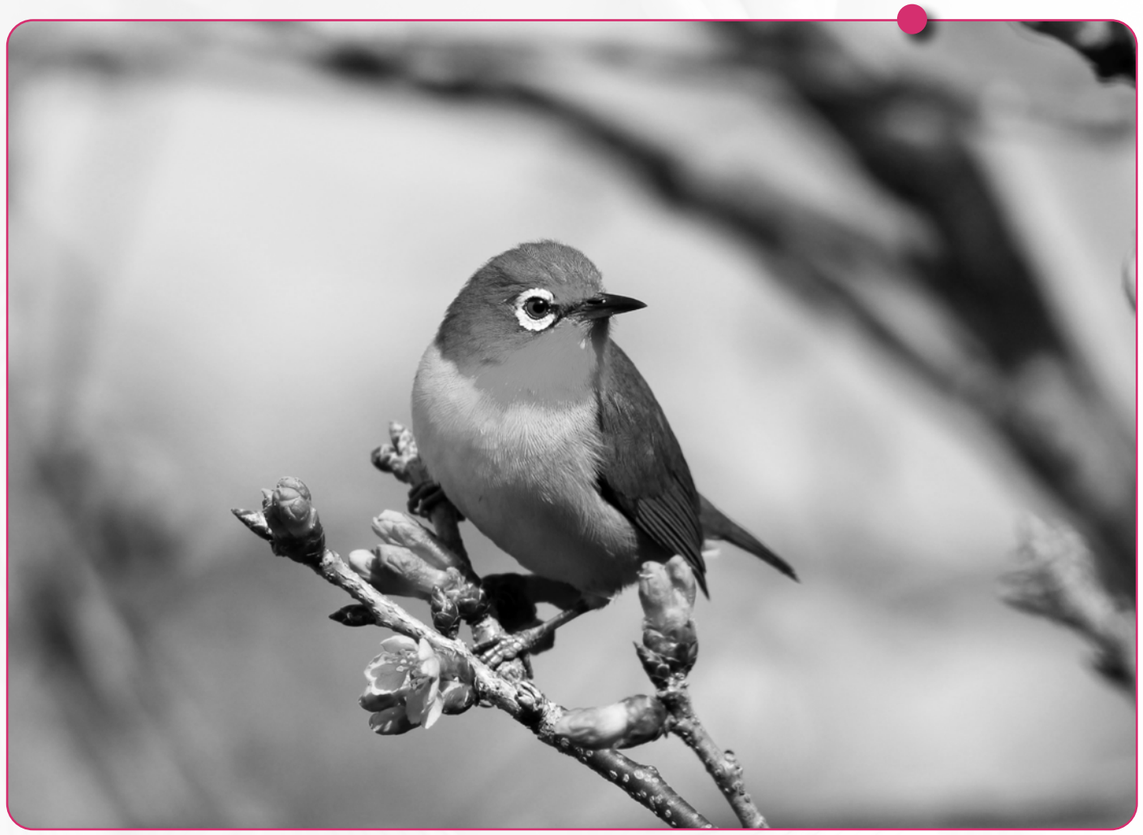
Now we can look at the evolutionary journey and we can start seeing that this old dorsal vagus is in virtually all vertebrae. So it occurred in the earliest vertebraes about 500 million years ago, but the spinal sympathetic nervous system didn't start off. It was actually an evolutionary innovation that occurred with the bony fish without the spinal sympathetic you're literally held hostage to a neurochemical regulation of your organs to mobilize them and cartilaginous fish like sharks don't have the spinal sympathetics, so their physiology gets worked up by chemicals and then has to dissipate.

This means sharks tend not to be very reflective. They don't make judgements. They're basically acting out at physiological state. Mammals came on the scene about 200 million years ago, and there's debate about whether it's 200 million years or a hundred million years, but what happens is that if you look in the fossil record, you find out that the ancient extinct reptiles are different to the primitive mammals because the reptiles don't have detached middle ear bones and middle ear bones are really this marker about whether or not there was an ability to detect certain vocalizations as cues of safety.

So as mammals transitioned from reptiles, they got that ventral vagal circuit, that new vagal circuit and that ventral vagal circuit was linked to not only vocalizations, but also to listening and that means middle ear function. That was the in creating a system that could detect cues of safety in terms of intonation of vocalizations. So mammals had this ability to socially communicate. Now, some people might say, well, what about birds? Birds are not our relatives. They broke off of reptiles on the evolutionary tree after we did.

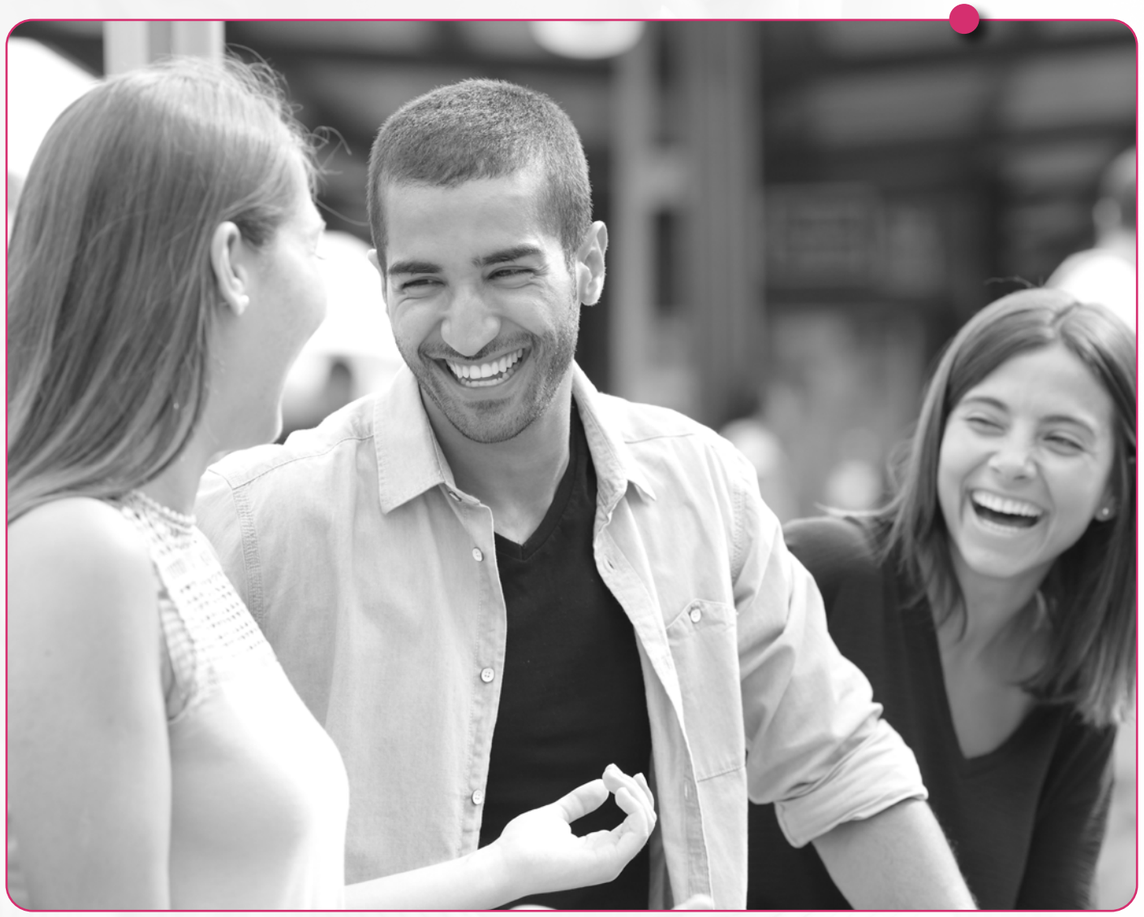
So they may have developed homologous methods of vocalization as cueing safety and danger, but they didn't develop it in the same way that we did, which links it to our autonomic regulation.

This gives you an idea of the vaguses this complex bundle part of it is coming out of a dorsal area. Part of it's coming out of a ventral area. Dorsal means the back ventral is our front and they're actually coming for from different areas although they're both vagal pathways, which means they're in the same conduit, but they are separable neural pathways.



THREE PHYLOGENETIC STAGES OF THE AUTONOMIC NERVOUS SYSTEM

This leads us to a phylogenetic organization of three stages. This primitive unmyelinated dorsal vagus that in mammals supports immobilization behaviors of fainting, shutting down, dissociation and the second stage is sympathetic nervous system that supports fight flight and this newer mammalian vagal circuit that supports social communication and enables the rest of the autonomic nervous system to support homeostasis, and so that social interactions are now elevated to become neuromodulators.



