

A Real Pain in the Brain (and Nervous System): The New Science of Chronic Pain

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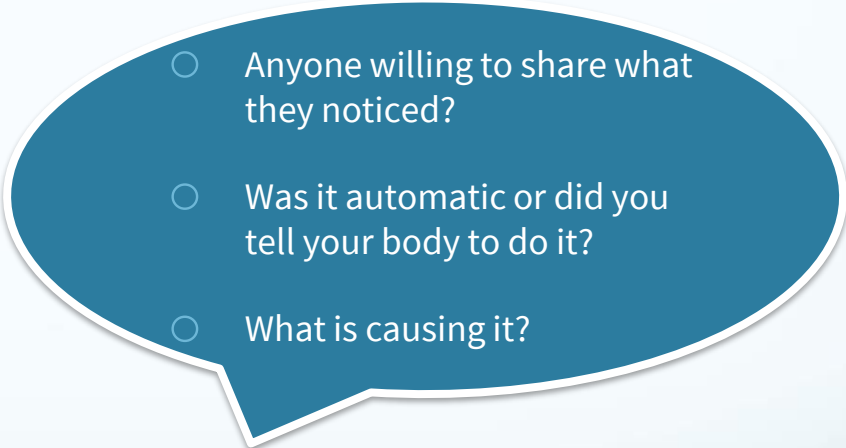
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The Human Stress Response

Take a minute and close your eyes. Think of a time in the last few weeks that was moderately stressful. Bring yourself back to the event, reminding yourself of the details of what happened.

Notice your body: how is it feeling and what is it doing?

- 
- Anyone willing to share what they noticed?
 - Was it automatic or did you tell your body to do it?
 - What is causing it?

What is happening in my body?



How The Mind & Body Affect Each Other

EXAMPLES

- Stressful day at work: tension headache, stomach upset, obsessive thoughts
- Giving a speech: sweaty palms, shaking, racing heart, racing thoughts, desire to run away, mind going blank, nervousness
- Having an argument: feeling hot, flushing, increased energy, tense muscles, talking louder,
- Car accident: tensing up, catching your breath, blood pressure rising, tingling, anxiety, fear
- Feeling embarrassed: blushing, desire to run, stomach issues, sweating, anxiety
- Daughter scores a goal in soccer game: feeling elated, increased energy, feeling warm, shake

TMS (Tension Myositis Syndrome), PPD (psychophysiological disorder), somatic symptom disorder, neural pathway pain, central sensitization, dysautonomia

Originally coined by Dr. John Sarno

Who is Dr. Sarno?

What is Mind Body Syndrome?

A physician and professor of Rehabilitation Medicine at N.Y.U. for more than 30 years, Dr. Sarno was frustrated by the lack of results with pain treatment. He revisited the science, conducted multiple trials, and discovered something incredible:

Most chronic pain and disease is caused by tension (stress) and not an underlying physical issue.

The New Science of Chronic Pain



MBS (Mind Body Syndrome) is a condition that causes real physical symptoms, such as:

- many forms of chronic pain
- gastrointestinal issues
- chronic fatigue and fibromyalgia
- those not due to pathological or structural abnormalities
- Those not explained by diagnostic tests.

MBS is created and exacerbated by processes in the brain and nervous system.

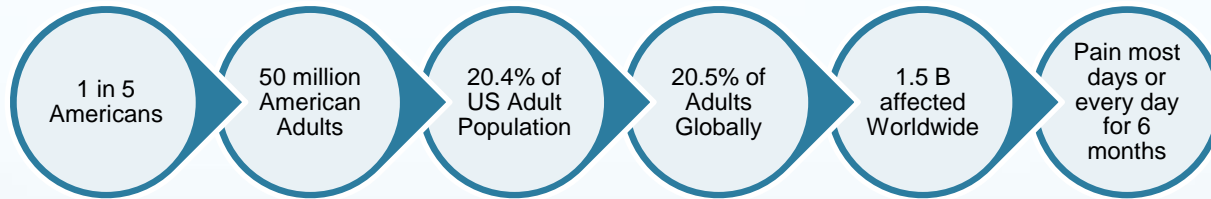
- Unprocessed emotions, unhealthy thought patterns, and everyday stresses
- lifestyle factors
- childhood stress
- trauma

Types of mindbody symptoms-all are real!!!

Body pain (back, neck, pelvic, joints, etc.)

- Chronic fatigue
- Fibromyalgia
- Gastritis
- Migraines
- IBS
- Neuropathy





The Epidemic of Pain and Chronic Symptoms



The Cost of Pain

\$636 billion
per year

Doctor visits

Surgery

Referrals

Specialists

Imaging

Medication

The success rate for back surgery is only 25%

Besides the well-known issues with addiction, opioids and other pain medications only give partial relief from pain.

Opioids lead to ***increased pain over time***. The body reacts by increasing the number of pain receptors in the brain to try to get the pain signal through again. Opioids overwhelm the brain and over time the brain loses the ability to produce its own natural pain reducers.

Interestingly, **antidepressant drugs** are commonly prescribed for chronic pain conditions because they calm the central nervous system which helps to rewire the brain.

