When the Body Remembers: Trauma, the Nervous System, Chronic Pain, and Integrative Treatment Strategies

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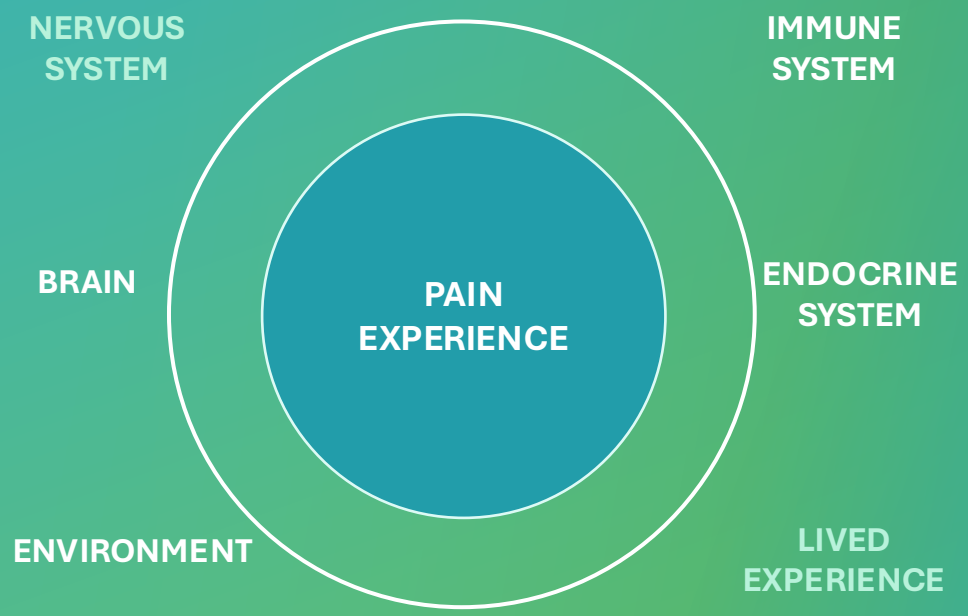
Learning Objectives

1) **Differentiate** trauma as a physiological and neurobiological process rather than solely a psychological diagnosis, and recognize its association with chronic pain, chronic illness, and increased risk of autoimmune disease.
2) **Describe** the neurobiology of trauma, including autonomic nervous system dysregulation, HPA axis dysfunction, cortisol imbalance, limbic system activation, neuroinflammation, cytokine signaling, and central sensitization, and explain how these mechanisms contribute to persistent pain.
3) **Recognize** how trauma-related physiological changes can influence multiple body systems—including immune, endocrine, gastrointestinal, musculoskeletal, and mitochondrial function—and contribute to complex chronic pain disorders.
4) **Evaluate** evidence-based treatment strategies for chronic pain that incorporate nervous system regulation, trauma-informed care, somatic therapies, EMDR, neurofeedback, anti-inflammatory nutrition, targeted supplementation, movement, and appropriate pharmacologic interventions.
5) **Identify** patients who may benefit from a trauma-informed, multidisciplinary approach and understand how addressing underlying physiological and psychosocial contributors can improve pain outcomes and overall quality of life.
6) **Apply** an integrative framework to develop individualized treatment plans that address both the underlying physiology and the patient's lived experience, with the goal of improving resilience, function, and long-term recovery.

WHEN THE BODY REMEMBERS

What if chronic pain is more than a problem with the tissue?

- Pain is **more than a signal from injured tissue**
- Pain is shaped by the **brain + nervous, immune & endocrine systems**
- **Environment and lived experience** influence pain processing
- Prolonged threat can alter how the **nervous system processes pain**
- Chronic pain can become a **whole-body physiological experience**



THE QUESTION BECOMES:

Are we treating the **source** of the pain...
or only the **output?**

Trauma-informed care asks us to look beyond the pain location and understand the whole person.

TRAUMA IS MORE THAN A PSYCHOLOGICAL DIAGNOSIS

Trauma can affect the **mind** AND the **body**

- NERVOUS SYSTEM
- IMMUNE SYSTEM
- ENDOCRINE SYSTEM
- PAIN-PROCESSING SYSTEMS

Trauma can alter multiple interacting systems—not only thoughts, emotions, or behavior.

EXPOSURE MAY BE:

- SINGLE EVENT
- REPEATED EXPERIENCES
- ONGOING CIRCUMSTANCES

Not everyone exposed to trauma develops lasting symptoms.

The response is individual—and shaped by the person's experience.

Trauma is not only about what happened.

It is also about how the body and nervous system responded to what happened.

WHAT IS TRAUMA?

Trauma occurs when an experience overwhelms an individual's capacity to cope **or creates a significant disruption in safety, attachment, or functioning.**

IT CAN INVOLVE:

- **ACTUAL OR PERCEIVED THREAT**
- **PHYSICAL OR EMOTIONAL HARM**
- **SERIOUS INJURY OR ILLNESS**
- **LOSS OF SAFETY OR CONTROL**
- **REPEATED OR PROLONGED ADVERSITY**
- **EXPERIENCES THAT OVERWHELM THE BODY'S ABILITY TO ADAPT**

Trauma is not defined solely by the event.
The individual's experience and the lasting effects matter.

THE THREE E'S OF TRAUMA

1 EVENT

What happened?

A single event, repeated events, or ongoing circumstances

2 EXPERIENCE

How was it experienced?

Threat, fear, helplessness, loss of control, overwhelm, lack of safety

3 EFFECT

What happened afterward?

CHANGES IN:

- **Nervous system function**
- Behavior & emotions
- Sleep
- Immune function
- **Pain processing**
- Physical health
- **Relationships & daily functioning**

Same event ≠ same response

Trauma is shaped by the **event**, the individual's **experience**, and the resulting **effects.**

TRAUMA DOESN'T ALWAYS LOOK LIKE TRAUMA

TRAUMA CAN BE:

PHYSICAL

Serious injury
Surgery or repeated procedures
Burns, accidents, head injury
Chronic physical pain

EMOTIONAL / RELATIONAL

Abuse
Neglect
Loss
Betrayal
Chronic interpersonal stress

MEDICAL

Life-threatening illness
Repeated hospitalizations
Invasive procedures
Prolonged or frightening medical experiences

DEVELOPMENTAL

Childhood adversity
Chronic instability
Attachment disruption
Ongoing lack of safety

ENVIRONMENTAL / COLLECTIVE

Natural disasters
War
Violence
Community or generational trauma

AND SOMETIMES...

the body itself becomes the source of ongoing threat.

