SHOULD PAIN BE YOUR GUIDE?

Clinical Reasoning, Guided by Theory & Biopsychosocial Factors

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CONFLICTS OF INTEREST

Dr. Sigmund does not have any conflict of interest to report with this presentation

Dr. Frey-Law does not have any conflicts of interest to report with this presentation

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#1 REASON YOUR PATIENTS COME IN…

Pain

PAIN
MOVEMENT

Patient Cases

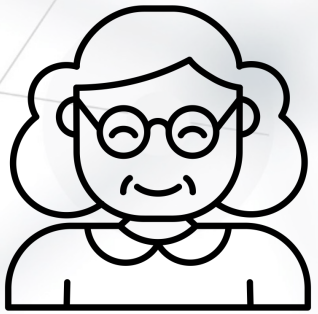
Sharice: 8y.o. recently healed from broken arm

Lee: 29 y.o. firefighter d/c from rehabilitation s/p Achilles repair

Vera: 64 y.o. grandmother with knee osteoarthritis

Jennifer: 36 y.o. hockey coach with lower back pain

Brad: 18 y.o. cross country runner with bilateral exertional medial tibial pain



SHARICE, 8 y.o.

Recently healed from broken arm

MOI: fall from monkey bars on playground

Phy Ed teacher reports that she won't use her arm for anything

4 wks d/c from rehabilitation. PT reports that she exhibited = strength Bilat and no atrophy at d/c, consistent with your exam

She tells you she just "doesn't want to hurt her broken arm again"

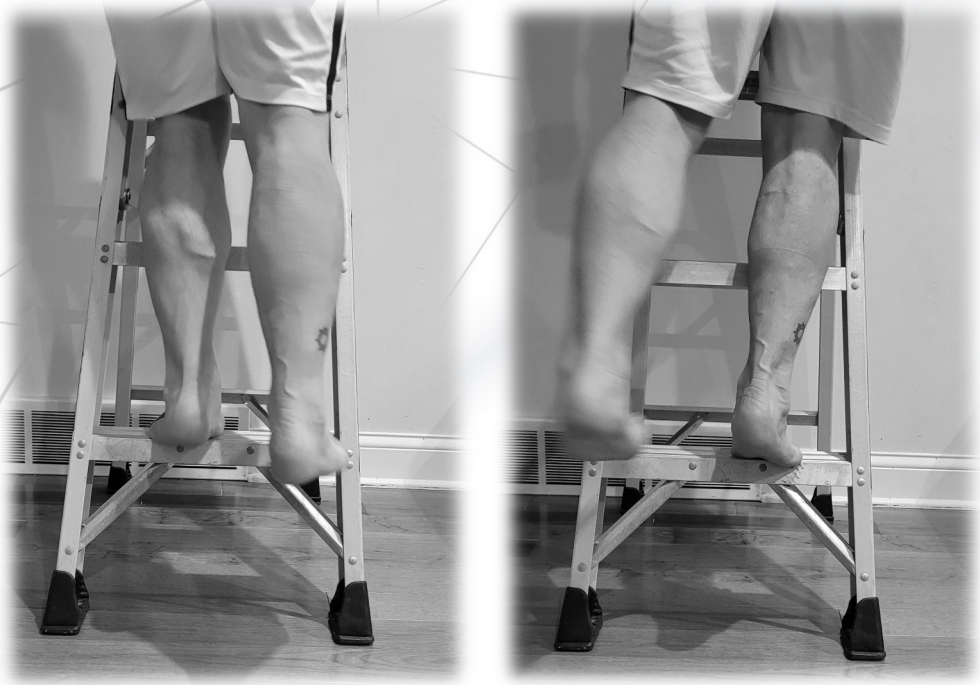
Lee (29 y.o. firefighter)

D/c from rehabilitation s/p Achilles repair

No current pain reported, with full strength bilaterally, gait appears to be WNL, = bilat.

c/o antalgic pattern while on ladder with external load, unable to push off

Denies fear/anxiety related to the movement



Vera, 64 y.o., Retired

Knee osteoarthritis (OA)

Has 2 friends with significant health concerns following falls on stairs

Set of 15 stairs in the house she cannot avoid

Antalgic pattern

Worsening pain in the knee

Has to wear shorts because anything brushing her knee is painful, pain spreading into thigh

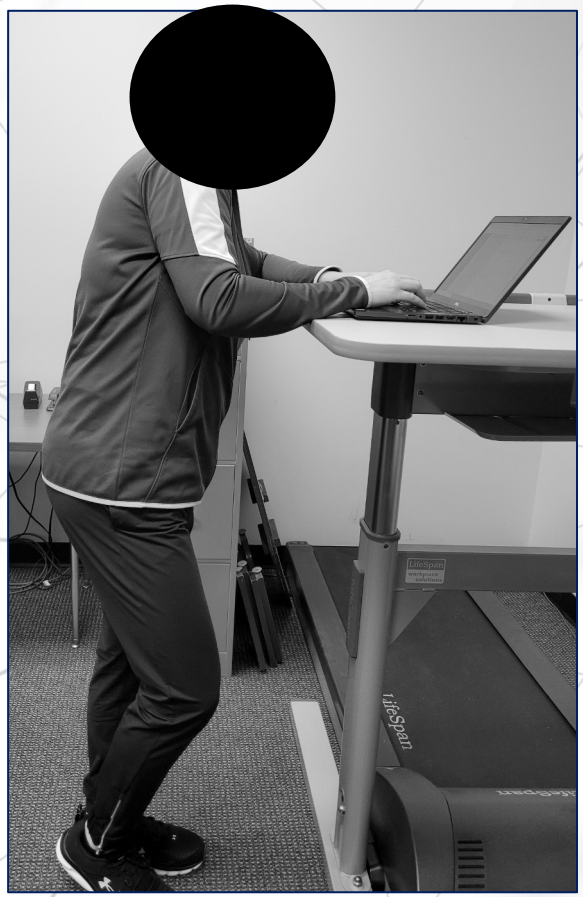
Jennifer, 36 y.o. Hockey Coach

Intermittent LBP x 6 yrs. Current flare 7/10 pain, no radiculopathy. Presents with spasm.

Pain seems to worsen with each flare. Interferes with prolonged postures, sleeping, and skating.

Physical activity has decreased drastically in the past year, leading to other health issues and onset of depression.

Pain-free ROM becomes more limited with each flare. Pain is widespread. No treatments work anymore, despite previous success. Even palpation hurts.



Brad, 18 y.o. Cross Country Runner

Same type of shoes, broken in but low mileage, same surface, slight increase in training mileage to prepare for college XC

Extremely flat feet. Overstrider.

New onset of bilat shin pain, began 3 months ago. Presents as tightness of Tibialis Anterior

Pain seems to be spreading over time, but no hyperresponsiveness

MIXED MESSAGES WE HEAR ABOUT PAIN-MOVEMENT RELATIONSHIPS

Pain → Altered movement patterns

"Dysfunctional" movement → pain

Movement is Medicine™

"It's all in your head"