Other Costs

- ✓ Emotional
- ✓ Addiction
- ✓ Depression
- ✓ Anxiety
- ✓ Quality of Life
- ✓ Social Stress
- ✓ Employment



- ✓ Stigma
- ✓ Invisible Illness
- ✓ Isolating
- ✓ Feeling "Crazy"
- ✓ Discrimination
- ✓ Stereotyping

The 5th Vital Sign



- In 1950 doctors were concerned with four vital signs: body temperature, blood pressure, heart rate, and respiratory rate
- Pain was viewed as unimportant and only as a symptom of an underlying condition
- Anyone who had pain without an identifiable cause was thought to be “crazy”
- Many doctors became concerned that their patients' pain wasn't being addressed
- They advocated for the introduction of the 5th Vital sign, which is a patient's current level of pain

The 5th Vital Sign cont



- Suddenly doctors had a huge problem on their hands due to the large amount of patients with chronic pain, and being untrained in how to help
- This is when doctors started ordering pills, imaging, surgeries and physical therapy
- Due to advances in modern technology doctors can dig to find something that could be the cause of pain
- However, we now know that imaging can show normal abnormalities which are not necessarily the cause of the pain

Prevent Yourself from becoming a VOMIT

Victim of Medical Imaging Technology

Medical imaging procedures such as MRI's, cat scans, ultrasounds, x- rays can be very valuable for identifying serious medical conditions such as fractures, dislocations, and spinal cord injuries. However, minor findings are of no value to explain the majority of aches and pains. Studies show that from a psychological point of view, the findings are actually harmful. Those patients that became a victim of VOMIT had more doctors visits, longer lasting pain, more disability, and a lower sense of well being

Vomit facts continued



- A study of lumbar spine amongst healthy 20 to 22 year olds with no back pain found that 48% had one degenerative disc and 25% had a bulging disc
- A study of the thoracic spine showed 29% of healthy adults had a disc bulge actually deforming and pressing on the spinal cord did not even know about it.
- A study of the hips revealed 77% of healthy hockey players who had no pain had hip and groin abnormalities on their MRI.
- 85% of adults with no actual knee pain have x-rays that show knee arthritis, and 48% of healthy professional basketball players had meniscal damage on their MRI with no pain.
- 40% of professional baseball pitchers had either partial or full rotator cuff tears yet had no pain while playing and remained pain free 5 years after the study
- 32% of people with no foot or heel pain have heel spurs (associated with plantar fasciitis) visible on an x-ray.
- An MRI study of healthy adults and seniors found that 98% of all men and women with no neck pain had evidence of degenerative changes in their cervical disks.

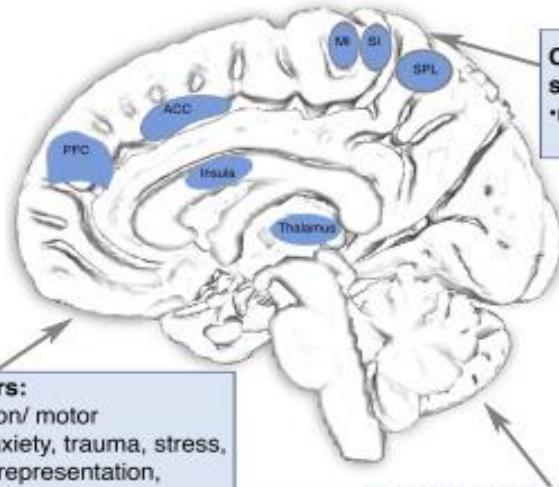
Prevalence of degenerative spine imaging findings in asymptomatic patients, n=3300

Age (yr)

Imaging Finding	20	30	40	50	60	70	80
Disk degeneration	37%	52%	68%	80%	88%	93%	96%
Disk bulge	30%	40%	50%	60%	69%	77%	84%
Disk protrusion	29%	31%	33%	36%	38%	40%	43%
Annular fissure	19%	20%	22%	23%	25%	27%	29%
Facet degeneration	4%	9%	18%	32%	50%	69%	83%
Spondylolisthesis	3%	5%	8%	14%	23%	35%	50%

Pain Without Tissue Damage

Factors determining the outcome of phantom limb pain



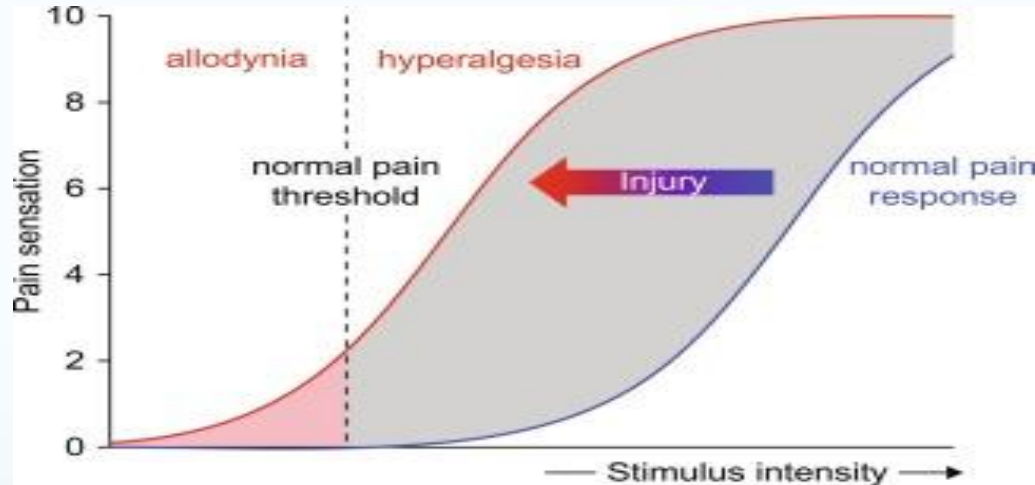
Changes in the central nervous system with phantom limb pain
•reorganization / preserved function

