

FINDING EQUILIBRIUM:

The Reconciliation and Practical Integration of Modern Pain Concepts with Classic Manual Therapy Paradigms

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Disclosures

Anjanette and Daniel teach con-ed courses on pain

Daniel teaches con-ed courses on manual therapy and is the director of a manual therapy fellowship

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Objectives

- At the conclusion of our session, the attendee will...
 - Understand traditional manual therapy models, reasoning strategies and supporting literature.
 - Review the history and evolution of pain science concepts and supporting literature.
 - Be able to recognize signs of central sensitization.
 - Understand the concept of mechanism-based classification of pain as nociceptive, peripheral neuropathic, and/or centrally sensitized.
 - Draw parallels between Maitland's concepts of SINSS assessment and today's modern understanding of pain science concepts.
 - Appropriately reason through dosing of manual intervention with the patient's pain presentation and mechanism-based classification in mind.
 - Appreciate the strengths, limitations, and practical integration of modern pain science concepts with both biomechanical and patient-response models of manual therapy.

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TRADITIONAL MANUAL THERAPY MODELS

Classic Approaches to Assessment and Clinical Reasoning

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Early Descriptions of Manual Therapy


- Records of ancient MT in
 - Native Americans
 - Pacific Islanders
 - Japanese, Chinese, and Indians
 - Central Asian shamans
 - Central American sobadors
 - Bone setters in Nepal, Russia, and Norway
- First documented description by Hippocrates in ~400 BC

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Late 1800s: Osteopathy, Chiropractic, and Physiotherapy Emerge

A word on what medicine looked like:


- Very rudimentary reasoning. Logic was based on symptoms.
- Poor med school admissions and completion standards
 - Admission based on ability to afford
 - Often just two 4-month semesters
 - At Harvard, students could fail 40% of classes & still graduate



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Late 1800s: Osteopathy and Chiropractic

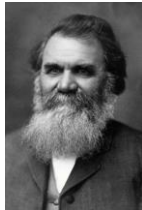
- A.T. Still
 - Theory: Normalization and healthy function of the MSK system could cure many diseases.
 - Offered a safe, effective, and conservative alternative to medicine
 - Founded Osteopathy on 3 key concepts:
 - The body is a unit
 - Structure and function are reciprocally interrelated
 - The body has self-regulatory mechanisms that respond to rational conservative therapies based on the above 2 points



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Late 1800s: Osteopathy and Chiropractic

- D.D. Palmer
 - Father of chiropractic
 - Learned manipulation from a physician, and likely was influenced by A.T. Still
 - Famously claimed to have restored the hearing of Harvey Lillard
 - Theory: Misalignment → Pressure on a Nerve → Disease, and...
 - Adjustment/Correction → Normalized Alignment → Disease Cured



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QUESTION: Who are often considered some of the big "forefathers" of OMPT?

- James Cyriax
- Freddy Kaltenborn
- Geoff Maitland
- Robin McKenzie
- Brian Mulligan
- Stanley Paris
- Etc...

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Major Contributions by Selected Key Players


- James Cyriax (England)
 - Considered the "father of orthopaedic medicine"
 - Influenced by physiotherapists - many family ties
 - MANY contributions to orthopaedics and PT, including the concepts of
 - End Feels
 - Selective Tissue Tensioning
 - Early thoughts on annular and nuclear displacement



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Major Contributions by Selected Key Players


- Freddy Kaltenborn (Norway)
 - Application of arthrokinematic concepts to manual therapy
 - Convex-Concave Rules
- Geoff Maitland (Australia)
 - Gentle oscillatory mobilizations
 - Grades of mobilization
 - Movement diagrams
 - Clinical Reasoning based on patient response



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Major Contributions by Selected Key Players

- **Stanley Paris (New Zealand / USA)**
 - Early concepts of "Regional Interdependence"
 - EXTREMELY influential in the founding of IFOMPT, AAOMPT, and the APTA Orthopaedic Section and overall advancement of OMPT
- **Robin McKenzie (New Zealand)**
 - Centralisation/Peripheralisation
 - Dynamic Disc Model
 - Repetitive/Sustained Movements
 - Patient Empowerment
- **Brian Mulligan (New Zealand)**
 - Mobilization with Movement
 - Correction of positional faults to restore physiologic motion
 - Emphasized continuous assessment



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Philosophical Differences

- Many nuances in individual schools of thought, but in general the two philosophic model groupings are:
 - *Biomechanical / Pathoanatomical Model*
 - Still, Palmer, Cyriax, Kaltenborn, Paris
 - *Patient Response Model*
 - Maitland, McKenzie*, Mulligan*

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SINSS: A Deeper Dive into a Key Piece of Geoff Maitland's Model

- **Severity:** How much impact on the pt's life?
- **Irritability:** How easily provoked, and to what extent? What does it take, and how long/much, to settle?
- **Nature:** What factors are at play?...tissue(s) involved, red/yellow flags, co-morbidities, etc.
- **Stage:** Improving, worsening, or staying the same? Stage of healing?
- **Stability:** How stable or predictable?

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SINSS: Practical Example A

- 40-yr-old male with 5-9/10 R shoulder pain
- MOI: fall from ladder at home 2 weeks ago. X-rays in the ER (-) for fx, but he hasn't sought further medical attention. Unchanged since onset.
- Unable to work currently due to pain.
- Agg: any attempt to lift the arm → immediate 9/10 pain
- Eases: rests arm and takes pain meds...will ease within 3 hours
- No co-morbidities. Denies symptoms elsewhere. Denies numbness/tingling.

S?
I?
N?
S?
S?

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SINSS: Practical Example A

- How does this influence pt. mgmt.?

S: High

I: High

N: MSK / RC

S: Acute / Unchanging

S: Stable & Predictable

- Severity: Find answers quickly.
- Irritability: Take caution in the OE and initial Rx. Err conservatively.
- Nature: Less extensive systems review needed. Tailor the OE to test your hypothesis of RC, plus any competing.
- Stage: Respect tissues. If a change is made, it's likely your fault.
- Stability: You know what's likely to bring it on. Less fear of other exam components, but take caution with active shoulder movement.