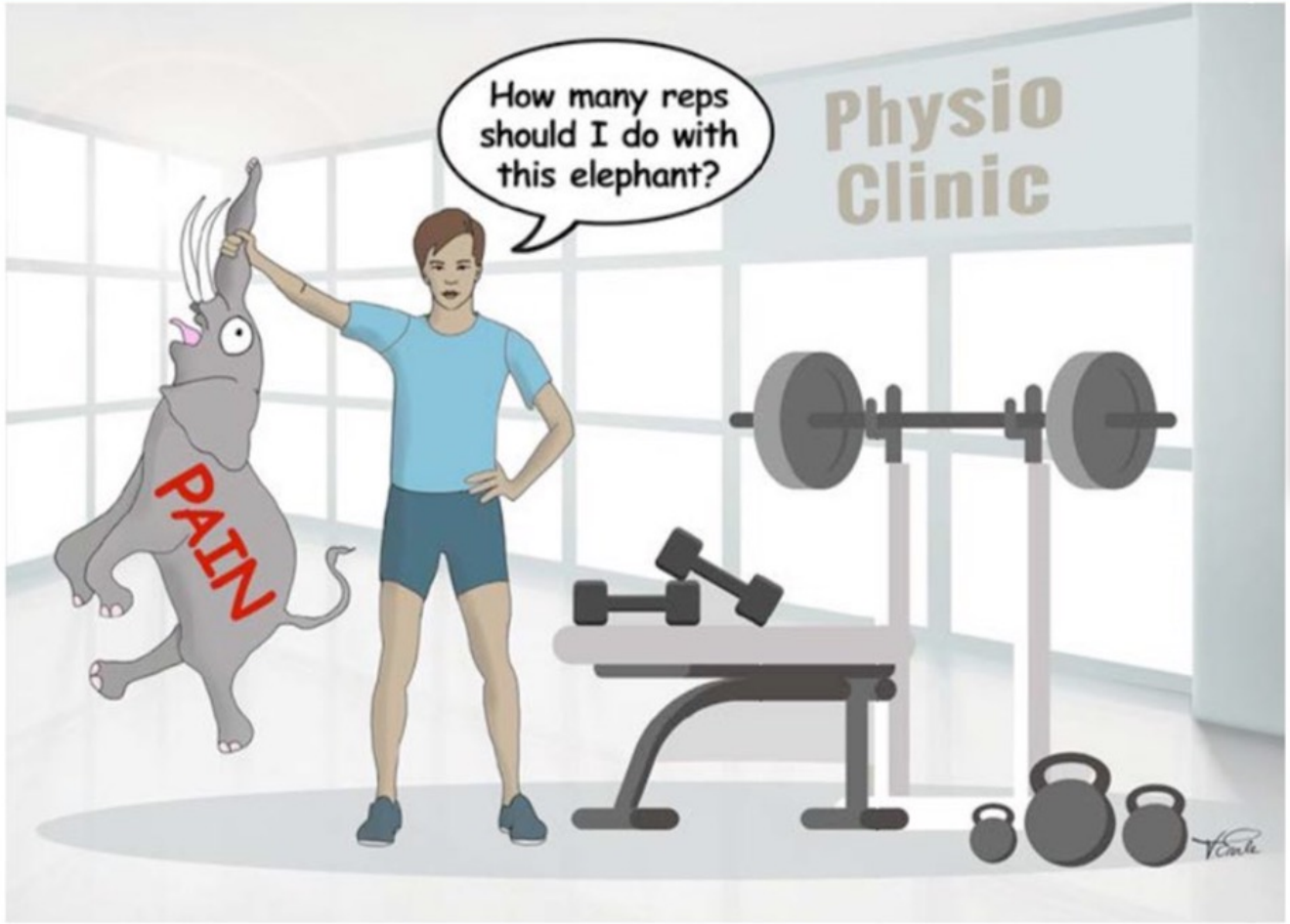


Figure 1 The elephant in the room: 'How many reps should I do with this elephant?'.

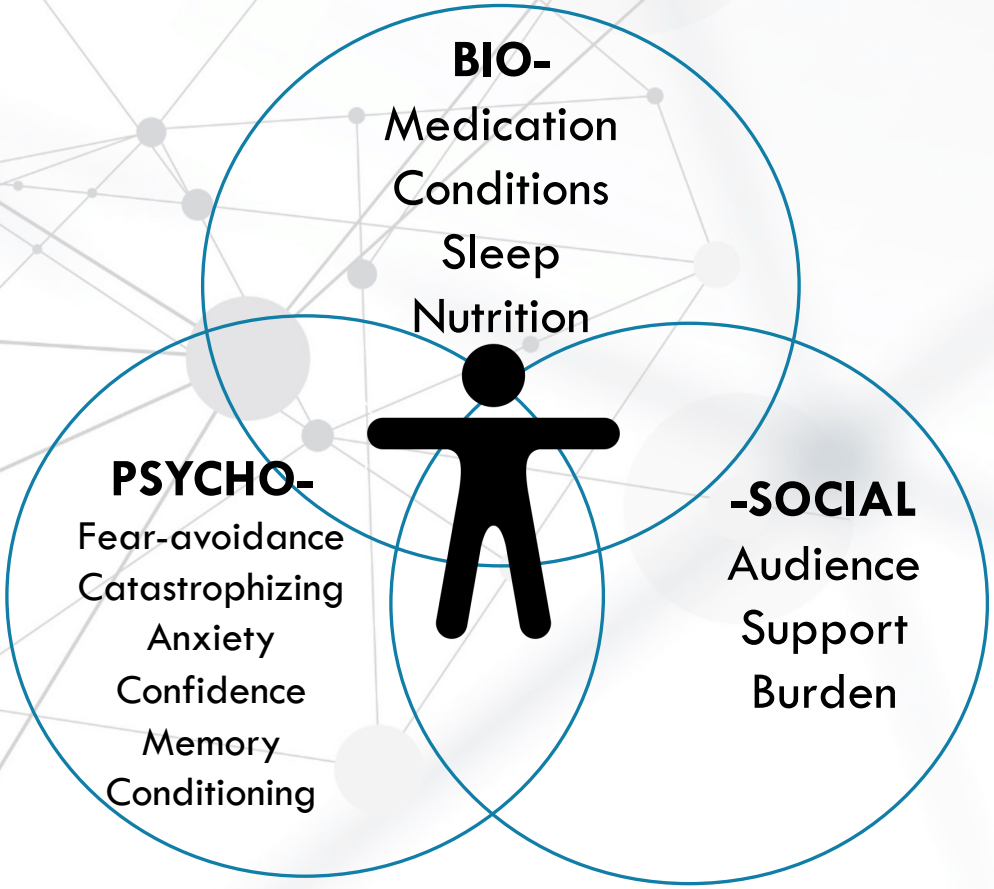
(Smith, Riel, Vicenzino, & Littlewood, 2019)

So what do we do with that?

(Smith et al, 2017)

THE BIOPSYCHOSOCIAL MODEL

1. It isn't the Biopsychosocial *Pain* model.
2. HUMANS are biopsychosocial beings.
3. MOVEMENT is also biopsychosocial.

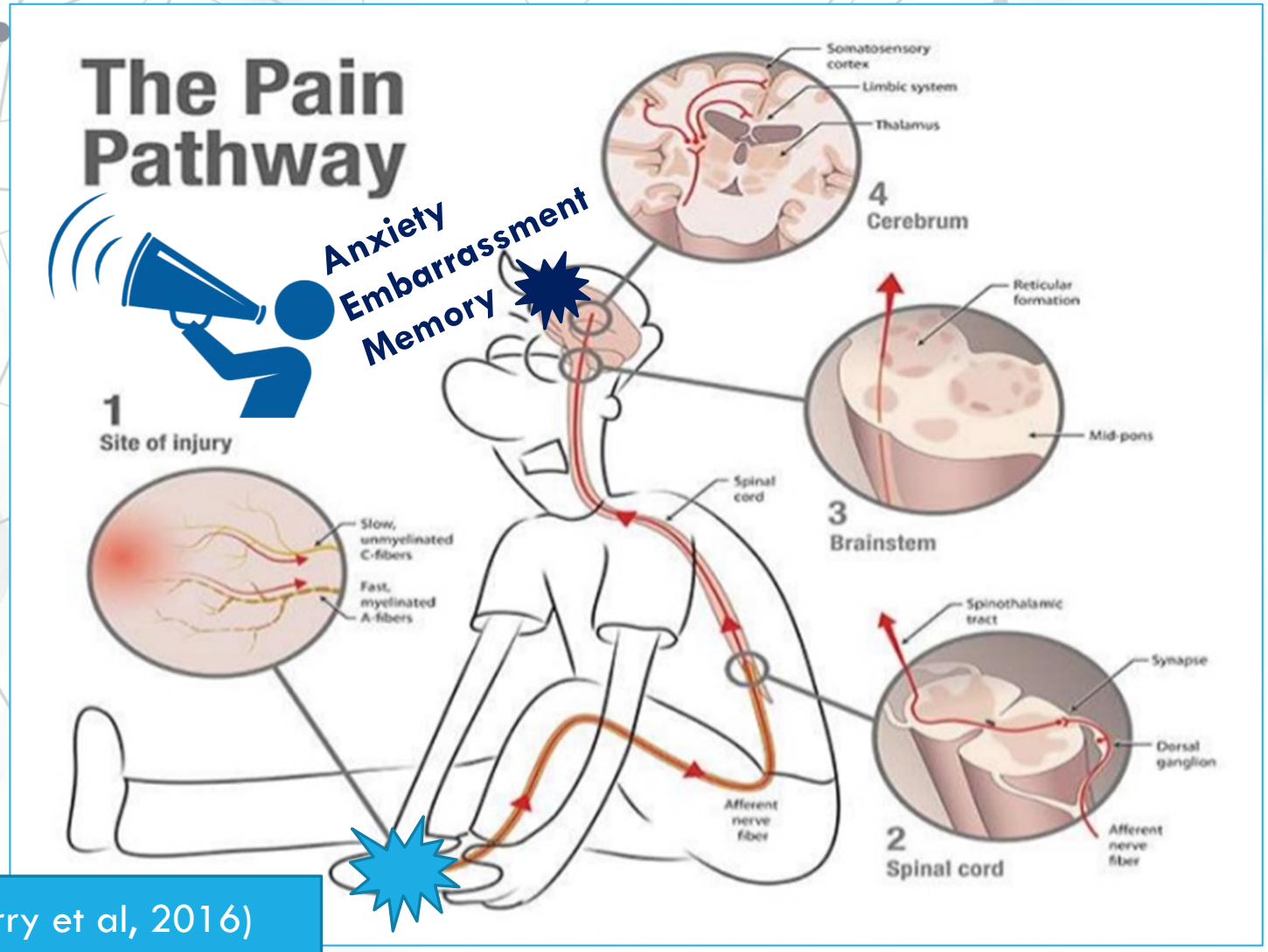


Njis, 2016

PAIN & MOVEMENT: AMPLIFIERS

Fear-Avoidance
Pain Catastrophizing
Pain-Self-Efficacy
Movement Self-Efficacy
(Re-injury) (Movement) Anxiety