HIERARCHICAL MODEL OF AUTONOMIC STATE

Myelinated (supra-diaphragmatic) Vagus

↓

Sympathetic Nervous System

↓

Unmyelinated (sub-diaphragmatic) Vagus

THE AUTONOMIC NERVOUS SYSTEM

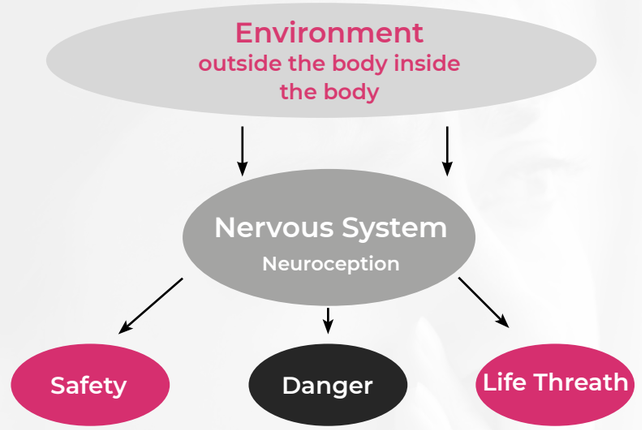
The autonomic nervous system functions in a hierarchical manner, paralleling evolution, but parallels evolution in reverse. So we start with newer circuits and then under challenge, we revert to older circuits.

And this creates this model of autonomic state in which is newer ventral vagal circuit, which is myelinated and myelin is the fatty substance that goes around the neural fibers. It enables the nerves to respond more rapidly and with greater specificity. So we have to think of it as a coaxial cable that is now insulated. Unmyelinated fibers respond slower and in a sense they have less precision than the myelinated ones.

Now in this model, you have this newer circuit that comes on with mammals and it is functions as inhibitory over the other two circuits. So basically it's a container or constrainer of the rest of our autonomic nervous system, and we'll learn why this is so important because it means we can recruit both the sympathetic and that unmyelinated dorsal vagal circuit to support our health, growth and restoration. As long as we keep those circuits out of states of defense. And we keep them out of states of defense when we have that myelinated vagal circuit on. So the sympathetic nervous system is given permission to be highly expressive when we take away that ventral vagal circuit. Without the social engagement, we can start seeing aggressiveness and tantrums occurring, but there's a another point that we need to really emphasize early, and that is when the sympathetic nervous system is functioning it's inhibitory of that dorsal vagal circuit. So it starts to inhibit the homeostatic functions of that.

But on the adaptive view, as long as you keep that sympathetic nervous system firing you can't shut down. And there are many people who have a deep trauma history, but are now extremely energized and activated, but can't sit still underneath that. I can't sit still bit is this a memory within their nervous system of shutting down. So the adaptive feature is as long as I keep moving, I can't shut down. And in parts of somatic experience, part of Peter Levine's strategies is he starts seeing the mobilization as a positive attribute that is now dealable. So because they're literally moving up from a shutting down from, like the videos of the gazelle collapsing, it collapses, and then it starts to twitch and starts to mobilize. But mobilization keeps it now from shutting down again or being vulnerable as prey. As humans follow this sequence and we often see in those who have experienced trauma, high risk mobilized behaviors as individuals try to live their lives after surviving severe trauma.

THE QUEST FOR SAFETY: EMERGENT PROPERTIES OF PHYSIOLOGICAL STATE



Spontaneously engages others
eye contact, facial expression, prosody supports visceral homeostasis

Defensive strategies
fight/flight behaviors (mobilization)

Defensive strategies
death feigning/shutdown (immobilization)

So the theory can be kind of mapped into this figure in which we are on a quest for safety, and we have a nervous system in this world and it responds to cues coming from inside the body and outside the body. But in our nervous system, the brain is making decisions. It's evaluating the features of those cues, those sensory cues from inside the body and outside the body and making decisions. It's the determining or reacting and saying, "I'm in a safe environment". And when it makes that decision, there are emergent properties. It's not an in intentional behavior. It's an emergent one.

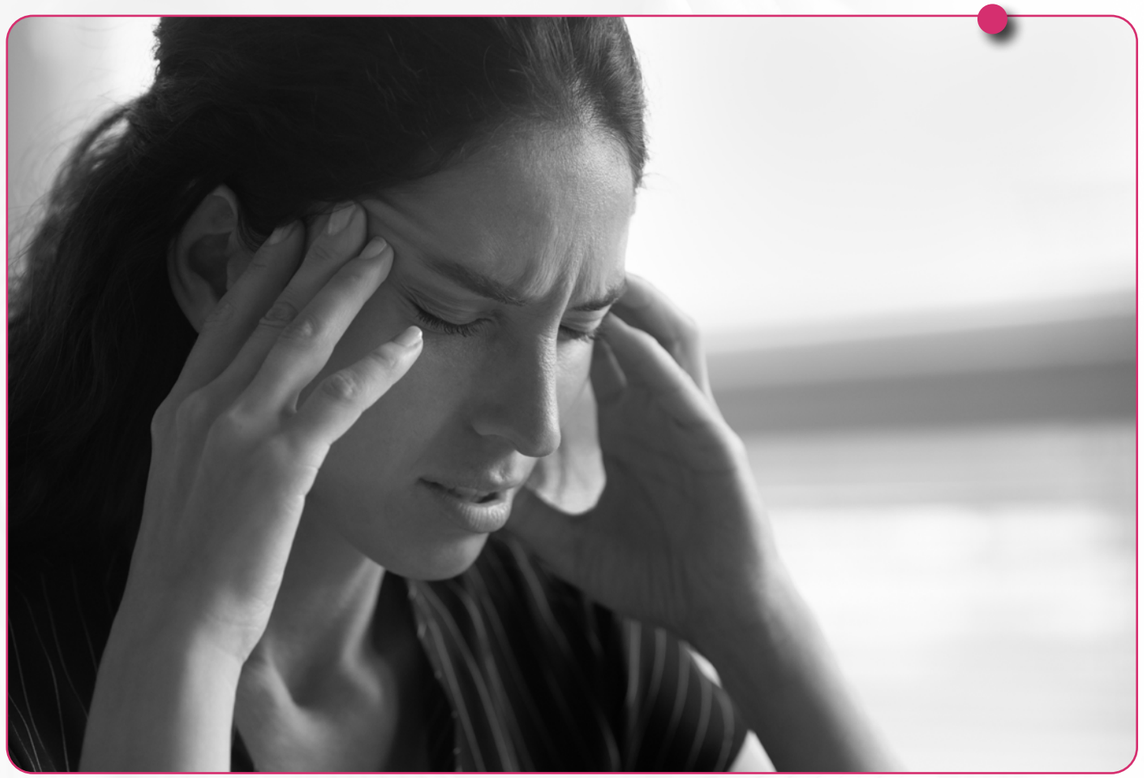
So once the nervous system makes that decision, it can spontaneously engage others, and you see this in spontaneous eye contact, facial expressivity, intonation of voice and when you have those features being expressed, it's supporting underlying visceral homeostasis. But if the system detects danger, it starts turning off those social engagement behaviors and giving permission to our mobilization system. In a sense, it says, I'm not going to compete with your need to mobilize, to fight or flee. I'm not going to inhibit that so that ventral vagal circuit becomes dormant. In a sense it gives permission for those defensive behaviors to occur.

Now, this is fine for short periods of time, but over long periods of time, we start to label it as chronic stress. We label it as being manifested in anxiety disorders in which the body is stuck into the state of chronic defensiveness. Life threat has a categorically different response profile. Life threat basically says, I have to get out of here. I have to disappear. And that recruits initially the very ancient reptilian response, total immobilization where you stop breathing. And you may even defecate to reduce the metabolic demand. And that's because reptiles had little need for oxygen. Their brains were very small. They could stop breathing for a couple hours and they were fine. There was no brain damage, but mammals with their relatively large brains are oxygen dependent, which means they cannot stop breathing for very long periods of time. So death fainting, or what's called vasovagal syncope, where you would pass out, becomes a last resort, and I believe that if you've had those responses, your body may create an adjustment so that when you are triggered again, you don't shut down.

You don't pass out. You may freeze. You may immobilize, but maintaining sufficient sympathetic tone to maintain the upright posture, enough oxygenated blood, and enough muscle tone so your body doesn't tip over. I think freeze is this adaptive reaction to having shut down once. And the body now saying - you have to get out of there. You have to immobilize, but let's put you in a state that's not going to kill you. And I think that dissociation is part of the same trajectory. That dissociation is – "I'm getting out of there", in a different way in a mental metaphorical way by saying - I'm becoming someone else I'm not there anymore.

So I've dissociated. So I think the nervous system has great repertoire of how it can deal with life threat type behaviors. But the initial primitive one is to basically totally shut down.