Contextual factors:
•sensory stimulation/ motor
•psychological (anxiety, trauma, stress, depression, body representation, cognitive processes)

Peripheral factors:
•input from the residual limb (muscle contractions, ectopic activity from neuroma, dorsal root ganglia, spinal cord)
•use-dependent plasticity (compensatory overuse of the intact/residual limb, prosthesis use)



Pain Without Tissue Damage



Allodynia: pain elicited by a stimulus that normally does not cause pain

Hyperalgesia: an increased pain response produced by a stimulus that normally causes pain

Pain Gate Theory

Stimuli w/no damage

Brain of chronic pain patient will allow the pain signal to enter while most brains will block (gate) the pain signal



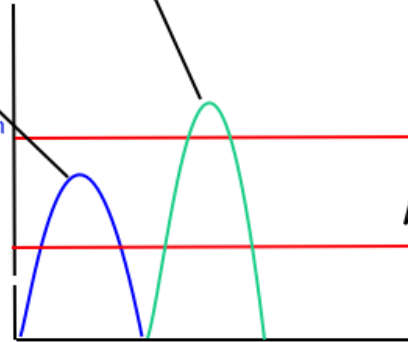
Threshold to perceive pain



Threshold for chronic pain syndromes

Stimuli with damage

Brain of both chronic pain and normal population will allow pain signal to enter, but intensity may differ.



Factors Affecting Threshold

- ★ -Brain input
- ★ -Spinal cord input
- Memories
- Emotions
- Expectations
- Attention
- Genetics

Key

- Stimulus w/tissue damage
- Stimulus no tissue damage

@drjonathanchung

The 5th Vital Sign Continued

- Despite all these advances in technology we are still a society in chronic pain
- The way pain has been viewed and treated has not been successful and a new understanding is needed
- With the most recent advances in neuroscience we know the majority of chronic pain is not due to structural problems
- We now have science to prove the role of the brain and the nervous system in producing and maintaining pain.



Brain as a Protector



Our brains are constantly on guard, looking for perceived danger or threat. Over our lives our brain learns and encodes threats, and we learn if we are generally safe in the world or generally unsafe. Our brains learn what things make us safe or unsafe. All of this is remembered and encoded. Pain is one of the brain's common responses to threat. Other responses are fatigue, depression, anxiety, insomnia.

The brain doesn't know the difference between a physical threat and an emotional threat. The brain can feel threatened by physical and/or emotional injury, or even anticipation of physical injury and/or emotional injury.

Examples:

- fear of losing a job
- loss of a relationship
- emotions: guilt, shame, anger, grief, and others

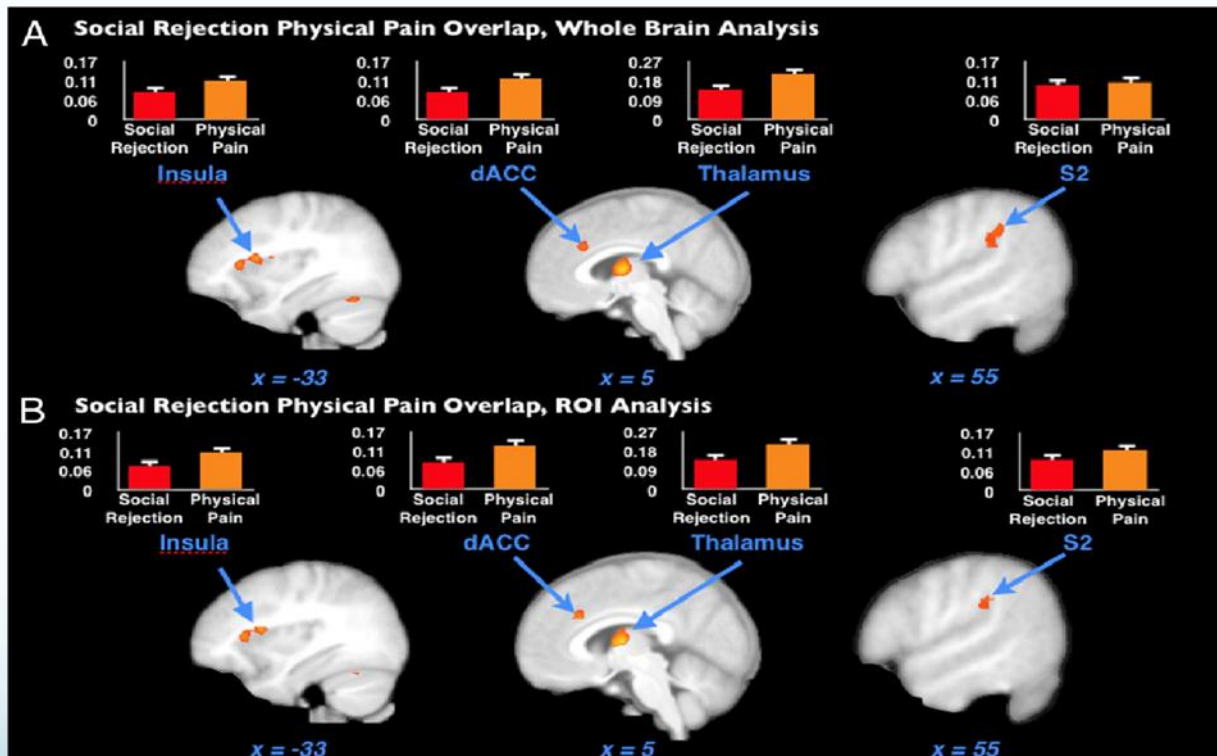
Any threat can trigger a pain response in the brain.