WHEN THE BODY STAYS IN SURVIVAL MODE

1. **A threat occurs.**
2. **The brain detects danger.**
3. **Autonomic + stress responses activate.**
4. **Survival is prioritized over restoration.**

If the threat is prolonged—or the system does not adequately return to baseline—

the adaptations designed to protect us can begin to contribute to dysfunction.

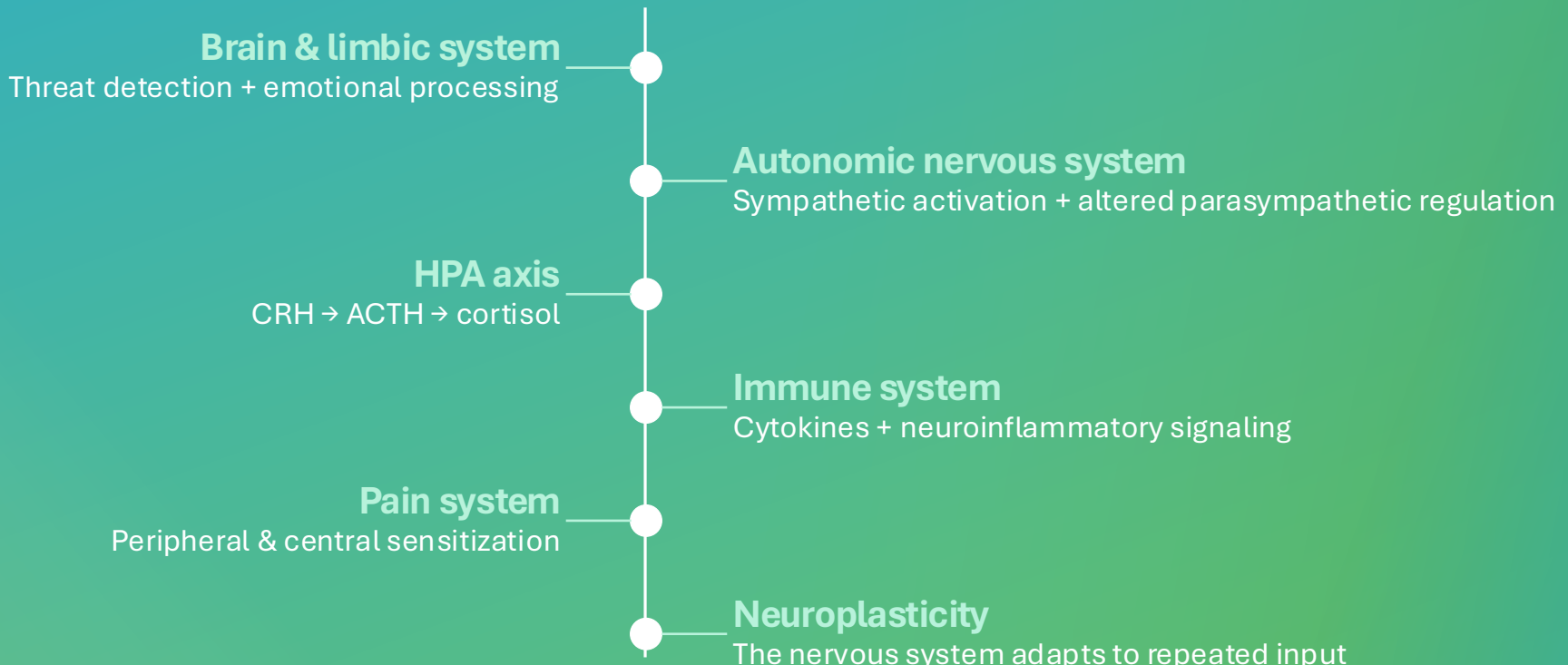
- **Altered pain processing**
- Sleep disruption
- Immune changes
- Hormonal changes
- **Hypervigilance**
- Muscle tension

This is where trauma intersects with chronic pain.

THE NEUROBIOLOGY OF TRAUMA

When the brain perceives threat, the body responds.

TRAUMA CAN ENGAGE INTERCONNECTED SYSTEMS



These systems don't operate independently.

They communicate continuously.

THE STRESS RESPONSE

ACUTE THREAT → ADAPTIVE RESPONSE

1. **THREAT**
   A threat is detected
2. **BRAIN**
   Danger is recognized
3. **SYMPATHETIC NERVOUS SYSTEM**
   Mobilization begins
4. **HPA AXIS**
   Hormonal response activates

SYMPATHETIC NERVOUS SYSTEM ACTIVATES:

↑ **Heart rate**

↑ **Blood pressure**

↑ **Alertness**

↑ **Muscle readiness**

↑ **Glucose availability**

HPA HORMONAL CASCADE: **CRH → ACTH → CORTISOL**

THE GOAL:

Survive the threat → **Return to baseline** → **Repair & recover**

WHEN THE BODY PERCEIVES THREAT

Sympathetic activation prepares the body to respond.

MOBILIZE FOR ACTION:

- ↑ Norepinephrine / epinephrine
- ↑ Heart rate
- ↑ Muscle tension
- ↓ Digestive activity
- ↑ Vigilance
- ↑ Glucose availability
- ↓ Energy devoted to long-term repair

IN ACUTE STRESS

This is protective.

WITH PERSISTENT STRESS

The system may become more reactive, less flexible, or slower to return to baseline.