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SINSS: Practical Example B

- 60-yr-old female bus driver with 0-8/10 R-sided neck pain and occasional tingling in the ulnar forearm hand
- MOI: Gradual and insidious ~4 months ago. No medical evaluation/care to date. Somewhat spreading/worsening since onset.
- Performing all job duties, though turning head while driving is painful.
- Agg: R cx rotation → 4/10 pain...eases within 30 sec on return. Prolonged sitting/driving → 8/10 pain with significant arm tingling after 4 hours...eases within 10 minutes of sitting in recliner with head supported.
- Hx of HTN and hyperlipidemia. Denies chest pain, but does note occasional mid-scapular pain that follows neck pain.

S?
I?
N?
S?
S?

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SINSS: Practical Example B

- How does this influence pt. mgmt.?

S: Mod
I: Non-Low
N: MSK w/ possible neuro (radic, TOS, TrP).
need to r/o CV.
S: Chronic / Worsening
S: Stable & Predictable

- Severity: Need to find answers and reverse course, but no severe functional impact currently.
- Irritability: Still progress OE in terms of vigor, but it may take a pretty substantial exam (repeated movements, OPs, quadrants) to find answers.
- Nature: Must query/test the CV system further. Must include neuro exam. Tailor the OE to test your competing hypotheses.
- Stage: Acute tissue injury not a factor. Current reversal of course indicates correct direction.
- Stability: You know what's likely to bring it on.

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WHAT ROLE DOES MANUAL THERAPY PLAY IN TREATING COMMON NMSK CONDITIONS?

What does the evidence say???



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Most Common Conditions Encountered in YOUR Clinic?



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Most Common Conditions Encountered in YOUR Clinic?

- Low Back Pain
- Neck Pain
- Hip OA
- Knee OA
- Plantar Heel Pain
- Cuff Pathology
- Lateral Epicondylalgia
- Carpal Tunnel Syndrome
- Etc...



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What Does the Evidence Say?

- Low Back Pain

Chou 2007 (ACP & APS CPG)

Recommendation 7: For patients who do not improve with self-care options, clinicians should consider the addition of nonpharmacologic therapy with proven benefits—for acute (ie, back pain, spinal manipulation), for chronic or subacute low back pain: intensive interdisciplinary rehabilitation, exercise therapy, acupuncture, massage therapy, spinal manipulation, yoga, cognitive-behavioral therapy, or progressive relaxation (weak recommendation, moderate-quality evidence).

Delitto 2012 (JOSPT CPG)

INTERVENTIONS - MANUAL THERAPY: Clinicians should consider utilizing **thrust manipulative procedures** to reduce pain and disability in patients with mobility deficits and acute low back and back-related buttock or thigh pain. **Thrust, non-thrust mobilization and nonthrust mobilization** procedures can also be used to improve spine and hip mobility and reduce pain and disability in patients with subacute and chronic low back and back-related lower extremity pain. (Recommendation based on strong evidence.)

Qaseem 2017 (Updated ACP CPG)

- Upheld strong recommendations for manual therapy as a component of first-line treatment for both acute/subacute and chronic low back pain

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What Does the Evidence Say?

- Neck Pain: Blanpied 2017 (JOSPT CPG)

- Advocates sub-grouping into 4 ICF-based classifications:
 - Neck Pain with Mobility Deficits
 - Neck Pain with Movement Coordination Impairments
 - Neck Pain with Headache (cervicogenic HA)
 - Neck Pain with Radiating Pain (cx. radiculopathy)

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Neck Pain With Mobility Deficits		Neck Pain With Movement Coordination Impairments (WAD)	
<p>Acute</p> <ul style="list-style-type: none"> Therapeutic mobilization Cervical mobilization or manipulation Cervical ROM, stretching, and isometric strengthening exercise Advice to stay active plus home cervical ROM and isometric exercise Supervised exercise, including cervicospinothoracic and upper extremity stretching, strengthening, and endurance training General fitness training (stay active) <p>Subacute</p> <ul style="list-style-type: none"> Cervical mobilization or manipulation Therapeutic mobilization Cervicospinothoracic endurance exercise 	<p>Chronic</p> <ul style="list-style-type: none"> Therapeutic mobilization Cervical mobilization Combined cervicospinothoracic exercises/mobilization or manipulation Mixed exercise for cervicospinothoracic region—neuromuscular conditioning: coordination, proprioception, and postural training; stretching; strengthening; endurance training; aerobic conditioning; and cognitive affective elements Supervised individualized exercises "Stay active" lifestyle approaches Dry needling, low-level laser, pulsed or high-power ultrasound, intermittent mechanical traction, repetitive brain stimulation, TENS, electrical muscle stimulation 	<p>Acute if prognosis is for a quick and early recovery</p> <ul style="list-style-type: none"> Education: advice to remain active, act as usual Home exercise: pain-free cervical ROM and postural element Monitor for acceptable progress Minimize collar use <p>Subacute if prognosis is for a prolonged recovery trajectory</p> <ul style="list-style-type: none"> Education: activation and counseling Combined exercise and physical modalities and specific low-level strengthening plus manual therapy (cervical mobilization or manipulation) plus physical agents: ice, heat, TENS Supervised exercise: active cervical ROM or stretching, strengthening, endurance, neuromuscular exercise including postural, coordination, and stabilization elements 	<p>Chronic</p> <ul style="list-style-type: none"> Education: prognosis, encouragement, reassurance, pain management Cervical mobilization plus physical modalities, progressive essential low-level cervicospinothoracic strengthening, endurance, flexibility, functional training using cognitive behavioral therapy principles, vestibular rehabilitation, eye-head-neck coordination, and neuromuscular coordination elements TENS

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Neck Pain With Headache (Cervicogenic)		Neck Pain With Radiating Pain (Radicular)
<p>Acute</p> <ul style="list-style-type: none"> Exercise: C1-2 self-SNAG <p>Subacute</p> <ul style="list-style-type: none"> Cervical manipulation and mobilization Exercise: C1-2 self-SNAG <p>Chronic</p> <ul style="list-style-type: none"> Cervical manipulation Cervical and thoracic manipulation Exercise for cervical and scapulothoracic region: strengthening and endurance exercise with neuromuscular training, including motor control and biofeedback elements Combined manual therapy (mobilization or manipulation) plus exercise (stretching, strengthening, and endurance training elements) 	<p>Acute</p> <ul style="list-style-type: none"> Exercise: mobilizing and stabilizing elements Low-level laser Possible short-term collar use <p>Chronic</p> <ul style="list-style-type: none"> Combined exercise stretching and strengthening elements plus manual therapy for cervical and thoracic region; mobilization or manipulation Education: counseling to encourage participation in occupational and exercise activity Intermittent traction 	

