Stress Relief Synchrony

Transforming Body, Brain, Mind and Movement

Section A: Stress Relief Now!

This information will make a lot more sense if we take a few moments to exhale and land.

So first, let it all out! Get the big exhale going, let your jaw bone buzz with the outgoing breath.

And once you've exhaled, let's inhale, all the way to your belly button. When you inhale, your belly button expands, pushes out.

Then when you exhale again, your belly button softens back towards your waist.

That's it. Keep going.

Nose or mouth breathing? Doesn't matter right now. What matters is that when you inhale, your belly expands, and when you exhale, everything softens. Find your rhythm with this.
Follow your breath down to your belly. From inside this belly breath, expanding and softening, notice how you're sitting on your chair. Are you shifted onto one sitz bone more than the other? Are you clenched through your bottom?

Let the deep belly breath help those tissues unclench and soften. All you have to do is focus on that belly expand/soften and then observe what changes.

Now follow that belly breath up the body. When you inhale and your belly expands, it pushes your ribcage up and open. Your lungs and heart get more room, your spine undulates with relief as it all lengthens.

Your neck rolls and fidgets with your shoulders, then softens. Your jaw softens too. Even your eyeballs unclench.

If you get lost or distracted, just go back to the belly expanding and softening. Your nervous system knows what to do with that invitation.

Ok, now are we all here?

You know what you just did?

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You woke up your peaceful nervous system, made some new brain neurons, and woke up a great connection from breath to brain to body. Now let's make it real.

1. **Breathe it.** Go ahead, every breath counts as great practice.
2. **Feel it.** From the inside, really. Belly moving? Butt unclenched? Ribcage opening? Neck, jaw and eyeballs softer? Feel whatever you notice.
3. **NAME IT**. "good" "juicy" "peaceful" "quiet" "UH huh" "yeah" "oh!" "ugh" "big sigh"

Feel what your breath is illuminating within your own body.

Your breathing body shows your brain it is safe and calm, your brain acknowledges that input and decides to make a nice output, which means that your hands get warm and your jaw gets soft and maybe you even stretch or move instinctually.

***Breathe It * Feel It * Name It ***
and
Move It!

Naming it is important, it kicks up the happy juice in your brain that lets you grow stronger wiring to this new pattern of safe relaxation.

***Breathe It * Feel It * Name It ***

You just grew some new brain cells.
Your memory and learning centers just woke up.
Your digestive hormones just reconnected to your gut.
Your cardiovascular system just rebooted and can run on slow and easy again.
Your sleep hormones will sing you lullabies tonight.

All because you took a few good belly breaths!

How can it be that easy, you wonder? Do just a few breaths count?

Yes, it IS that easy. Let's go explore why and how and keep breathing while we learn!

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Section B: Stress Regulation Dynamics
Where We Start

Most of us function with a simplistic view of our bodies, usually dysfunction-oriented.

"My back is killing me"
"My guts are a mess"
"I've got a headache that won't quit"
"I can't sleep at night"
"I'm so tired all the time."
"I'm worried about everything."

And yet, while we focus on these stories of muscle aches and pains, creaky bones, upset stomachs and sleepless nights, internally, our bodies are working hard to keep us upright and functioning in the world.

"Turn off the cortisol!"
"Calm down the gut lining!"
"Crank out some endorphins!"
"Slow down that respiratory rate!"
"Drop the blood pressure!"

The term "stress" was originally coined by Hans Selye, MD in the 1930's, as he discovered that the nervous, endocrine and immune systems all interacted with each other. Specifically, he observed that physical, chemical, biological and emotional stimuli, administered to the endocrine pituitary-adrenal axis of rats, resulted in activity of the thymus and lymph nodes (immune system).

Our "stress systems" in the body are elegantly designed to handle particular components individually, while they all communicate in response to internal and external stress stimuli. Today we will be looking at the two branches of this system: the "hard wiring" of the Autonomic Nervous System (ANS) and the "software program" of the Hypothalamus-Pituitary-Adrenal (HPA) axis, as they both interact with the nervous system and the immune system. Each component manages a primary element of homeostasis - or balanced function within the body - which includes response to and recovery from stressors.

