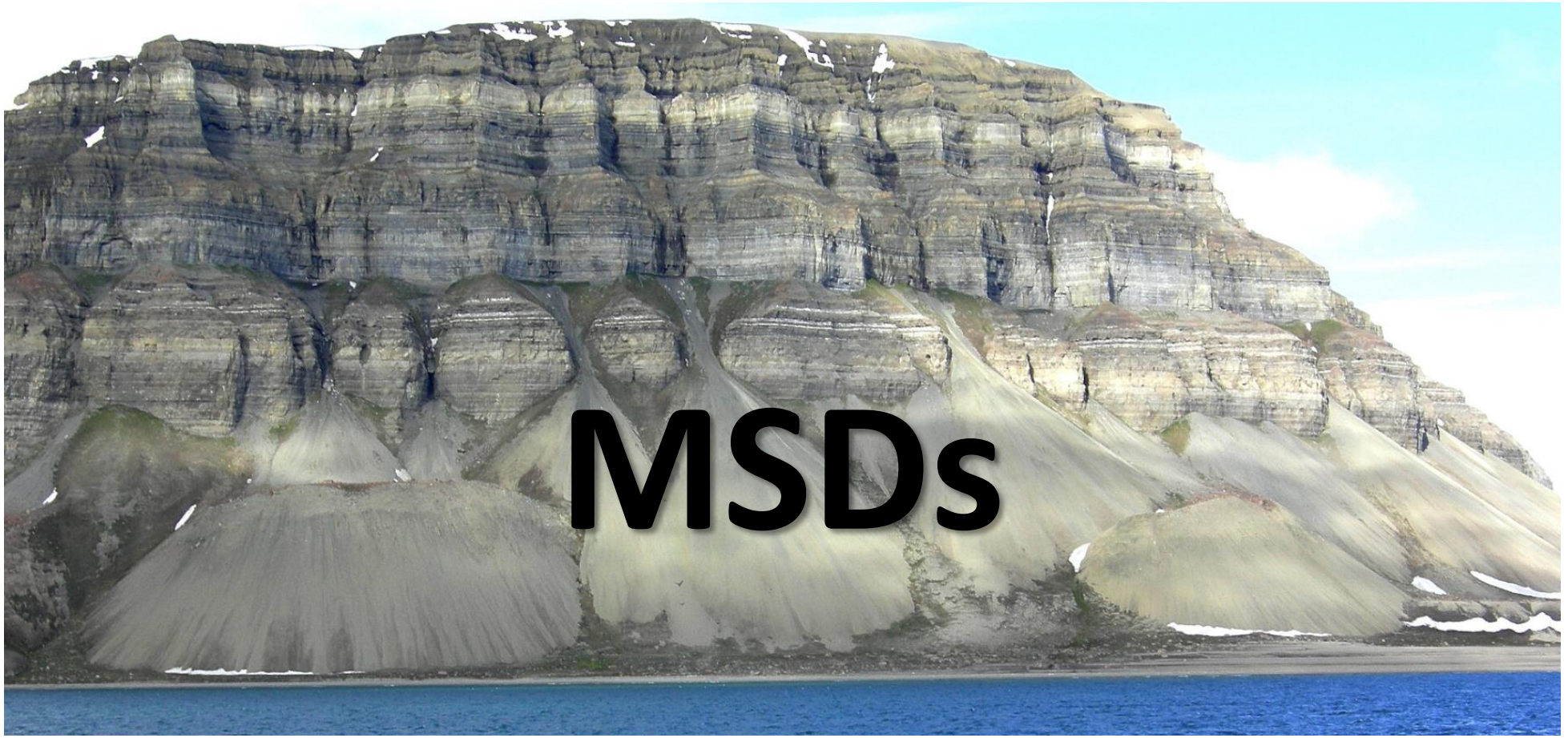
PRÓMOTION
Physical Therapy

The Curious Case of Chronic Pain and MSDs

Michael D. Kane, MPT, MOMT, FAFS

Story…Talus Gerat



"We don't see the world as it is, we see it as we are"
-Anais Gin

"When you change the way you look at things, the things you look at change."
-Wayne Dyer

What is an MSD?

An **MSD** is a "Neuro-**M**usculo-**S**keletal **D**isorder."

MSDs are commonly referred to as: Cumulative Trauma Disorders (CTDs), Repetitive Strain Injuries (RSIs), Sports, Orthopedic, Ergonomic, or biomechanical Injuries, & Degenerative conditions associated with aging.

Referred to as aches, pains, strains, sprains, over-exertion, over-use pulled-muscles, trigger points, spasms, slipped or bulging discs, misalignments, or vaguely diagnosed symptomatically as *anatomical*-pain (back, neck, knee, etc.).

They may be biological or biomechanical in origin.

MSDs cause pain & impair activity, posture, mobility, stability, comfort, confidence & safety. They can also lead to complications or further injury.

Most MSDs are the result of *cumulative* rather than *acute* trauma. As such, MSD conditions may persist, worsen, & deteriorate over time. unless the cause of the symptoms is resolved..

Most MSDs are functional, not medical, & will resolve in 7-10 days with self-pacing, pain avoidance & an over-the-counter pain reliever (OTC NSAID).

Fast Facts

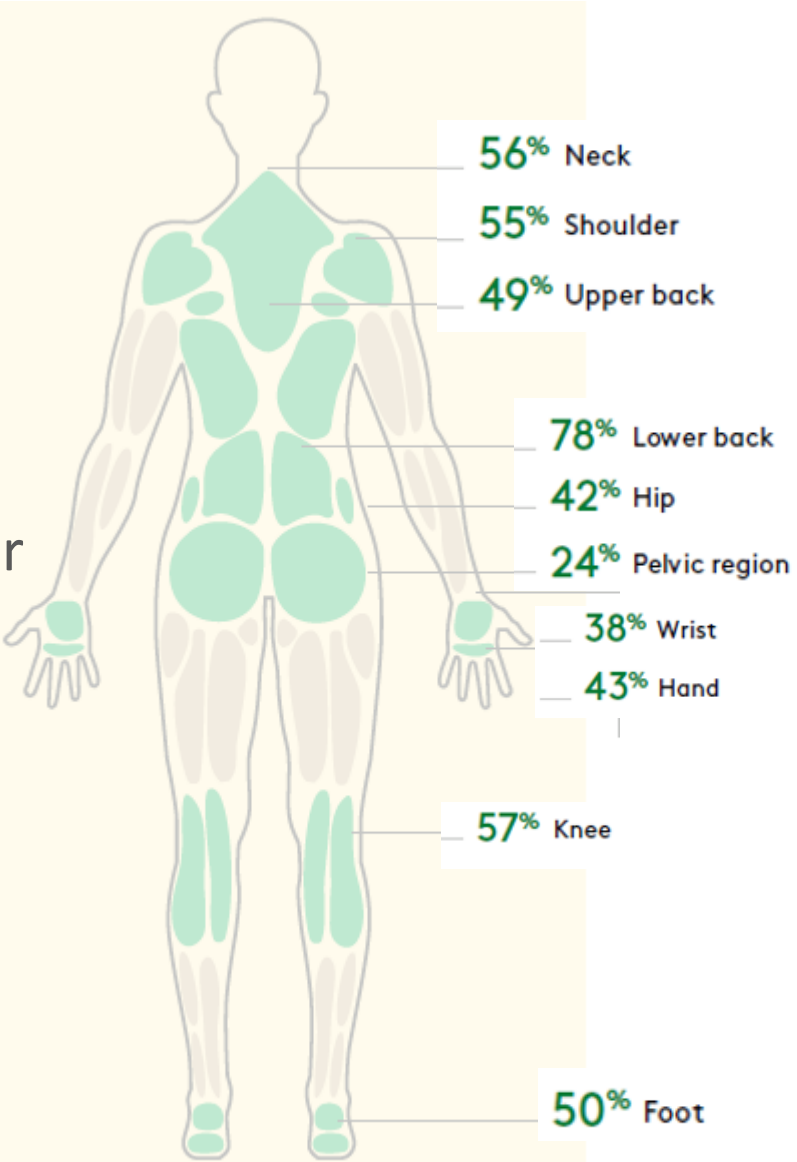
MSDs are our #1:

- ❖ Health Spend
- ❖ Disability Cause
- ❖ Opioid Driver

MSDs …*A Wicked Problem*

(Muscular-Skeletal Disorders)

- MSDs are the #1 cost in healthcare today – 20% of total spending ($600+ billion annually)
- …70% more than heart disease (#2) & 75% more than cancer (#3); while affecting more people than both combined
- Affecting 54% of people…and more than one region!
- The #1 cause of disability globally
- Population demographics & health costs guarantee the problem will escalate – *the status quo is not acceptable*.



The State of MSDs Report…2022

MSDs are disproportionately affecting Americans: 54% of Americans are suffering from a musculoskeletal disorder…at any one time

Pain: a complex sensory, cognitive, and emotional experience that can impose great personal, psychological and socioeconomic stressors and burdens on patients.

Chronic Pain: Pain that has continued for an extended time…"a pain condition [that] persists or recurs for longer than three months"; or more…

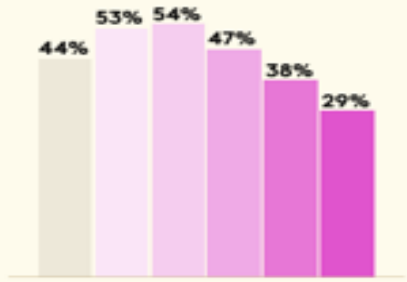
Chronic pain and mental health are inextricably linked…so holistic treatment approaches are critical.

90% of employers report MSDs as their top medical spend.

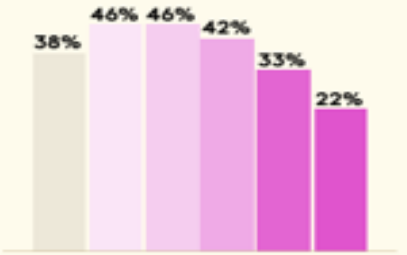
Over the last decade, MSD claims have doubled in the US, even though the number of people with MSDs has remained the same.