So immobilization, as a defense strategy was a missing concept in psychology and psychiatry. Although forced immobilization restraining is a frequent feature of trauma and chronic abuse. And this led to a basic dialogue that not all stressors result in fight flight and not all vagal pathways were restorative because there is a vagal defense reaction, and this was not well acknowledged within psychology and within psychiatry.



Except if you moved into the world of neonatology, where I was doing research in the late seventies and early 1980s, what you could see is that you often saw apnea and bradycardia in preterm babies. And that was because their defense system was reptilian if they were preterm because the mammalian ventral vagal circuit was not developed. So you could actually see in the premature infant, this maturation trajectory, and you could see the flat face, the sounds of their cries.

And even in terms of their heart rate patterns, they were not showing the ventral vagal signature, which is respiratory sinus arrhythmia. So you could see, you could actually see the vulnerability in the heart rate pattern for the breathing to stop and for bradycardia or massive slowing of heart rate to occur. And this always occurred when that ventral vagal circuit was not effective.

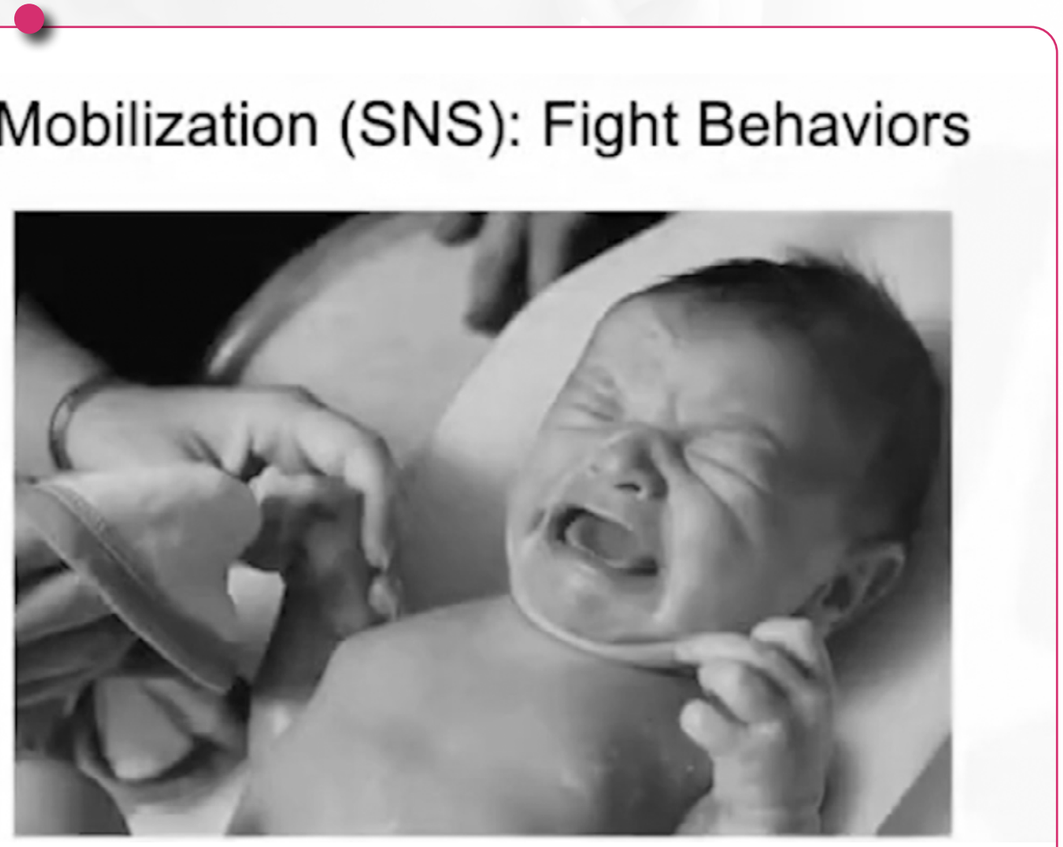
And you can see immobilization with fear in the mouse and the jaws of a cat. What you think is that the mouse may be dead, but you don't know because small rodents have this ability to go into this massive death fainting response is a profound response, which is basically a vagal reaction of shutting down, but the mouse frequently will not die. Although some will die from going into the state. And the probability is that the cat will lose interest. And then the mouse will wake up and scamper off. But it is a very risky strategy, neurophysiologically risky because it reduces oxygen flow to the brain.

I received an email several years ago which said:

"I read about the body immobilizing instead of fighting or fleeing. I am now 69. And when I was 18, I was nearly strangled and then sexually assaulted. Years later I was speaking with my daughter about this incident and she was disbelieving that I did what I did and that I froze. I felt so ashamed and judged. After reading your theory, I cannot tell you how excited vindicated I feel... I am crying right now."

This narrative, this story is a common story, that many survivors of trauma report. That is that their bodies immobilized, and they no longer have agency or control of moving and they are often blamed by judges and by the community for not fighting. And the theory is it provides a narrative that explains why not moving or not fighting is not the same thing as accepting or consenting for someone to touch you. So this gave voice and gave a narrative to people who had experienced forced traumas.

We can see mobilization with fear and you can see that its flight and this becomes fight. And you can see the muscle tone and you can even see newborn babies, the motor tone of their body, full term babies showing this basically a sympathetic fight reaction. And if you were monitoring autonomics in all three cases, you'd see heart rates going up and you see the vagal regulation, the heart going down.



When you see social engagement, you focus on the face. You look at the upper part of the face, the orbital bustle around the eye called the Orbicularis oculi. And you sense and feel the vibrant interaction between the two individuals co-regulation. So autonomic state shifts, state consistent with evolution in reverse or dissolution. Evolution in reverse or dissolution was a term that was coined by John Hughlings Jackson in 1884, about brain damage and brain injury.

This was his quote, "the higher nervous arrangements inhibit (or control) the lower, and thus when the higher are suddenly rendered, functionalists, the lower rise in activity." And what he was trying to explain was that brain damage or disease to higher levels of the cortex resulted in a dis-inhibition of lower brain structures. And that this was following evolution in reverse. What I started to do was to utilize this construct of evolution in reverse or dissolution and apply it to the autonomic nervous system in polyvagal theory. So the autonomic nervous system reacts to challenges in a phylogenetically ordered response hierarchy with the newest components of the autonomic nervous system responding first. And this is suppression or removal of the impact of the ventral vagal tone, an increase in sympathetic tone, and if that doesn't get the organism into a safe state, a shutting down through that dorsal vagal activity, which result in Bradycardia clinical, the low levels of heart rate, potentially life threatening.

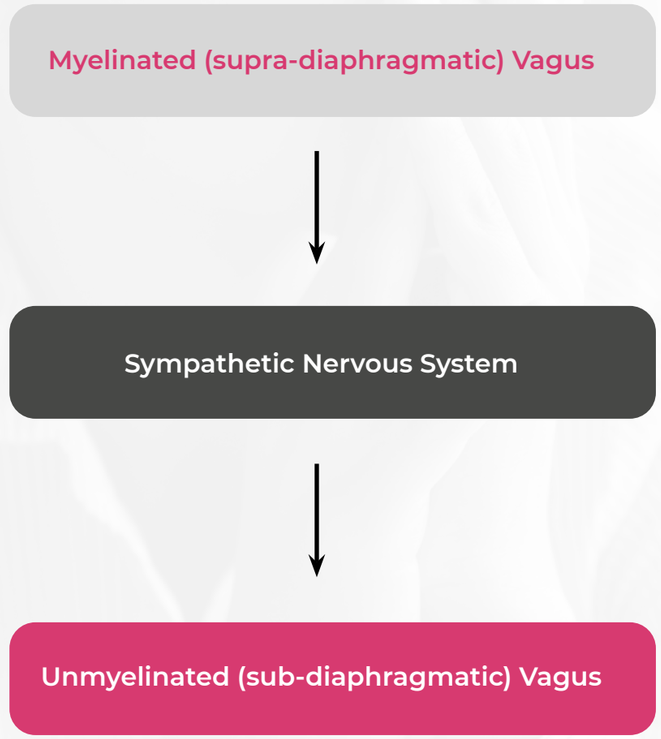
TRAUMA TRIGGERS DISSOLUTION: EVOLUTION IN REVERSE

Structure	Fuction	VVC	SNS	DVC
Head	Communication	+		
Limbs	Mobilization		+	
Viscera	Inmobilization			+

We can see that stress triggers this dissolution, or we want to use the word traumatic stress, chronic stress, but basically this prolonged or sequence of disruptions will result first in a dampening of that ventral vagal circuit, then excitation of the sympathetics, and then since the sympathetics are metabolically costly, the body can't do this forever so it starts to switch into a mode of conservation, which is shutting down using a neural mechanism that unmyelinated that dorsal vagus.