Our Regulatory System: The Autonomic Nervous System (ANS) and the HPA Axis

The Very Basic, Simplified Autonomic Circuitry (our O/S: operating system)

The Autonomic Nervous System (ANS):

The ANS is formed in utero by the crest cell layer (the "icing on the cake") that infiltrates all of our emerging tissues, systems and structures.

There are three branches of the ANS:
1. Sympathetic
2. Parasympathetic
3. Gastroenteric

1. Sympathetic

- Our "fight, flight or freeze" wiring
- Located in the sympathetic ganglia, paravertebrally through the cervical and thoracolumbar segments.
- Also referred to as the "thoracolumbar" autonomics
- Generally detects danger external to us, in the environment, so we can respond and survive (= "fight, flight or freeze")
- When fired, stimulates the HPA axis to trigger a neurochemical reaction that fuels a fight/flight/freeze response: heart rate increases, pupils constrict, face grimaces, gut empties, reflexes override frontal lobes.
- Because of its exquisitely sensitive radar to our environment, and its deep-rootedness in the reactive limbic system, the sympathetics can be triggered by stimuli largely unrecognized by our cortical radar.
- Smells and sounds ride our ancient olfactory and auditory wiring straight into the limbic system, which can itself trigger activation of the HPA axis and a subsequent sympathetic drive through all systems.
- Cortisol, the main hormone of this fight-or-flight response, is meant to be short-term fuel to get us out of danger. But in our culture, stress feels relentless and we may not get to down-regulate out of that cycle. Cortisol overflow changes our brain structure in key areas, and can impair hormonal function of sleep, digestion, metabolism (insulin regulation), memory and learning. Cortisol overflow can kill brain cells, especially in the hippocampus (responsible for learning and memory).

Our skin is the largest repository of sympathetic fibers in the body. It is wired straight to the brain.

What are we touching in therapy, whether we are riding stories of joint mobs, soft tissue mobs, myofascial work, cranial work, positional release, range of motion exercises? We are touching skin. We are touching the wiring to the brain. (Embryologically, via the ectoderm layer, skin is the outside of the brain). While we may think we are perceiving joint capsules, or fascia, or cranial rhythm, the BODY and BRAIN are interpreting our presence as afferent sensory input that may or may not be "safe," and transmitting efferent signals from the brain to the tissues beneath our hands that reflects its decision.

2. The parasympathetic system
    - The "reboot" function that restores us to balanced internal function when we are safely out of danger.
    - The parasympathetic ganglia are located in the sacral plexus and in the medulla of the brainstem.
    - It regulates our internal visceral and vascular functions, including cardiovascular, respiratory, digestive and excretory systems.
    - It is designed to activate more quickly than the sympathetic drive! Exhaling decreases our heartrate within milliseconds. Inhaling dampens this response, raising the heartrate, within several seconds.
    - While it may be considered the "peaceful" system, (vs the "stressful sympathetics"), it is not passive. It is our POWERFUL nervous system.

When we are grooving in our parasympathetic system, our endocrine system is in balance, and we can have normalized endocrine function, a quiet somatic brain, good creative juices flowing, and proliferating neurons. We sleep better, digest our food properly, regulate our cardiovascular system properly, and decrease inflammatory and autoimmune mischief.

3. The gastroenteric system.
- Long disregarded by the medical field, this third branch functions largely in the parasympathetic mode.
- With 90% of our neurotransmitters made in the gut, and >60% of our immune system functioning within those walls, our GI tract deserves some parasympathetic bliss.
- GI function is therefore also participating in the HPA axis dialogue for digestive hormone output as well as immune system organization.
- "Gut Feelings" are an important part of our parasympathetic, internal survival radar, whether considering the "safety" of last nights sushi or a vague emotional uneasiness about a decision.

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The sympathetic ("stressful") and parasympathetic ("peaceful/POWERFUL") nervous systems are built to operate with agility. This means that we are built to mobilize quickly from one state to the next. When danger has passed, we can calm down and get internally regulated again. This actually lets our survival radar function more efficiently and effectively.

For example: our brains are most highly metabolically active at night, while we sleep. During sleep, we cycle through REM (rapid eye-movement) sleep and SWS (slow wave sleep). Typically, in REM sleep we are dreaming, and in a sympathetically aroused state. In SWS, we drop into deep, non-dreaming sleep that is parasympathetically driven. Thus, at night, our brain gets to nimbly dance between the two autonomic drives. This is critical to our health, especially in the cardiovascular system.