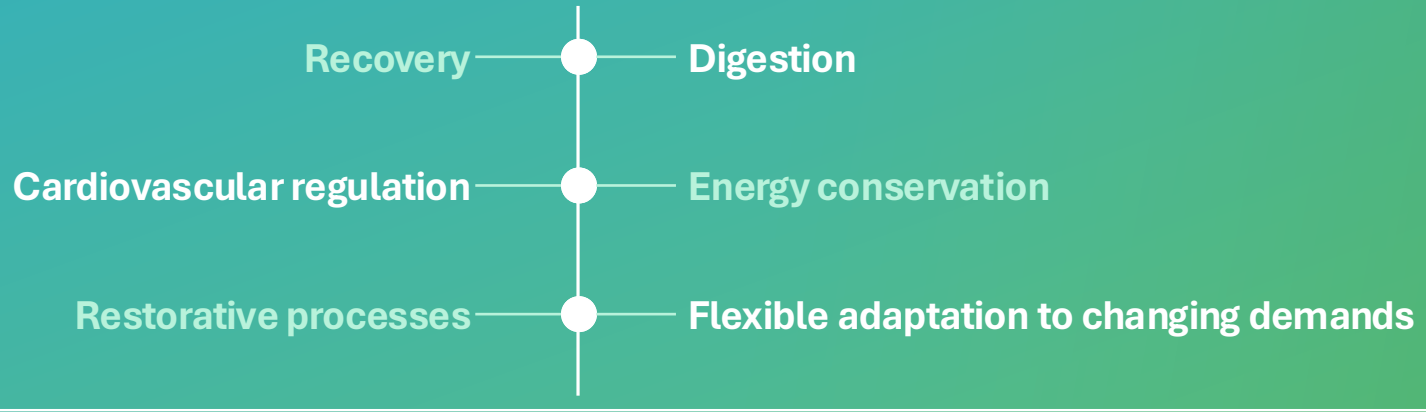
The body begins prioritizing

PROTECTION OVER RESTORATION

THE OTHER SIDE OF THE EQUATION

PARASYMPATHETIC / VAGAL REGULATION

The parasympathetic system helps support:



HEALTHY REGULATION ISN'T SIMPLY "ON" OR "OFF."

THE GOAL IS FLEXIBILITY

Activate when needed → **Recover when safe** → **Respond appropriately again**

Chronic stress can disrupt this flexibility.

Less effective regulation + persistent threat signaling → **Reduced capacity to return to baseline**

THE HPA AXIS

THE ENDOCRINE STRESS CASCADE

1. **Hypothalamus**
   CRH
2. **Pituitary**
   ACTH
3. **Adrenal cortex**
   Cortisol

Cortisol acts throughout the body

CORTISOL HELPS COORDINATE THE STRESS RESPONSE

- Mobilizes energy
- Modulates immune activity
- Influences cardiovascular function
- Influences cognition and arousal
- Helps coordinate the stress response

NORMALLY Stress → activation → recovery → negative feedback

WITH CHRONIC STRESS **The regulation of this system can become altered.**

Not simply “too much cortisol” or “too little cortisol”—

but dysregulated timing, magnitude, feedback, and responsiveness.

CORTISOL & THE ADRENALS

Cortisol is not “bad.”

IT IS ESSENTIAL FOR

- Energy regulation
- Immune modulation
- Blood pressure regulation
- Stress adaptation
- Maintaining homeostasis

THE ISSUE IS DYSREGULATION

Chronic stress can alter:

- Cortisol rhythm
- Feedback sensitivity
- Stress reactivity
- HPA-axis communication

THE RELATIONSHIP IS BIDIRECTIONAL

Stress ↔ HPA axis ↔ Immune system ↔ Pain

Think dysregulated stress physiology—not “adrenal fatigue.”

WHEN STRESS SIGNALING MEETS THE IMMUNE SYSTEM

Persistent stress can influence immune and neuroimmune signaling.

STRESS SYSTEMS COMMUNICATE WITH IMMUNE CELLS

1. Sympathetic signaling
2. HPA-axis signaling
3. Immune regulation
4. Neuroimmune signaling

INFLAMMATORY MEDIATORS CAN INCLUDE

- IL-1β
- IL-6
- TNF-α
- Chemokines
- Other inflammatory signaling molecules

The nervous system and immune system are in constant communication.

NERVOUS SYSTEM — **PAIN** — IMMUNE SYSTEM

Pain is part of that conversation.

MICROGLIA: THE CNS IMMUNE SENTINELS

Microglia are resident immune cells of the central nervous system.

THEY HELP MONITOR:

- Neural environment
- Tissue injury
- Cellular stress
- Synaptic activity

UNDER PERSISTENT STRESS OR INJURY

Microglial activity can become altered or "primed."

ACTIVATED MICROGLIA CAN INFLUENCE

1. Cytokines + chemokines + neurotransmitter signaling
2. Neuronal excitability
3. Pain processing

Neuroimmune signaling can therefore amplify pain.

The immune system can change how the nervous system processes sensory information.

CYTOKINES CAN TALK TO THE PAIN SYSTEM

Inflammatory signaling molecules can influence nociceptive pathways.

EXAMPLES

- IL-1β
- IL-6
- TNF-α

THESE SIGNALS CAN INFLUENCE

1. Peripheral nociceptors
2. Spinal cord signaling
3. Glial activation
4. Neuronal excitability
5. Brain pain-processing networks

THE RESULT CAN BE

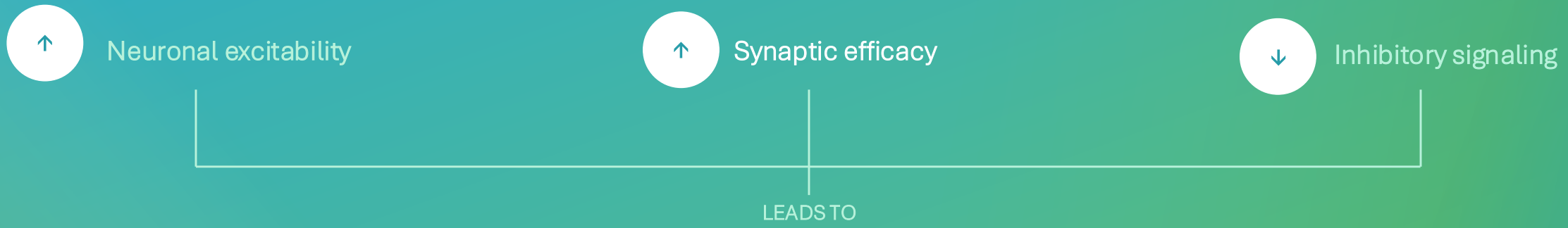
MORE SENSITIVITY → **LESS INPUT NEEDED TO PRODUCE A PAIN RESPONSE**

The pain system responds at a lower threshold.