Pain as a Danger Signal



- If you put your hand on a hot stove, pain lets you know to move your hand.
- Sometimes your brain interprets things as dangerous when they are not.
- For example: If I toss you a baseball and your brain thinks it's a hand grenade, you would respond as if it was dangerous even though it is safe.
- When the brain thinks something is dangerous, it amplifies the sensation.
- Imagine you were wearing a hearing aid and I am talking at a 2 out of 10 volume. If your hearing aid is set too high, you would hear me at a 7 even though I'm only talking at a 2. Your brain interprets the signal as louder.
- It's the same with neural pathway pain. There is a volume knob in our brains that is controlled by the brain's perception of safety. If this volume knob gets turned up, it interprets sensations louder than they are because the brain perceives them as dangerous.

Emotional pain equals physical pain



All Pain Is Real!

“Anyone who says your pain isn’t real or the pain is all in your head is either cruel, ignorant, or both. It implies that you are crazy or mentally ill which is obviously not true.”

-Dr. Howard Schubiner

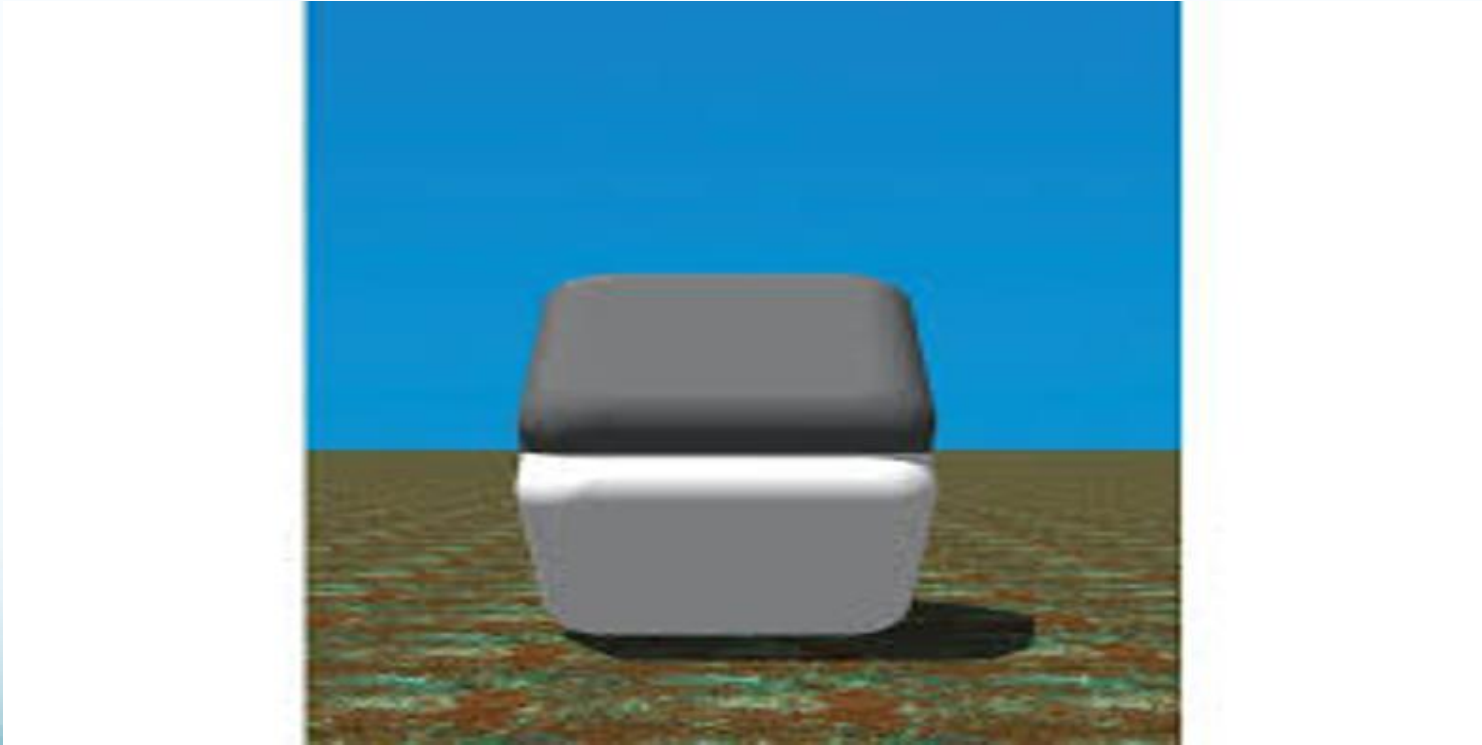
All Sensation is created by the Brain, including pain

Predictive coding: the brain creates all sensory experience. The brain is by no means perfect. It can interpret safe situations as dangerous. It can also make mistakes in the way it processes sensory information.

Vision is determined by the visual cortex, not the retina; Taste is determined by the primary gustatory cortex rather than the tongue; Hearing is determined by the auditory cortex, not the ear.

Examples of predictive coding: Expecting an iced tea and getting a coke can create a sensation of disgust rather than pleasure; Cornsweet Illusion; Old/Young Woman; Yanni vs. Laurel

Cornsweet Illusion



Vision is Constructed

What you
focus on is
what you see



Yanni vs Laurel



All Sensation is created by the Brain, including pain

All of our experiences are derived from learned neural circuits. Pain is a decision made by the brain to protect us from danger.