Pain and the Brain

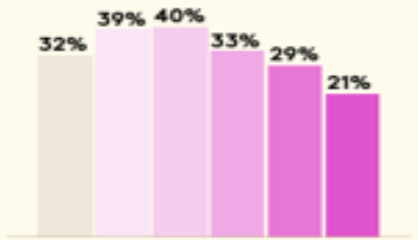
- Pain/Chronic pain can create a cycle of fear, depression, anxiety movement avoidance and increased perception of pain.
- People with MSDs often have other health conditions that feed into this cycle.
- 50%+ say it effects sleep, 30% say pain reduces their ability to adopt healthy habits, 15-20% also have obesity, type 2 diabetes
- Need for a more holistic approach



MSK pain made me feel more anxious



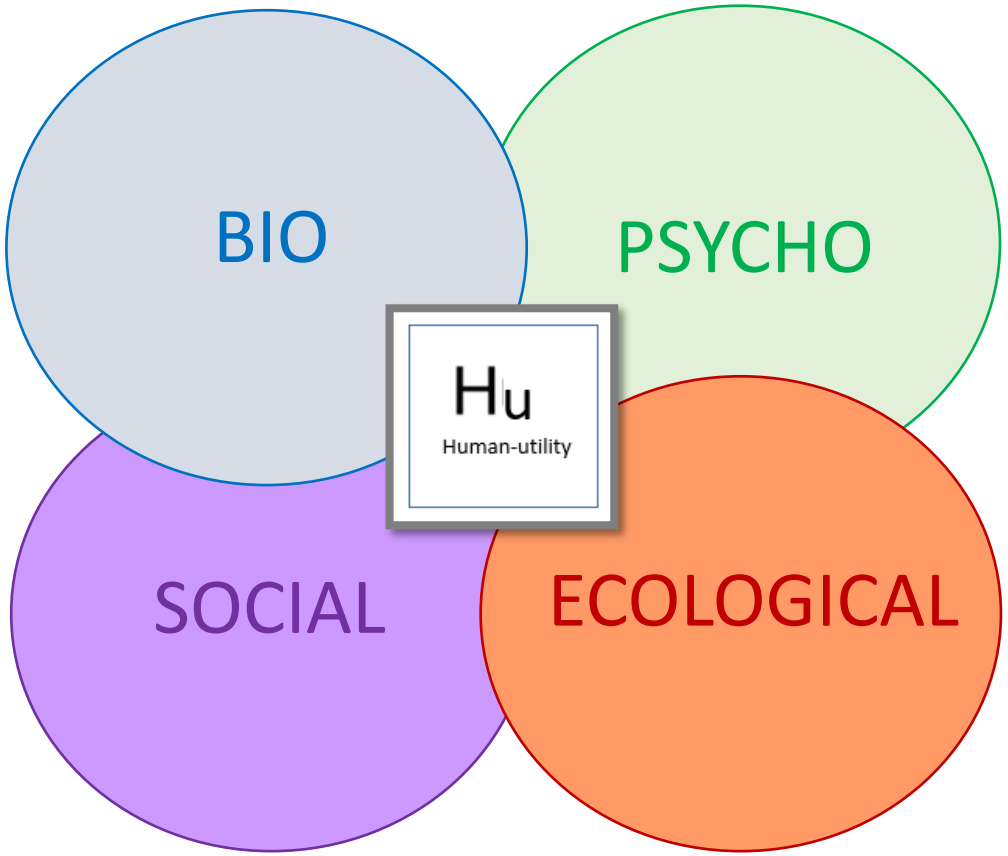
MSK pain made me feel more depressed



MSK pain made me feel more isolated

State of MSK Care 2024

A biopsychosocial-ecological model includes a greater understanding of how the nervous system
processes injury, disease, pain, threat and emotions.



u·til·i·ty

/yo͞o ˈtiləde͞/

noun

1. the state of being *useful*, *profitable*, or *beneficial*.
2. fitness for some purpose or worth to some end

Adjective

1. useful, especially through being able to perform several functions.

Bio-Psycho-Social Approach

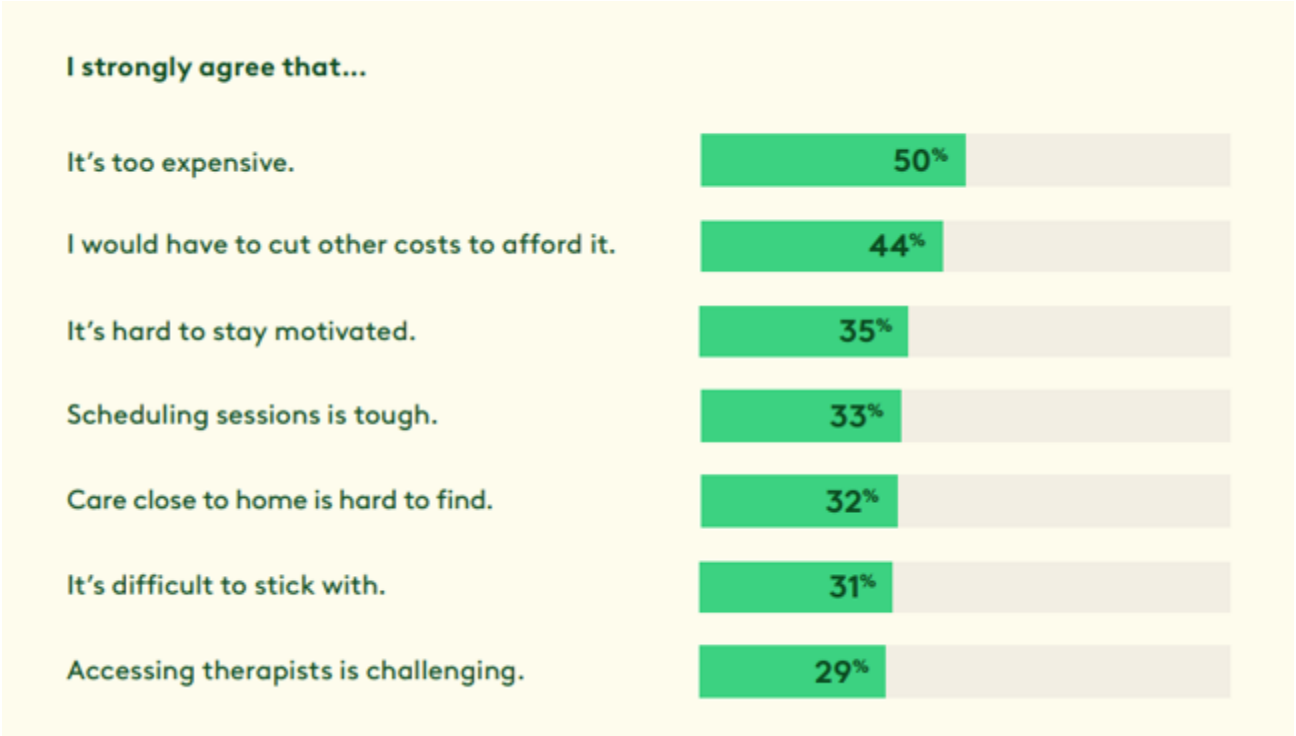
- Physical Therapy is considered the best first-line approach for chronic MSDs.
- Less than 10% get access
- Surveys show those who use it are highly satisfied
- Trends: Reported use of PT increased a sense of improvement vs. no use

Boersma P, Cohen RA. Physical, speech, rehabilitative, or occupational therapy use among adults aged 25–64, by veteran status: United States, 2019–2020. NCHS Data Brief, no 439. National Center for Health Statistics. 2022. doi:10.15620/cdc:118600

National Institutes of Health. Eunice Kennedy Shriver National Institute of Child Health and Human Development.

Rehabilitation Barriers

- Referral Strategies
- Insurance
- Cost
- Time
- Access



State of MSK Care 2024

Job-1: Understanding The Struggle

I am here because…

Progress revolves around…

There is a GAP

SolveMasters

Goals: AIM structures the PATH

- “If you don’t know where you’re going any road will get you there.”
- Clinical Goals-Pain, ROM, Strength, Mobility, Flexibility, Special Tests.
- Insurance Goals-Return to prior level of function or return to ADLs.
- Utility Goals-Return to what they want, need and love to do.

Health and Social Outcomes and a Bio*psycho*social Interview

The Art of Medicine: A Physician-Patient Communication Conference

CIR Policy and Education Initiative. November 11, 2011

Improved patient recall. *(Roter, 1989; Roter, Hall, Katz, 1987; Hall, Roter, Katz 1988)*
Improved medication adherence. *(Roter, 1989. Hall,Roter, Katz, 1988)*
Fewer tests and refferals. *(Stewart, et al, 2000)*
Faster symptom resolution. *(Egbert, 1964)*
Better control of hypertension. *(Inui, Yourtee, Willimason, 1976)*
Better control of diabetes. *(Hojat et al, 2011)*
Less doctor shopping.
Lower risk of malpractice lawsuits *(Beckman et al, 1988; Stewart, 1984; Buller and Buller, 1985; Bertakis et al, 1991)*

Greater patient satisfaction. *(Hall, Roter, Katx, 1988; Stewart, 1984; Buller and Buller, 1985; Bertakis et al, 1991)*
Greater provider satisfaction. *(Suchman, Mathews, 1988)*

Your Brand and the Human Element

November 2022

When it comes to the brand promise, **every experience** – whether direct or indirect – can change brand associations.

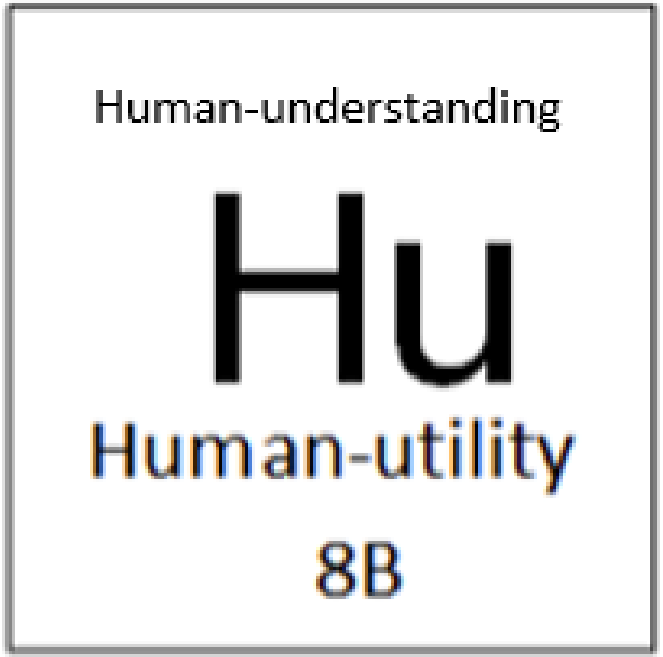
People who felt they were **treated as unique** are 295% more likely to rate an organization's overall image/reputation as 'excellent'.

Statistically speaking, the odds of a healthcare organization receiving an **'excellent' brand** rating are more than 9 times higher when healthcare consumers report that everyone treated them as unique.

Market Insights data shows that the odds of **being a Promoter** are 12 times higher when patients report that everyone treated them as unique.

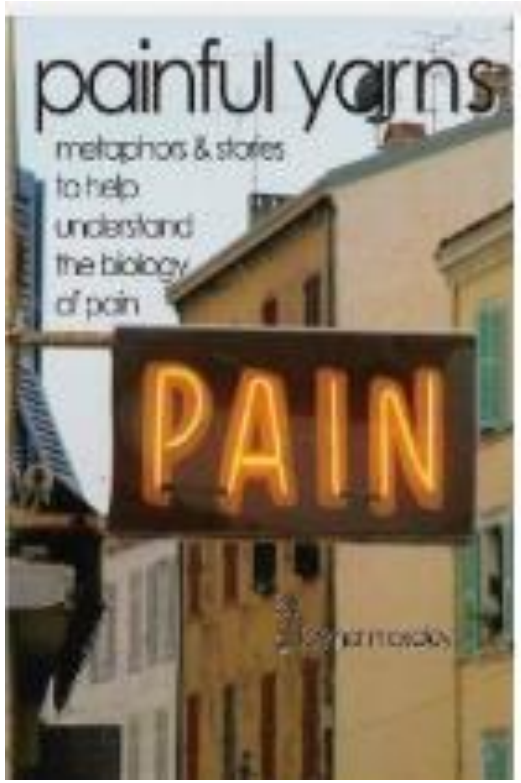
Taken together, the brand perception and NPS results clearly highlight the importance of **Human Understanding** when it comes to building and maintaining brand strength.