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What Does the Evidence Say? - Hip Osteoarthritis

Hochberg 2012 (ACR Guidelines)

Table 5. Nonpharmacologic recommendations for the management of hip osteoarthritis (OA)

We strongly recommend that patients with hip OA should do the following:

- Participate in cardiovascular and/or resistance land-based exercise
- Participate in aquatic exercise
- Loss weight (for persons who are overweight)

We conditionally recommend that patients with hip OA should do the following:

- Participate in self-management programs
- Receive manual therapy in combination with supervised exercise
- Receive psychosocial interventions
- Be instructed in the use of thermal agents
- Receive walking aids, as needed

We have no recommendations regarding the following:

- Participation in balance exercises, either alone or in combination with strengthening exercises
- Participation in tai chi
- Receiving manual therapy alone

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What Does the Evidence Say? - Knee Osteoarthritis

Hochberg 2012 (ACR Guidelines)

Table 3. Nonpharmacologic recommendations for the management of knee OA

We strongly recommend that patients with knee OA should do the following:

- Participate in cardiovascular (aerobic) and/or resistance land-based exercise
- Participate in aquatic exercise
- Loss weight (for persons who are overweight)

We conditionally recommend that patients with knee OA should do the following:

- Participate in self-management programs
- Receive manual therapy in combination with supervised exercise
- Receive psychosocial interventions
- Use modality-directed patellar taping
- Wear modify weight insoles if they have lateral compartment OA
- Wear laterally wedged insoles if they have medial compartment OA
- Be instructed in the use of thermal agents
- Receive walking aids, as needed
- Participate in tai chi programs
- Be treated with traditional Chinese acupuncture*
- Be instructed in the use of transcutaneous electrical stimulation

Denninger 2015 (Narrative Review: MT in Knee OA)

CONCLUSIONS

From the available data, some evidence exists to demonstrate the clinical utility of manual therapy for older patients with knee pain, specifically patients with knee OA. Clinical trials are encouraged to utilize both soft-tissue and joint mobilizations. Utilizing manual therapy targeting the knee complex as well as the foot/ankle complex, hip, and lumbar spine may yield optimal therapeutic improvements for pain and function.

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What Does the Evidence Say? - Plantar Heel Pain

Cleland 2009 (RCT: MT+Ex vs Modalities+Ex)

CONCLUSION: The results of this study provide evidence that MTEX is a superior management approach over an RFA approach in the management of chronic neuropathic heel pain at both the short- and long-term follow-ups. Future studies should examine the contribution of the different components of the exercise and manual physical therapy programs.

Martin 2014 (JOSPT CPG)

INTERVENTIONS - MANUAL THERAPY

A Clinicians should use manual therapy, consisting of joint and soft tissue mobilization procedures to treat relevant lower extremity joint mobility and calf flexibility deficits and to decrease pain and improve function in individuals with heel pain/plantar fasciitis.

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What Does the Evidence Say? - Cuff Pathology

***Some conflicting evidence out there as to whether MT provides additional benefit to exercise alone, but...**

Comparison of Supervised Exercise With and Without Manual Physical Therapy for Patients With Shoulder Impingement Syndrome

Syndrome

Results: Subjects in both groups experienced significant decreases in pain and increases in function, but there was significantly more improvement in the manual therapy group compared to the exercise group. For example, pain in the manual therapy group was reduced from a pretreatment mean (\pm SD) of 575.8 (\pm 220.0) to a posttreatment mean of 174.4 (\pm 183.1). In contrast, pain in the exercise group was reduced from a pretreatment mean of 557.1 (\pm 237.2) to a posttreatment mean of 360.6 (\pm 227.3). Strength in the manual therapy group improved significantly while strength in the exercise group did not.

Conclusion: Manual physical therapy applied by experienced physical therapists combined with supervised exercise in a brief clinical trial is better than exercise alone for increasing strength, decreasing pain, and improving function in patients with shoulder impingement syndrome. *J Orthop Sports Phys Ther* 2000;30:126-137.

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What Does the Evidence Say? - Cuff Pathology

Annals of Internal Medicine ORIGINAL RESEARCH

One-Year Outcome of Subacromial Corticosteroid Injection Compared With Manual Physical Therapy for the Management of the Unilateral Shoulder Impingement Syndrome

A Prospective Randomized Trial

David J. Reinkensmeyer, PT, DPT, Robert B. Taylor, PT, DPT, and Joshua A. Cholewicki, PT, PhD

Results: Both groups demonstrated approximately 50% improvement in Shoulder Pain and Disability Index scores maintained through 1 year; however, the mean difference between groups was not significant (1.5% [95% CI, -6.3% to 9.4%]). Both groups showed improvements in Global Rating of Change scale and pain rating scores, but between-group differences in scores for the Global Rating of Change scale (0 [CI, -2 to 1]) and pain rating (0.4 [CI, -0.5 to 1.2]) were not significant. During 1-year follow-up, patients receiving CS had more CS-related visits to their primary care provider (60% vs 47%) and required additional physical therapy (18% vs 20%), and 10% needed physical therapy. Transient pain from the CS was the only adverse event reported.

Conclusion: Both groups experienced significant improvement. The manual physical therapy group also had a year 30-reduced health care resource use than the CS group.

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What Does the Evidence Say? - Lateral Epicondylalgia

Journal of PHYSIOTHERAPY

Invited Topical Review

Physiotherapy management of lateral epicondylalgia

Leanne M Bisset*, Bill Vicenzino*

Research BMJ

In summary: manual therapy techniques to the elbow, wrist and forearm can reduce pain and increase pain-free grip strength immediately following treatment, although in many instances, meta-analysis was not possible due to heterogeneity between manual therapy techniques and timing of follow-up assessment. There was insufficient evidence of any long-term clinical effects for manual therapy alone.