- Caveman story
- Garden hose and snake
- Nail in boot
- Nail in hand
- Vietnam Veteran

Caveman



If one of our ancestors was running to chase a deer and broke their ankle, do they want pain? Yes! Without pain they would run on a broken ankle and may never hunt again because of the damage.

If they were running while being chased by a lion and broke an ankle, they would not get pain even though there is tissue damage. Their brain would decide that their protection is better served by continuing to run, and the pain would become apparent when they are away from the danger.

Garden Hose and Snake



A man was bit by a snake. He had tremendous pain in his leg. Years later he was walking through his garden felt a lot of pain in his leg. He couldn't believe he had been bit by a snake again! When he looked down at his leg, he realized that he did not get bit by a snake, but in fact a garden hose had rubbed up against his leg.

His brain perceived the hose as a threat because it resembled a snake that had caused him pain before.

Nailed It



UK Nail in Boot

This man stepped on a nail at a construction site and had severe pain. He was rushed to the hospital where he was given pain meds immediately. When they removed the boot the nail had gone between his toes. There was no injury at all. His brain decided to protect him by creating severe pain.



Nail in Hand

This person accidentally shot a nail into their hand while alone at a construction site. They had zero pain. Their brain decided it would be better for them to drive to the hospital than be alone in severe pain. This was a subconscious decision by their protecting brain. When they arrived at the hospital, they began to feel the pain from the nail.

Vietnam Veteran



A woman was in the Vietnam war and got injured by shrapnel in a firefight. She had a lot of pain and got medevaced out in a helicopter. Her injuries healed, because all injuries heal. The danger signal in her brain that activated pain turned off, so she was pain free. Twenty years later she was startled by a helicopter coming up from behind her and felt the same pain from the prior shrapnel injuries. Her brain learned those neural circuits of pain, remembered them, and activated them due to the sound of the helicopter. This sound was the trigger for her pain.

It's NOT all in your head!

- ✓ The pain is real. Many doctors say that this kind of pain is more painful than pain from structural damage.
- ✓ It's a physical change in the structure and function of your brain and nervous system.
- ✓ Your brain creates neural pathways
- ✓ Study By Javiera Hashmi to see where pain shows up in the brain:
- ✓ In this study she compared patients with acute low back pain (less than 2 months) and chronic low back pain (more than 10 years) Using MRIS they saw that in the first group, the acute pain was activating the front of the brain (that's normal for acute pain). With the second group it moved to the emotional part of the brain!!!!

Proportion of chronic conditions that are brain induced:

- Headaches: 98%
- Fibromyalgia: 99%
- IBS: 99%
- Anxiety/Depression: 99%
- Pelvic pain syndromes: **90%**
- Chronic neck/back pain: > 85%

The Process of Developing MBS

1. Human brains and nervous systems develop in tandem with the environment. Therefore, childhood stress primes the brain and nervous system to be overly reactive.
2. Teen and adult stress triggers and reinforces those same reactions and solidifies coping mechanisms along with personality traits that create increased internal pressure.

Childhood adversities such as divorce, family conflict, sexual or physical abuse along with adult experiences of victimization are common in people with TMS.

People develop personality traits to cope with stressful childhood experiences such as: putting more pressure on themselves, self criticism, self blame, excessive worrying, and being overly conscientious people-pleasers. They more often than most lack their own self care and self worth. These traits put people at higher risk for developing MBS.

AGE

LIFE EVENT

PATHWAY

SYMPTOMS



Stress/Hurt

Danger

Stress/Hurt

Danger

!

Stress/Hurt

Danger

!!

Stress/Hurt

Danger

!!!

What About You?