The Human Element



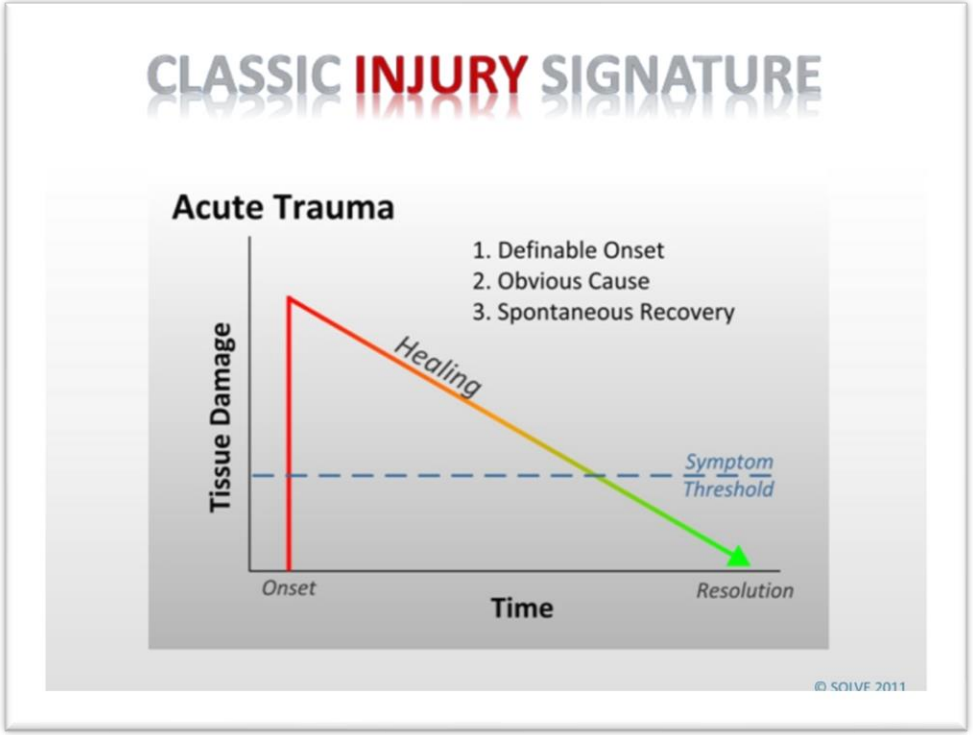
Function and the Science of Pain: The processing

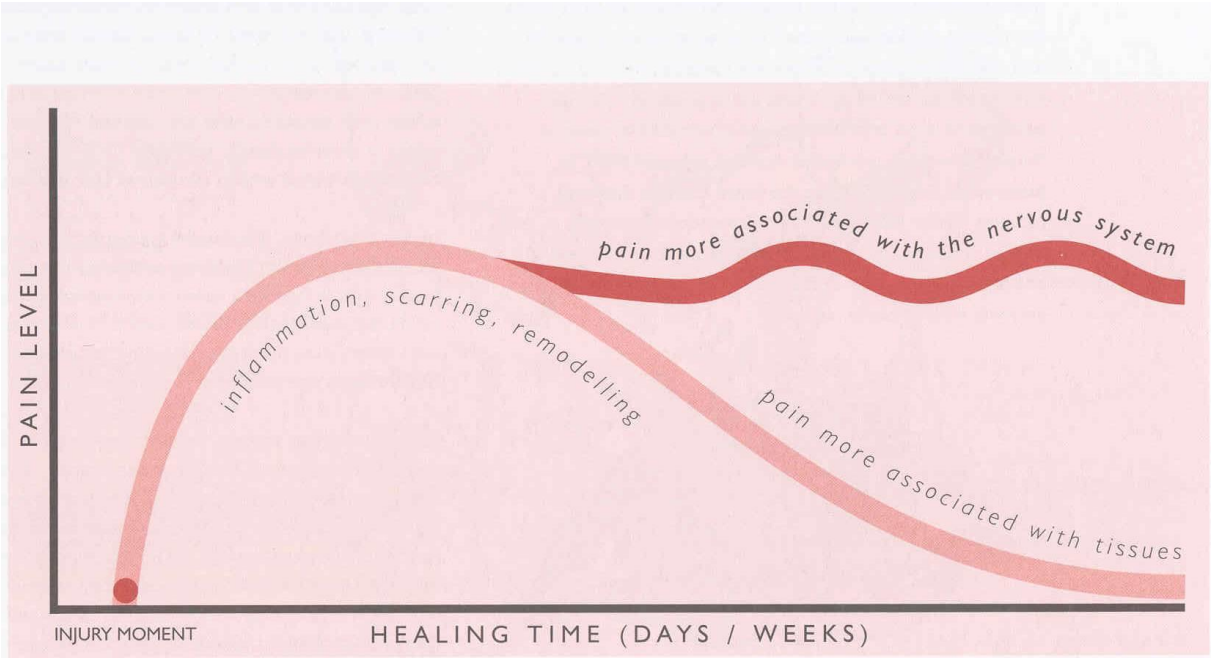
- **Pain** depends on the **brain's evaluation of danger.**
- **Pain is a critical protective device**–it should be ignored at your own peril
- **Nociception** is not sufficient for pain
- **Pain provides a conscience correlate** of the brains **implicit perception** of the threat to body tissues
- **Pain does not provide** a measure of the state of the tissues.
- The evaluation of how much danger the tissues are actually and, happens quickly and outside of conscious awareness.
- **Pain depends on the unconscious evaluation** of threat to body tissues
- The brain subconsciously evaluates information, and in light of every other piece of information available, and evokes a response.
- The conscious experiences based on all you know, but more so on what you do not know that you do not know.
- Pain is **considered a conscious experience** based on the brain's subconscious evaluation of how much danger the tissues are in.
- Pain is the conscious correlate of **perceived threat** to tissues.
- The brain subconsciously evaluates information, and in light of every other piece of information available, and evokes a response.
- Pain depends on the answer to the question…? How dangerous is this really?"
- The brain uses the virtual body to tell you where your actual body is in danger.
- **It hurts where your brain thinks the problem is**, not necessarily where the problem is.
- When **pain persists, it does not take much to make it hurt more**.
- The brain implement strategies the protect the region.
- Including…the way the brain scans for threatening cues, using other body parts to protect the area, moving differently, behaving differently, reacting differently, avoiding certain tasks activities or movements, and laying down more receptors for certain types of stimuli.
- It is **only when the brain is satisfied that enough has been done to get the tissues out of danger**, that it stops making the body parts painful.



GL Mosely. Painful Yarns. Dancing Giraffe Press. 2010

Chronic Pain: Altered CNS Alarms



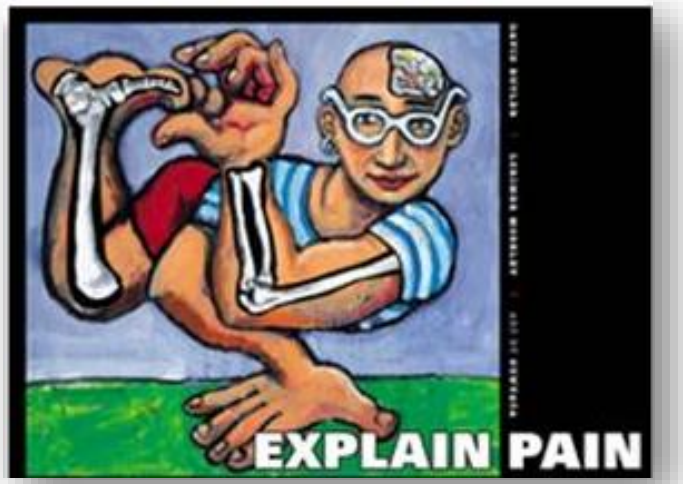


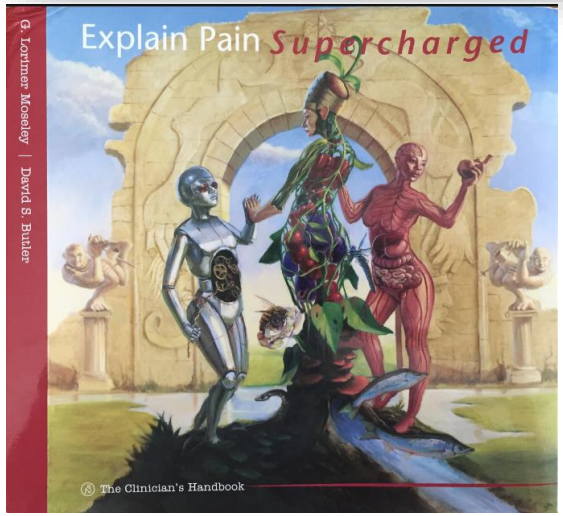
G. Lorimer Moseley and David S. Explain Pain Supercharged. Butler Adelaide City West: NOI Group Publishers, 2017.

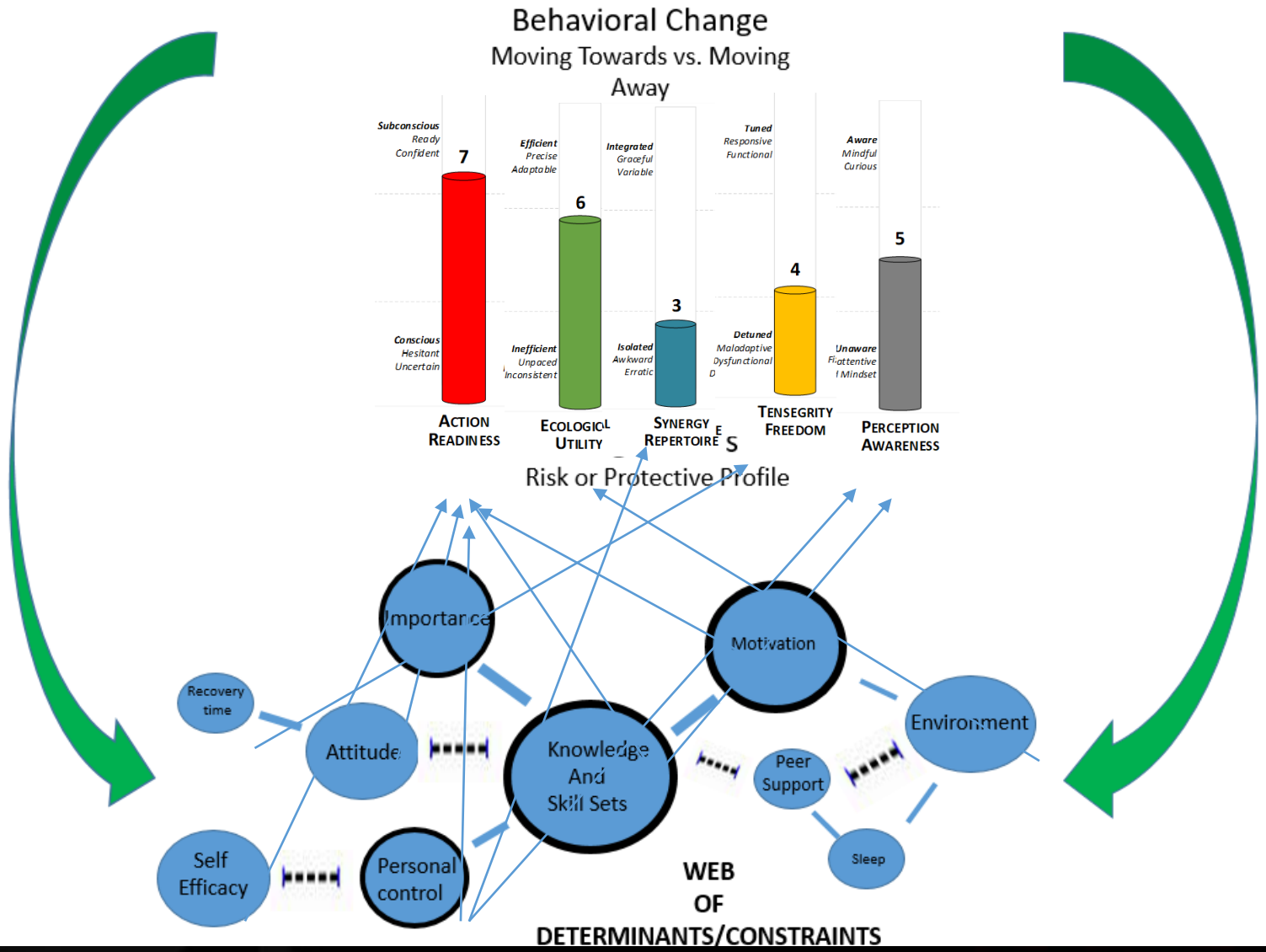
- The pain is in your head…"No brain…No pain."
- Injured tissues have reasonably defined healing times.
- Pain persists in many cases even though the initial injury has had time to heal.