Pain/ Injury Memory
Associations with Pain
Conditioned Responses

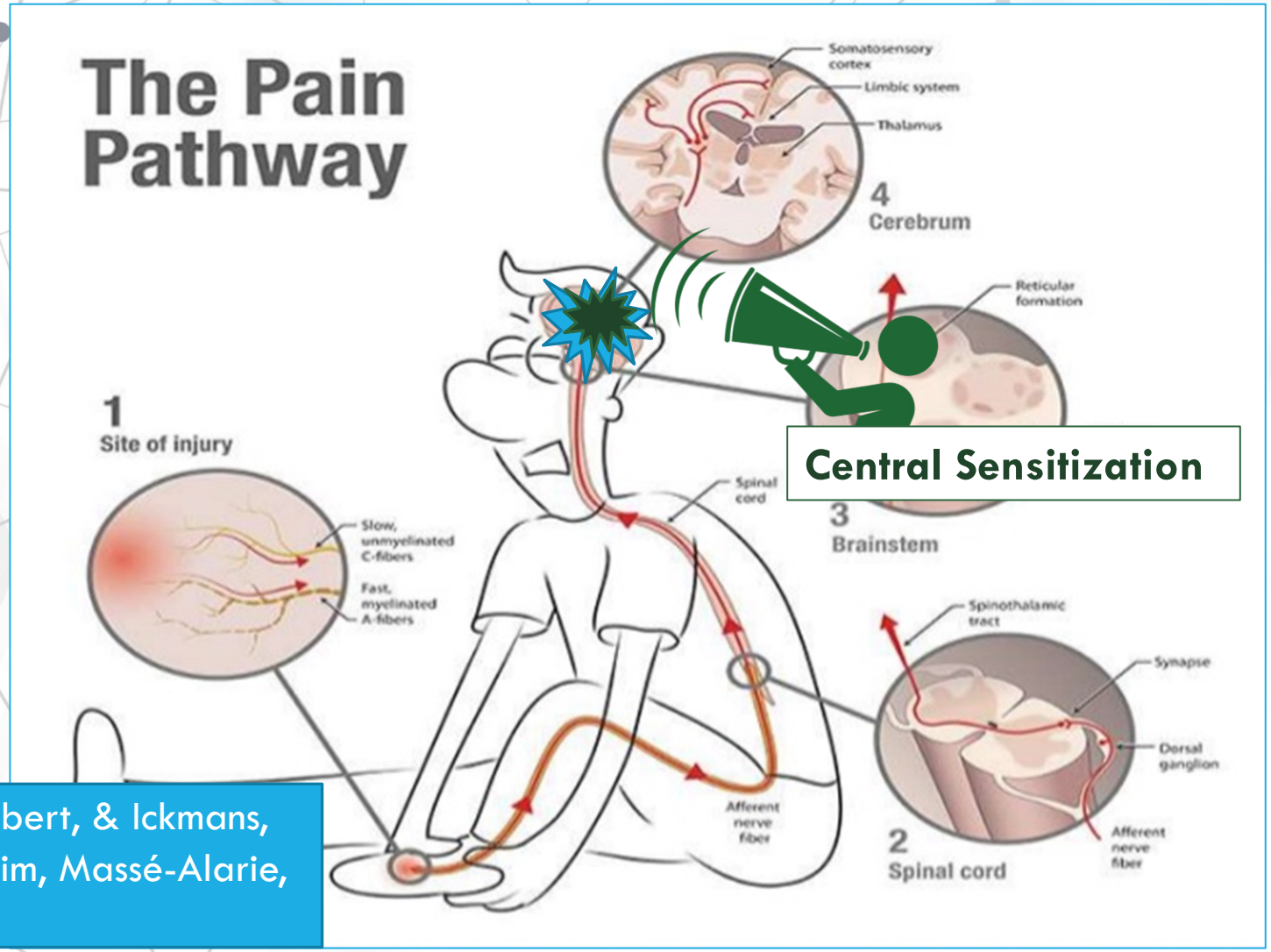


(Hodges & Smeets, 2015; Rehm et al, 2021; Terry et al, 2016)

PAIN & MOVEMENT: AMPLIFIERS

Pain Sensitization
Peripheral or Central
Nociplastic Pain vs. Nociception

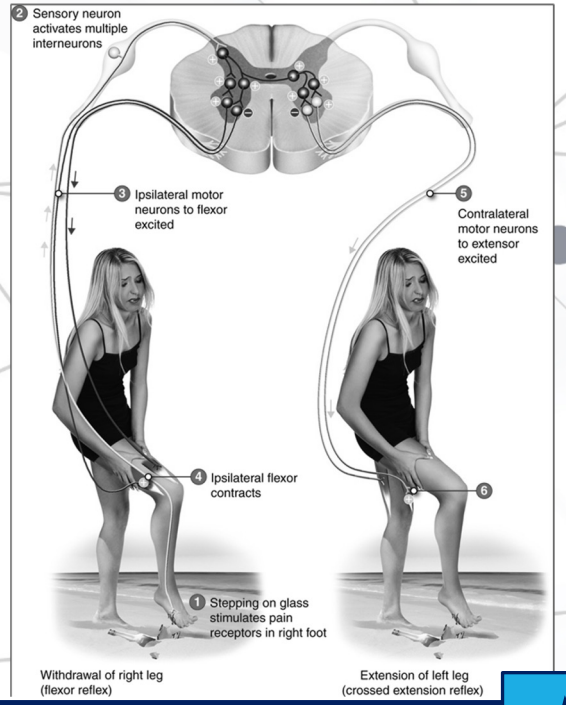
Pain with Non-Noxious Stimuli
Hyperresponsive Pain Response
Less Stimuli to Achieve Pain Response
Inefficient Pain Inhibition
Pain Spreads



(Hodges & Smeets, 2015; IASP, 2021; Njis, Goubert, & Ickmans, 2016; Roy et al, 2017; Roussel et al, 2013; Shraim, Massé-Alarie, & Hodges, 2021; Woolf, 2011)

WHAT WE KNOW: PAIN-MOVEMENT RELATIONSHIPS

Flexor Withdrawal Reflex



More easily elicited in patients with knee osteoarthritis (OA) (Courtney et al, 2010)

Vicious Cycle Theory

Minimal Support in Trigger point & TA
(Simons, 1996; Peck, Murray, & Gerzina, 2008)
Sustained pain was present with reduc
muscle activity
(Rains, 2008)

Strength Inhibition Theory*

Saline injection into healthy knees
Reduced strength w/pain onset
increased strength after pain subsided
(Henriksen et al, 2011; as cited in Merkle, Sluka & Frey-Law, 2018)

WHAT WE KNOW: PAIN-MOVEMENT RELATIONSHIPS

Pain Adaptation Theory

(Lund, 1991)

Agonist Inhibited
Antagonists Facilitated
Experimentally-induced pain i
healthy lower legs
(Graven-Nielsen, 1997)

Suboptimal Tissue Loading Hypothesis

Pathomechanical models
Dysfunctional Movement → Chemical or Mechanical Activation of Nociceptors
Changes loading & response (suboptimal)
(Hodges & Smeets, 2015)

Fear-Avoidance* Models

Pain→ Altered Movement Patterns (Protective Response)
When does it stop serving a purpose?
(Vlaeyen & Linton, 2000; Hodges & Smeets, 2015)

WHAT WE CAN BE CERTAIN OF…

Motor Response is Individualized

There is no predominant, universal theory guiding clinical practice

WHERE WE STAND: MODELS EXIST IN PILLARS

(Pain) Mechanism-Based Approach

Movement-Based Approach

Other*

Chimenti, Sluka, & Frey-Law, 2016
Njis, Goubert, & Ickman, 2013

5-FACTOR MODEL

	More + Outcomes	More - Outcomes
Evidence of pain sensitization?	Nociception	Nociplastic
Protective Response?	No	Yes
What is the Motor Response?	Facilitated	Inhibited
Evidence of Suboptimal Movement impacting the condition?	No	Yes
How habitual is the movement pattern?	Newly Learned	Habitual, Fundamental

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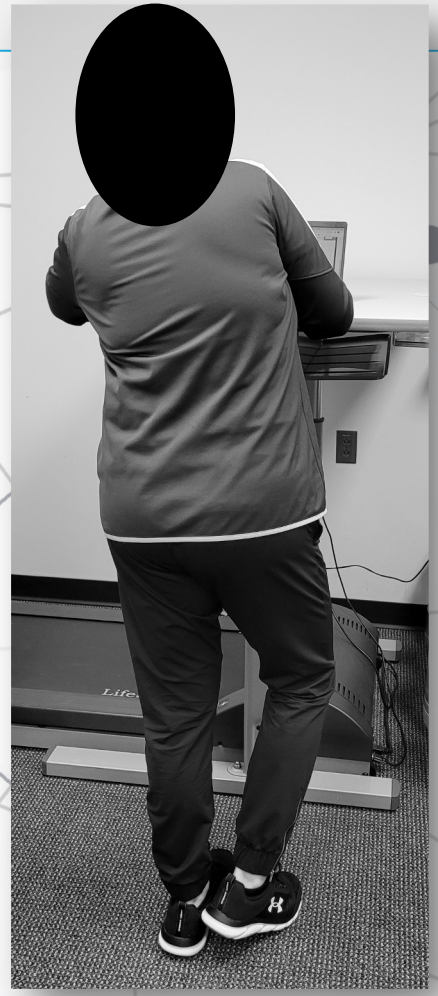
WHAT ELSE WE KNOW