Patients who are in sympathetic overdrive lose this ability. They may sustain "cardiovagal withdrawal" whereby the cardiovascular system is overdriven by the sympathetics, a state that results in hypertension, dysregulated cardiac function, cardiovascular inflammation, and other complications. These patients do not cycle through the "on-off" switch overnight, and wake with high blood pressure and heart rate. The critical systems in the body never get their "reboot" overnight.

This sets the stage for chronic vascular inflammation and autoimmune dysfunctions, as fueled by the hormonal responses of the HPA axis, which is the primary coordinator of the stress response.

The HPA Axis

While typically thought of as the body's "stress system," the HPA axis functions more completely as the body's *energy regulator*. It is responsible for controlling almost all of the hormones, nervous system activity and energy expenditure in the body, as well as modulating the immune system. The hypothalamus and pituitary serve as the body's primary interface between the nervous system and the endocrine system.

It can be considered as a cognitive system, as it compares a perceived external signal with an internal, learned picture of the world, and then chooses an appropriate response from a large repertoire of possible responses.

When detecting a new disturbance in the surrounding environment, HPA, memory and brain-balance wiring evaluate and choose from possible responses. Stressor signaling actually imprints its message on our HPA antenna, and the HPA system can decode the particular stressor to call up a very particular response. This is a recognition-and-response pattern.

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The HPA axis functions in distinct rhythms, producing spurts of hormones in a fairly predictable cycle. It is a communication system within the body that structurally includes the hypothalamus, the pituitary gland, the adrenal gland, the thyroid and the gonads. This system regulates itself via circadian rhythms, stimulated by the presence of daylight and darkness. Different hormones are stimulated to release at certain times, and hormone release is regulated through positive and negative feedback loops.

This circadian fluctuation optimizes the daily functional tone of other physiological systems through the rhythmic hormonal secretion of the HPA system. Typically, the HPA axis produces its highest levels of cortisol between 6am - 9am. Levels sustain throughout the day and begin to decline in late evening. By the low point of midnight, the surge begins again. (Other hormones are produced in their own rhythm with the circadian cycle, such as melatonin, and growth hormone).

This axis is the interface between endocrine and central nervous system, and may be referred to as the "neuroendocrine system." It coordinates our internal circadian rhythms of behavior and physiology. While the master "clock" is the SupraChiasmic Nucleus (SCN) of the hypothalamus, "subordinate clocks" play an important role in circadian coordination. The adrenal clock plays an important role in synchronizing physiological and metabolic rhythms between different regulatory systems. In vivo this adrenal circadian clock can be entrained by light.

The HPA axis can be stimulated by any physical or emotional stress, including hypoglycemia, hypoxia, trauma and surgery.

The HPA axis controls immune-inflammatory reactions, to maintain homeostasis in healthy people. Because it regulates our immune system, any HPA axis dysfunction may contribute to aberrant immune responses.

The neuroendocrine and immune systems are "intimately interconnected with one another, and stimulation of one system results in communication of the stimulation to the other system."

The HPA axis itself is considered to be a cognitive system, as it imprints sensory information regarding stressors and calls up the proper response for that stimulus.

Some consider that the immune system acts like a sensory organ, informing the brain of antigenic challenges. If so, then the immune responses may be "conditioned" through sensory stimuli. Overflow of cortisol suppresses immune reactions and increases the susceptibility of patients to infectious diseases.

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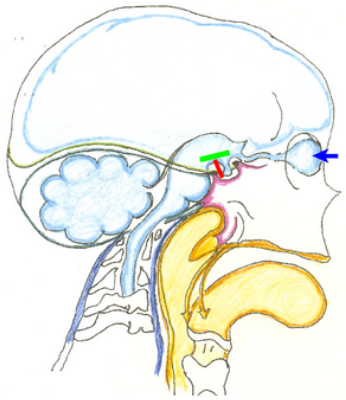
Proper regulation of the neurodendocrine and immune systems contributes to intestinal physiology, secretory immune function, conception and the transfer of immunity to offspring, and also affects sleep and recovery from disease.