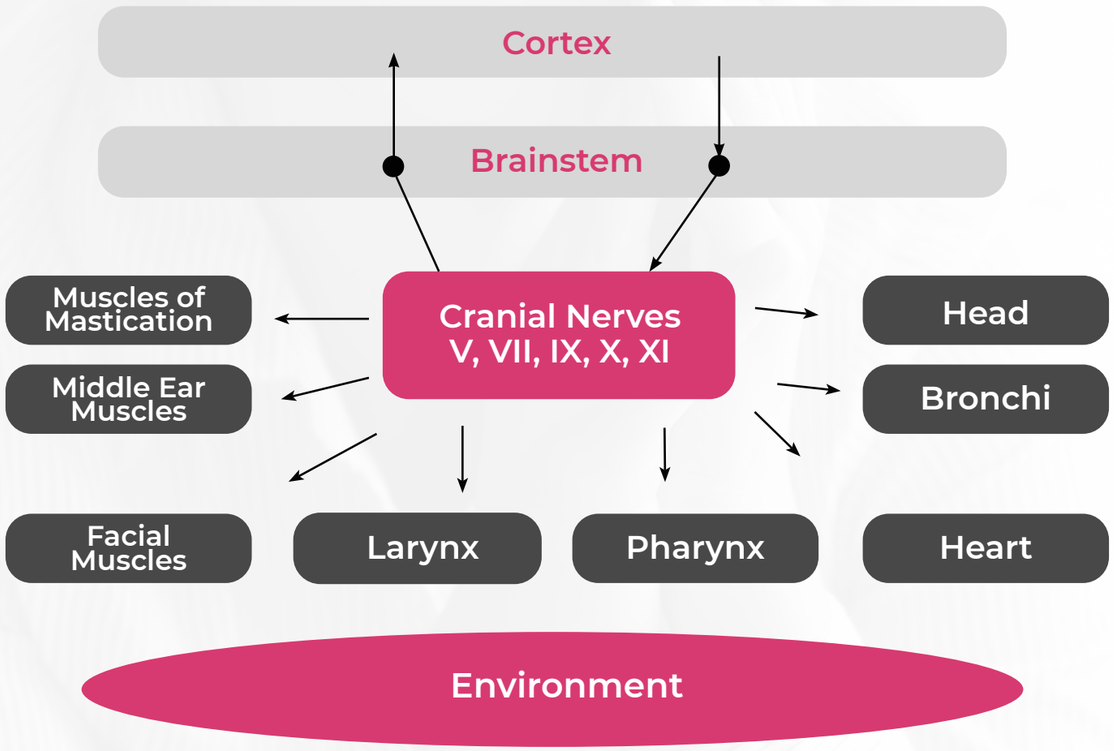
In a way we can think of our structures, having a sequence of functions, linked to different brain stem nuclei. The head is the structure of social communication and is linked to that ventral vagal complex. If that doesn't put us into states of safety, we mobilize, we use our limbs and we require a sympathetic nervous system to drive that. And if that doesn't get us into safety, we immobilize and we now change the neural structures of our viscera, or we trigger our viscera through the dorsal vagal system. We try to reduce our metabolic needs.

TRAUMA AND STRESS TRIGGER DISSOLUTION: EVOLUTION IN REVERSE



Now what we're going to do is deconstruct social engagement. And this is a little bit on the complex side. However I will try to explain it as best as I can. When you saw the face, visualize that we're now going to look at what the face is connected to. So there's a cortex sending signals of cues of safety or threat to the brainstem. And the brainstem is now regulating five pathways or a collection of pathways which is called special visceral efferent, which are the pathways that go through five cranial nerves that control the striated muscles of the face and head. Now they go to five cranial nerves, but they represent a common integrated core within the brainstem. So they're just exiting the brainstem, they are talking to each other, they're interactive in the brainstem, but now their pathways of motor control are coming out of five different cranial nerves and they're muscles of mastication and as I talk about this, think about symptomatology of various clinical disorders.

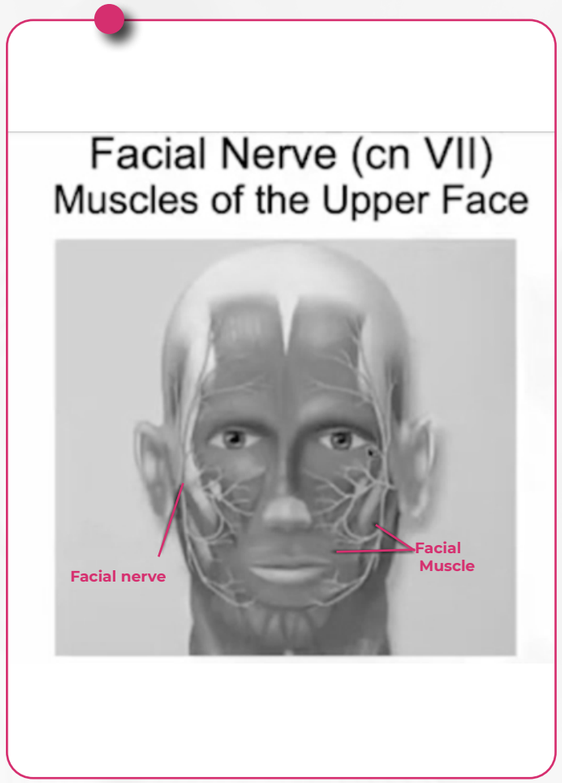
DECONSTRUCTING THE SOCIAL ENGAGEMENT SYSTEM SPECIAL VISCERAL EFFERENT PATHWAYS

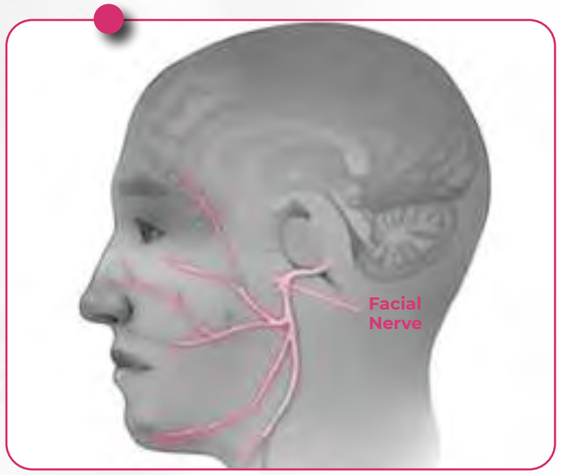


So you have muscles of mastication which may be linked to eating disorders, or let's say sucking swallowing. The sucking behavior to try to calm down. You have muscles of the middle ear, which are listening for social communication and neural tone to these muscles enables us to hear cues of safety. You have nerves that regulate the face, especially the upper part of the face because the facial nerve also is a regulator of the muscles of the middle ear, as well as the trigeminal muscle, related to muscles of mastication also goes into the middle ear.

Then you have laryngeal and phlaryngeal nerves. Now the laryngeal and pharyngeal nerves are actually vagal nerves. They're coming out the vagus and they're regularly intonation. So you start seeing this collection of nerves coming together that we call facial expressivity and vocal intonation, and they're linked to head-nodding and head turning. And in the brainstem, they're communicating with the heart and the bronchi through that myelinated vagus.

So you see that our social engagement behaviors, the neural regulation of muscles of the face and head are also linked to the regulation of our autonomic nervous system. And this is just showing you that the important muscle around the eye is the orbicularis oculi and you can see where the facial nerve is going. It maps into the face, but we're going to always emphasize the upper part of the face because that's our social part of our face. And in these images you can see the branch of the facial nerve goes into the middle ear structures and regulates a muscle called the stapedius. Which is one of the two smallest muscles in the body.