NOCICEPTIVE ⟷ NOCIPLASTIC



Central Sensitization Matters

Worse post-treatment AND post-surgical outcomes

(Njis, Goubert, & Ickman, 2016; Roussel et al, 2013)

Worse sleep quality and less physical activity levels, and poorer motor control

(Shraim et al, 2019; Sigmund et al, 2021; Varrecchia et al, 2022)

(Pain) mechanism-based approaches

(Chimenti, Frey-Law, & Skluka, 2016; Njis, Goubert, & Ickmans, 2016)

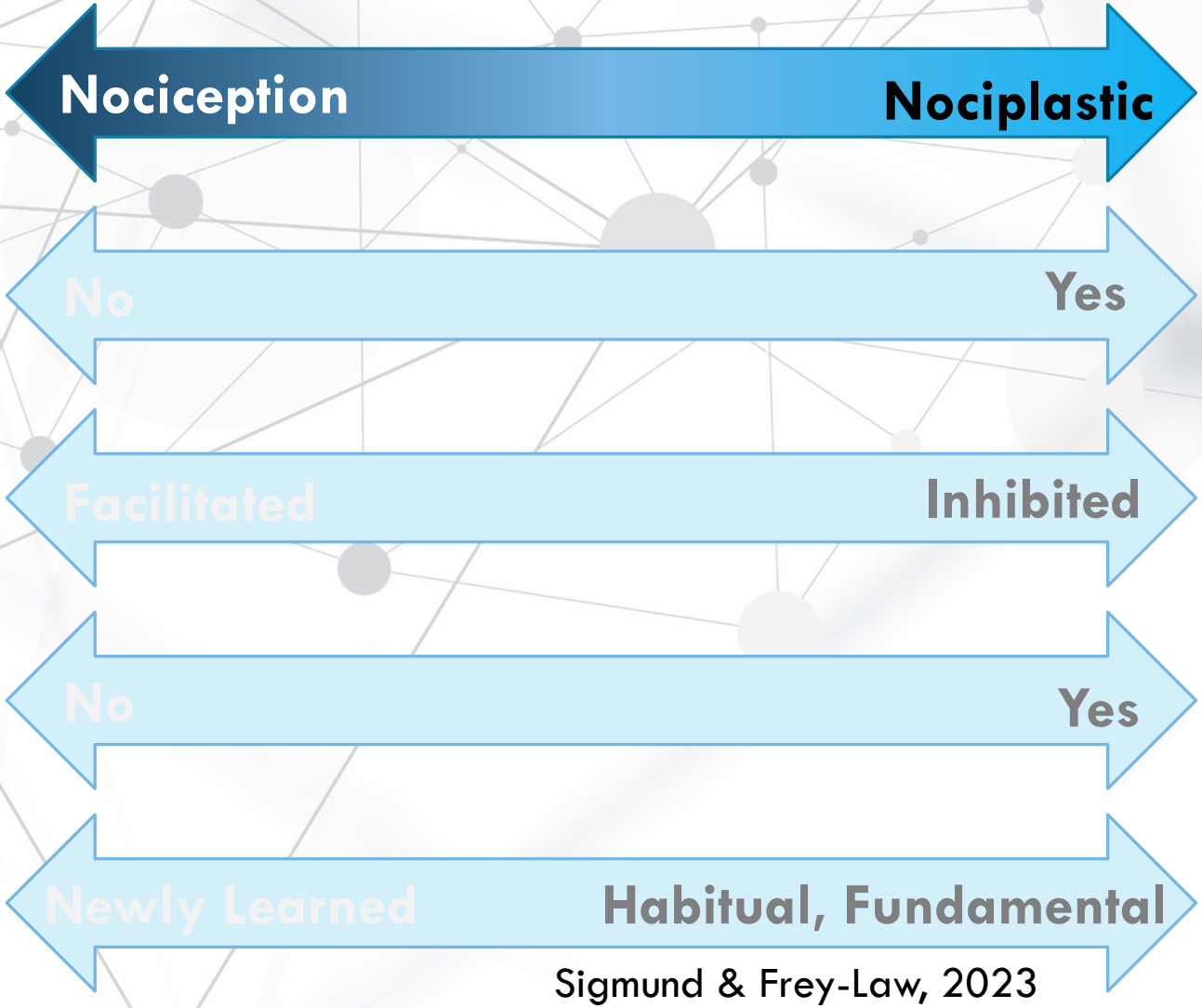
5-FACTOR MODEL

Evidence of pain sensitization?

- Pain outlasts or seems exaggerated for the Dx
- Less stimulus→ pain
  - New pain with palp or Tx
- Pain with non-noxious stimuli
  - Cotton swab test
- Hyperresponsive
  - Temporal summation test
- Pain is more widespread

Treatment impacting central or peripheral mechanisms?

Chementi, Frey-Law, & Sluka, 2016; Njis, Goubert, & Ickman, 2016



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WHAT ELSE WE KNOW

NO ⟷ YES

Protective Response Matters

Pain or antalgic pattern that no longer serves a purpose

(Chimenti, Frey-Law, & Sluka, 2016; Hodges & Smeets, 2015; Hodges & Tucker, 2011; Lewis & O'Sullivan, 2018; Woolf, 2011)

Fear-avoidance/ Movement Anxiety

(Karayannis et al, 2013; Lewis & O'Sullivan, 2018; Njis, Goubert, & Ickman, 2016)

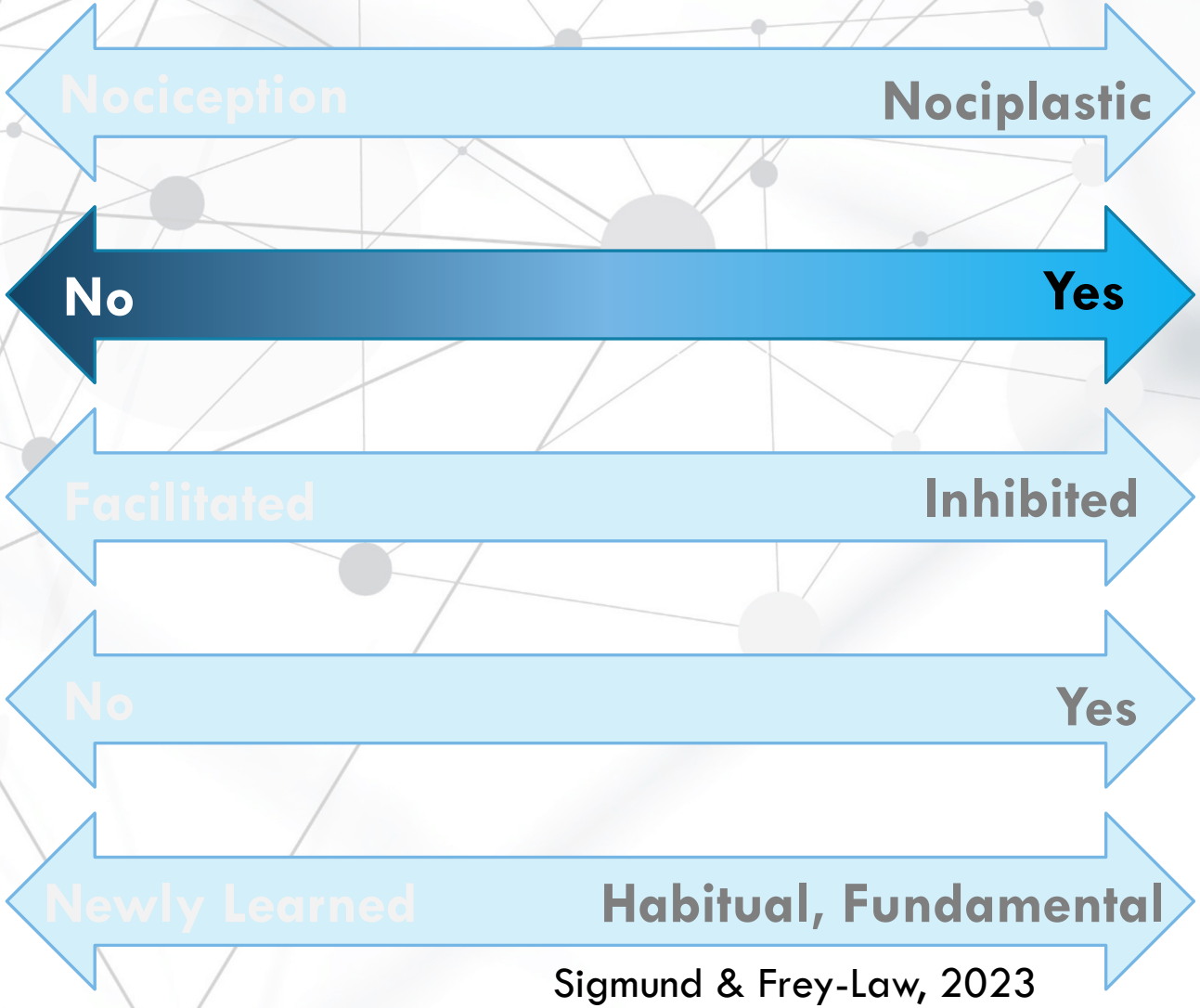
5-FACTOR MODEL

Protective Response?