Conclusion: Physiotherapy consisting of low magnitude and frequency manual therapy, a structured exercise program, and a reasonable alternative to injections in the mid to long term. The significant observation of a decrease in corticosteroid injections after physiotherapy compared with the control group with high recurrence rates implies that this treatment should be used with caution in the management of tennis elbow.

Mobilisation with movement and exercise, corticosteroid injection, or wait and see for tennis elbow: randomised trial

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What Does the Evidence Say? - Carpal Tunnel Syndrome

- Tal-Akabi et al 2000: Carpal Mobs vs Neurodynamics vs Control
 - Treatment better than control
 - Carpal Mobs and Neurodynamics showed equal benefit
- Rozmarny et al 1998: Usual Care vs Nerve & Tendon Glides in pts awaiting CTR
 - 60% of those receiving nerve & tendon glides opted to cancel surgery!
- Bialosky et al 2009 & 2011
 - Neurodynamics improve objective measures of pain; correlates w/ clinical outcomes for CTS
- Oskoueii et al 2014: Splinting & Modalities vs [Same + MT + Neurodynamics]
 - Multiple symptom-related and function-related outcomes measured
 - ALL significantly favored the group receiving MT and Neurodynamics

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What Does the Evidence Say? - Carpal Tunnel Syndrome

- Manual Therapy vs Surgery
 - Fernandez-de-las-Penas: 2 separate studies in 2015 and 2017
 - Short-Term: PT achieved better outcomes (symptoms, function, strength)
 - Long-Term: Outcomes virtually equal for both groups

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BOTTOM LINE:

Various forms of manual therapy have been shown to be an effective form of conservative treatment for most common NMSK issues.

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HOWEVER, A Few Problems with Elements of our Traditional Models...

- No evidence to date for "vertebral subluxations" (Homola 2006, Ernst 2008)
- We cannot detect "positional faults" - much less "correct" them (Tullberg 1998, Van Der Wurff 2000, Flynn 2002, Hsieh 2002, McGrath 2006, Goode 2008)
- The convex-concave rule doesn't always pan out (Johnson 2007, Brandt 2007)
- Dynamic Disc Model: YES in healthy discs; questionable in degenerative or symptomatic discs (Kolber 2009)
- Lack of precision in many manual techniques (Powers 2003, Kulig 2004, Ross 2004, Snodgrass 2006)
- Specificity of application of techniques doesn't always seem to matter (Aquino 2013, Slaven 2013, Langevin 2015)

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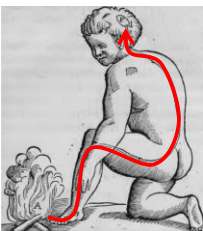
There MUST be more to consider...

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HISTORICAL CONTEXT ON HOW WE'VE VIEWED PAIN

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Pain: An Evolution of Understanding



Cartesian Model -1600s (Moayed 2013)

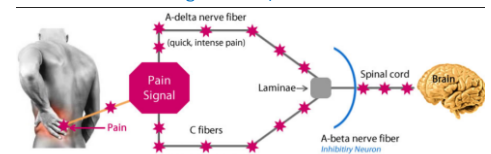
- Proposed that the intensity of the stimulus was directly proportional to the intensity of pain

Hinted to the role of perception and central processing, but pain was definitively an input. For pain to cease, the input stimulus must be removed.

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Gate Control Theory (Melzack and Wall, 1965)

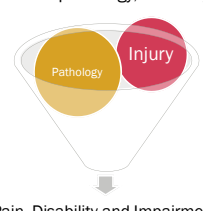
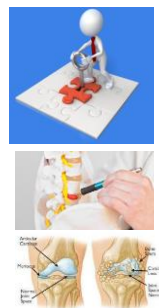
- Supports Specificity, Intensity and Pattern Theories
- Pain perception is modulated by Excitatory and Inhibitory effects on interneurons
 - Pain stimulation "gate" can open or close



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Biomedical Model

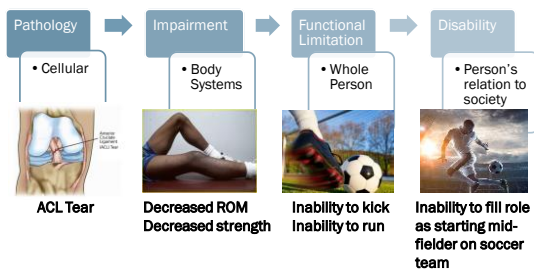
- Lock and Key Metaphor
- Fix the pathology, fix the symptom

Pain, Disability and Impairment

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Nagi's Model of Disability



Pathology → Impairment → Functional Limitation → Disability


- Pathology:** Cellular (ACL Tear)
- Impairment:** Body Systems (Decreased ROM, Decreased strength)
- Functional Limitation:** Whole Person (Inability to kick, Inability to run)
- Disability:** Person's relation to society (Inability to fill role as starting mid-fielder on soccer team)

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But how does this model explain...

Man shoots nail into brain and thinks nothing of it

Dante Astella believed he was only grazed when a nailgun went off and didn't believe doctors when they showed him X-ray



Phantom Limb Pain?



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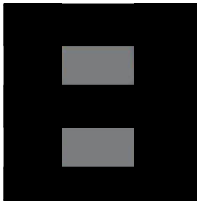
Problems with Biomedical Model

FALSE ASSUMPTIONS	TRUTHS
Associate pain with tissue damage • Site of pain is cause of pain	Poor correlation between tissue damage and pain
Equate Nociception/nerve impulses with pain • PNS sends signals to CNS/brain	Pain experience is an output of various parts of CNS
Focus on acute pain • Does not explain persistent pain	Pain can persist after tissues heal

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Nociception vs. Pain

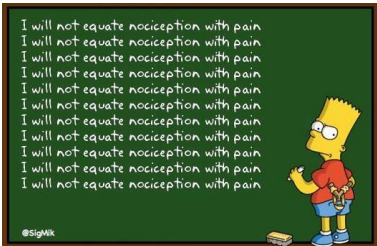
- Nociception and Pain are different.
- Nociception can inform pain, but pain is ultimately a conclusion reached by the brain.
- Parallels with Vision
 - What we see is merely our brain's interpretation of light signals, but the brain's interpretation can differ from reality