Childhood Stressful Events Poll

Please get a piece of paper, and make two columns: One Yes, One Maybe

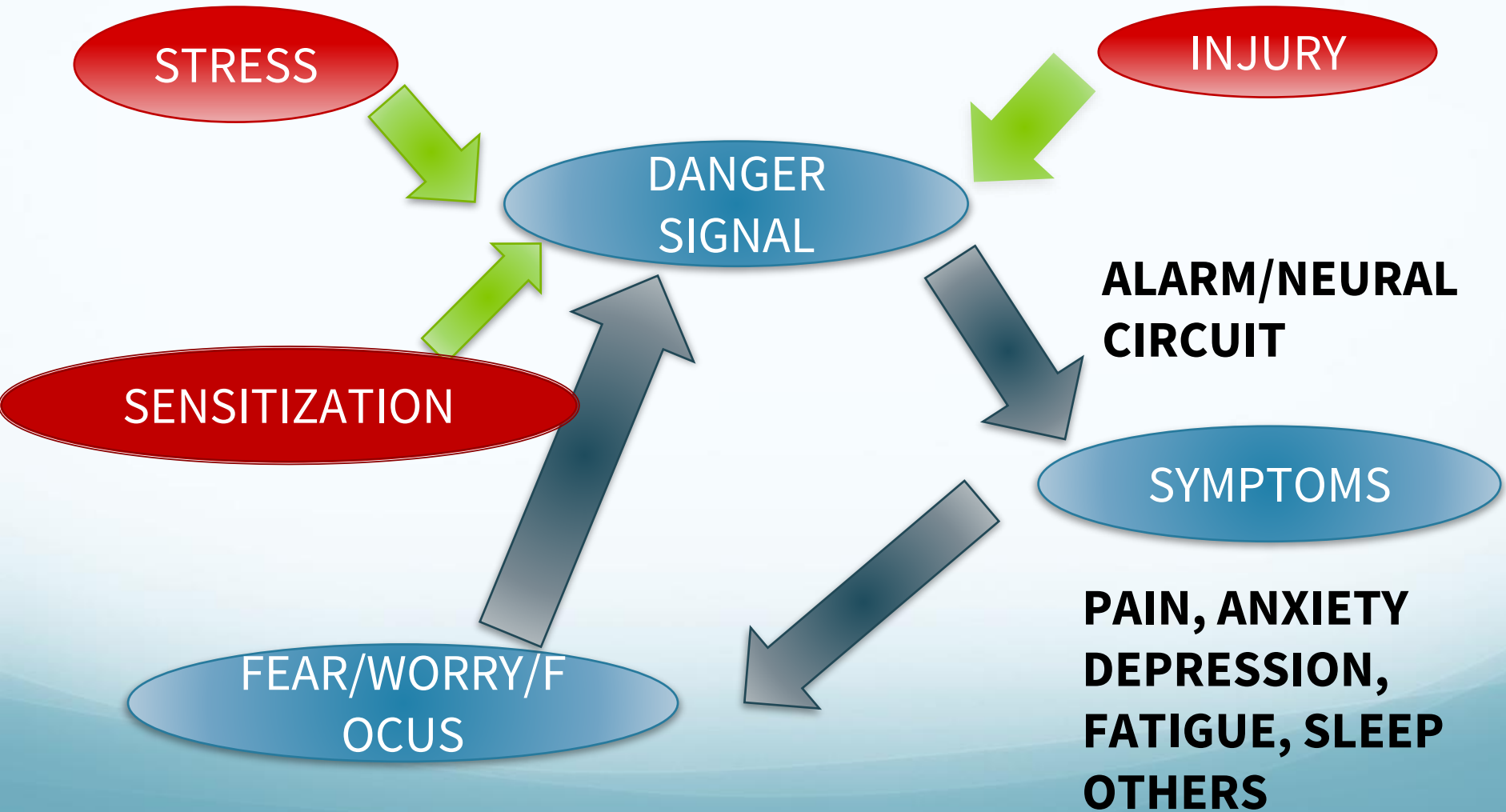
Yes	Maybe

Which of these describe you?

- Having low self-esteem
- Being a perfectionist
- Having high expectations of yourself
- Wanting to be good and/or be liked
- Frequently feeling guilt
- Feeling dependent on others
- Being hard on yourself
- Taking on responsibility for others
- Often worrying
- Having difficulty making decisions
- Following rules strictly
- Having difficulty letting go
- Tending to hold thoughts and feelings in
- Tending to harbor rage or resentment
- Not standing up for yourself

The Process of Developing MBS cont.

3. Our unconscious brain interprets innocuous sensory information from our environment as dangerous. This danger signal sets off a cascade of physiological changes that create physical symptoms in the body. The symptoms occur due to activation in a part of the brain called the amygdala which prompts the autonomic nervous system to activate the fight, flight, or freeze response.
4. This causes increases in muscle tension, changes in blood pressure, heart rate, body temperature and neurological activity, and gastrointestinal and genitourinary activation, which lead directly to MBS symptoms.
5. This creates more activation of the danger response and a vicious cycle of learned neural pathways occurs due to increased focus, worry and attention to the symptoms.