- Avoidance (movement, activity)
- Fear or threat of pain
- Anxiety or worry
- Expectation of pain
- Intrusive pain/performance thoughts
- Nocebic messaging

May Require Referral
Graded Exercises Protocols
Pain education

Chementi, Frey-Law, & Sluka, 2016; Njis, Goubert, & Ickman, 2016



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WHAT ELSE WE KNOW

INHIBITION ⟷ FACILITATION

Motor Response is Individualized

(Merkle, Frey-Law, & Sluka, 2018)

May be an issue of CONTROL rather than activation; Motor Cortex reorganization

(Hodges & Tucker, 2011; Sigmund et al, 2021; Tsao, Galea, & Hodges, 2019; Te et al, 2017; Tucker et al, 2011; VanDieen et al, 2019;Varrecchia et al, 2022)

Motor response & psychosocial responses (i.e. stress/anxiety/attention)

(Hodges & Smeets, 2015; Karayannis et al, 2013; Moseley, Nicholas, & Hodges, 2004)

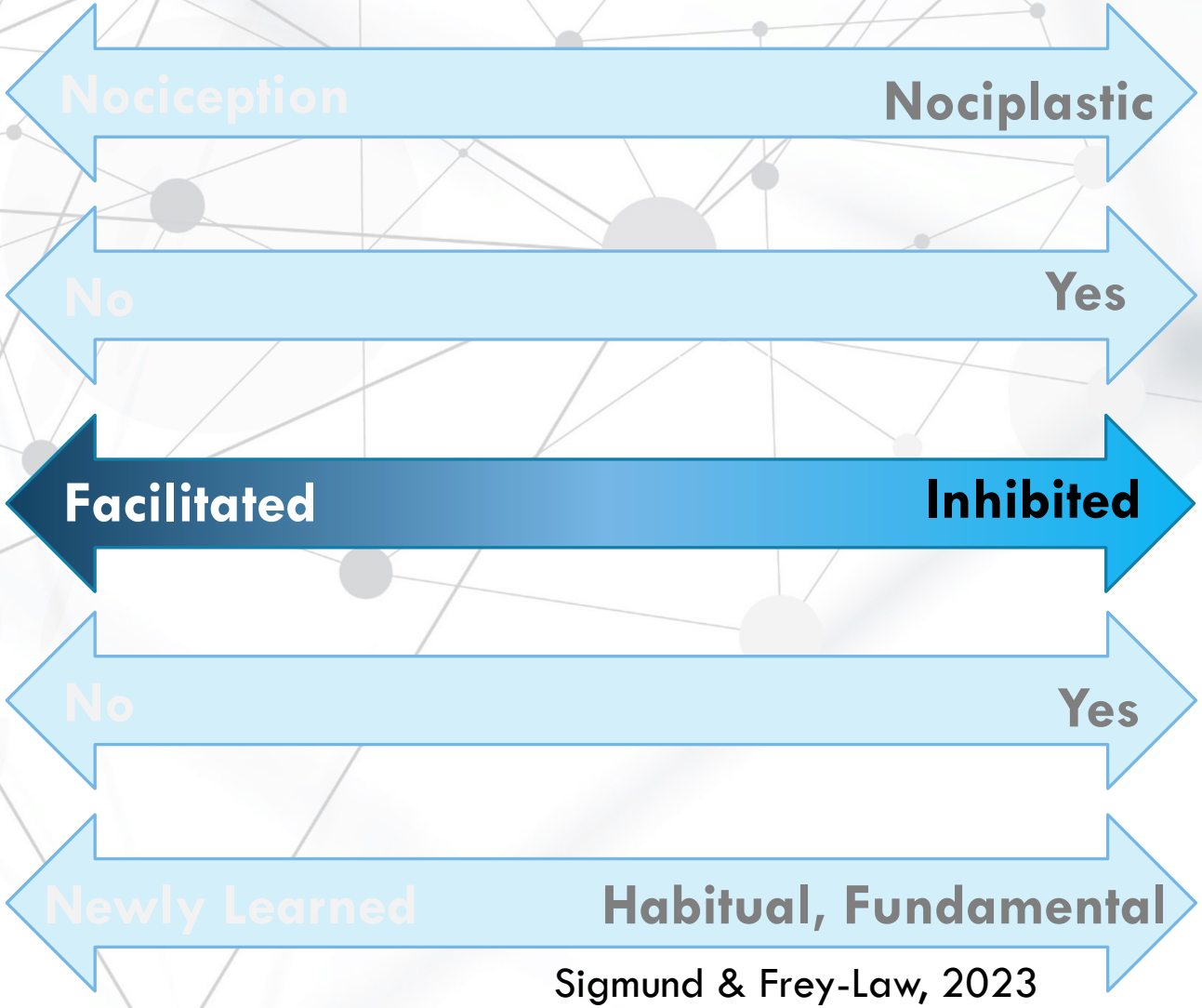
5-FACTOR MODEL

Motor Response?

- **Clinically:**
  - **See**
  - **Hear**
  - **Feel**
- **Related to psychosocial factors?**

Use one to treat the other
(i.e. inhibit hyperfacilitation & facilitation for inhibition)*

Chementi, Frey-Law, & Sluka, 2016; Njis, Goubert, & Ickman, 2016



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WHAT ELSE WE KNOW

NO ⟷ YES

Suboptimal Tissue Loading
Timing Matters

Is it related to the onset of pain?
Is it interfering with movement?
(Merkle, Frey-Law, Sluka, 2018; Steffens, 2015; Hodges & Daneels, 2019)

Conditioning→ Expectations of pain without nociception
(Hodges & Tucker, 2011; Moseley, Nicholas, & Hodges, 2004)