CENTRAL SENSITIZATION

The nervous system becomes more responsive to incoming signals.

Repeated or intense nociceptive input can produce changes in central pain pathways.



LEADS TO

AMPLIFIED PAIN PROCESSING

STIMULI THAT PREVIOUSLY PRODUCED

little pain → more pain OR no pain → pain

This is one mechanism by which pain can become less tightly coupled to ongoing tissue damage.

NEUROPLASTICITY

The nervous system is designed to adapt.

Repeated experiences can change:

1. Synaptic strength
2. Neural connectivity
3. Excitability
4. Sensory processing
5. Emotional and cognitive responses

This adaptability is essential for learning and survival.

But chronic pain can involve maladaptive plasticity.

THE NERVOUS SYSTEM CAN BECOME INCREASINGLY EFFICIENT

at detecting and responding to threat.

What protects us in the short term → **can become persistent in the long term.**

FROM TRAUMA TO CHRONIC PAIN

1

THREAT

Physical • emotional •
environmental • medical

→

2

STRESS RESPONSE

Sympathetic activation
HPA-axis activation
Altered parasympathetic regulation

→

3

NEUROIMMUNE SIGNALING

Cortisol + catecholamines
Microglia + cytokines
Neuroinflammatory signaling

↓

4

ALTERED PAIN PROCESSING

Peripheral sensitization
Central sensitization
Increased neuronal excitability

←

5

NEUROPLASTICITY

The nervous system adapts
to repeated input

←

6

PERSISTENT PAIN

Pain becomes increasingly influenced
by the state of the nervous system—
not only the original injury.

AND THE CYCLE CAN FEED ITSELF

Pain → threat → stress → inflammation → sensitization → more pain

TRAUMA SHOWS UP ACROSS SYSTEMS

Traumatic stress has been associated with a range of chronic pain, functional, and inflammatory conditions.

COMMON CLINICAL PATTERNS INCLUDE

- Fibromyalgia & widespread pain
- Irritable bowel syndrome (IBS)
- Temporomandibular disorders (TMD/TMJ)
- Autoimmune & inflammatory conditions
- Migraine & chronic headache
- Chronic pelvic pain
- Chronic neck & musculoskeletal pain

One patient may experience several of these simultaneously.

This is where looking at systems— not isolated diagnoses— becomes important.

Co-occurrence is a signal to widen the clinical lens.

DIFFERENT DIAGNOSES. OVERLAPPING PHYSIOLOGY.

TRAUMA / CHRONIC STRESS → **Autonomic dysregulation • HPA-axis changes • Neuroimmune signaling • Inflammatory signaling**
Altered pain processing • Central sensitization • Neuroplasticity → **MULTIPLE SYSTEMS CAN BE AFFECTED**

- **BRAIN**
  Migraine • altered pain processing
- **MUSCULOSKELETAL**
  Fibromyalgia • neck pain • widespread pain
- **TMJ**
  Jaw pain • muscle tension • TMD
- **PELVIS**
  Chronic pelvic pain
- **GUT**
  IBS • altered gut-brain signaling
- **IMMUNE SYSTEM**
  Inflammatory & autoimmune disease associations

The diagnosis may be different. **The underlying physiology may overlap.**

DIFFERENT LABELS → **SHARED MECHANISMS**

A systems review can connect conditions that appear separate.

WHAT DOES THE RESEARCH SHOW?

FIBROMYALGIA

Systematic reviews and meta-analyses identify associations between lifetime stressors/trauma and fibromyalgia, although trauma is one of many potential risk factors.

MIGRAINE

A 2026 systematic review found a positive association between PTSD and migraine across 11 studies, with reported prevalence and incidence generally higher among people with PTSD.

IBS

A meta-analysis found that PTSD was associated with increased likelihood of IBS; another meta-analysis of adverse childhood experiences found substantial heterogeneity, highlighting limitations in the evidence.

CHRONIC PELVIC PAIN

Trauma history and PTSD are common among women with chronic pelvic pain and are associated with greater symptom burden and functional impairment.

TMD / TMJ

Systematic reviews suggest an association between PTSD/traumatic stress and temporomandibular disorders, although the evidence is limited and heterogeneous.

AUTOIMMUNE DISEASE

Recent systematic reviews identify an association between childhood adversity/traumatic stress and several autoimmune diseases, but causality remains uncertain.

TRAUMA & THE IMMUNE SYSTEM

Chronic stress & trauma does not automatically cause autoimmune disease.

But traumatic stress may influence biological systems involved in immune regulation.

1. Traumatic stress
2. Autonomic + HPA-axis dysregulation
3. Altered inflammatory / immune signaling
4. Changes in immune regulation
5. Potential vulnerability or disease activity in susceptible individuals

WHAT THE RESEARCH TELLS US:

Trauma is associated with increased risk of several autoimmune conditions.

But autoimmune disease remains multifactorial.

Association does not mean inevitability.

Stress & Trauma may be one contributor among many.

MULTIFACTORIAL CONTRIBUTORS

Genetics • infections • environmental exposures • hormones • immune regulation • lifestyle • stress

PAIN IS NOT "ALL IN YOUR HEAD."

The brain is not separate from the body.

The nervous system communicates continuously with:

1. Immune system
2. Endocrine system
3. Musculoskeletal system
4. Gut
5. Cardiovascular system
6. Environment

Trauma can change the way these systems communicate.

And those changes can become part of the patient's pain experience.

Understanding the biology does not invalidate the pain.

It helps explain it.

SO WHAT DO WE DO WITH THIS INFORMATION?

"The goal isn't to convince patients that their pain is psychological.

The goal is to understand how the brain and body respond to threat—and how those responses can become part of the pain experience."

If pain is influenced by multiple interconnected systems...

our treatment approach should be multidimensional, too.