Education and Pain

- There are a host of studies that demonstrate…
- An educational strategy that addresses the neurophysiology and the neurobiology of pain
- Educational approach can have a positive effect on pain, disability, and physical performance.







Modifiable Risk Factors

Change reactions are based on a complex patterns of behavioral risk factors which combine to facilitate or inhibit the desired change. This model may be used to help determine patterns of relationships between factors leading to emerging progress toward change (move towards vs. move away). There is no web of determinants that exists for change to our knowledge. Until future robust statistical analyses are carried out that can identify the relationships between these relevant factors and how they combine to create or inhibit change, we use this model for the purpose of illustrating the concept.

Imaging

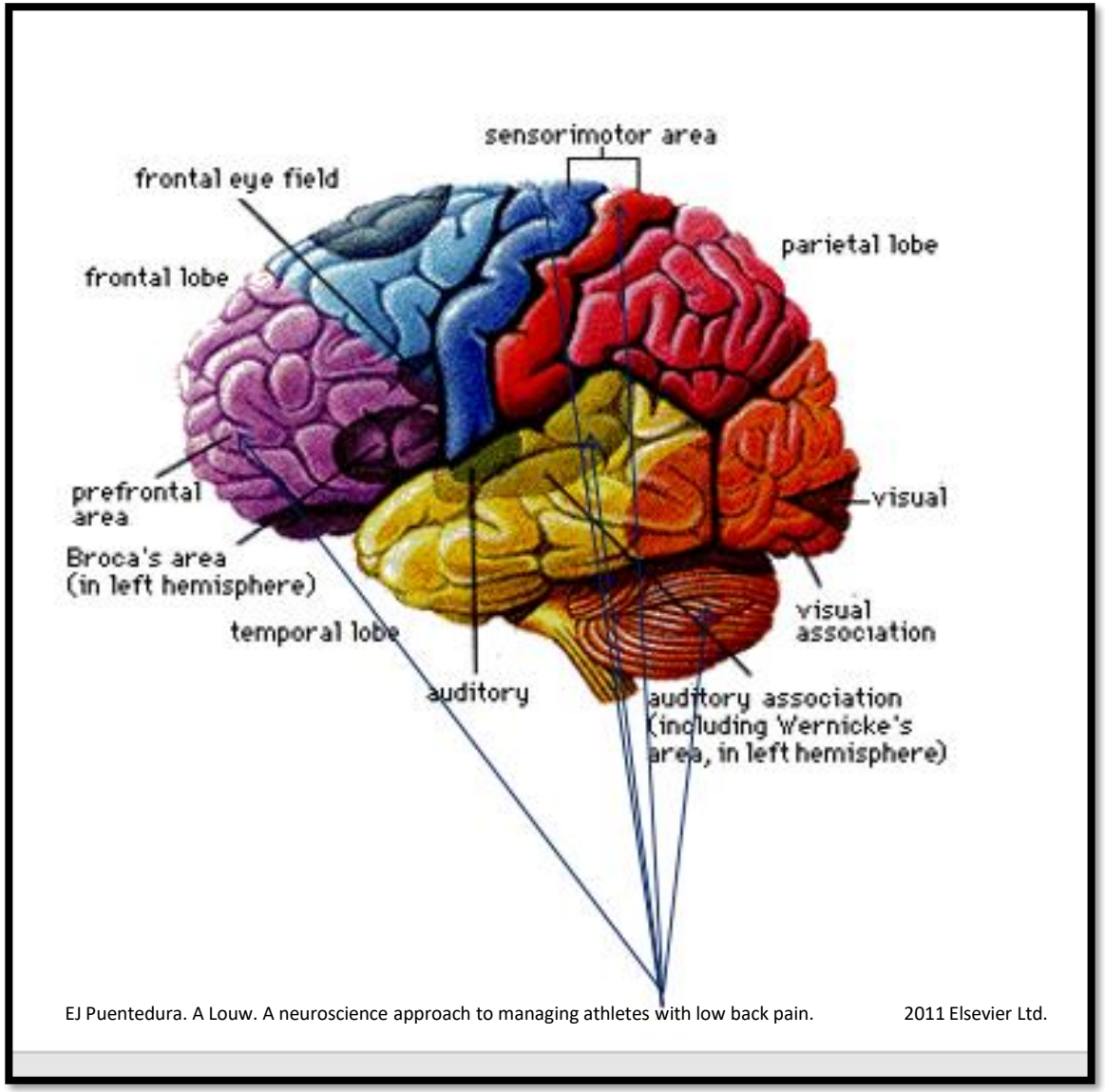
- Medical imaging can be very valuable for identifying serious medical conditions such as broken bones, ligament tears or tumors.
- These tests are of little value in helping explain the vast majority of aches and pains in the muscles and joints.
- Studies support that they are even at times harmful from a psychological point of view.
- A recent retrospective review of MRI and CT imaging procedures ordered by primary care providers and analyzed for appropriateness against evidence-based guidelines revealed that 26% of the procedures did not meet the criteria for the imaging and less than half of the unnecessary procedures revealed anything that guided intervention.
- Several studies have shown that those who are told of “abnormal” (though irrelevant) findings on their medical imaging have more MD/Health care visits, longer lasting pain, more disability, and a lower sense of well being.
- Every day , thousands of patients ***can be deceived*** by their imaging reports as they are informed of coincidental tendon tears, disc bulges, degenerative and arthritic changes and the presence of swelling.
- Often times these findings are the result of normal “WEAR.” and do not suggest the need for pain medication, injections or surgery.

BMJ VOLUME 326 7 JUNE 2003 bmj.com

Harris, I. Surgery the Ultimate Placebo. A surgeon cuts through the evidence.. NewSouthPublishing. 2016

The Brain/Pain Processing

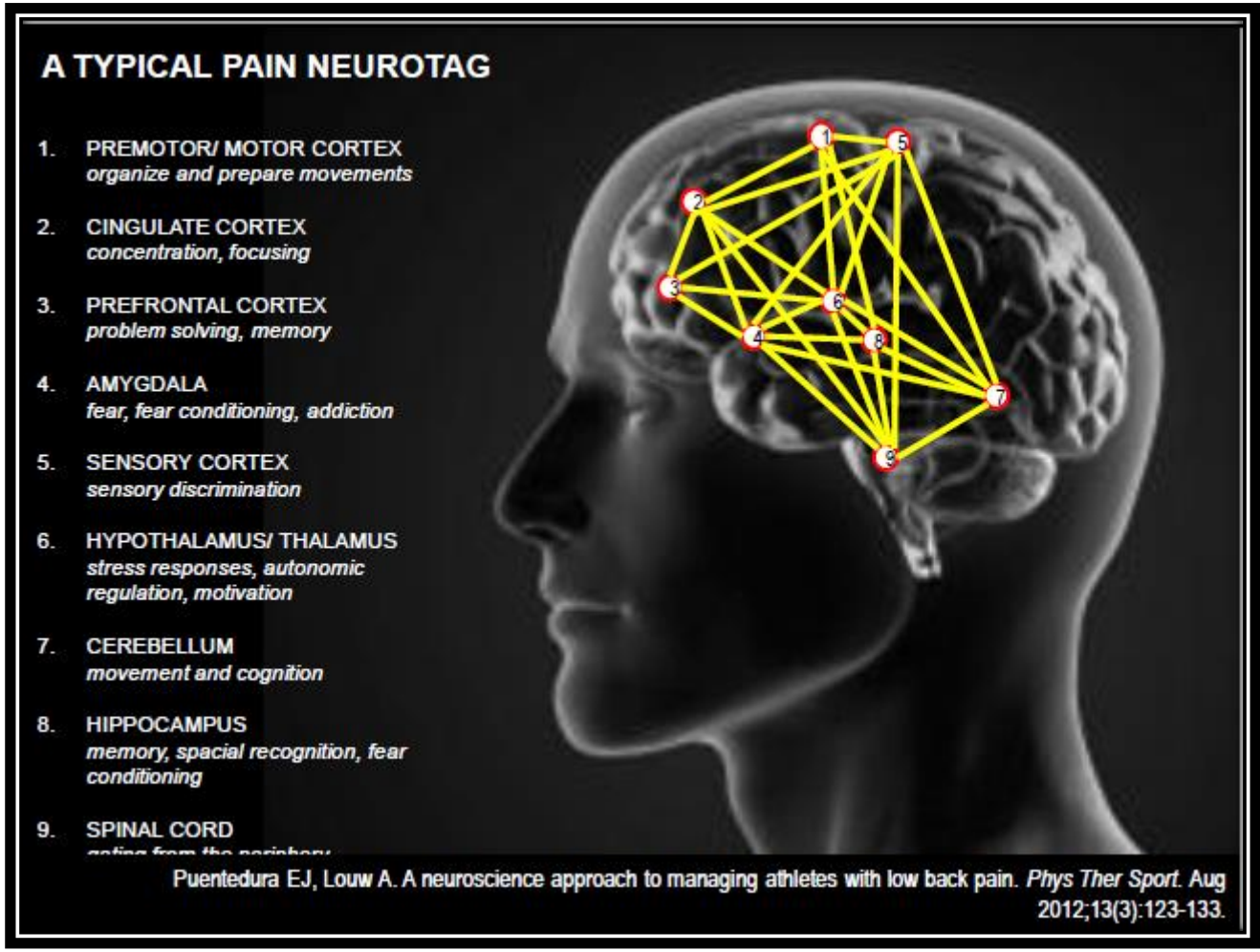
- Neural representations networks or **neurotags** are large group of brain cells that are distributed across multiple brain areas that are thought to evoke a given output.
- a **neurotag** is labeled according to its output.
- Each **neurotag** consists of numerous brain cells, which can be called member brain cells.
- Each member is part of the multiple **neurotag** system.
- A good analogy is that of a in orchestra. Never musicians contribute to many pieces (outputs), and each piece (output) involves a group of musicians distributed across the orchestra
- The brain has different areas (ignition nodes) used for…
  - Sensation
  - Movement
  - Emotions
  - Memory
  - Metaphors

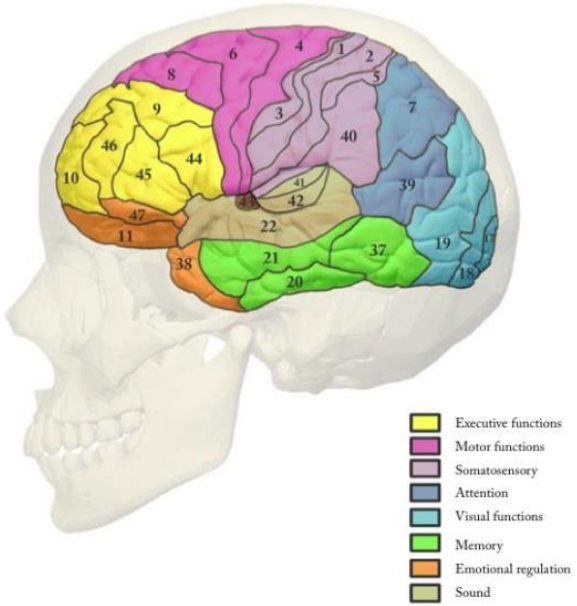


EJ Puentedura. A Louw. A neuroscience approach to managing athletes with low back pain. 2011 Elsevier Ltd.