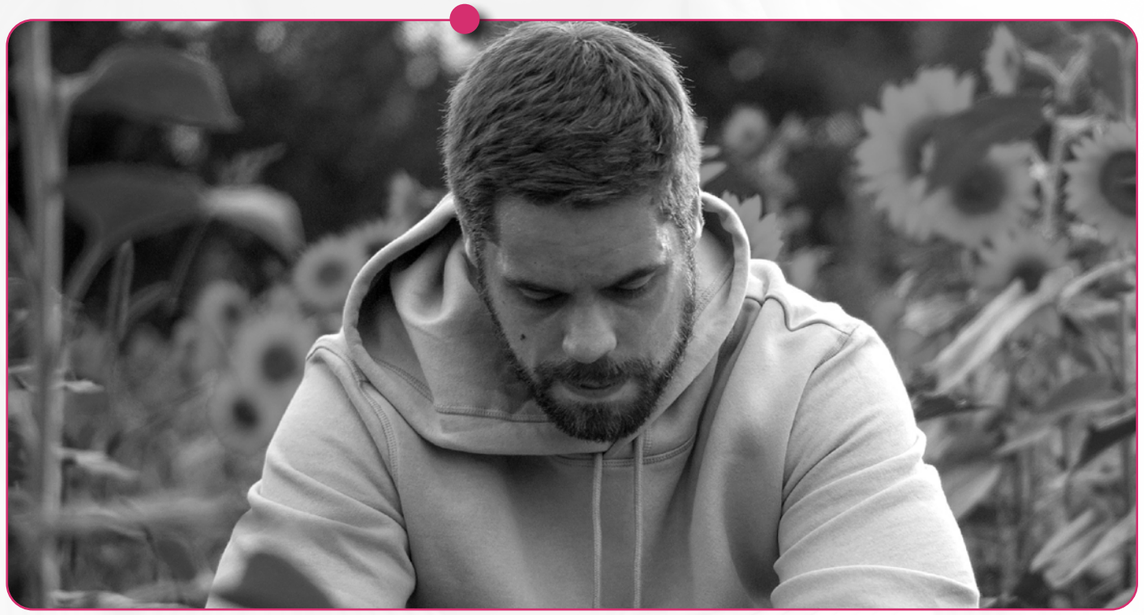
Trauma disrupts opportunities to co-regulate. Trauma disrupts the social engagement system phase one of co-regulation and since polyvagal theory is a hierarchal model, if we disrupt phase one, phase two is not available. So trauma optimizes our defenses, bio-behavioral states of defense. So we have to understand both the good and the bad of what our nervous system is doing. Our nervous system, following trauma is re-tuned to be more defensive, more efficient in being defensive, whether or not the defense is merited.

At birth mammals have a bi-directional neuro communication between the face and the heart and this becomes what we see as the suck swallow breathe and vocalized circuit. This forms the core of a social engagement system. So even as we get older, we start using suck swallow, breathe, and vocalize as a method to calm us down when we don't have social interaction.

So when we think in terms of eating disorders, we think in terms of individuals ingesting food as a method to regulate their physiological state, but it's literally displacement of the more efficient method which is through social interaction. Metabolic demands, perceived danger, life-threatening illness, retract the social engagement system resulting in face that is not social and a physiological state, which is the removal of that ventral vagal break on the heart that promotes defensive behaviors.

So if we think about illness, illness results in the autonomic nervous system that's in a state of defense and we can see this of course occurring during COVID. And we can have a different understanding of what COVID and long COVID has on the autonomic nervous system.

The social engagement system, functionally choreographs the sympathetic and the dorsal vagal circuit to support health, growth and restoration. The basic point is that the sympathetic and the dorsal vagal circuit are involved in homeostasis, but will only support homeostasis when that social engagement system with that ventral vehicle circuit is board and from a clinical perspective, the face and voice give you the insights in terms of what physiological state, what polyvagal state the client is in. Polyvagal, informed therapies work by exercising the bi-directional brain-body communication system involving vagus, exercising the vagal break and contributing to enhance regulation of bodily organs and the muscles of the face and head, facial expressivity and vocalizations.



This means that reciprocal dialogue is a neural exercise. This means that breath work is a neural exercise. This means that chants and vocalizations and singing are neural exercises. This means that listening is neural exercise. This means that playing a wind instrument is a powerful neural exercise. Then you see features of breath and face in other strategies like yoga. So you start seeing the neural regulation of these systems are following the rules of what might be called a polyvagal informed therapy.

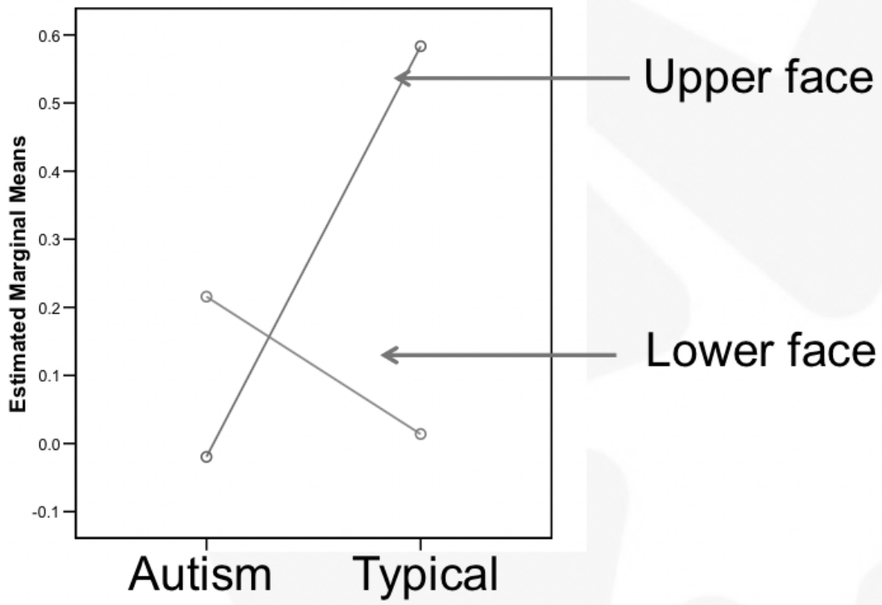
When the social engagement system isn't working, you can see certain deficits in several pathologies or psychopathologies. You would see some of these deficits, even with physical illness or chronic illness and under what you might even call toxic stress. And that would be a lack of prosody in one's voice, poor eye contact, difficulties in social communication, blunted facial expressivity, difficulties in behavioral state regulation, being hypervigilant, anxious, distractible, impulsive, having tantrums, and often even being hypoaroused.

So both hyperaroused and hypoaroused would have manifestations when the system isn't working. Difficulties in listing, following verbal commands. Speech language delays may occur if you're a child whose social engagement system isn't working well, maybe being in an abusive home or having childhood illnesses, chronic illnesses, may result in a delay in the speech and language. Having sound hypersensitivity, auditory hypersensitivity, being overreactive to sounds, but under-reacting to human voice, having this almost paradoxical phenomenon of being sound sensitive, but not being able to detect human voice or understand it. And that's because the tuning of our middle ear structures to detect sounds during a danger, during predator conditions is to dampen our ability to extract the frequency band of human voice while optimizing the ability to detect lower frequency sounds of movement near us. Oral motor defensiveness and we talked about the ingestive features. So you often find that individuals who have flat affect may also not be very curious about foods. So they may just always want to eat the same food.

Now in autism, we can look at the upper parts of the face. And the picture on the left is from a textbook showing an autistic individual, and you see the orbital muscle around the eye as being totally flat. But you also see the fingers in the ear because when that muscle around the eye is flat and another branch from the same nerve is going to those middle ear muscles, it's going to the stapedius and if the upper part of the face is flat, the neural signal to the stapedius is to relax so that you can now hear predator sounds and not hear human voice.

The other two pictures come from a special issue of Newsweek and you see the flat of upper part of the face and the vacant stare.

So we start making interpretations of what faces look like. We would say distant, non-engaged. And it's really because that obicularis oculi, the orbital muscle, is not cuing to us that the social engagement system with that ventral vagal circuit is on board.