1. Nervous system regulation
2. **Movement**
3. Sleep
4. **Nutrition**
5. **Supplements**
6. Psychological / trauma-informed care
7. **Medications when appropriate**
8. Addressing relevant physiological contributors

FROM **"Where does it hurt?"** → TO **"What is keeping the system in a state of protection?"**

TREAT THE WHOLE PERSON

Chronic pain is multidimensional.

An effective treatment plan may need to address:

1. **Nervous system**
   Regulation • safety • trauma • pain processing
2. **Sleep**
   Circadian rhythm • restorative sleep • recovery
3. **Nutrition**
   Adequate nourishment • metabolic health • gut health
4. **Movement**
   Mobility • strength • confidence • graded exposure
5. **Physiology**
   Inflammation • immune function • hormones • metabolism
6. **Medications & targeted therapies**
   When appropriate
7. **Relationships & community**
   Connection • support • belonging

The goal is not to find ONE intervention. → **The goal is to build capacity across multiple systems.**

Whole-person care builds resilience—not dependence on a single lever.

NERVOUS SYSTEM REGULATION

Help the nervous system become more flexible—not simply “calm.”

POTENTIAL TOOLS INCLUDE

1. Breathwork
2. HRV biofeedback
3. Mindfulness / meditation
4. Somatic therapies
5. EMDR
6. Neurofeedback
7. Vagus nerve stimulation
8. Yoga / Tai Chi
9. Safe relationships & community

THE GOAL

Increase the capacity to move between activation and recovery.

Threat → activation → recovery → adaptation

Flexibility—not permanent calm—is the marker of regulation.

TRAUMA-INFORMED CARE

Create safety before asking the patient to go deeper.

SOMATIC THERAPY

- Develop awareness of bodily sensations
- Build capacity to tolerate activation
- Increase perceived safety and control

EMDR

- Evidence-based treatment for PTSD
- May be appropriate when trauma symptoms and chronic pain coexist
- Should be provided by appropriately trained clinicians

NEUROFEEDBACK

- Uses real-time feedback to help patients develop greater regulation of brain activity
- Evidence is emerging across chronic pain and trauma-related conditions

TRAUMA-INFORMED CARE ASKS

“What happened to you?” — not — **“What is wrong with you?”**

Safety • choice • collaboration • empowerment

TWO PATHWAYS IN TRAUMA TREATMENT

TOP-DOWN APPROACHES

Top-down: Begins with thoughts, beliefs, memories, and meaning.

Cognitive Processing Therapy (CPT)
Prolonged Exposure (PE)
Trauma-focused CBT
Written Exposure Therapy (WET)
Narrative Exposure Therapy (NET)
Cognitive Therapy for PTSD
Acceptance & Commitment Therapy (ACT)
Meaning-making / narrative therapy
Psychoeducation
Parts/IFS work*

BOTTOM-UP APPROACHES

Bottom-up: Begins with physiological state, sensations, and bodily experience.

Somatic Experiencing (SE)
Sensorimotor Psychotherapy
EMDR*
Yoga / trauma-sensitive yoga
Movement-based interventions
Breathwork / autonomic regulation
Grounding and orienting
Progressive muscle relaxation
Biofeedback / HRV biofeedback
Mindfulness/interoceptive practices*

*Some approaches can incorporate both pathways.

TOP-DOWN APPROACHES

Thoughts → Emotions → Behavior → Physiological Response

Top-down interventions explore how experiences shape thoughts, beliefs, emotions, and behavior.

Questions a therapist may explore:

What happened?

What meaning did I make of it?

What beliefs developed?

What am I avoiding?

How can I develop a different relationship with the memory or belief?

Example: Cognitive Processing Therapy (CPT)

Trauma-related beliefs may include:

“It was my fault.”

“I can’t trust anyone.”

“The world isn’t safe.”

“I’m permanently damaged.”

Therapeutic goal: Identify and work through trauma-related beliefs that contribute to ongoing distress.

BOTTOM-UP APPROACHES

Physiological State → Sensation / Emotion → Cognition / Meaning

Instead of beginning with:

“What are you thinking?”

A therapist might begin with:

“What happens in your body when you notice that?”

Areas of focus

Heart rate and breathing
Muscle tension and posture
Movement and bodily sensations
Freezing, shutdown, or hyperarousal
Interoception (awareness of internal body signals)
Impulses to fight, flee, or submit
Sensations associated with traumatic memories

Example: Somatic Experiencing (SE)

Emphasizes tracking physiological activation and sensations while gradually building the capacity to experience activation without becoming overwhelmed.

Therapeutic goal: Increase awareness of bodily responses and support a greater capacity to navigate physiological activation.

WHEN TOP-DOWN & BOTTOM-UP PATHWAYS OVERLAP

Some therapeutic approaches incorporate both cognitive and physiological processes.

EMDR

Eye Movement Desensitization and Reprocessing

May involve working with:

Traumatic memories
Cognitions and beliefs
Emotions
Visual imagery
Body sensations
Bilateral stimulation
Physiological activation

EMDR can engage both cognitive and physiological channels.

Internal Family Systems (IFS)

May involve:

Identifying beliefs and meanings

Exploring internal relationships and “parts”

Experiential reflection

Emotional and embodied awareness

The broader takeaway: Trauma treatment does not always fit into a single category.

Different approaches may emphasize thoughts, bodily experience, or a combination of both, depending on the therapy and the individual.

WHICH APPROACH IS THE BEST FIT?

Match the approach to the patient's experience.

BOTTOM-UP + HYBRID APPROACHES

“I know I'm safe, but my body doesn't seem to be getting the message.”

May be worth exploring when patients experience:

Strong physiological responses despite understanding they are safe

Hyperarousal, muscle tension, or shutdown

Bodily distress that persists even when they understand the experience cognitively

TOP-DOWN APPROACHES

“Understanding why I think and feel this way helps me move forward.”

May be worth exploring when patients:

Can discuss traumatic experiences without becoming significantly dysregulated

Benefit from understanding trauma-related beliefs and patterns

Are ready to work with memories, meaning, and cognitive interpretations

WHY THIS MATTERS IN CHRONIC PAIN

Chronic pain can involve prominent bodily symptoms and physiological responses.

Consider incorporating body-oriented approaches alongside cognitive and psychological care when appropriate.