The Pain Experience

- Multiple parts are ignited during a pain experience.
- They link up electrically and chemically
- The pattern of activity which creates our perception of pain is called a NEUROTAG.
- The brain makes value judgments on the inputs and responds.
- Together, all the systems help to create a **pain** experience, a motor experience, and a **stress** experience, and a **memory** experience.





MODULATION

Secondary neurotag

Secondary neurotag

Secondary neurotag

Secondary neurotag

Secondary neurotag

Secondary neurotag

Primary neurotag → ACTION → Feeling

Primary neurotag → ACTION → Belief

Primary neurotag → ACTION → Movement

Primary **neurotags** affect an action at the end organ such that its output results in a tangible outcome motor, pain, and beliefs…

Bayesian Inference

Real time Predictive Analytics

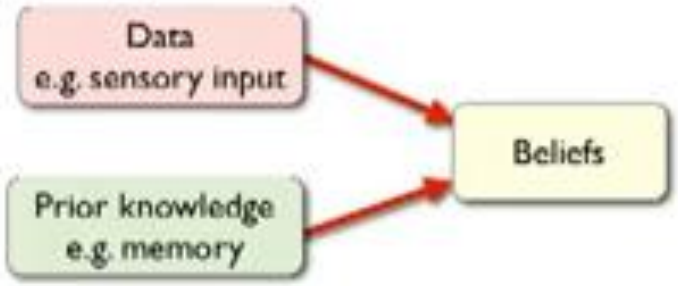
$$P(\text{belief} \mid \text{sensory input}) = \frac{P(\text{sensory input} \mid \text{belief})\ P(\text{belief})}{P(\text{sensory input})}$$

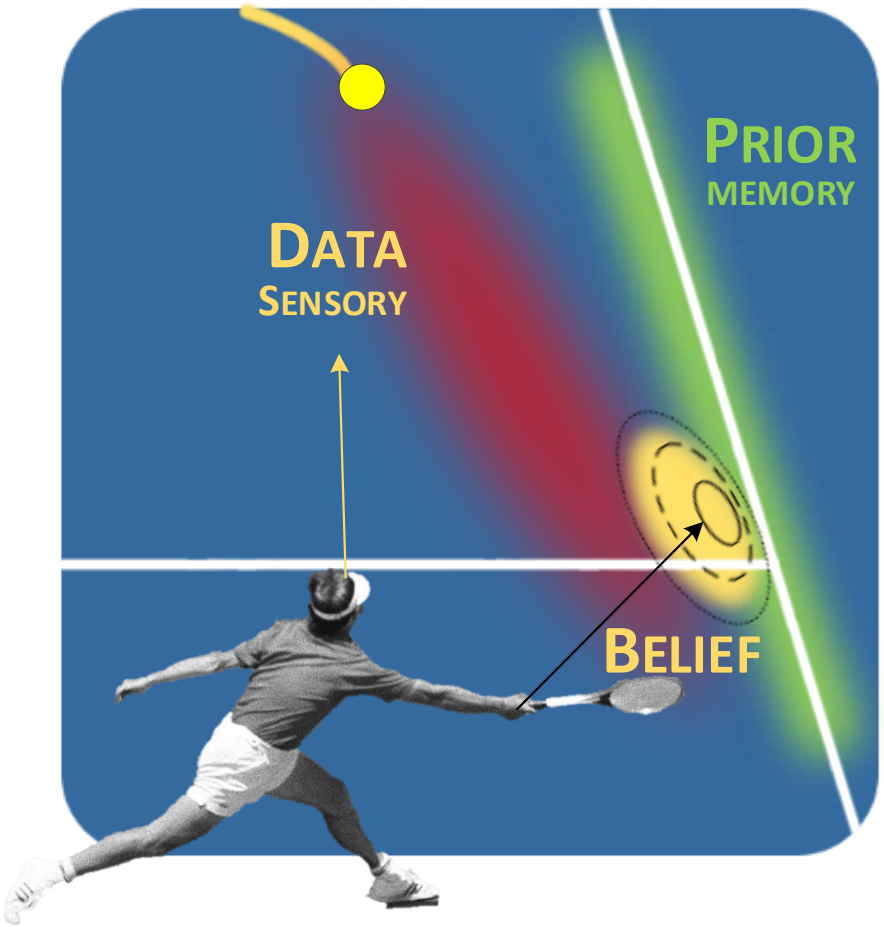
Definitions

In·fer·ence

1. a conclusion based on evidence & reasoning.
2. suggests or assumes the existence, fact, or truth of (something) as a basis for reasoning, belief, or action.

Synonyms: theory, belief, postulate





Repetition is the Mother of Skill

- Skills…through repetition, strengthen neural pathways and, develop powerful “movement skills” maps in their brain (Moseley, 2003b; Nielsen & Cohen, 2008).
- This same process occurs in patients with pain, but in a negative way (Moseley, 2003b).
- Patients who continue to “live their pain” are essentially sealing the pain pathways via the repeated activation of neurotransmitters such as dopamine (Girault & Greengard, 2004).

Neuroception and the PolyVagal Theory

The human nervous system evolved to protect us against threat, both internal and external.

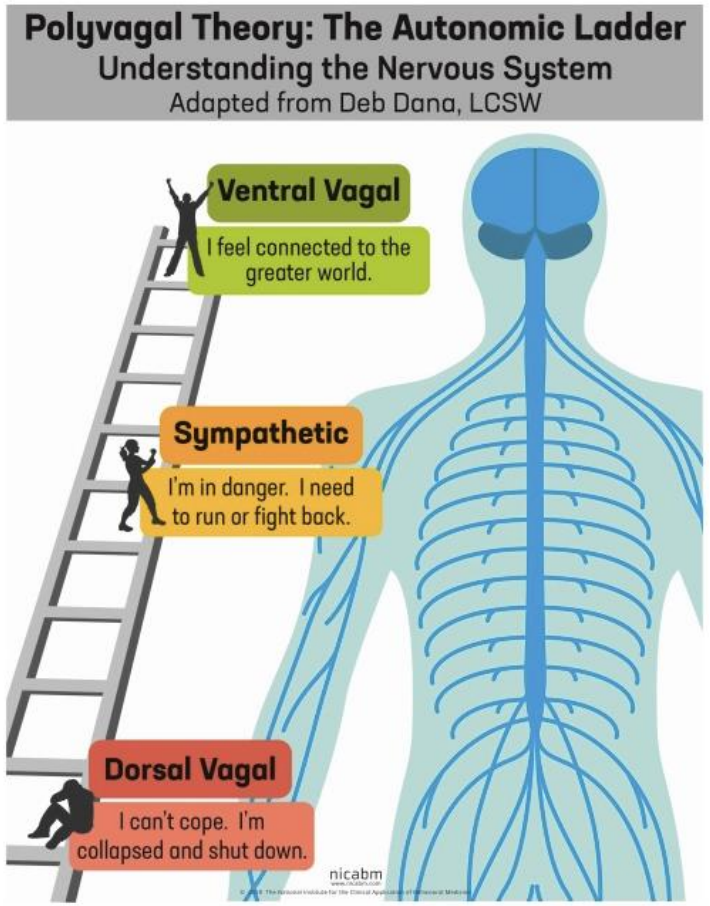
Cardiac vagal tone, measured as respiratory sinus arrhythmia (RSA), represents a continuous, unconscious biomarker of such threat.

Stress has a logical relationship to conscious self-regulatory capacities since it down/up regulates activity in the prefrontal cortex and ANS, which are hubs for executive cognitive processes and breath and heart function.

Internal threats common to aging include…

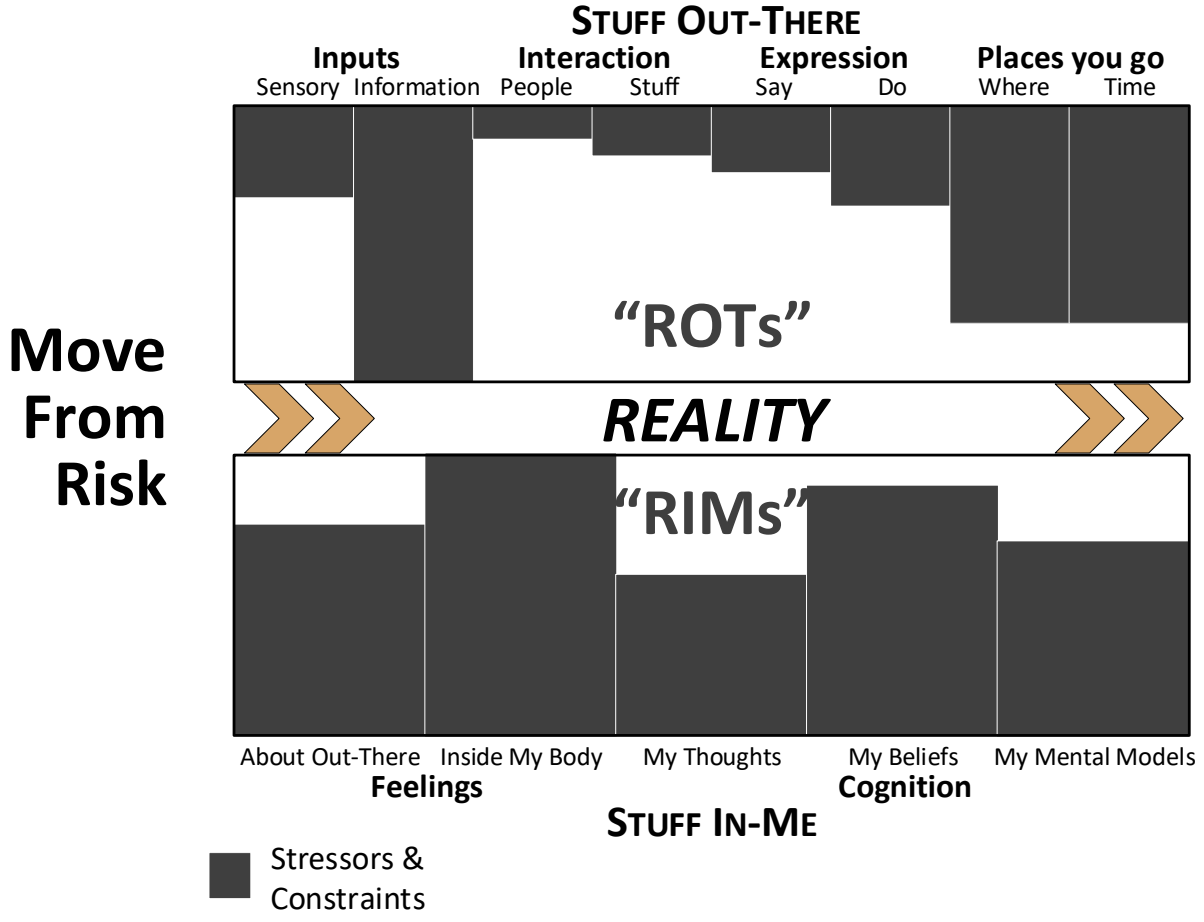
the burden of chronic disease
decline in cognitive function
decreased social interactions
deficits with mobility
compromised sensory/motor action
environmental challenges

Creates changing in vagal tone. Breathing and HR



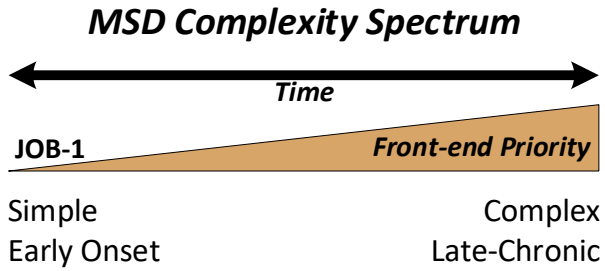
Porges, SW. The Pocket Guide to the Polyvagal Theory. W W Norton and Co. 2011.