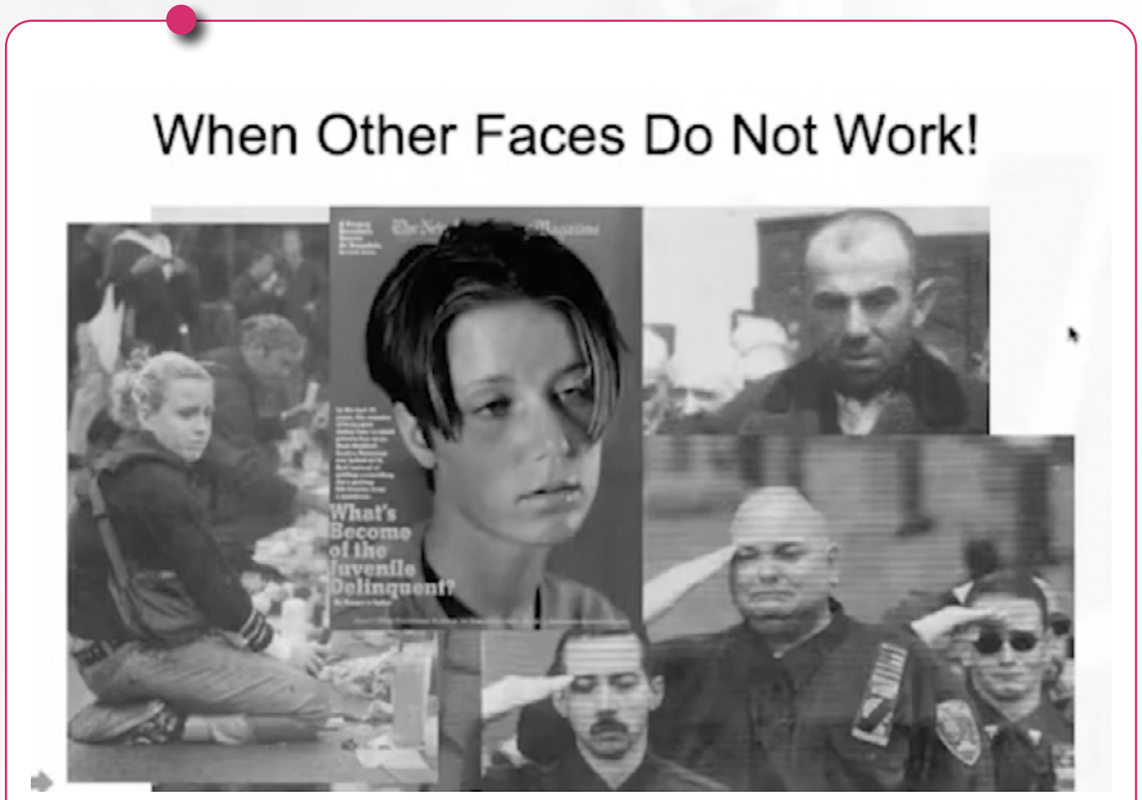


And this is a unpublished study from my laboratory, looking at autistic individuals and age match controls, looking at the upper part of the face in typicals and atypical the autistic individuals and typical contols. So the upper part of phase is very low in terms of neuro tone, EMG tone, compared to the upper part of the face in typical kids. So upper part of the face is really where atypical individuals' muscle tone is greatest, but if we look at the autistic individual, they are showing more neural tone to the lower part of the face, than the typicals, and that's because they have more voluntary control. So often you would ask, let's say, ask an autistic individuals to smile. The smile would be in the lower part of it not in the upper because the lower part of the face we have much more voluntary control of.

We can see that there are faces that do not work. There is one from a textbook. One was a young lady in my laboratory. I could see the flat face and the poor muscle tone. And one is a painting called the Sick Child by Gabriel Metsu from the Wright Museum in Amsterdam. And again, this is an ill child, not an autistic child, but you can see the similarity of the flat face and the poor motor tone.

Of course faces following trauma also don't work. Here you can see a face following 9/11. This is a adolescent who had been an abused survivor from Auschwitz. And these are three firemen at a funeral following 9/11. And you can see the manifestation of their grief in different ways.

One of them you can, the one at the front looks dissociated while the others are expressing emotions. And we need to start asking if we're in a state of expressing emotions, are we more accessible for intervention or for normalization than if we basically become numb?



Trauma re-tunes autonomic state compromising our ability to feel safe enough to connect with others. This is a picture of children in the Eastern European orphanage. And you can see there are a lot of children in the and lots of toys, but the remarkable feature of this picture is that no two children look at each other or look at the same toy and this is very, very unusual. Normally individuals will look at each other or have shared attention. So we can see that even though they're in proximity with others, they are totally alone. There's no connectedness, there's no co-regulation.

Here you see that when children, typical children play their shared attention cooperation, reciprocity, and these neural exercises are going on of co-regulation. Trauma results of the chronic disruption of connectedness that shifts autonomic state, it distorts social awareness, it displaces social engagement behaviors with defensive reactions and then we are reminded about John Healy Jackson disillusion.

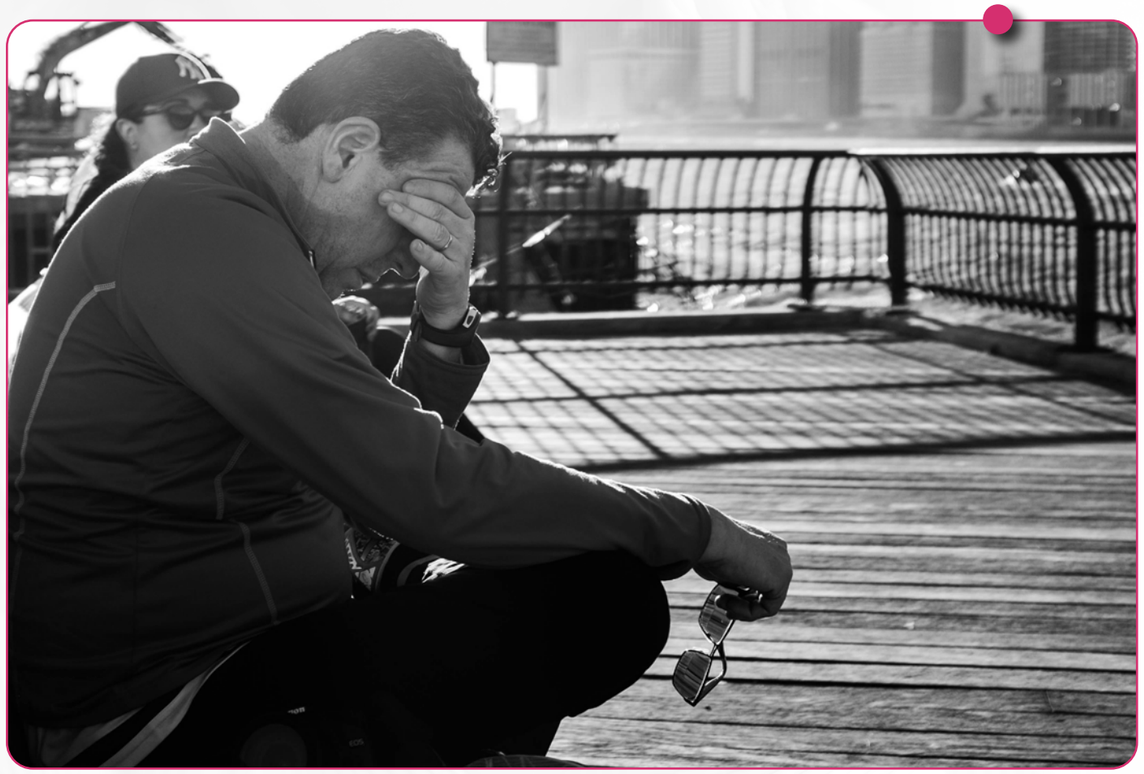
So we have the fight flight reaction, but if that doesn't help us, or we overwhelm our energy resources, our body will shut down. So trauma interferes with helpful reciprocal co-regulation, which I'm often calling neural exercises and it disrupts our neurophysiological regulation.

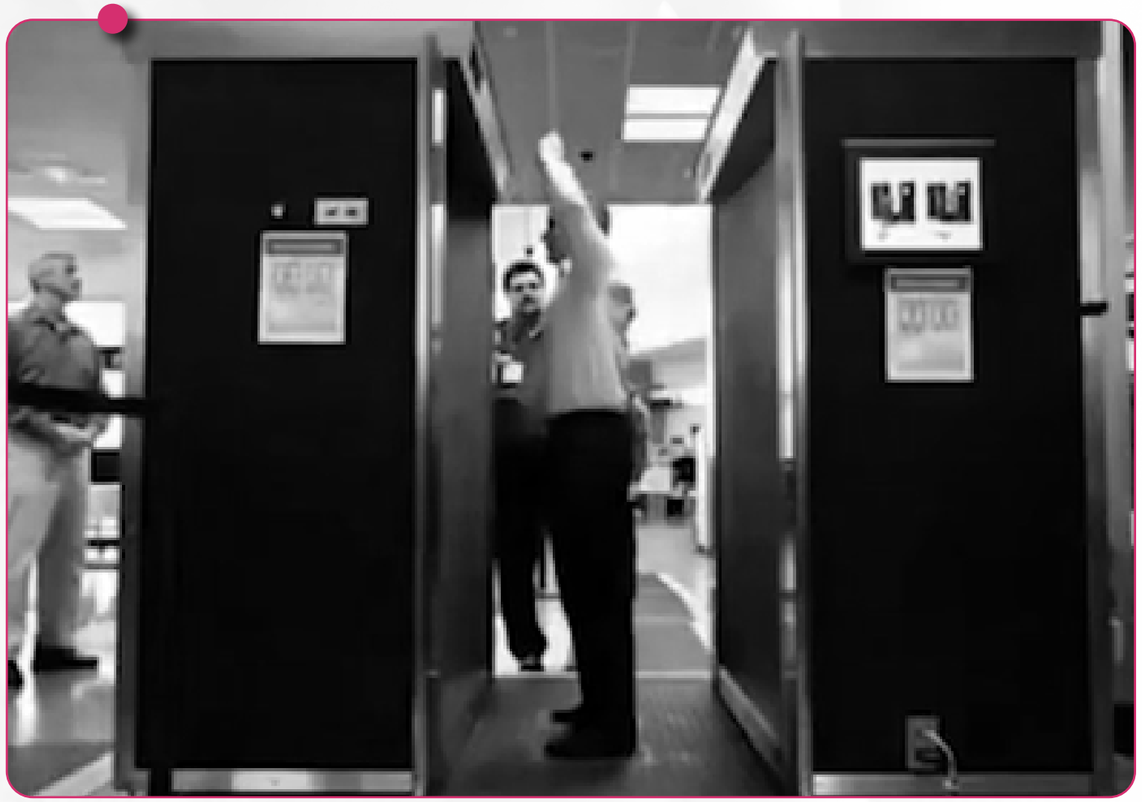
NEUROCEPTION

Neuroception is the mechanism to shift our autonomic state. It's the unconscious evaluation and detection of risk in the environment. So rather than say, "I perceive danger." I start to think about that and say that if we use that terminology, we are literally blaming people who don't detect the danger and are injured. They are basically accused of, "Why didn't you perceive that it was dangerous?" And the answer is the nervous system didn't detect it, or in some cases the nervous system did, but they overrode that neural cue and said, "I should get into that car. Why should I be concerned?"