KEY TAKEAWAY: The best approach is individualized—not one-size-fits-all.

SAFETY IS BIOLOGY

When the nervous system receives enough cues of safety, the body can shift towards regulation and restoration.

CONSIDER

SLEEP

- Consistent sleep/wake schedule
- Circadian support
- Address sleep disorders
- Create conditions for restorative sleep

RELATIONSHIPS

- Safe relationships
- Social connection
- Community
- Therapeutic alliance

ENVIRONMENT

- Reduce ongoing sources of threat when possible
- Create predictability and safety
- Support recovery

A patient cannot be expected to regulate in isolation.

Connection is part of the treatment environment.

Safety is shaped by rhythms, relationships, and surroundings.

NUTRITION IS INFORMATION

Food provides signals to the body.

NUTRITION CAN INFLUENCE

- Immune signaling
- Metabolism
- Gut microbiome
- Blood glucose regulation
- Mitochondrial function
- Inflammatory pathways

BUILD THE FOUNDATION

- Whole, minimally processed foods
- Adequate protein
- Fiber-rich plants as tolerated
- Healthy fats
- Omega-3-rich foods
- Adequate micronutrients
- Hydration
- Stable blood glucose

REDUCE **Excess added sugar • refined carbohydrates • ultra-processed foods**

The goal isn’t a perfect diet.

The goal is nourishment that supports the individual’s physiology.

THERE IS NO SINGLE "PAIN DIET"

Start with the foundation.

Whole-food, nutrient-dense eating

THEN INDIVIDUALIZE BASED ON

- Metabolic health
- GI symptoms
- Food tolerance
- Autoimmune disease
- Nutrient deficiencies
- Cultural preferences
- Food access
- Patient goals

POTENTIAL FRAMEWORKS

- Mediterranean-style principles
- Paleo / ancestral principles
- Autoimmune Protocol (AIP)
- Elimination / reintroduction when clinically appropriate

THE QUESTION ISN'T **"Which diet is best?"** **ASK**

"What pattern of eating helps THIS patient thrive?"

Foundation first. Then personalize.

THE GUT–BRAIN–IMMUNE CONNECTION

THE GI TRACT COMMUNICATES CONTINUOUSLY WITH

Brain

↕

Microbiome

↕

Immune system

↕

Inflammatory pathways

SUPPORT THE FOUNDATIONS

- Adequate protein & nutrients
- Fiber & plant diversity as tolerated
- Regular bowel movements
- Healthy blood glucose regulation
- Address constipation, reflux, dysbiosis, or other GI pathology when present
- Individualize food triggers rather than unnecessarily restricting the diet

Gut health is not a separate category.

It is part of whole-body health.

The gut participates in whole-system regulation.

SUPPLEMENTS: TARGETED, NOT AUTOMATIC

Supplements can be useful—but they should have a purpose.

POTENTIAL ADJUNCTS INCLUDE

Omega-3 fatty acids
Inflammatory signaling & cardiovascular/brain health

Magnesium
Neuromuscular function, sleep, and selected pain conditions

B vitamins
Energy metabolism & nervous system function

Creatine
Cellular energy + emerging evidence for brain health

Minerals
Correcting deficiencies and supporting cellular function

Probiotics / prebiotics
Selected GI indications

Collagen / glycine
Protein and connective-tissue support

INDIVIDUALIZE BASED ON

Symptoms • diet • medications • labs • tolerance • clinical goals

Use the right tool for a defined purpose.

WHEN APPROPRIATE: TARGET THE METABOLIC TERRAIN

Depending on the individual, clinicians may consider:

Mitochondrial support
Support cellular energy production when clinically indicated

Adaptogens
Potential support for stress/endocrine signaling in selected patients

Peptides
An emerging area requiring careful consideration of evidence, safety, and regulatory status

Metabolic support
Address insulin resistance, dysglycemia, and metabolic dysfunction

AMPK-related pathways
Metabolic signaling involved in cellular energy balance

THE PRINCIPLE

Don’t supplement the diagnosis.

Identify the physiological problem → choose the appropriate intervention.

Precision begins with the problem—not the label.

MEDICATIONS ARE PART OF THE TOOLBOX

Pharmacologic treatment can be appropriate and valuable.

DEPENDING ON THE PATIENT'S DIAGNOSIS AND CLINICAL SITUATION

SNRIs
e.g., duloxetine

TCAs / SSRIs
Selected patients and indications

Gabapentinoids
e.g., pregabalin (Lyrica)

Low-dose naltrexone
Off-label use in selected chronic pain conditions

Anti-inflammatory medications
When appropriate and safe

Sleep medications
When clinically indicated

THE GOAL ISN'T

To medicate the symptoms away

IT CAN BE

Medication + rehabilitation + behavioral care + lifestyle + targeted interventions

Integration expands the toolbox. We want to take care of the whole person.

MOVEMENT IS A NERVOUS SYSTEM INTERVENTION

Movement does more than strengthen muscles.

IT CAN PROVIDE THE NERVOUS SYSTEM WITH

- Predictable sensory input
- Evidence of safety
- Increased confidence
- Improved circulation
- Improved sleep
- Greater physical capacity
- Reduced fear of movement

START WHERE THE PATIENT IS

- Walking
- Physical therapy
- Resistance training
- Graded exposure
- Yoga
- Tai Chi

PROGRESSION MATTERS

Capacity → confidence → **movement** → adaptation

Build capacity first; confidence and adaptation follow.

CAN RHYTHMIC MOVEMENT CHANGE HOW WE PROCESS THREAT?

RHYTHMIC, BILATERAL MOVEMENT MAY PROVIDE

1. **Repetitive sensory input**
2. **Attentional engagement**
3. **Predictability**
4. **Alternating stimulation**
5. **Exposure without overwhelming the system**

Walking, running, and other rhythmic movement may share some features with **bilateral stimulation used in EMDR.**

THE CLINICAL OPPORTUNITY

Use safe, rhythmic movement as part of rehabilitation and nervous-system regulation—without overselling the mechanism.

COMMUNITY-BASED CARE: NERVOUS SYSTEM & WELLNESS COACHING

Laurie Martinchuk, OT • Live Your Moxie

"What if your pain isn't about being 'broken'…
but a nervous system that is stuck on high alert?"