Brain Games Video: <https://youtu.be/PN1NAIM55tU>

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Nociception vs. Pain



@SigMik

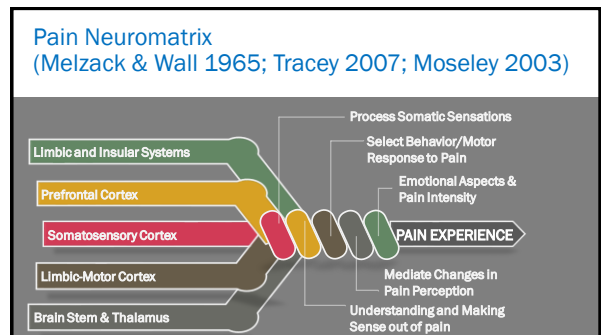
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Review of Current Understanding of Pain and Related Concepts

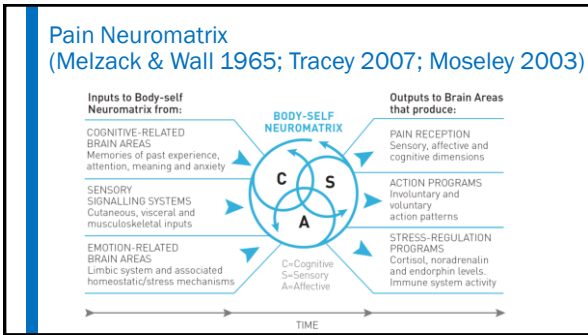
"Pain is a personal, **subjective** experience influenced by cultural learning, **the meaning of the situation**, attention, and other psychological variables." (Melzack 2013)

"An unpleasant **sensory and emotional experience** associated with **actual or potential** tissue damage, or described in terms of such damage." (International Association for the Study of Pain)

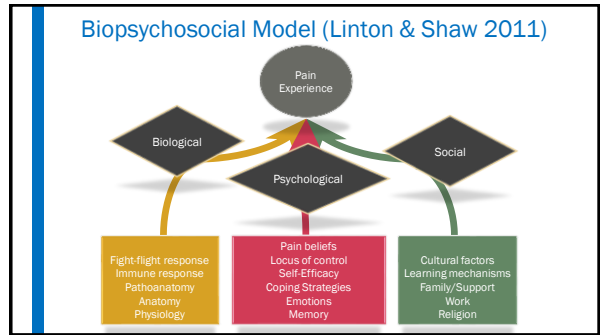
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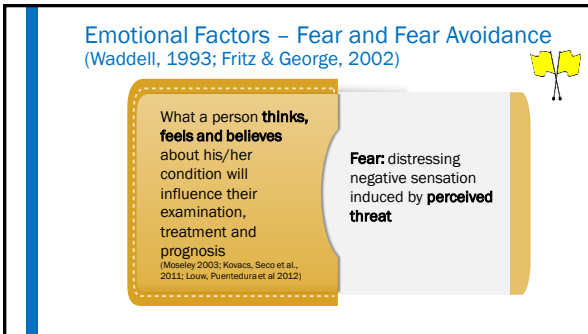
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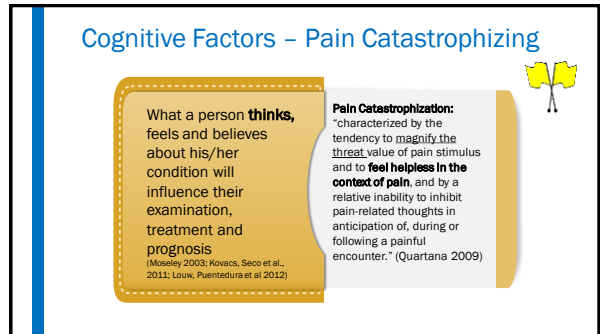
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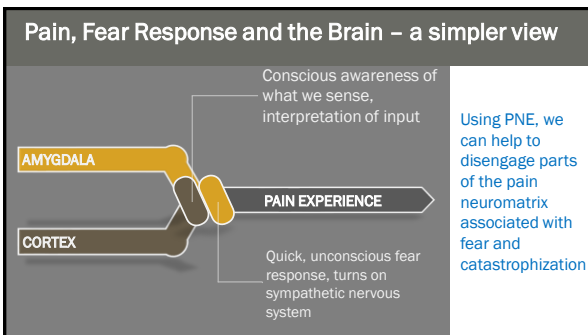
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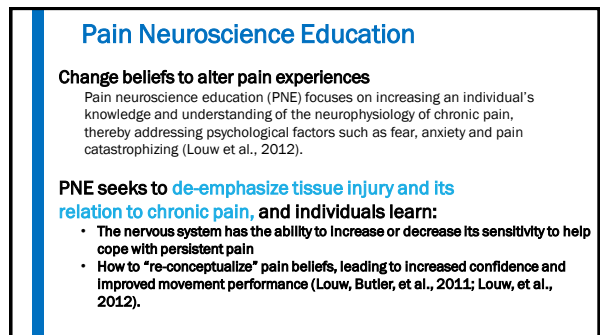
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WHAT ROLE DO MODERN PAIN CONCEPTS PLAY IN TREATING COMMON NMSK CONDITIONS?



What does the evidence say???

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What Does the Evidence Say? - Low Back Pain

Louw et al, 2015

The message of this case study is powerful for the physical therapist treating spinal pain patients, by underscoring the importance of education in leading to immediate changes in cognitions, ROM and beliefs regarding a patient's perception of injury, treatment and potential recovery.

Mosley 2004

The findings support the inclusion of neurophysiology education... and concordantly raise doubts about the suitability of conventional (structural-pathology based) back-school type education in these programs.

Ryan et al, 2010

Pain biology education was more effective for pain, and pain self-efficacy than a combination of pain biology education and group exercise classes for individuals with CLBP, in the short term.

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What Does the Evidence Say? - Chronic Musculoskeletal Pain

Louw et al, 2011

Compelling evidence for the use of NE in decreasing pain ratings, increasing physical performance, decreasing perceived disability, and decreasing catastrophization in patients with chronic MSK pain...

NE may have potential impact by countering any iatrogenically induced maladaptive beliefs encouraged by treatment with physicians who practice pain management from the "tissue damage" perspective. These maladaptive beliefs are also often reinforced by misdirected and failed surgery or interventional procedures.