And they weren't listening to their body or listening to their own intuitions. Neuroception is very close to listening to your intuition, listening to your body's reaction. It doesn't mean that your body's right, but your body is making an evaluation. So it's the nervous system's detection of risk outside the realm of awareness. What's interesting about neuroception is that we are not reliably aware of the cues, but we tend to be reliably aware that our body is shifted state, and this can create problems because our body can shift state and we might attribute it to the person across the table from us.

And if our body goes into the state of defensiveness, we become reactive and we may start blaming people for things that they are totally unaware of. So the nervous system detection of risk and others without awareness, but we are often aware that our body has shifted state due to that automatic adaptive and reflexive detection. This reaction can dampen our defense systems and facilitate social behavior. This is what cues of safety do. Or it can promote defensive behavior - the defensive strategies of mobilization, fight flight, or amobilization such as shutdown and dissociation. So do the neural portals that enable cues of safety to calm our physiological state and promote social engagement behavior, provide insight into therapeutic strategies? And again, if we step back and say there are master co-regulators and are master therapists and they are often the same person, does it really matter what they think their strategy treatment is, or is their presence and their support and their inter action, including their ability to witness the other, is that providing a sufficient package of cues to calm the physiology of the client into more spontaneous engagement behaviors? In a sense to start normalizing the client's behavior.



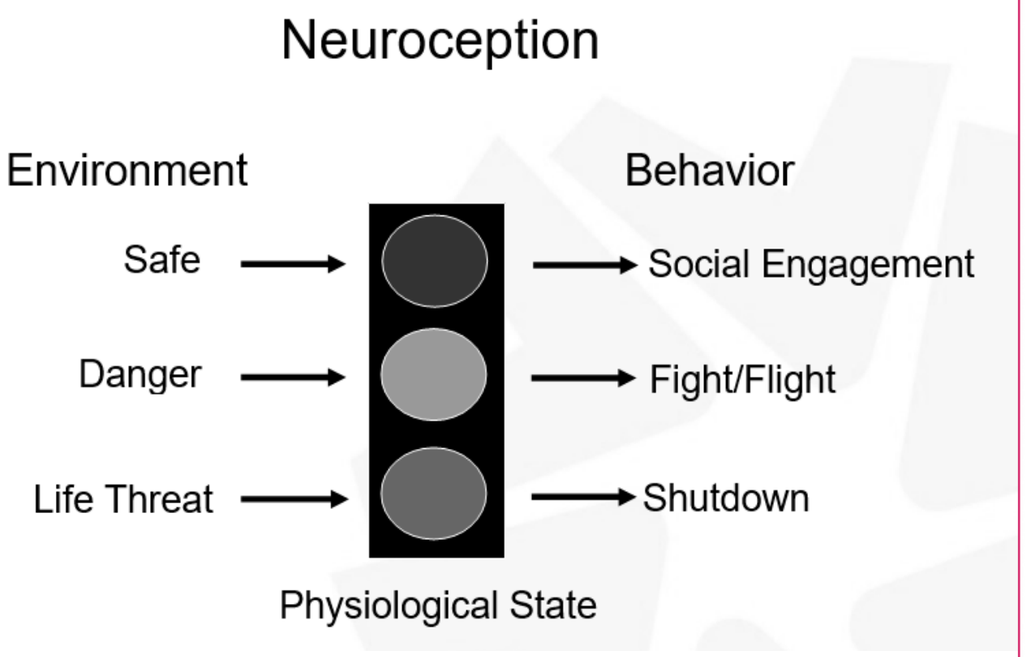


Nueroception functions very much like our own personal onboard TSA agent. We can think of this likw this sequence of pictures of a dog and a bear. So that's a polar bear and that's a dog.

Nueroception functions very much like our own personal onboard TSA agent. We can think of this likw this sequence of pictures of a dog and a bear. So that's a polar bear and that's a dog.

So the polar bear has come to see the dog and it looks like a welcoming greeting. And again, if we look at the next picture, we get the full story. We see that the polar bear is now showing the ventral side, which is saying, I'm saving your presence. And the dog is close in a sense playing with the bear they come together to play.

Now, the interesting part is if you go backwards, you notice one thing is constant across all three pictures and that is face-to-face eye-to-eye interaction. And that is to ensure that the physical movements and the physical touch is not misinterpreted as being aggression and when children play and they do this, they play well. But when children do not, or children are not aware of the other child's presence and they actually hit the other child, people get hurt. And in part, this is why individuals who are on spectrum have difficulty being welcomed into playgroups, because their awareness of the other tends to be limited because their bodies are in states of more defensiveness, not allowing that bias to pick up the cues of interaction.

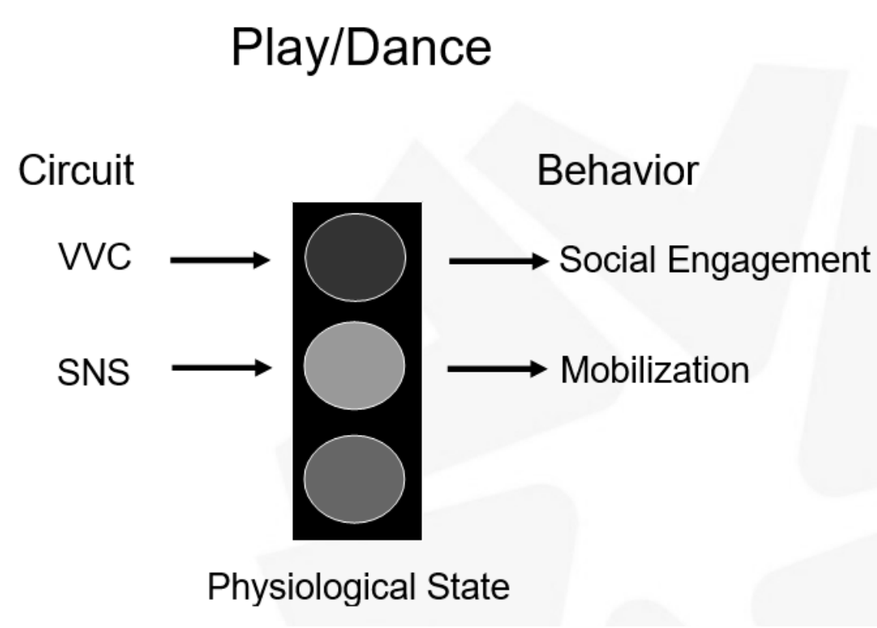


So our neuroception functionally matches our environment to our physiological state and the physiological state is represented by green being the ventral vagal circuit. Sympathetics being yellow and red being the dorsal vagus and the cues functionally are triggering the physiological state.

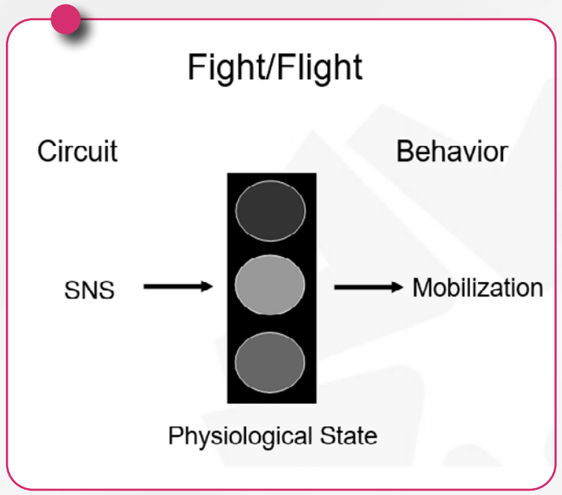
And the physiological state is functionally that intervening variable that determines the features of our behavior.