A NERVOUS-SYSTEM–FOCUSED APPROACH MAY HELP PATIENTS EXPLORE

- **Stress & threat physiology**
  Recognizing patterns of activation and recovery
- **Nervous system regulation**
  Building tools for shifting between activation and restoration
- **Body awareness**
  Learning to recognize signals, sensations, and responses
- **Lifestyle & wellness**
  Sleep • movement • stress • daily routines • recovery
- **Capacity & resilience**
  Building the ability to tolerate stress and return toward regulation

THE GOAL

Not to convince patients that their pain is "just stress."

But to help them understand:

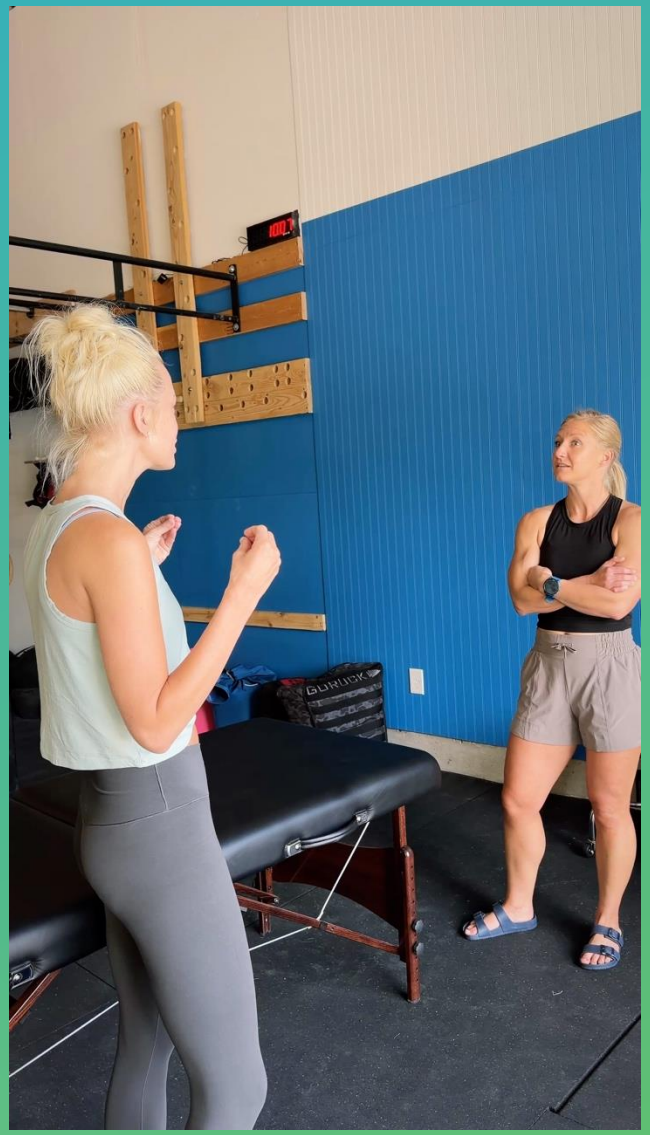
"My body isn't broken.
My nervous system may be protecting me."

AN IMPORTANT PIECE OF THE WHOLE-PERSON TOOLBOX

SAFETY → REGULATION → CAPACITY → FUNCTION

NERVOUS SYSTEM & EMOTIONAL RELEASE WORK

Laurie Martinchuk, OT • Live Your Moxie



COMMUNITY-BASED CARE: MUSCLE ACTIVATION TECHNIQUE

Dan Zeller • Muscle Activation Technique (MAT)

A hands-on neuromuscular approach focused on muscle activation and function.

MAT PRACTITIONERS WORK WITH

- **Muscle inhibition**
  Identifying muscles that may not be recruiting effectively
- **Neuromuscular function**
  Assessing the relationship between the nervous system and muscular activation
- **Movement & stability**
  Improving the body's ability to produce and control movement
- **Muscle balance & compensation**
  Addressing patterns that may contribute to altered movement

ANOTHER TOOL IN THE TOOLBOX

ASSESS → ACTIVATE → MOVE → REASSESS

THE CLINICAL CONCEPT

When the body perceives threat, injury, or dysfunction, movement strategies can change.

Those changes may contribute to:

COMPENSATION → ALTERED LOADING → MUSCLE TENSION → PAIN → REDUCED MOVEMENT

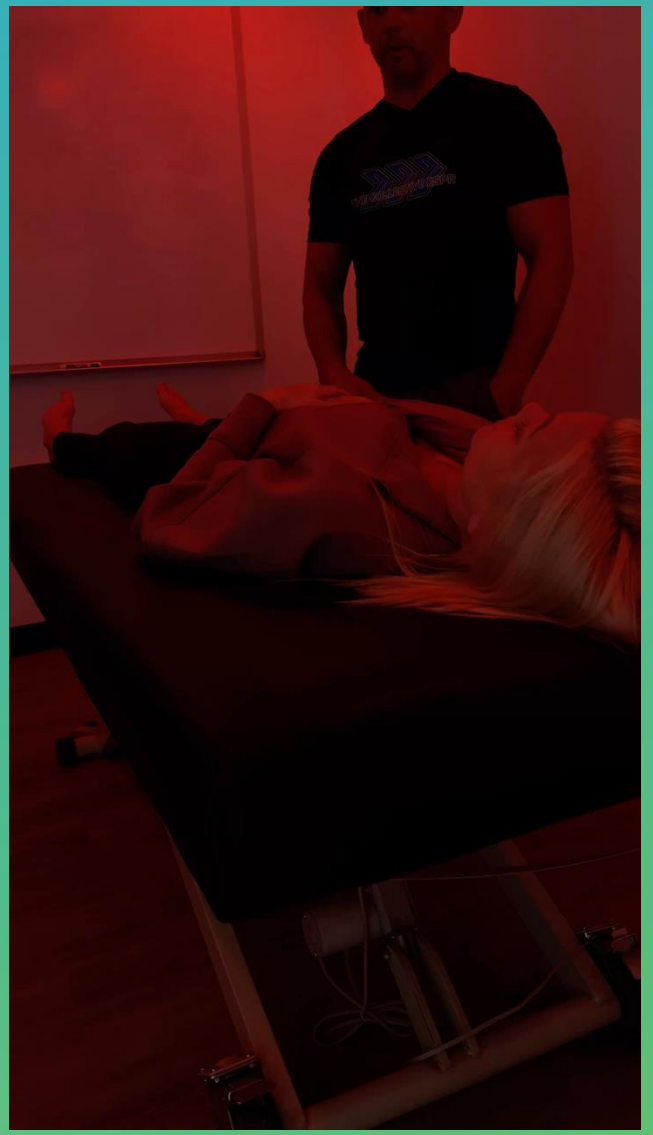
MAT OFFERS ANOTHER LENS

Instead of asking only: "Where does it hurt?"