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What Does the Evidence Say? - Chronic Fatigue Syndrome

Meus et al, 2010

By starting with pain physiology education before applying more active modalities, dysfunctional beliefs could be alleviated. Physical therapists often are at a loss with what to do with patients with CFS because of the low exercise tolerance and postexertional malaise typically seen in patients with CFS, resulting in low therapy adherence and efficacy. By reconceptualizing pain, somatic vigilance may decrease and pain thresholds' tolerance, and in consequence, physical performance could increase.

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Favoring a "Hands off" Approach

PNE seeks to de-emphasize tissue injury and its relation to chronic pain

- Top-down approach, using PNE and graded motor imagery has been shown to reduce pain and disability
 - Chronic pain conditions
 - Acute pain
 - Post-surgical conditions

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Favoring a "Hands off" Approach

A significant part of a person's pain experience is correlated with the vigilance of the central and peripheral nervous system (Louw et al, 2017)

- In a subgroup of patients, the central nervous system (CNS) becomes hypervigilant, creating significant clinical challenges to the use of active and passive movement strategies and manual therapy.
- Providing manual therapy or exercise to address local tissue pathology could bring the patient's focus back to the low back tissues as the source of their problem (Puentedura and Flynn 2016)

Then, for patients with chronic pain, is manual therapy helpful?

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BOTTOM LINE:
 Various forms of pain science education have been shown to be effective conservative treatment for common NMSK issues.

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BUT.....HAS THE PENDULUM SWUNG TOO FAR FOR MANY?

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A Bit of "Collegial Conversation"

All manual therapy and its advocates have been misleading and bullshitting us and patients for far too long... and its about time these witless knob fiddlers are pushed out of our profession!

The only rationale, critical, evidenced based manual therapists are the one's who have abandoned it!
 #ManualTherapySucks #CampHandsOff #TillDie

So what do you think of my new course t-shirt...
 #ShoulderComplex #DryNeedlingSucks #ManualTherapySucks #PassiveTreatmentSucks

#Warning #Extremely #Controversial #Tweet
 There is NO technical skill needed in ANY manual therapy!
 *Except red flag/safe application!

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A Bit of "Collegial Conversation"

MANUAL CORRECTION AND TREATMENT OF THE SACROILIAC JOINT

Manual Correction and Treatment of the Sacroiliac Joint

by [redacted]

The sacroiliac joint has long been touted as a significant factor in generating pain in the low back region. Studies have shown up to 40% of low back pain may be due to involvement of the sacroiliac joint. Learn to detect, measure and describe biomechanical changes of the pelvis with these exciting new courses! Continuing from Part I, this course discusses the fixation and manipulation techniques of [redacted] and therapeutic exercise techniques to treat the sacroiliac joint.

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[VIEWPOINT]

ALAN J. TAYLOR, PT, MSc - ROGER KERRY, PT, PhD

When Chronic Pain Is Not "Chronic Pain": Lessons From 3 Decades of Pain

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Lessons from 3 Decades of Pain

(Taylor & Kerry 2017)

- 53-yr-old patient with 35-year history of exercise-induced (cycling) leg pain and low back pain (LBP)
- Over 35 years of serial misdiagnosis and mismanagement – all according to the current fashionable trend in PT
 - Identification and “correction” of malalignments and leg length discrepancies
 - Mobilization of stiff segments; Stabilization of hypermobile segments
 - Repeated extension for a “bulging disc” / “derangement”
- Eventually (after >20 years) was categorized under the “chronic pain” label
 - → pain management, counseling, cognitive behavioral therapy, and various combinations of other pain therapies and education/classification based cognitive functional therapy.
 - None of the described interventions proved to be successful.

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Lessons from 3 Decades of Pain

(Taylor & Kerry 2017)

- MRI confirmed minor disc protrusions at L4-L5-S1, with “mild impingement” on the neural tissue.
- No neurological deficits on physical examination.
- For the first time, the PT did a lower-limb vascular assessment (ABI pre- and post-exercise)
- History, subsequent vascular assessment and MRA confirmed = progressive stenotic lesion, extensive stenosis of his common/external iliac artery
- He made a full recovery following surgery and was able to return to cycling, running, and skiing with no leg pain (he still reported occasional LBP, which he self-managed).

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“We suggest that no approach, no matter how vocal and evangelistic its followers, would likely be any more certain than what preceded it.”

- Taylor & Kerry, 2017

What we can learn:

1. Any school of thought or management approach can never be 100% right for every patient.
2. Chronic or persistent pain may well be indicative of central sensitization, but this is not a foregone conclusion.
 - There are subgroups of patients with chronic pain who display little or no central sensitization
 - There are countless cases of delayed diagnosis and/or misdiagnosis.
3. The evidence base changes daily, and history suggests that many of the things we are sure about today will be questioned in the future.
4. First-line practitioners will be exposed to more complex cases in both acute and chronic settings.
 - Do not overlook the importance of red flags screening, and skillful assessments/examinations

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REMEMBERING THE BIO PART OF THE BPS MODEL

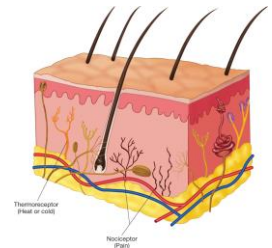
70

BACK TO THE TISSUES

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A Review...

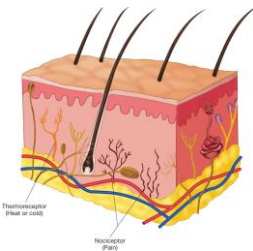
- Sensory Receptors in the tissues:
 - Proprioception
 - → GTOs, Mm Spindles, JT Receptors
 - Touch, Skin Stretch, Pressure, Vibration
 - → Hair follicle receptors, Ruffini endings, Merkel's discs
 - Two-Point Discrimination (fine touch)
 - → Meissner's corpuscles
 - Temperature
 - → Free nerve endings (thermoreceptors)
 - Nociception
 - → Free nerve endings (nociceptors)



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A Review...