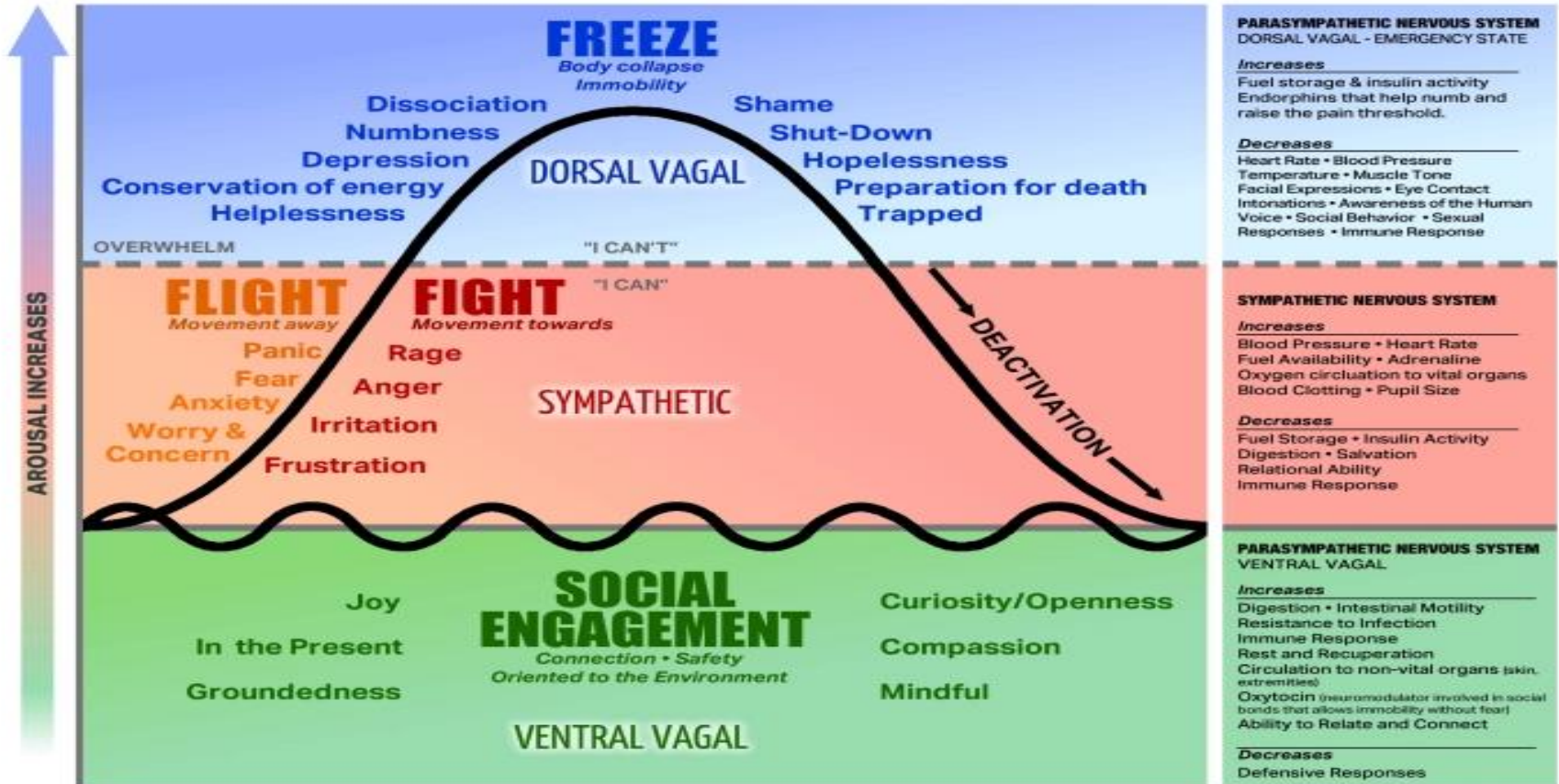
Factors of Pain

Chronic pain results when pain is reinforced over time by four factors:

1. Reactions to the pain of fear, worry, hopelessness, frustration, and excessive focus.
2. Ongoing physical damage (which only occurs in a minority of chronic pain disorders).
3. Ongoing psychological or social threat.
4. Lack of joy, happiness and peace.

Making an accurate diagnosis of pain as being non-structural (when appropriate) and interventions that target these four factors can be effective to reduce or eliminate pain

Polyvagal Theory-Your Nervous System

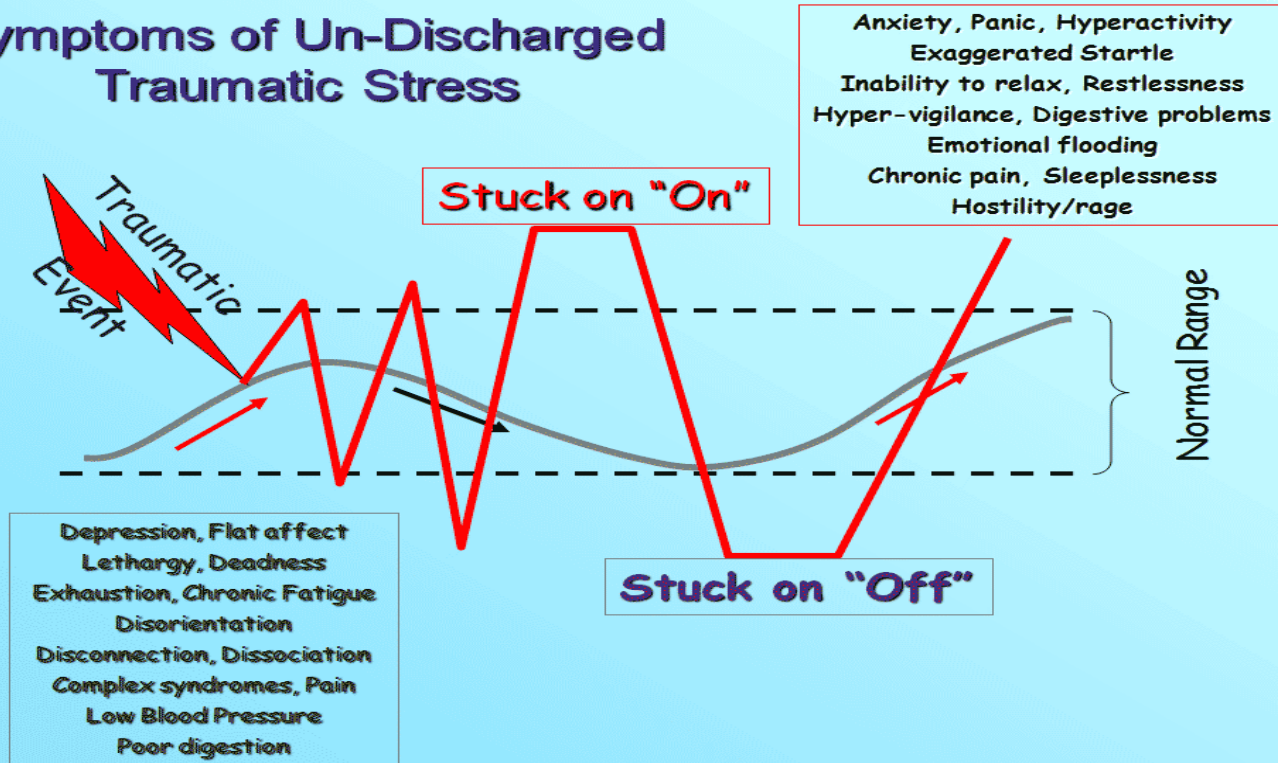


Adapted by Ruby Jo Walker from: Cheryl Sanders, Steve Hoskinson, Steven Porges and Peter Levine

rubyjowalker.com

Flight Fight Freeze

Symptoms of Un-Discharged Traumatic Stress



What About You?