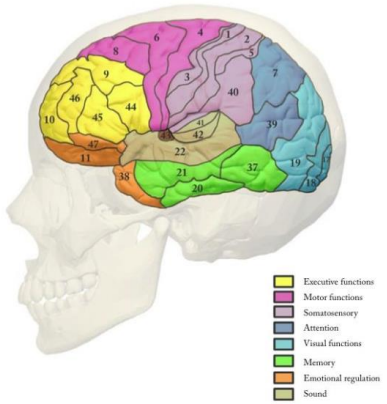
Calibrating The Challenge: The TIEs



Move From Risk

Pathway To Better





A

Externally driven

Internally driven

Nociception

Visually detected threat

Expected threat

Perceived current status of tissue

Perceived current body position/location

Social threat

Feeling

Beliefs

Pain primary neurotag

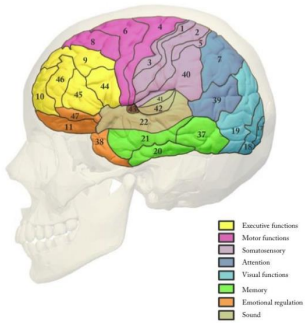
Pain

Movement

Believed but not correct

We think…"Increased pain…no gain!"

Gl Moseley, H Flor. Targeting Corticol Representations in the Treatment of Chronic Pain: A Review. Neurorehabilitation and Neural Repair 26(6) 646– 652. 2012



B

Externally driven

Nociception

Visually encoded threat

Internally driven

Expected threat

Perceived current status of tissue

Perceived current body position/location

Social threat

Pain primary neurotag

Movement primary neurotag

Pain

Movement

Gl Moseley, H Flor. Targeting Corticol Representations in the Treatment of Chronic Pain: A Review. Neurorehabilitation and Neural Repair 26(6) 646– 652. 2012

Task Performance

Corticol body matrix conceptualization

The strength of the secondary neurotags influence how the primary neurotag influence the action and the motivation and confidence involved in creating the action.

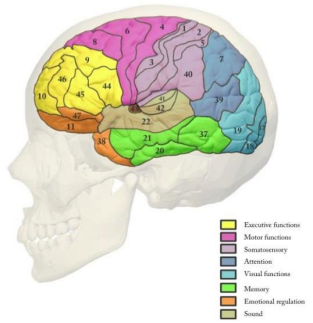
Externally driven input

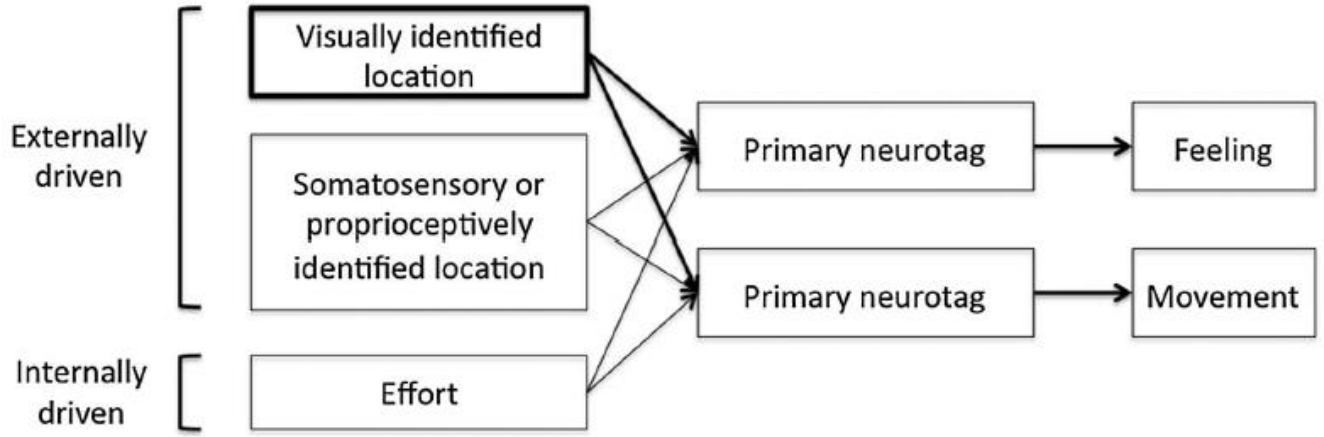
Internally driven input

The weight of the lines denote neuronal strength – number or neurons, efficiency of firing.

Feeling-Knowledge of results

Movement-Knowledge of action





Gl Moseley, H Flor. Targeting Corticol Representations in the Treatment of Chronic Pain: A Review. Neurorehabilitation and Neural Repair 26(6) 646– 652. 2012

The Classic Movement Approach

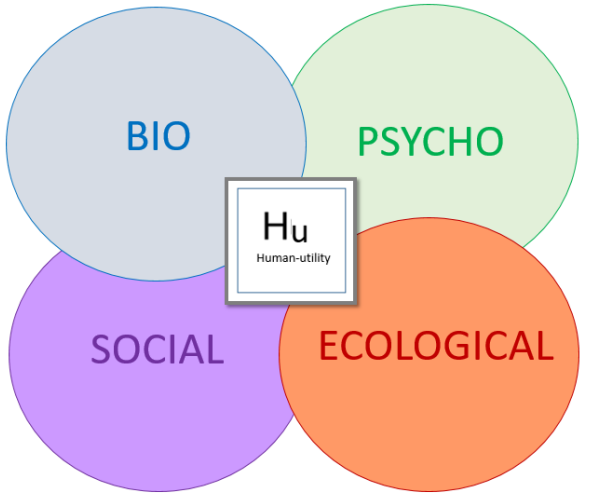
- MSDs and the pain associated with them often lead to reduced movement and reduce participation in activities, activities of daily living, leisure activities etc.
- Reductions in movement might occur because of physiological impairment (for example loss of range of motion, strength, proprioceptive deficits, and the use of external bracing, or for fear of pain provocation.
- Rehabilitation involves gradually increasing movement, strength, endurance and skill.
- The design of a process of exercises to help return the patient to their prior level of activity or desired goals.
- The initial focus of rehabilitation is on loading tissues in a graded fashion until the patient is satisfied that they can withstand the requirements of any particular exercise, task, activity.

The BPSE Approach

- Returning to what you want, need and love to do is also dependent on an approach that…
- (1) provides a working model that integrates the complex proprioceptive, motor and spatial representations that are involved in human function,
- (2) stipulates that neurotags, the outputs of which act on end organs (eg, muscles or blood vessels) are closely integrated with neurotags, the outputs of which act on sensations, emotions and feelings
- (3) implies that both external and internal events or situations, including the location of body parts, are mapped spatially according to a frame of reference centered about oneself ('egocentric'), and a frame of reference centered on an external object or limb ('allocentric').
- This implies that spatial tasks that interrogate both frames of reference should be incorporated into rehabilitation.

“What core biopsychosocial processes should be targeted with this client given the goals in this situation, and how can they most efficiently and effectively be influenced?”

Process Based approach…
Variable…in action and approach
Context dependent…creates transfer
Application level of organization
…cell…muscle…synergies…actions…teams…task…environment etc.
Dimension of application: *Motion. Force. Time. State. Space. Energy*.
Retention…pattern formation retained so they can be reinforced and reproduced and counted on to create *adaptability and resiliency*…in both client and provider



SolveMasters

DECODE CONCERN ...*A scientific process where movement & mind meet to beat MSDs*

INTAKE INTERVIEW

"Tell me..."

Triage & Concern
- Flags

Impaired Tasks/Activity
- Primary – SANE
- Secondary...
- Body Charts

Indexes
- Risk
- SANE
- PFSF
- PAIN

...Desire for Help?

OBSERVE

"Show Me"

Primary Task Impairment

TASK PERFORMANCE:	YES	NO
Adequate Results	●	○
Optimal Quality	●	○
Asymptomatic	○	●
Safety (Self & Others)	●	○

CORRELATE

Secondary Task Impairments

TASK PERFORMANCE:	YES	NO
Adequate Results	●	○
Optimal Quality	●	○
Asymptomatic	○	●
Safety (Self & Others)	●	○

CLARIFY

Movement Testing & Tuning
- Postures & Positions
- Patterns/Drivers/T-Zones
- Relevant Planes & Chains
- Big-Rocks: F/A, H, TS, SG
- Coordination/ Mobility/ Stability
- Interregional Dependencies (CRs)
- Symptom Sources
- Functional Constraint/s

CONSIDER

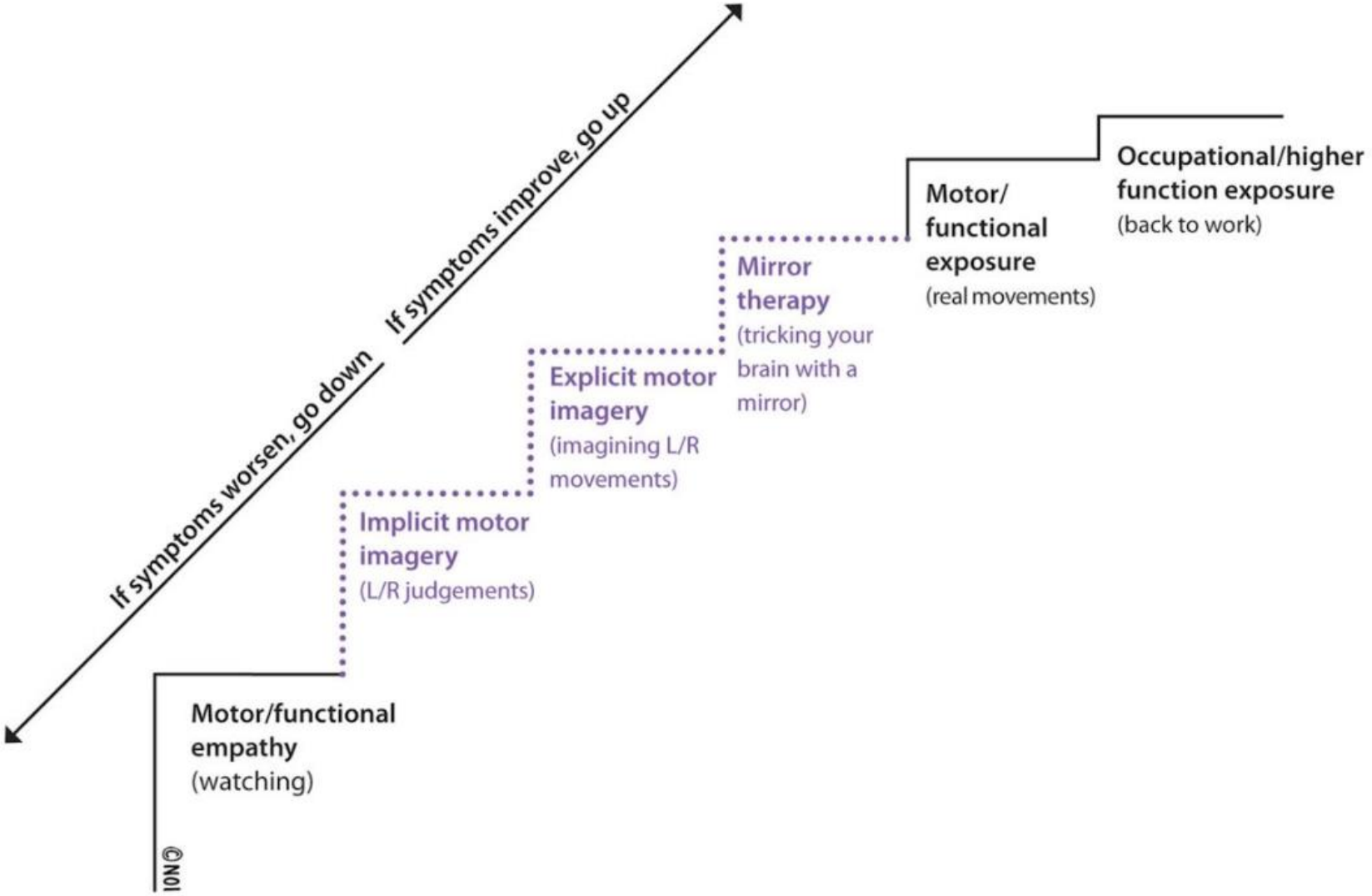
Scenario Narratives
- Patterns, Phases & Drivers
- Inside-Out & Outside-In
- Ambiguity & Mismatches
- Celerate & Anticipate
- Usual Suspects
- Control Parameter