Defects in the HPA axis are observed in autoimmune and rheumatic diseases, chronic inflammatory disease, Chronic Fatigue Syndrome and Fibromyalgia.

When a person endures chronic, unrelieved stress - whether related to work and family, or resulting from fears and habitual negative thoughts - the body's defenses can no longer keep up with the demands. Soon, symptoms appear that may develop into a stress cycle in which physical and psychological symptoms cause increased stress, which itself results in negative thoughts, more frequent activation of the stress response, and ultimately, more frequent or severe symptoms. Symptoms that characterize the stress cycle vary; elevated blood pressure, headaches, backaches, gastrointestinal disturbance, insomnia, palpations, muscle tension, and irritability are common.

Neurological Components and the Pathways



1. Light enters the eyes and stimulates the retinal pathways to specific tissues in the hypothalamus (green).
2. The hypothalamus responds by sending hormone signals to the pituitary gland (red).
3. The pituitary gland responds by making a hormone (ACTH) that travels to the adrenal glands.
4. The adrenal glands respond to this stimulus by producing cortisol.
5. Cortisol circulates throughout the body.
6. When cortisol reaches the brain, special receptors acknowledge its levels, and turn off production.
7. External stimulants may fuel greater cortisol production.
8. Resistant receptors may not acknowledge cortisol is circulating, and the system does not get shut off.

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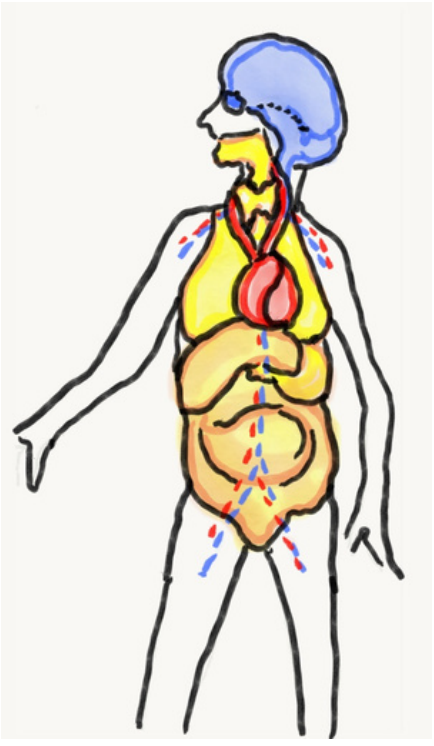
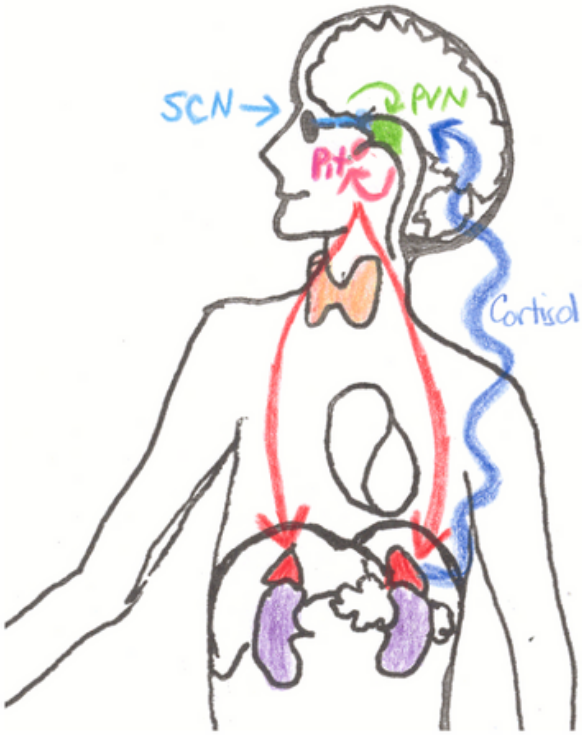
In this view we can see:
1. The blue line of stimulus from the retinas to the green hypothalamus.
2. The pink pituitary receiving impulses to create hormones (ACTH).
3. The red adrenal glands that receive the ACTH and make cortisol.
4. The purple kidneys that sit below the adrenal glands.
5. The peach "bow tie" at the throat is the thyroid gland, which also participates in the hormonal signaling of the HPA axis.