Does your nervous system prefer

Fight?
Flight?
Freeze?

Stress Bucket Analogy

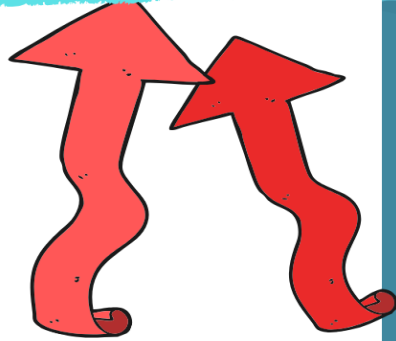


- Imagine a bucket filled with shame, grief, rage, sadness, stress, and negative thinking. It hits maximum capacity and threatens to overflow.
- Without a release valve, sometimes an emotion can become too strong. People with MBS personality traits have a difficult time feeling and expressing emotions because they have been conditioned to see them as “bad” or “wrong.”
- Because of this, the brain interprets certain emotions as threatening. Instead of processing and feeling the emotion, the brain and body create physical symptoms to protect against the perceived danger of the emotion.

“False” alarms are just as real as “real” alarms. MBS pain is just as real as structural pain.

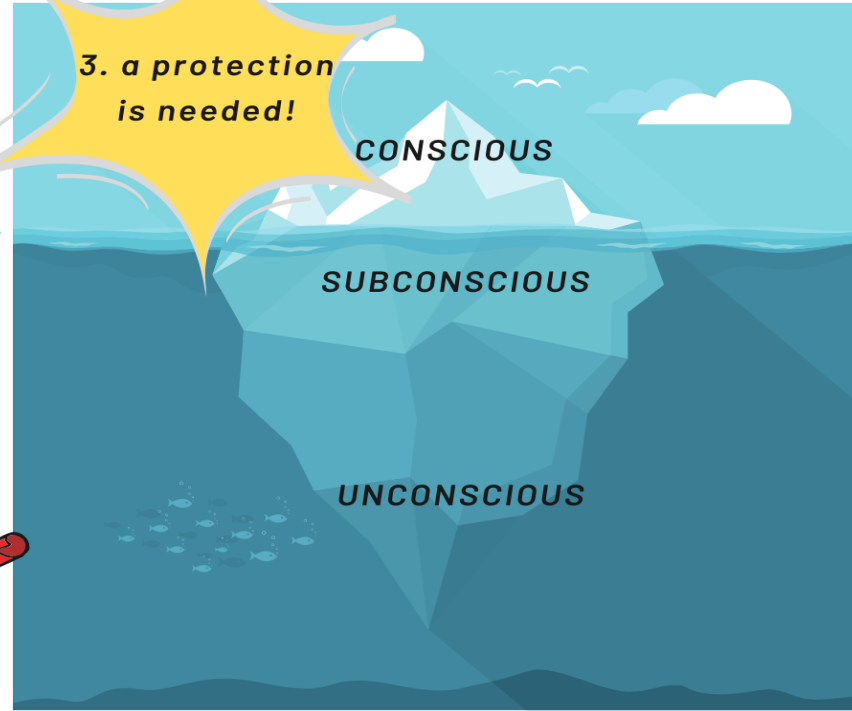
FORMATION OF SYMPTOMS

2. they get close to the surface of consciousness



1. feelings rise up

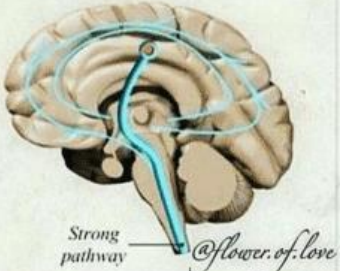
3. a protection is needed!



You can heal!

Reprogram your brain


Pathways
Neural pathways connect relatively distant areas of the brain or nervous system, each pathway is associated with a particular action or behavior.



Strong pathway @flower.of.love

Every time we think, feel or do something, we strengthen this pathway. Habits are well travelled pathways – our brain finds these things easy to do.

Neuroplasticity



New thoughts and skills carve out new pathways.

Repetition and practice strengthen these pathways, forming new habits.

Old pathways get used less and weaken.

With **repeated and direct attention** towards a desired change, we all have the ability to rewire our brains.

it takes 21 days to form a new habit

How neural pathways work--pain as a learned habit

Neural pathway pain is very common and reversible!

learning a language

playing the piano

free throw experiment

diet example

Do you have TMS?

Create an evidence journal

Let's connect the dots - evidence of tms vs structural

1. Personality traits
2. Prior symptoms
3. Stressors and past traumas
4. Assessments (PPD Association)
5. Pain Questions

Healing from neuroplastic pain is a multidisciplinary approach

- Knowledge, Acceptance and Pain Education
- Mindset and Focus
- Meditation and Mindfulness
- Exercise and Movement
- Affirmations
- Journaling
- The 3 S's: Self care, Self love, Self worth
- Somatics and Nervous System
- Reframe negative thoughts and thinking
- Joy and Gratitude

NOW WHAT????

“Nothing ever goes away until it has taught us what we need to know.” –Pema Chodron

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