If our physiology is calm, we have spontaneous social behavior. If the ventral vagus is doorment and our sympathetics get excited, we tend to be aggressive and defensive and utilize fight or flight behaviors. If we experienced life threat behaviors and our body starts to shut down, we're not interactive at all.

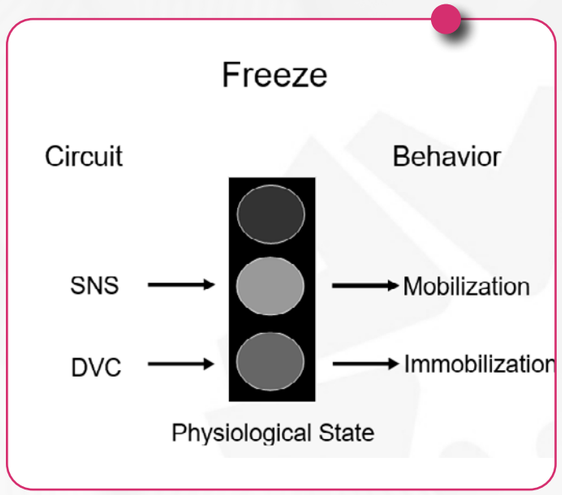
Now we have modifications of those three circuits integrate six states and of course the circuit is that ventral vagal circuit that promotes social communication and social behavior. And if we keep the social engagement system on and now move, we have play and dance. So we have mobilization with social contact and play and dance movement therapies capitalize on this ability to integrate the social engagement system with movement. Because if you again, have this trauma history sitting still may not be in your behavioral repertoire, you may need to move, but if you move with social engagement, you start building this neural regulation of the movement through the ventral vagal complex.



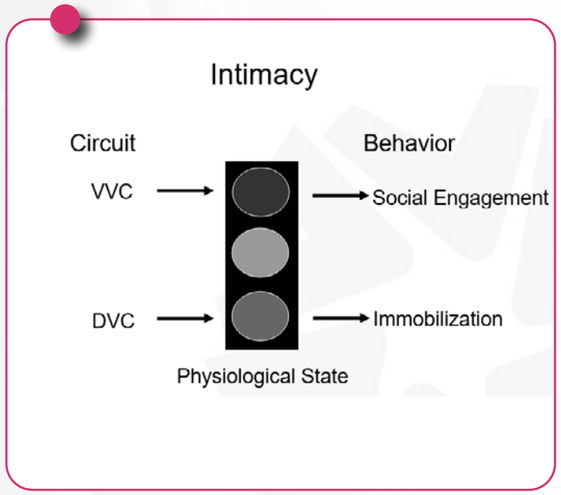
If you remove that social engagement system, then the mobilization can turn into fight or flight. It can become aggressive.



And if we link the sympathetic with the dorsal vagus, we can get this freeze behavior, which is a defensive reaction that is recruiting sufficient amount of sympathetic excitation. So the body doesn't collapse and you don't pass out.

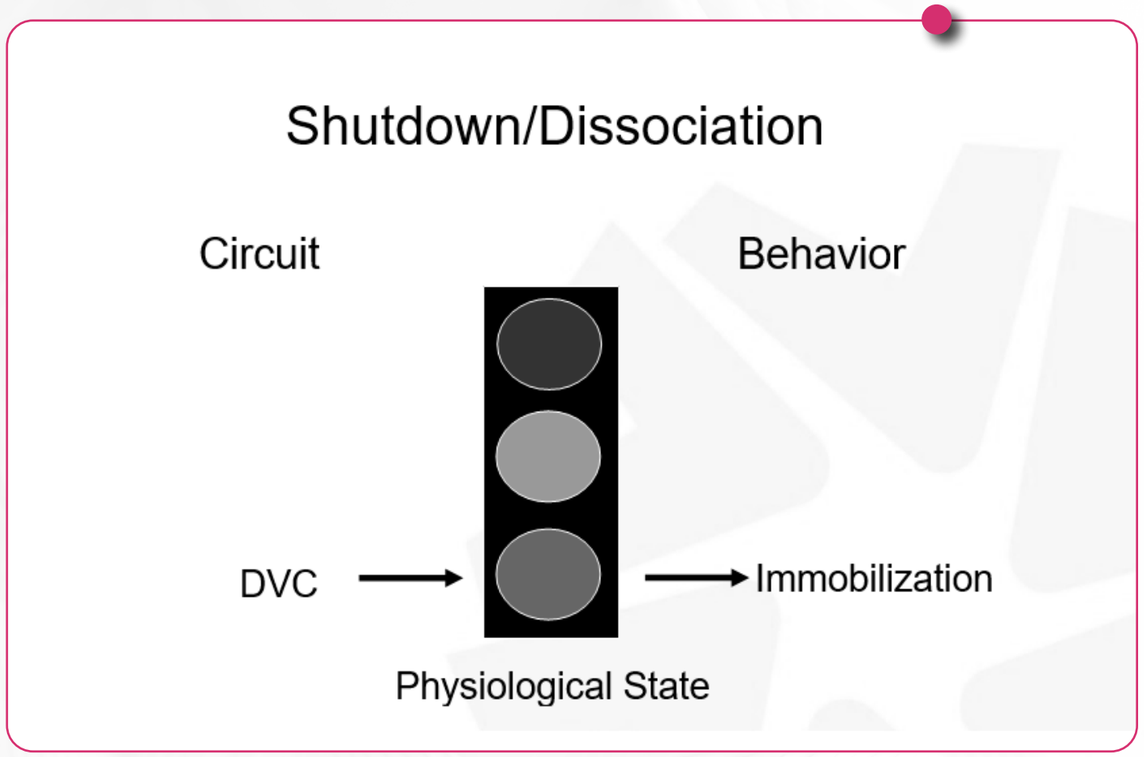


But intimacy is this unique adaptation and repurposing of an immobilization reaction or response. So we can link that ventral vagal system to the dorsal vagal one, suddenly we have shared moments of intimacy where bodies are quiet and safe with each other. And from a parental perspective, we see these states as the states that promote the most efficient utilization of resources within the body that promote homeostatic function, meaning health, growth, and restoration. So we have this wonderful smile of that child who sleeping well in the arms of the mother, because it's that moment where all defenses are removed, the body can now do what it needs to do, help us grow, help us repair.



If we don't have that social engagement system and we trigger that dorsal vagus. It's now there vulnerable to be at defense reaction and shut us down. So to start off with, we are a traumatized species. We have to acknowledge that the history of humanity is filled with trauma. And we have to also know that feeling safe, or being traumatized is not solely determined by the stimulator of the context it's also in part determined by the physiological state that we're in. And we have to also acknowledge that removal of threat is not sufficient to feel unsafe. So our physiological autonomic state becomes this intervening variable that influences our responses to cues of safe or danger.

And in the world of trauma, this enables us to acknowledge that some events can be profoundly disruptive to some people and not to others and what happens if that occurs? We often create a dialogue, or let's say a script, a narrative that says, "If I survived this, you should have." Well, we don't know. We don't even know if I could survive it in another time, because my survival or my reaction to the event is determined by the physiological state that I'm in at the moment of that event. That's determining my resilience.



So safety is the treatment, or being safe or feeling safe is the treatment. And safety is based on social connectedness, providing a neural expectancy, which promotes both mental and physical health. True experiences of feeling safe keep our autonomic nervous system out of states of defense. Feeling safe, optimizes homeostasis, while being threatened, compromises homeostasis. Being safe is not equivalent to removing threat. Removing threat is good, but not enough. Public health treatment models during the pandemic limit our opportunities to feel safe and co-regulate because our mental health models or public health models have limited our social interaction for a reason and not saying that the reason isn't the right reason, but we have to be acknowledging that there's a consequence to what our bodies need.

Our autonomic nervous system supports health, growth and restoration only when we're not recruited for defense. Loss of that social system, including the protective ventral vagal system results in a neurophysiology physiological state that supports defensive behaviors, and when chronic promotes mental and physical disorders. This latter statement, we want to elaborate because there are many so-called medically unexplained symptoms, including irritable bowel syndrome, and other forms of dysautonomia that are frequent comorbidities of trauma and chronic stress. And so it's not really that we have a mental health nervous system or a autonomic nervous system or a visceral system. We have one nervous system and when this nervous system is re-tuned to be defensive, it has a consequence on its homeostatic functions and that results in what are now called medically unexplained symptoms and often going under a broader term called dysautonomia.

And we can ask the question, what did the pandemic do to us. Are more people expressing medically unexplained symptoms? So autonomic state as an intervening variable becomes this critical conceptualization.

Physiological state is an intervening variable capable of biasing our responses to the world, and also biasing our responses to interventions. We want to make sure that the body creates a state that becomes accessible to interventions. So being in a defensive physiological state will interfere with the efficacy of interventions.