In this view, we can see the mature arrangements of the blue brain tube and the yellow yolk ball/gut tube. The mesoderm vascular system interpenetrates all tissues.

The crest cells are innervating and illuminating all tissues via the autonomic nervous system.

The brain tube continues to rely on the rhythms of the gut tube for optimal organization.



In this picture we can see the light stimulus affecting the (green) hypothalamus, which signals the (pink) pituitary gland to make ACTH, which goes to the (red) adrenal glands.

The adrenal glands make cortisol, which circulates throughout the body.

When it reaches the brain, receptors there acknowledge the presence of cortisol and turn off the hypothalamus-pituitary production.

Section C: How is it Built to Function?

The HPA axis can be called the "human circadian pacemaker" that regulates the timing and amplitude of several endocrinological functions, including cortisol and melatonin. Cortisol, controlled by neuro-humoral signaling in the HPA axis, is a pulsatile hormone secreted with daily rhythmicity, waning in late evening and peaking with awakening in the morning. Melatonin is typically produced overnight, beginning just before bedtime and ending just after wakening. Melatonin production is more directly linked through the brain and spinal cord via the pineal gland.

When the HPA Axis is exposed to chronic stress, and is therefore hyperactive, it frequently results in the suppression of reproductive, growth, thyroid and immune functions that may lead to various pathological states. Stress seems to be a provoking factor in those individuals with particular vulnerability, determined by genetic factors or earlier experience.

The Hypothalamic-Pituitary-Adrenocortical (HPA) system responds consistently to perceived novel or unfamiliar situations and can serve as an important biomarker of the response to a variety of different stimuli.

Psychosocial stress leads to a release of cortisol. While this psychoneuroendocrine response helps to maintain physiological as well as psychological equilibrium under stress, exaggerated secretion of cortisol has been shown to have negative effects on somatic health and cognitive/emotional functioning.

HPA axis responses to moderate psychosocial stress are heritable - genes and environment jointly influence the function of this endocrine system. Context is important!

The genetic influences upon the HPA axis begins in utero. We will be taking a look at Fetal Autonomic Development later in the course.

Adult Challenges

In adults, the HPA axis may be dysregulated in either direction: producing too much cortisol with overstimulation, or with low levels of morning cortisol (hyporeactive).

Immune and neuroendocrine abnormalities are associated with autoimmune diseases, chronic inflammatory conditions, allergies, and asthma, including Chronic Fatigue Syndrome and Fibromyalgia.

Decreased reactivity of the HPA axis increases the susceptibility to chronic inflammation. The sympathetic adrenomedullary (SAM) system is an adjunct immunoregulatory and anti-inflammatory stress-response system.

HPA regulates you internally, while the SAM is sensitive to psychosocial stressors, and may exacerbate inflammatory processes (especially in the skin and gut).

In adults, dysregulation of the HPA axis appears to be related to hypertension. Some studies show that alterations in HPA axis regulation might contribute to the atherosclerotic risk in hypertensive individuals, decreased cortisol responsiveness (binding to receptors), suppressing renin production in the kidneys and resulting in higher blood pressure.

Memory processing is also affected by cortisol dysregulation. Cortisol elevations in the morning appear to lead to impairing effects, while cortisol elevations in the afternoon might lead to absent or enhancing effects.

Depression

Depression is strongly correlated to HPA axis dysfunction. While genetic factors increase the risk of major depression, there is usually an environmental stimulus that triggers that expression, either conflict in the early family environment or exposure to stressful life events.

Factors from gestation and early childhood predict high symptom levels of depression and anxiety at age 10. Maternal depression is associated with higher rates of child depression. Genetic factors, important in adult-onset depression, may not be as important in depressions with onset before puberty.

Anxiety

According to cognitive activation theory, long-lasting work demands without rest or lack of coping may lead to sustained activation of the HPA axis and pathology.

Cortisol is one of the most important stress hormones in humans and increased basal levels of cortisol are considered a valid marker for sustained activation. When adults display abnormal decreases of cortisol during the day, the decrease typically relates to lack of control in the work environment, (displaced) decision authority, physical functioning, general health, and vitality.