- Four Different Types of Nociceptors
 - Mechanical
 - Thermal Hot (>122° F)
 - Thermal Cold (<41° F)
 - Polymodal
 - Respond to multiple stimuli, including mechanical, thermal, and chemical



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Peripheral Sensitization

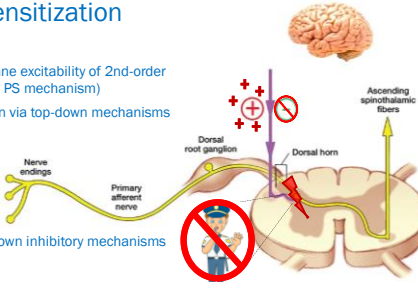
- 3 Primary Processes
 - Spontaneous Action Potentials
 - Increased Resting Potential (lowered stimulus threshold)
 - Inhibition of hyperpolarization period
 - more repetitive firing



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Central Sensitization

Increased membrane excitability of 2nd-order neurons (similar to PS mechanism)
Synaptic facilitation via top-down mechanisms



Reduction in top-down inhibitory mechanisms (disinhibition)
Interneuron death

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Curr Rheumatol Rep (2010) 12:448–454
DOI 10.1007/s11926-010-0134-x

Is It All Central Sensitization? Role of Peripheral Tissue Nociception in Chronic Musculoskeletal Pain

Roland Staud

- Both PS and CS sensitized to input from the tissues
- Continued nociceptive input has been shown to sustain a sensitized state (Heren-Gerber 2004, Vierck 2006, Staud 2010)
- Proper treatment requires both Top-Down and Bottom-Up approaches! (Nijs 2009)
- But how do we recognize when these factors are at play?
- How can we individualize our intervention to the patient???

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Mechanism-Based Classification of Pain (Smart 2011)

- 464 patients with back and leg pain assessed w/ standard protocol and classified by expert clinicians
- Expert clinicians completed 38-item Clinical Criteria Checklist (CCC)
- CCC items analyzed against expert classification



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Nociceptive Cluster

- Present:
 - Intermittent
 - Dull or achy at rest, but often sharp with provocation
 - Localized to a specific area, but possibly with somatic referral
 - Clear, and proportionate agg/ease variables
- Absent:
 - Descriptions such as “burning”, “shooting”, or “shocking”
 - Other associated dysesthesias (crawling, electrical, heavy)
 - Night pain/disturbed sleep
 - Abnormal postures or movement patterns

Nociceptive Pain Cluster	
Sn	91%
Sp	91%
-LR	.10
+LR	10

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Peripheral Neuropathic Cluster


- History of nerve injury, pathology, or mechanical compromise
- Pain referred in a dermatomal or peripheral nerve distribution
- Symptom provocation with tests that move/load/compress neural tissue

Peripheral Neuropathic Pain Cluster	
Sn	86%
Sp	96%
-LR	.14
+LR	22

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Referred vs Radicular Pain (Bogduk 2009)

	Somato Referred Pain	Radicular Pain	Radiculopathy
What/Why?	<ul style="list-style-type: none"> Pain perceived in regions innervated by nerves other than those that innervate the site of noxious stimulation Nerve roots aren't involved. Occurs due to convergence of multiple afferents on 2nd order neurons. 	<ul style="list-style-type: none"> Pain caused by ectopic discharge of a nerve root (NR) - typically involving the dorsal root or DRG Think chemical irritation, rather than pure mechanical compression, but these often co-exist 	<ul style="list-style-type: none"> May often co-exist with radicular pain, but either may be present independently of the other Conduction is mechanically blocked along a spinal nerve or one of its roots Not defined by pain, but by objective neuro signs
Features	<ul style="list-style-type: none"> Vague dull, aching, or gnawing pain. Difficult to localize. No dermatomal pattern 	<ul style="list-style-type: none"> Distinctive lancinating, electric, shocking, or burning pain Easily localized Follows a dermatomal pattern 	<ul style="list-style-type: none"> Sensory blocked → numbness Motor blocked → weakness Either or both → ↓ DTRs



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Centrally Sensitized Cluster

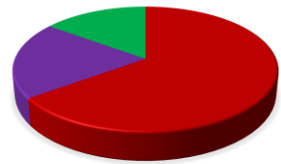
- Pain disproportionate to nature/extent of injury or pathology
- Non-mechanical, disproportional, or unpredictable patterns of pain provocation
- Presence of maladaptive psychosocial factors
- Diffuse and widespread tenderness to palpation

Centrally Sensitized Pain Cluster	
Sn	92%
Sp	98%
-LR	.08
+LR	41

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Mechanisms are NOT Mutually Exclusive

Many patients will fit >1 classification, though 1 may be predominant



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SO HOW DO WE INTEGRATE ALL THIS?



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In Patient Evaluation...

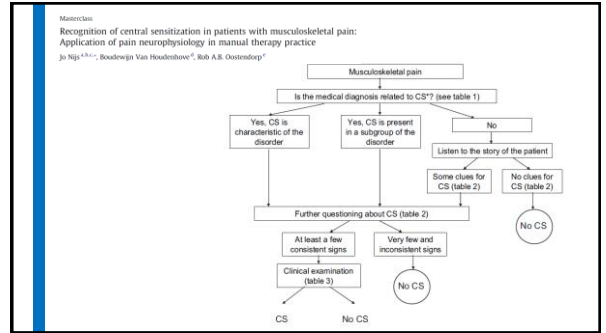
- Be cognizant of irritability, yellow flags, and pain mechanism clues EARLY
 - Clues as to beliefs, fears, co-morbidities, etc.
 - Thorough query of symptom description and behavior
- Your Objective Examination should be influenced by this!
- Example: High Irritability and/or Centrally Driven Pain?
 - Avoid provocation
 - Consider alleviating tests that are highly specific
- Consider non-traditional MSK tests and measures to rule in/out CS:
 - Neural palpation and neurodynamic testing in multiple regions
 - Palpation of multiple and remote areas

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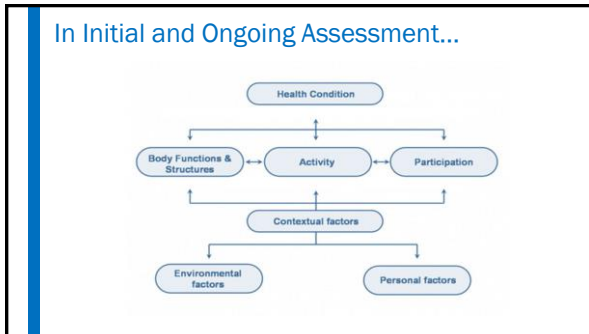
Masterclass
 Recognition of central sensitization in patients with musculoskeletal pain:
 Application of pain neurophysiology in manual therapy practice
 Jo Nij^{1,2,3,4,5}, Boudewijn Van Houdenhove⁶, Rob A.B. Oosterdoop⁷