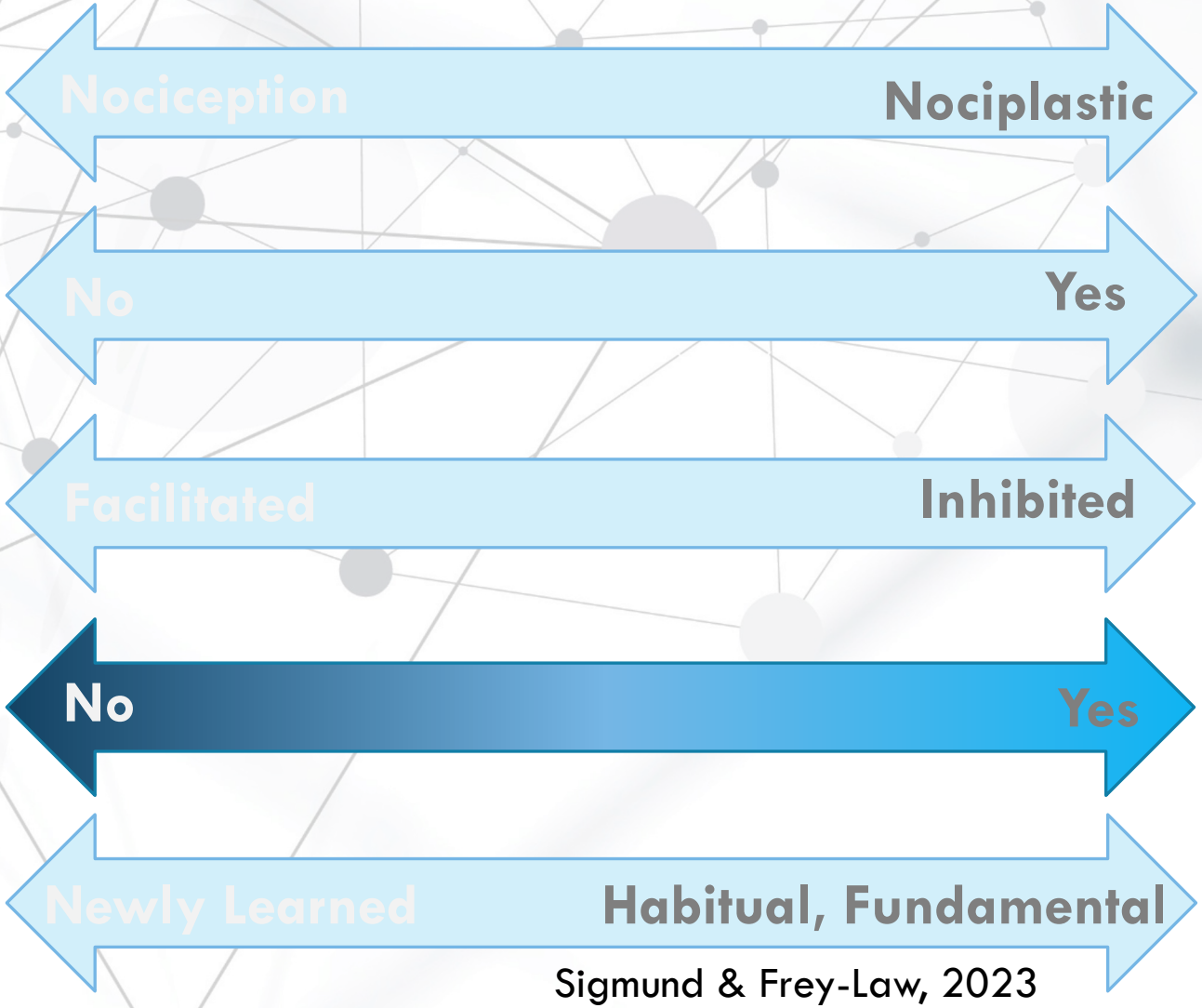
5-FACTOR MODEL

Suboptimal Movement pattern?

- **Movement pattern should be relevant to the condition**
- **Is the difference in motion helping or hurting?**
  - **Short-term benefit**
  - **Long-term consequences**

More focus vs.
Less focus on mechanics
BUT…

Hodges & Tucker, 2011
Hodges & Smeets, 2015



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WHAT ELSE WE KNOW

NEWLY LERANED ⟷ HABITUAL

Habitual movements & fundamental patterns are hard to retrain long-term

Retention & compliance

(Anderson et al, 2022; Barton et al, 2016; Davis & Futrell, 2016; Pairot-de-Fortenay et al, 2019; Richards et al, 2017; Whittier et al, 2020; Willy & Davis, 2011; Yang et al, 2007)

Task transference

(Levinger et al, 2013; Davis & Futrell, 2016)

Is there a pain-mechanics tradeoff?

(Esculier et al, 2018; Pairot-de-Fortenay et al, 2018; Ferber et al, 2011; Doyle et al, 2022)

Strengthening ≠ Movement retraining

(Willy & Davis, 2011)

5-FACTOR MODEL

How habitual is the movement pattern?

- Age of the patient?
- Retention & Task Transference are poor
- How long has an antalgic pattern existed?

Education, Movement retraining

Davis & Futrell, 2016

Nociception — Nociplastic

No — Yes

Facilitated — Inhibited

No — Yes

Newly Learned — Habitual

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Local Pain Relief (Ice, Heat, Manual Therapies*)	**Nociception**	**Nociplastic**
Maintain adaptations	**No**	**Yes**
Focus on Inhibition & Relaxation	**Facilitated**	**Inhibited**
Less focus on mechanics	**No**	**Yes**
Education > Mechanics	**Newly Learned**	**Habitual, Fundamental**

Pain Type

Protective Response?

Motor Response

Suboptimal Movement Interference?

How Habitual?

Central-Targeted Pain Relief (TENS with movement, physical activity, pain education)

↓non-protective adaptations (graded exercise, psych referral, education)

Focus on Activation & Control

Greater Focus on mechanics BUT…

Movement Retraining, Task Transference (coordination & control)

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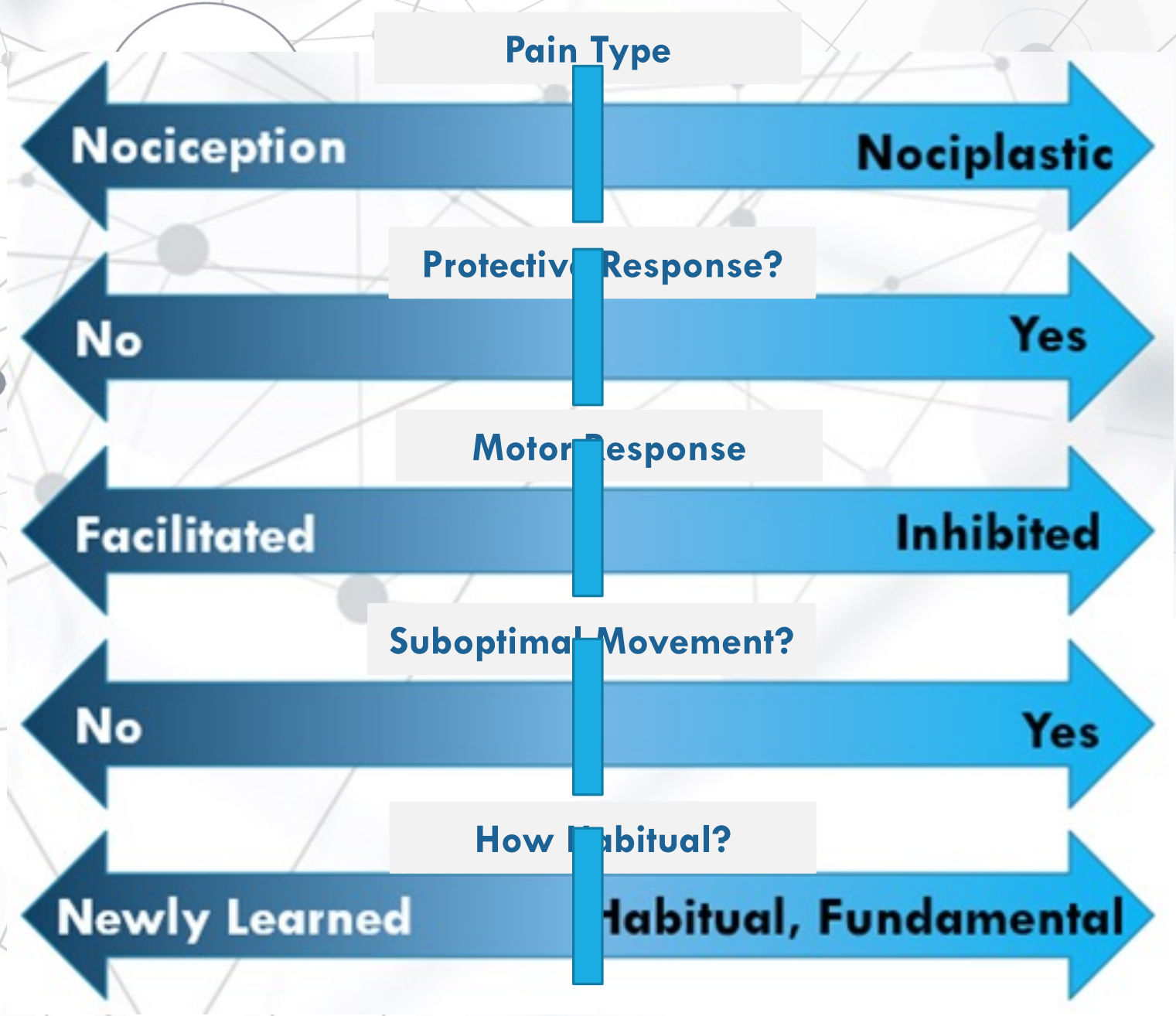