...What & Why Before Choosing

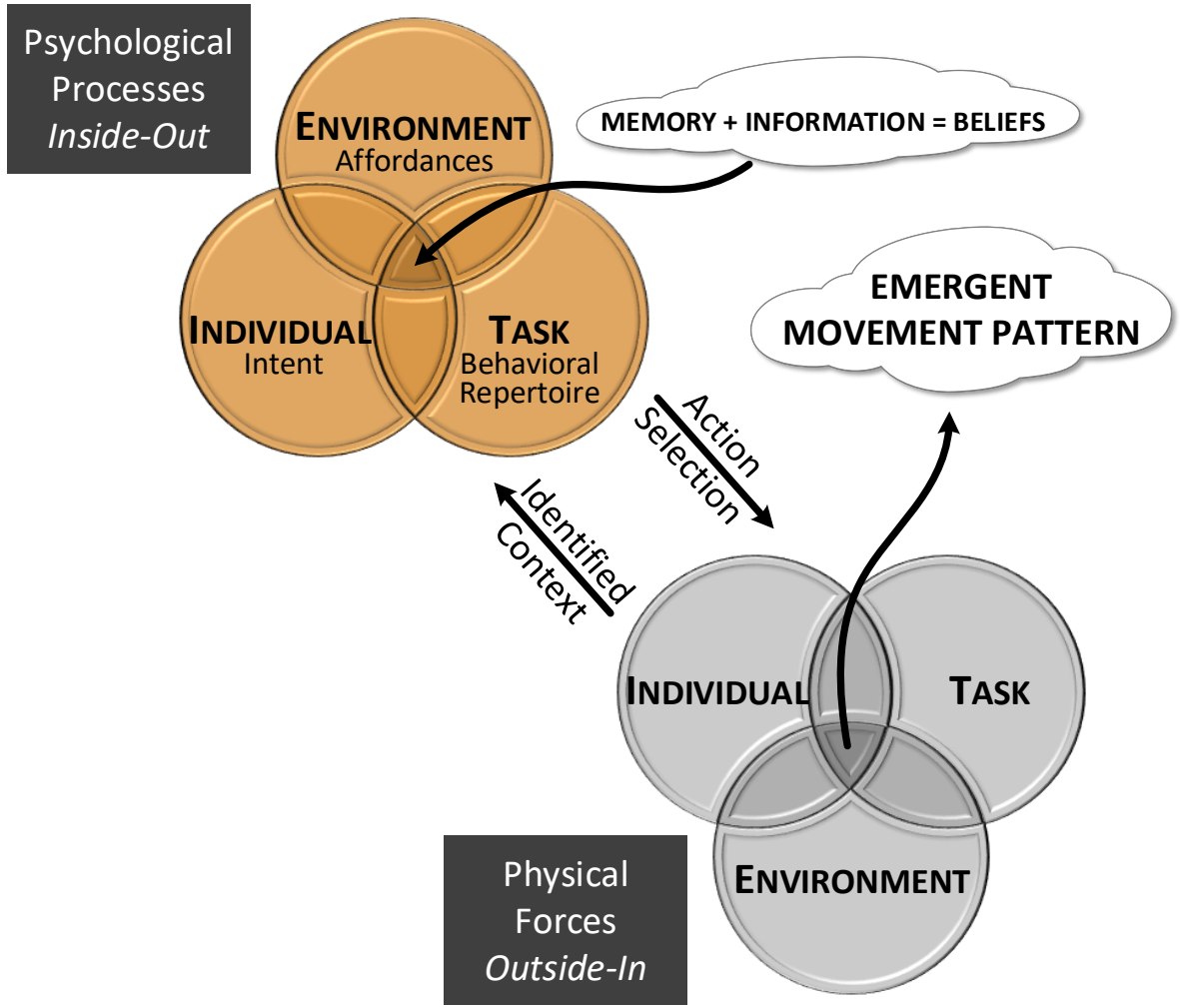
DECIDE

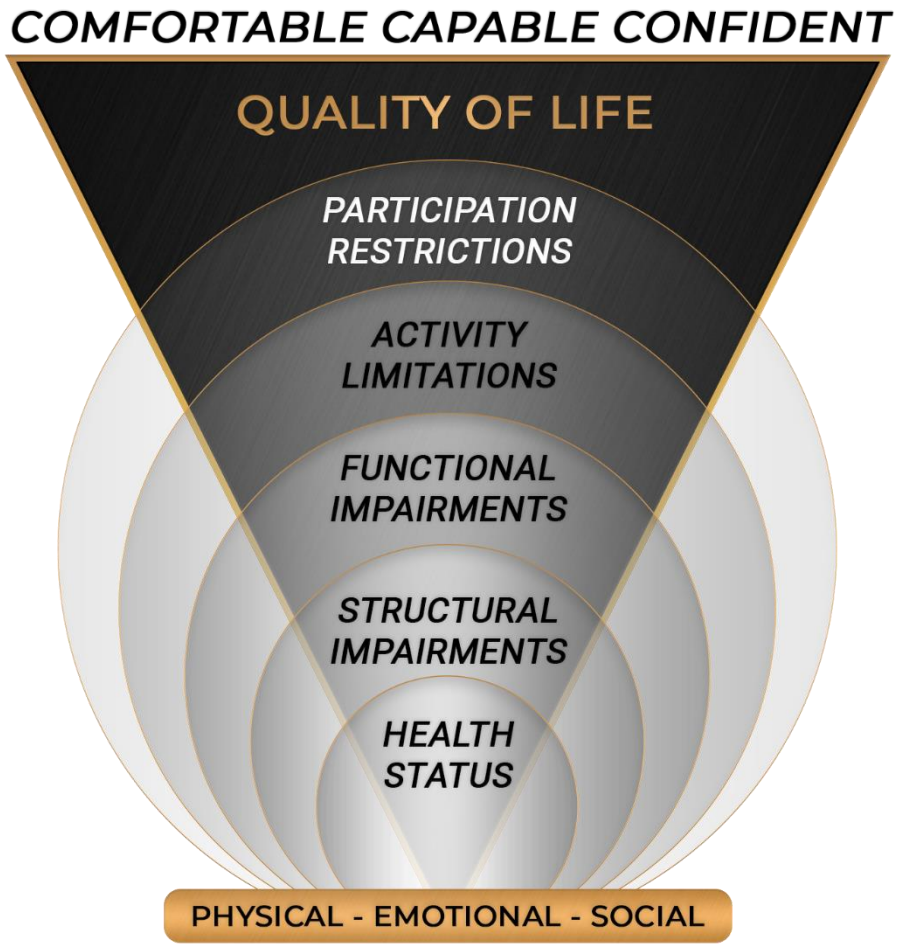
Hypothesis/Impression & Strategy
- Triage & Concern
- Stressors
- Symptom Source
- Functional Constraints
- Usual Suspects
- Influencers
- Countermeasures

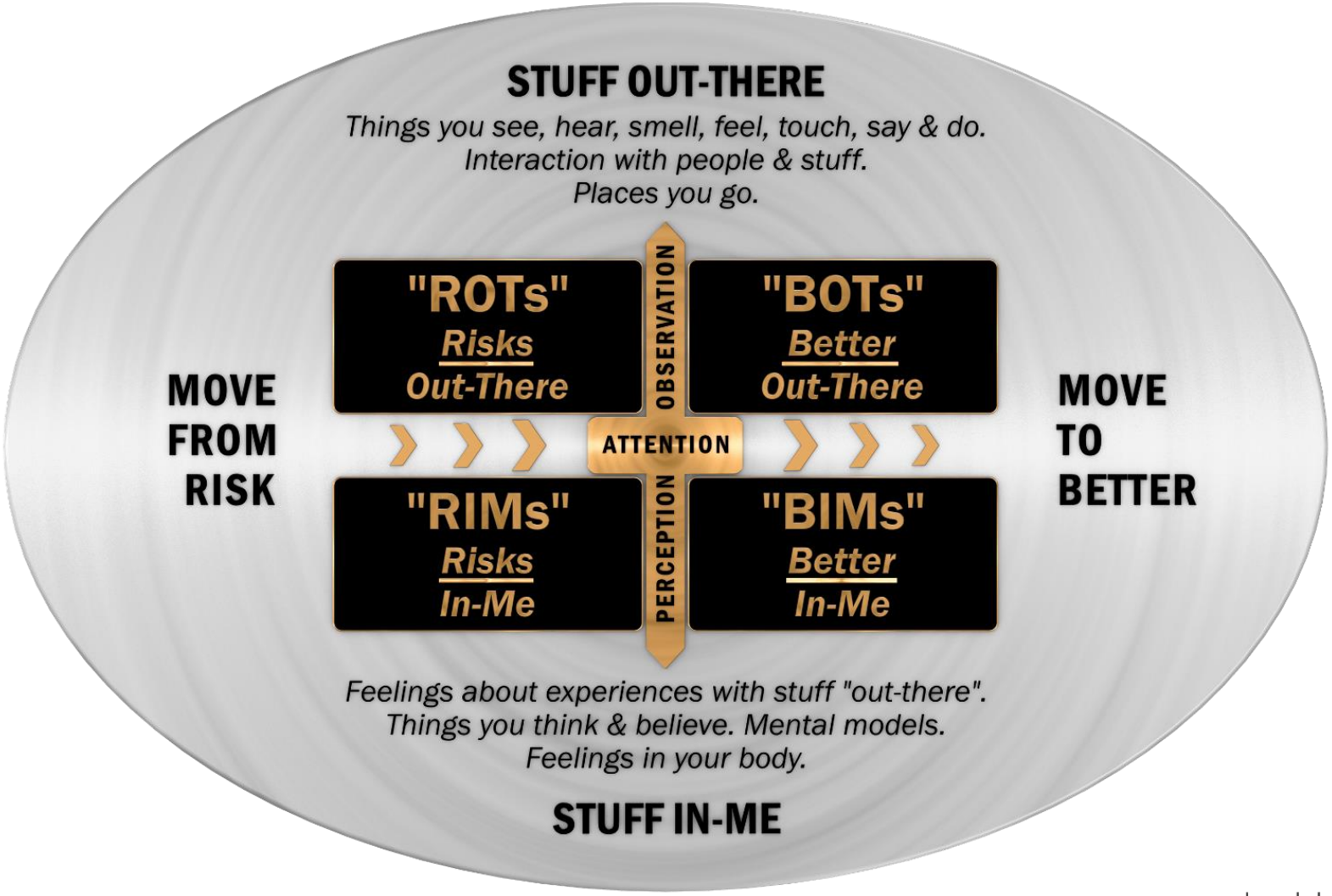
...Exercise Conscious Judgement



DS Butler,GR Moseley,TB Beames,TJ. Giles. Graded Motor Imagery Handbook. Noigroup Publications, 2012


Psychological Processes
Inside-Out
ENVIRONMENT
Affordances
INDIVIDUAL
Intent
TASK
Behavioral Repertoire
MEMORY + INFORMATION = BELIEFS
EMERGENT MOVEMENT PATTERN
Action Selection
Identified Context
INDIVIDUAL
TASK
ENVIRONMENT
Physical Forces
Outside-In