Treatment of depression alone is not enough to improve self-care… education may be a necessary intervention in addition to treatment of depression.

Sleeplessness.

Sleep is fundamental to the adaptive responses to infection and injury. Disruptions in our sleep cycles impair the critical brain circulation processes. Researchers also find a link between HPA axis dysregulation, poor sleep, and metabolic disorders.

Many adults (and increasing numbers of teenagers and young adults) complain of poor sleep patterns. Our medical culture is just beginning to acknowledge these issues, and is working to create meaningful support systems. The dental profession is also addressing sleep-disordered breathing and airway health.

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So, now what do we do?

Self-care, first for ourselves, must be understood at this level. When we know this place of autonomic self-regulation, we can model that for children and their parents/caregivers. As we identify common barriers to self care and recognize the importance of addressing these issues, we can help families develop strategies to overcome these barriers and reclaim a deeper, more meaningful level of health.

People with more social support perform self-care behaviors more frequently. Self-esteem or self-efficacy (confidence in one's own ability to carry out the necessary tasks and recommendations to manage a disease) is positively correlated with self-care.

Cognitive behavioral strategies are emerging as tools for stress management. Many of these studies examine some sort of mind-body meditation or focused breathing technique to alter physiological responses to stress. The neuroscience-based protocols that we are exploring here are also powerful tools for ANS regulation.

Subjects in Cognitive Behavior Stress Management (CBSM) groups show significantly reduced cortisol responses to acute psychosocial stress. The results show that CBSM reduces psychological and somatic symptoms and influences the ability to show a cortisol response corresponding to subjectively perceived stress.

As we explore our own journey of finding our Balance Zone, we can better offer support in this process to those in our care.

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In short, it's time to take a deep breath and pay attention.

Where we have unconsciously been imprinting stress signals and responses,
we can now decide to consciously "re-wire" the system
to acknowledge calming signals and responses.

First let's reconnect to our breathing… * Breathe It * Feel It * Name It *

Now let's explore the four simple steps of the rewiring process:

1. IDENTIFY

   What situations, interactions or thoughts, memories, beliefs, stories… get you stressed? Even in that quiet, clenched, queasy way?

   At first you might only identify them after they've gotten you all wound up.

   Observing the patterns is an important start, and will give you a chance to slow down… …the next time… so you can

2. PAUSE…. and ASSESS

   When you are aware of the triggers, you can start to slow things down a little with some breathing.

   Decide if you are really safe and ok right this moment, and if so, can you breathe through it a little?

   Can you learn to breathe through something that used to make you uncomfortable?

3. DECIDE

   When you can catch the triggers or the patterns before they start ("recognition") you can decide to respond differently.

4. RESPOND

   When you decide you are safe right now, and choose to breathe and feel your calmness, you are retraining your stress systems to protect you better.

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How does calming down and strengthening your "peaceful" nervous system protect you better?

* Your "radar" recalibrates and you can more accurately assess a dangerous or SAFE situation.

* When your peaceful nervous system is secure and agile, your health improves, especially your cardiovascular, metabolic, digestive, immune and hormonal systems.

* IT FEELS GOOD!! And when we feel good, it's contagious!

* When you are purring smoothly in your peaceful nervous system, you navigate the world in your own true flow. You may find that you are not over-reacting to drama around you!

So go ahead and…
*** Breathe It * Feel It * Name It * Move It * Share It * ENJOY IT!***

Some final thoughts.

* At first, practice when you are in a safe or quiet place. As your peaceful nervous system gets stronger, it will be easier to continue breathing during more hectic times. Take a few breaths at every red light, or when you sit down to eat, or as you go to bed at night.

* Every breath counts! The principles of neural plasticity show us that we can re-wire our brains for better health and function, and with every belly breath we are doing just that.

* You can't force someone else to relax but you can MODEL that behavior and resonance takes over from there. If you have rocked a baby to sleep, you know how this works already.

* Simply learning new coping skills decreases cortisol and increases your brain cell growth.

* There are many health benefits to focused breathing skills like this (upcoming discussions!) but of course, these strategies are not a substitute for proper medical attention for specific conditions.

So go ahead and…

*** Breathe It * Feel It * Name It * Move It * Share It * ENJOY IT!***