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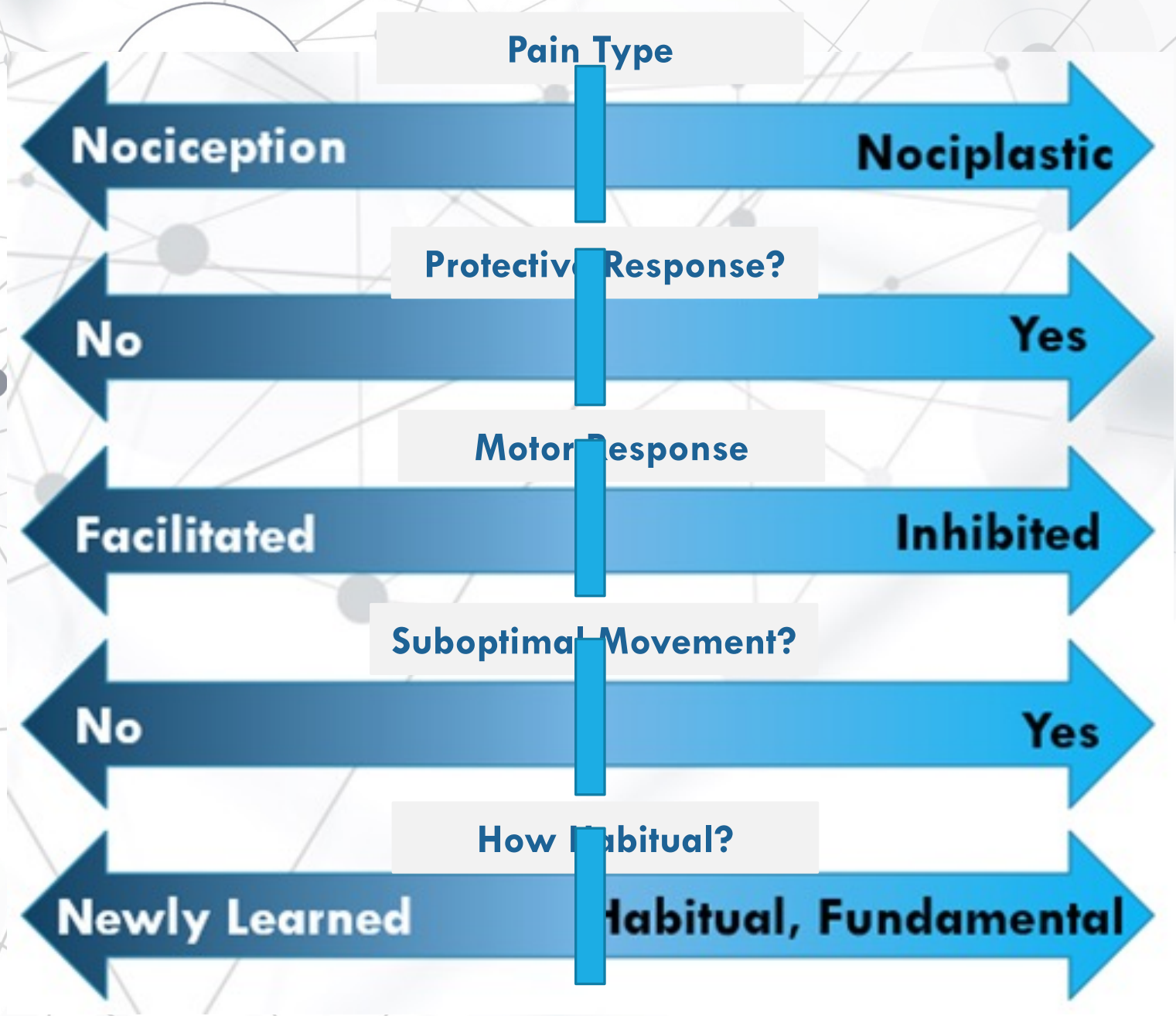

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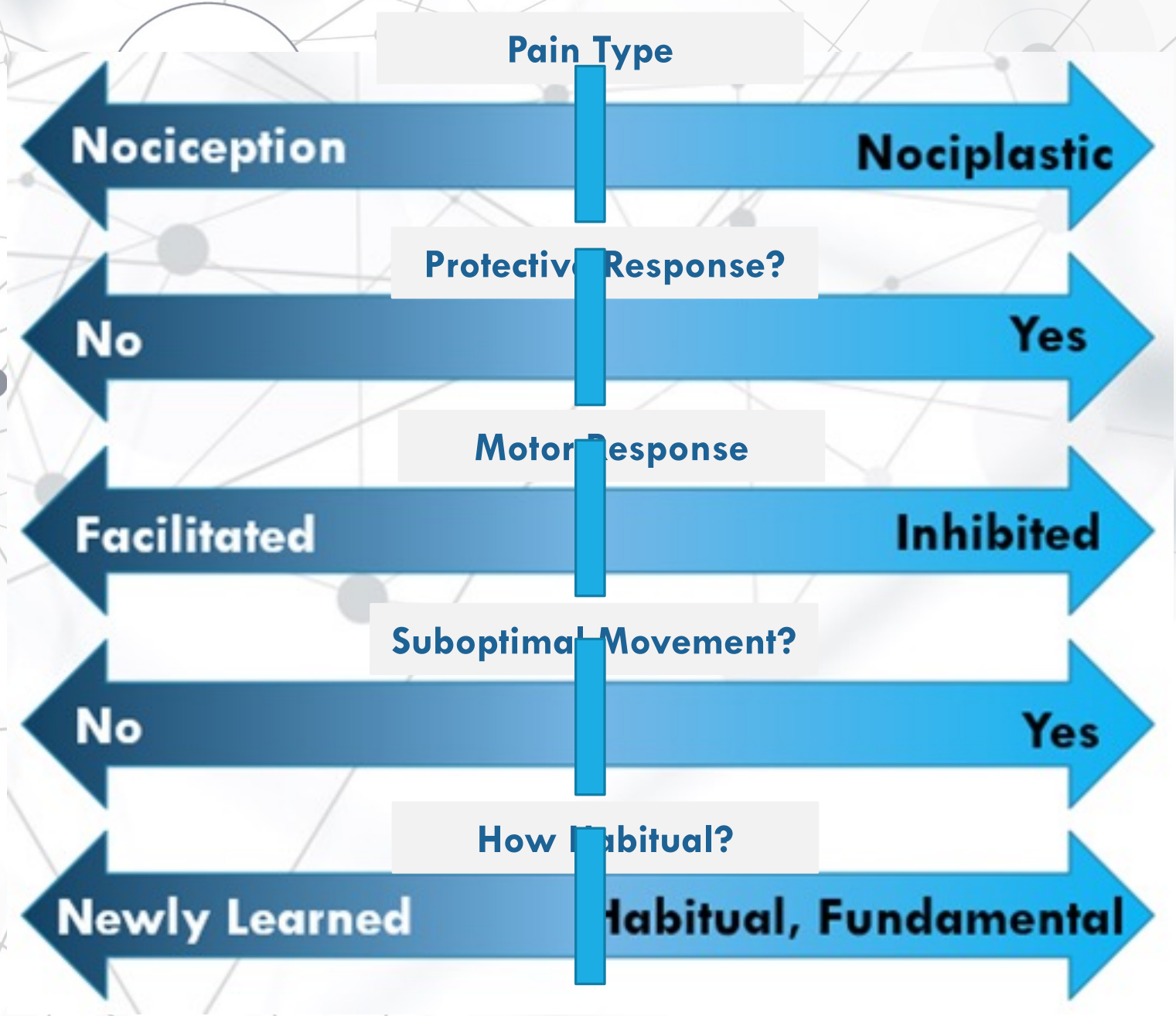

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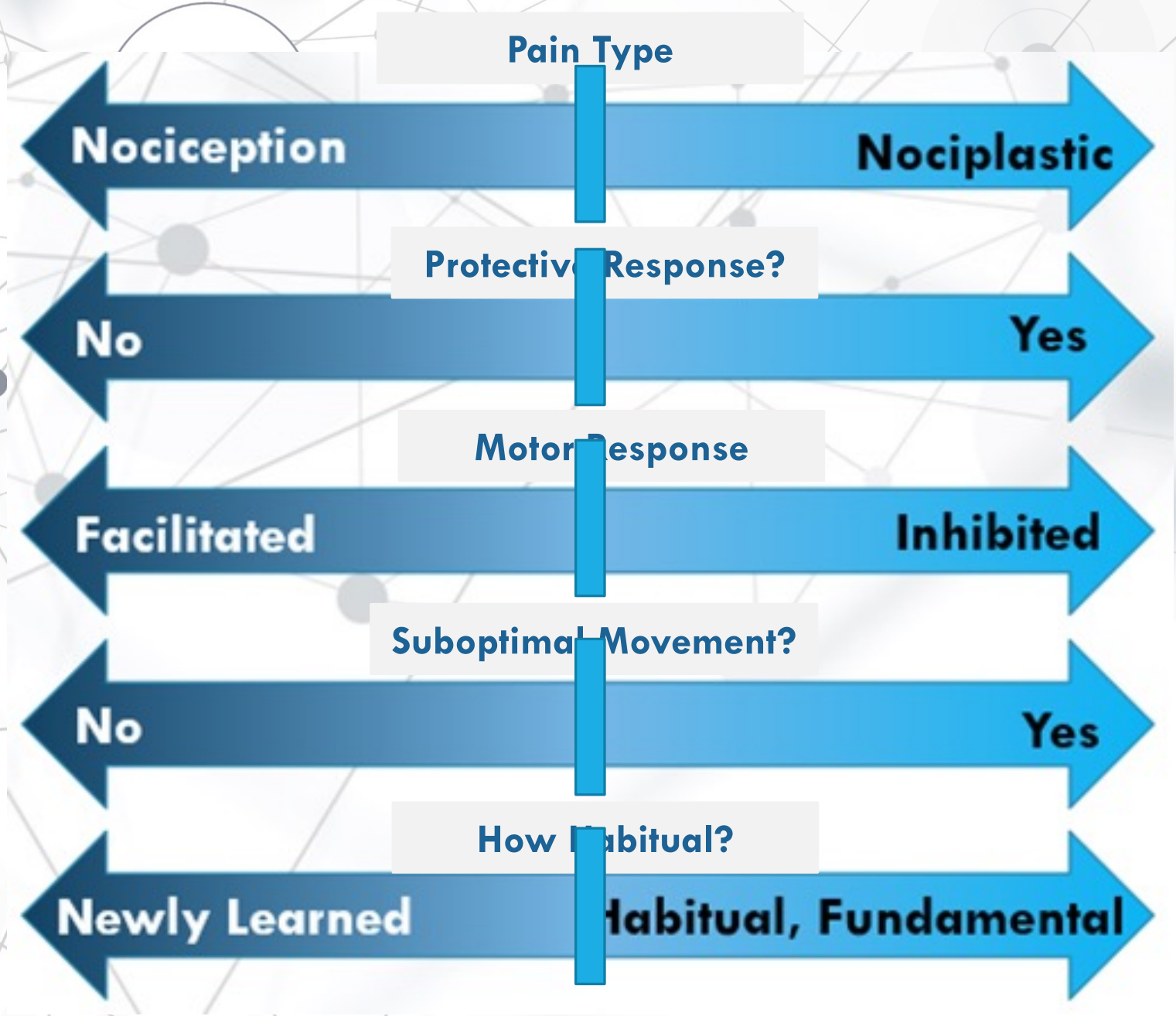