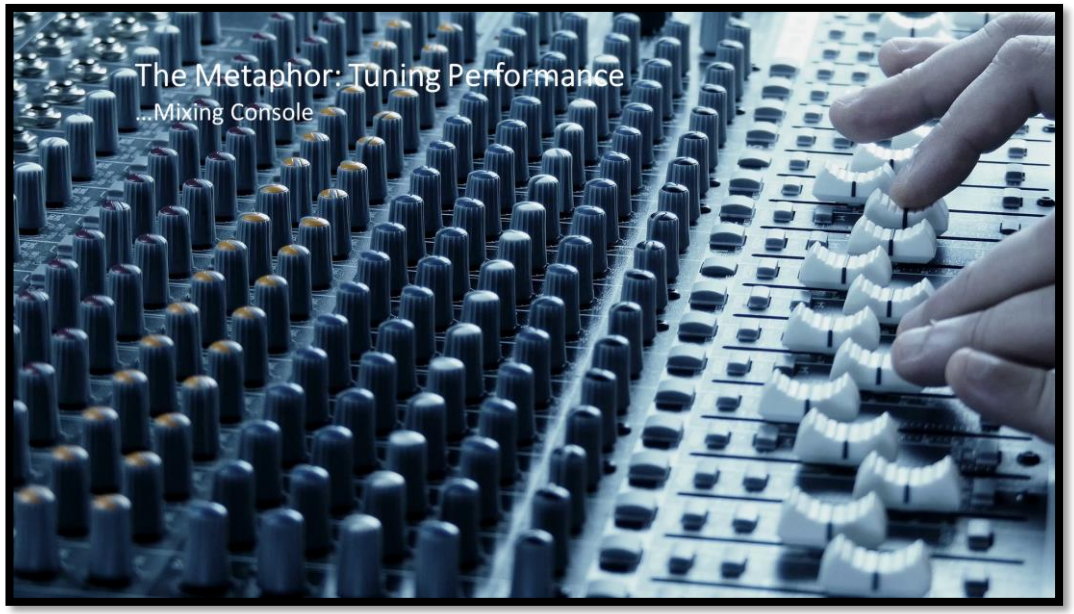
Metaphor and Move*meant* Literacy

- How we move, learn, plan, hurt, heal talk and how we live is influenced by how we think metaphorically.
- We use language to describe things. The verbal expression of thoughts or feelings.
- When our most important life experiences are often too abstract for basic understanding, we attempt to capture the nature of the experience by placing it in a relevant and more easily recognizable context.
- Metaphors emerge from our bodily experience in the world.
- Our choice of metaphors is important because they help us shape our perception of the world.
- Metaphors shape our thoughts and behavior…perception and action.

Metaphorical DIM/DOT	DIM/DOT Category	Metaphorical SIM/SOT
Each time I move it feels and sounds like broken glass	Things I hear, see, smell, touch, taste DOT	I'm changing the tune to God Bless the Broken road that brings me back. Kintsukoroi
I keep doing the same thing over and over like I'm stuck in a rut	Things I do DOT	I'm moving and exploring my surrounding again, just like a chameleon
The disc will slip if I bend over	Things I think and believe DIM	The right movements, time and understanding will re-inflate my disc
It's got me this time	Things I say DIM	I'm bouncing back and falling forward
Work is a cold dark place	Places I go DOT	Coming to work brings structure to my life
He makes my skin crawl	People I meet DOT	I realize how my friends have helped carry me through this and I'm ready to stand on my own two feet
Everything inside me is just falling apart I have heart disease	Things happening in my body DIM	Exercise makes it feel like everything runs like a well oiled machine Kintsukoroi

“Can-if” Involve Systematic Perturbation

- Turning-On: *Relevant Utility*
- Tuning-Out: Self-Doubt
- Tuning-In: *Attention & Resources*
- Tuning-Down: *Pain & Doubt*
- Tuning-Up: *Possibility & Performance*
- Toping Off: Capacity & Confidence
- Turning-On: Self-Efficacy
- Turning Off: Waste & Dependency

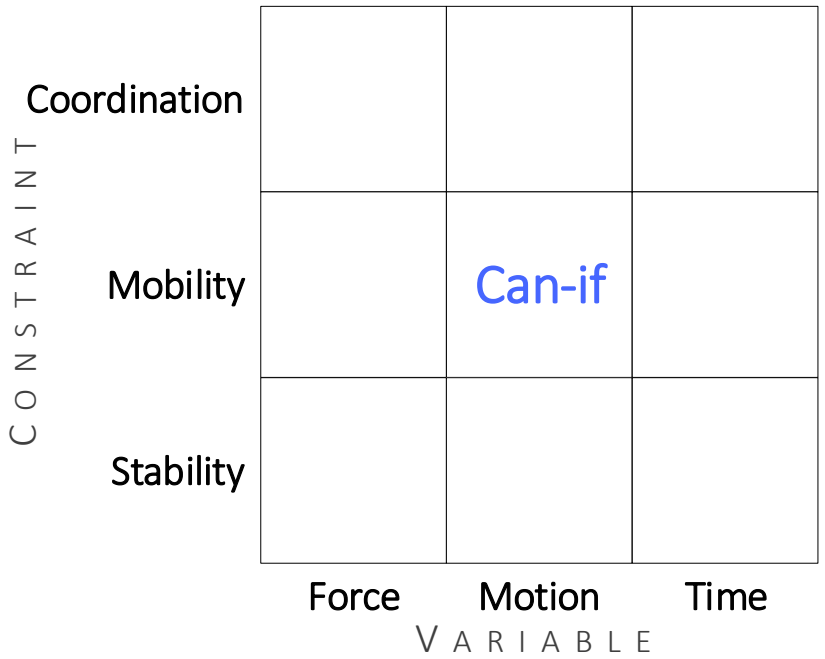


Progression

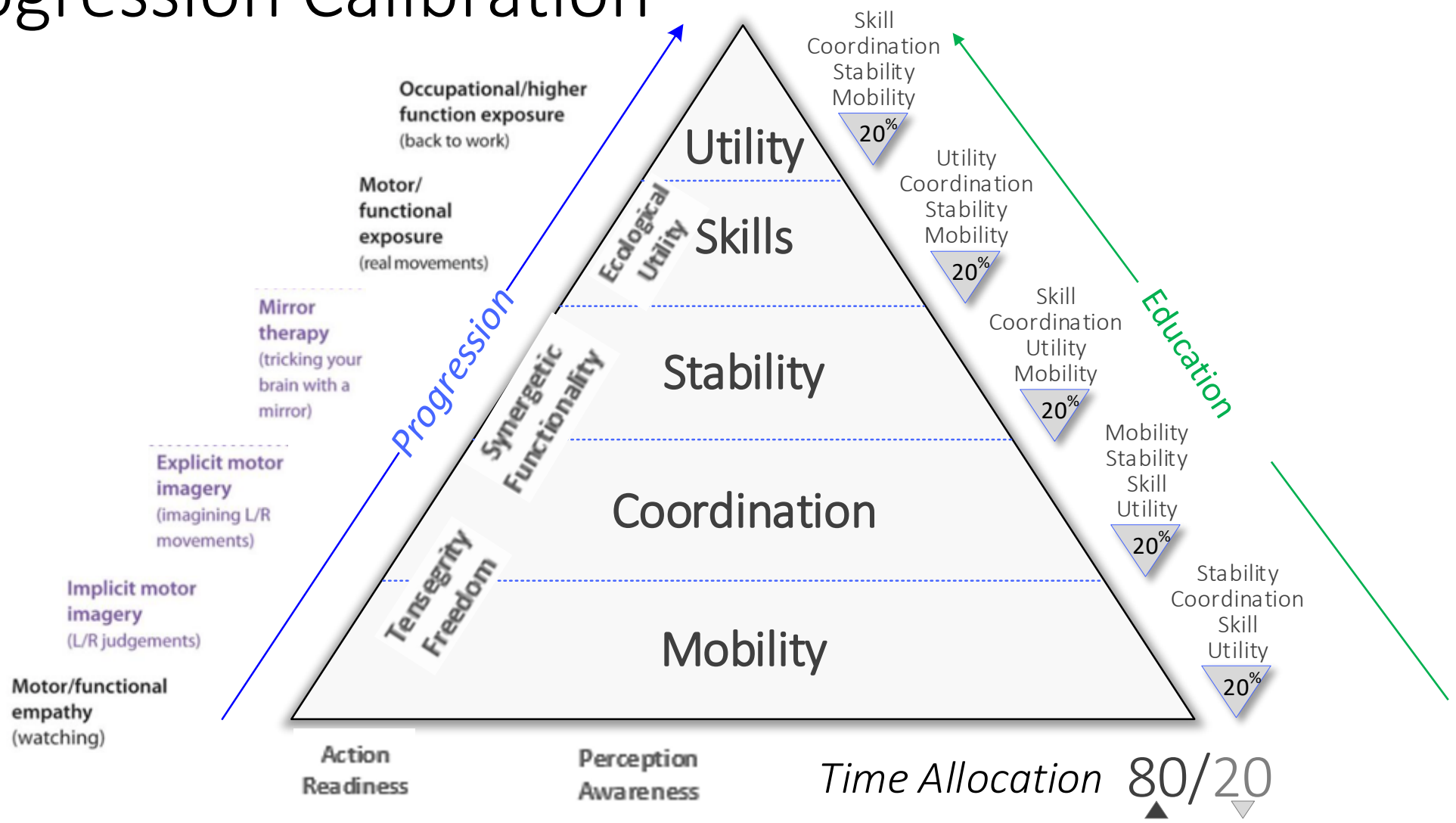
Guidelines

1. Begin with the ***end in mind*** (*T.I.E. Utility*)
2. ***Avoid symptomatic*** pain (*when harmful*)
3. Prioritize ***root cause*** (*constraint area, plane & chain*)
4. Be guided by the ***utility goal*** (*follow evidence & build on success*)
5. Determine **constraint priority** (*movement testing*)
6. Determine ***variable priority*** (*default to motion*)
7. Take the most ***direct solution pathway*** (*as safe*)

Progression Example



Progression Calibration



Time Allocation 80/20

Value in Musculoskeletal Medicine

*"Value in musculoskeletal care is a measure of the outcome of all health care services that are **delivered to maximize a person's…desired… function and participation** in society while minimizing impairments, pain and other symptoms."*

Low value care is defined as… services that provide little to no clinical benefit.

Low value care includes…

-Ineffective screening programs
-Diagnostic testing and imaging
-Inefficient organization of health systems
-Excessive use of medication
-Commercial ties to ancillary services
-Patient distrust
-Unnecessary surgeries
-Poor access

Low-value care in musculoskeletal health care: Is there a way forward? *Pain Practice*. 2022;22(Suppl. 2):65–70.

Value Care

- Patient-centered care containing information and education about the condition;
- Consideration of psychosocial factors as appropriate for improving pain and function;
- Encouraging people to remain at work. Stay active;
- Physical activity and exercise interventions;
- Manual therapy only as an adjunct to other treatments;
- Pharmacological options for short-term pain relief with careful consideration of potential harm harms;
- Advice to not perform routine imaging
- High-quality non-surgical care prior to surgery

Babatunde OO, Jordan JL, Van der Windt DA, Hill JC, Foster NE, Protheroe J. Effective treatment options for musculoskeletal pain in primary care: a systematic overview of current evidence. PLoS One. 2017;12:e0178621. 15. Lin I, Wiles L, Waller R, Goucke R, Nagree Y, Gibberd M, et al. What does best practice care for musculoskeletal pain look like? Eleven consistent recommendations from high-quality clinical practice guidelines: systematic review. Br J Sports Med. 2020;54:79–86