Also ask: "How is the nervous system controlling movement?"

MAT & NERVOUS SYSTEM WORK

Dan Zeller • Muscle Activation Technique (MAT)



PEMF: AN ADJUNCTIVE TOOL



PULSED ELECTROMAGNETIC FIELD THERAPY IS BEING STUDIED FOR

- Pain modulation
- Musculoskeletal pain
- Sleep / recovery
- Neuromuscular function

POTENTIAL ROLE

A non-invasive adjunct that may be incorporated alongside:

Movement • rehabilitation • sleep
stress regulation • conventional care

The evidence is evolving.

PEMF studies show promising findings in some pain conditions.

THERE IS NO ONE-SIZE-FITS-ALL PROTOCOL

Start with the patient—not the protocol.

ASSESS

- Pain pattern & diagnosis
- Trauma history & current safety
- Sleep
- Movement & physical capacity
- Nutrition & metabolic health
- GI function
- Medications
- Social connection
- Patient goals & readiness

THEN PRIORITIZE

What does this patient need FIRST?

What can they realistically tolerate?

What will build capacity rather than overwhelm the system?

Progress slowly. Reassess. Adjust.

The best treatment plan is the one the patient can actually participate in.

Participation is a clinical outcome.

THE INTEGRATIVE PAIN FRAMEWORK

1 CREATE SAFETY

- Trauma-informed communication
- Therapeutic relationship
- Sleep
- Environment

→

2 REGULATE

- Breath
- Mindfulness
- Somatic approaches
- HRV / biofeedback

3 RESTORE CAPACITY

- Nutrition
- Movement
- Physical therapy
- Graded exposure

→

4 ADDRESS PHYSIOLOGY

- Metabolic health
- GI health
- Inflammation
- Nutrient deficiencies
- Relevant medical conditions

5 USE THE TOOLBOX

- Medications
- Psychological therapies
- Targeted supplements
- Adjunctive modalities

→

6 REASSESS & INDIVIDUALIZE

- What is changing?
- What is helping?
- What is overwhelming the patient?
- What does the next layer of care need to be?

Safety → regulation → capacity → physiology → tools → reassessment

"When we understand pain as an experience produced by an interconnected biological system, our treatment options expand."

THE GOAL IS TO HELP THE PATIENT BUILD

- **SAFETY**
- **CAPACITY**
- **RESILIENCE**
- **FUNCTION**
- **CONNECTION**
- **CONFIDENCE IN THEIR BODY**

We don't ask an overwhelmed system to do everything at once.

We create enough safety and capacity for the system to begin adapting.

HEALING IS NOT ONE INTERVENTION.

It is a process of restoring flexibility

across interconnected systems.

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BOOKS FOR FURTHER EXPLORATION

RESOURCES FOR PRACTITIONERS & PATIENTS

The Life-Changing Art of Self-Brain Surgery

Dr. W. Lee Warren

Neuroplasticity • thought patterns • resilience • personal agency

What My Bones Know

Stephanie Foo

Complex trauma • healing • lived experience • resilience

When the Body Says No

Dr. Gabor Maté

Stress • trauma • mind–body connection • chronic illness

Your Brain Is a Filthy Liar

Elisabeth McKay

Thought patterns • cognitive distortions • emotional awareness

It Didn't Start With You

Mark Wolynn

Family patterns • intergenerational trauma • inherited emotional patterns

The Body Keeps the Score

Dr. Bessel van der Kolk

Trauma • nervous system • brain–body connection • recovery

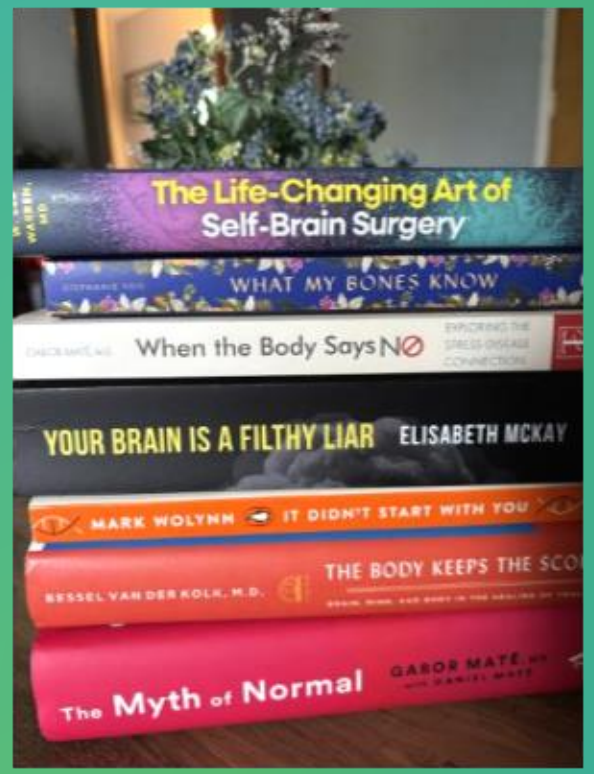
The Myth of Normal

Dr. Gabor Maté with Daniel Maté

Stress • trauma • culture • chronic illness • healing

A REMINDER FOR PATIENTS

Books can open the door to understanding—
but they are not a substitute for individualized
clinical care.



FOR PRACTITIONERS

Continue learning. Stay curious.
Listen to the story behind the symptom.