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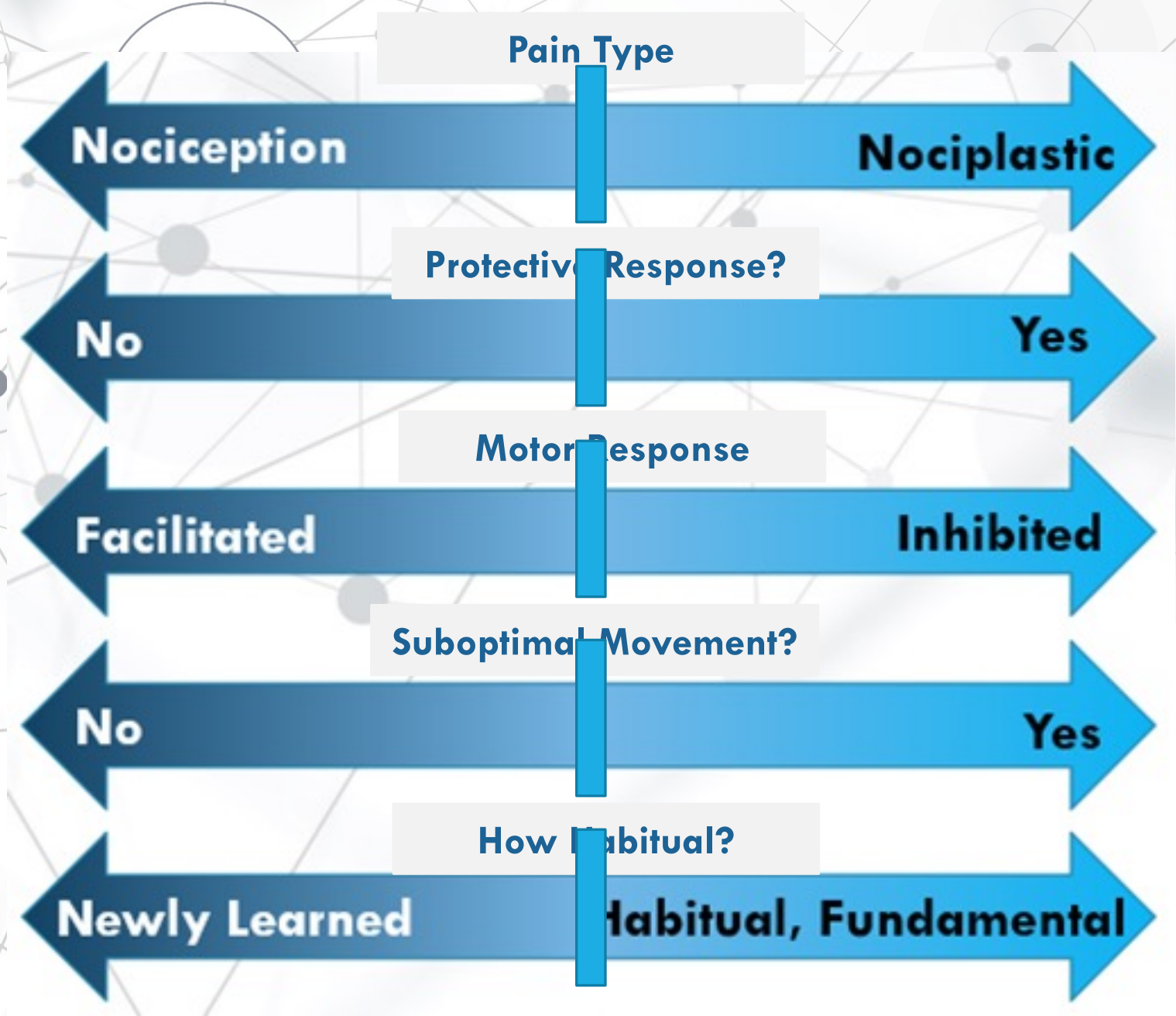

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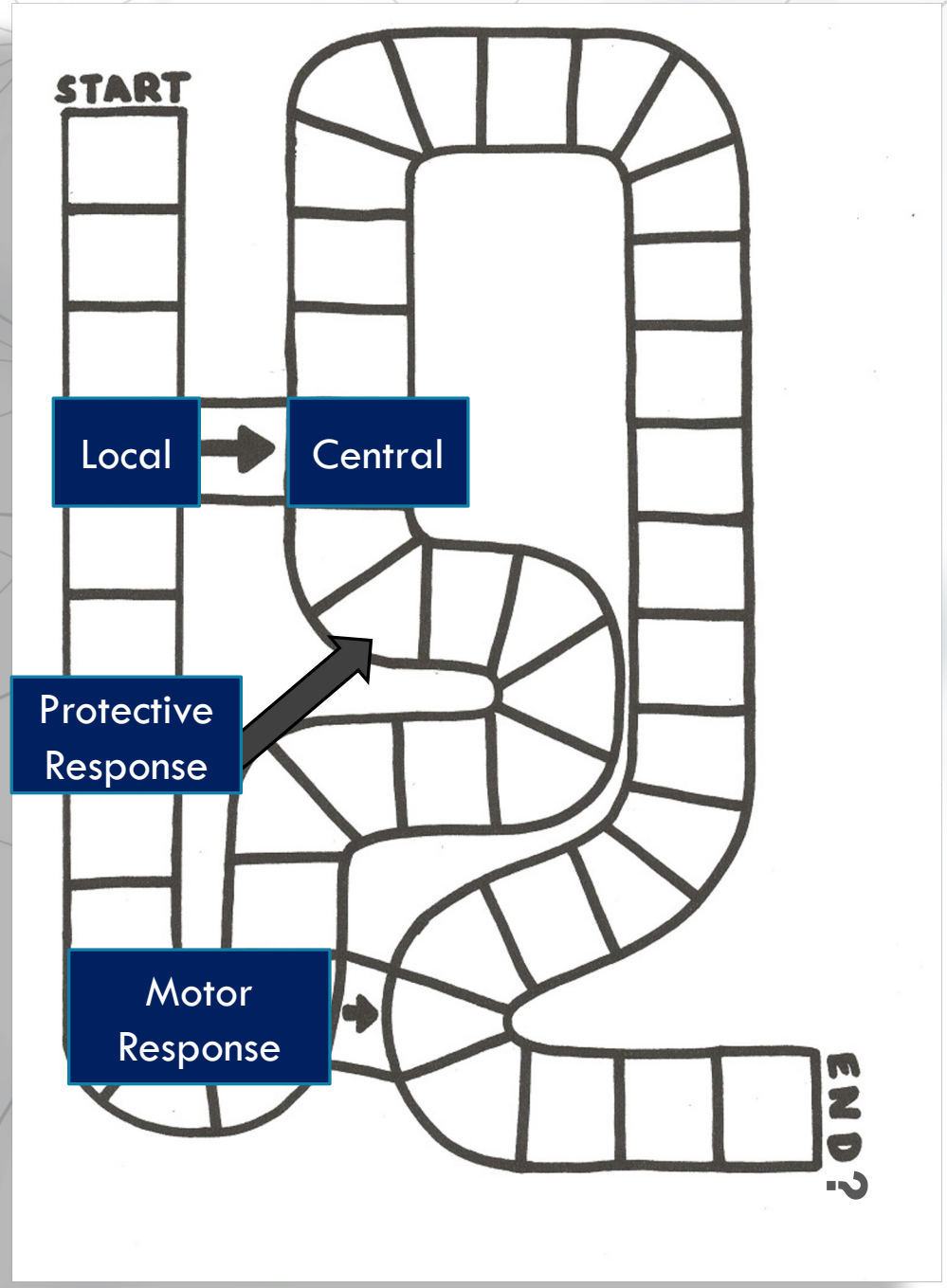
Should Pain Be your Guide?

- Hurt ≠ Harm
- Patient education, Reduce confusion
- No universal motor response to pain; Focus on *control*
- Pain sensitization & protective response may change approach
- How likely are we to change the pattern? What other options do we have?



THANK YOU
QUESTIONS?

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