Table 1	Table 2																																													
<p>Medical diagnosis associated with an increased likelihood for central sensitization</p> <p>Medical diagnosis: Central sensitization is a characteristic of the disorder</p> <p>Central sensitization is present in a subgroup of the disorder</p> <p>Central sensitization is not present in a subgroup of the disorder</p> <p>Chronic low back pain ✓ Chronic whiplash ✓ Ankylosing spondylitis ✓ Osteoarthritis ✓ Temporomandibular disorder ✓ Myofascial pain syndrome ✓ Fibromyalgia ✓ Rheumatoid arthritis ✓ Rheumatism ✓ Chronic fatigue syndrome ✓ Chronic headache ✓ Irritable bowel syndrome ✓</p>	<p>Table 2 Overview of the clinical examination of patients with suspected central sensitization^{1,2}</p> <p>Clinical tests</p> <ol style="list-style-type: none"> 1. Assessment of pressure pain thresholds at sites remote from the symptomatic site 2. Assessment of sensitivity to touch during manual palpation at sites remote from the symptomatic site 3. Assessment of sensitivity to vibration at sites remote from the symptomatic site 4. Assessment of sensitivity to heat at sites remote from the symptomatic site 5. Assessment of sensitivity to cold at sites remote from the symptomatic site 6. Assessment of pressure pain thresholds during and following exercise 7. Assessment of joint end feel 8. Brachial plexus provocation test <p>Symptoms related to the presence of central sensitization</p> <table border="1"> <thead> <tr> <th>Symptoms</th> <th>Characteristic of CS</th> <th>Might be related to CS</th> </tr> </thead> <tbody> <tr><td>Hypersensitivity to bright light</td><td>✓</td><td>✓</td></tr> <tr><td>Hypersensitivity to touch</td><td>✓</td><td>✓</td></tr> <tr><td>Hypersensitivity to noise</td><td>✓</td><td>✓</td></tr> <tr><td>Hypersensitivity to medications</td><td>✓</td><td>✓</td></tr> <tr><td>Hypersensitivity to mechanical pressure</td><td>✓</td><td>✓</td></tr> <tr><td>Hypersensitivity to medication</td><td>✓</td><td>✓</td></tr> <tr><td>Hypersensitivity to temperature (high and low)</td><td>✓</td><td>✓</td></tr> <tr><td>Fatigue</td><td></td><td>✓</td></tr> <tr><td>Sleep disturbances</td><td></td><td>✓</td></tr> <tr><td>Understanding sleep</td><td></td><td>✓</td></tr> <tr><td>Concentration difficulties</td><td></td><td>✓</td></tr> <tr><td>Sensory feelings (e.g. in limbs)</td><td></td><td>✓</td></tr> <tr><td>Tingling</td><td></td><td>✓</td></tr> <tr><td>Numbness</td><td></td><td>✓</td></tr> </tbody> </table>	Symptoms	Characteristic of CS	Might be related to CS	Hypersensitivity to bright light	✓	✓	Hypersensitivity to touch	✓	✓	Hypersensitivity to noise	✓	✓	Hypersensitivity to medications	✓	✓	Hypersensitivity to mechanical pressure	✓	✓	Hypersensitivity to medication	✓	✓	Hypersensitivity to temperature (high and low)	✓	✓	Fatigue		✓	Sleep disturbances		✓	Understanding sleep		✓	Concentration difficulties		✓	Sensory feelings (e.g. in limbs)		✓	Tingling		✓	Numbness		✓
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In the SINSS Model of Assessment

- **Severity:** How much impact on the pt's life?
- **Irritability:** How easily provoked, and to what extent? What does it take, and how long/much, to settle?
- **Nature:** What factors are at play?...tissue(s) involved, red/yellow flags, co-morbidities,
- **Stage:** Improving, worsening, or staying the same? Stage of healing?
- **Stability:** How stable or predictable?

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In the SINSS Model of Assessment

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- **Irritability:** How easily provoked, and to what extent? What does it take, and how long/much, to settle?
- **Nature:** What factors are at play?...tissue(s) involved, red/yellow flags, co-morbidities, **beliefs, predominant pain mechanism(s)**
- **Stage:** Improving, worsening, or staying the same? Stage of healing?
- **Stability:** How stable or predictable?

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In Treatment...

How will treatment differ if the mechanism seems more...

- Nociception driven?
- Peripheral neuropathic?
- Centrally driven/sustained?

What about kinesiophobia or inappropriate beliefs?

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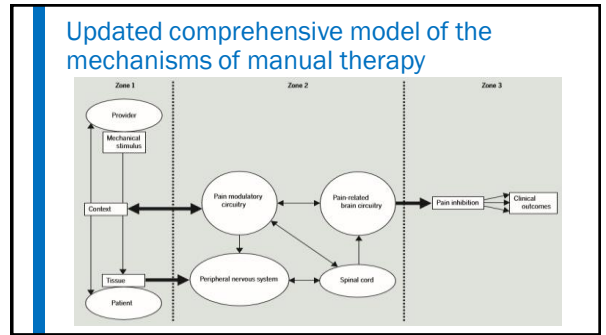
[CLINICAL COMMENTARY]

JOEL E. BIALOSKY, PT, PhD¹ • JASON M. BENECIUK, PT, PhD² • MARK D. BISHOP, PT, PhD³ • ROSELIO A. CORONADO, PT, PhD⁴
CHARLES W. PENZA, DC, PhD⁵ • COREY B. SIMON, PT, PhD⁶ • STEVEN Z. GEORGE, PT, PhD⁷

Unraveling the Mechanisms of Manual Therapy: Modeling an Approach

- What are the mechanisms through which manual therapy interventions inhibit pain?
 - The related mechanisms are likely a complex interaction of factors related to the patient, the provider, and the environment in which the intervention occurs.

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[CASE REPORT]

ERIC E. SAWYER, PT, DPT¹ • AMY W. MCDONVITT, PT, DPT¹ • ADRIAN LOUW, PT, PhD²
EMILIO J. PUENTEDEURA, PT, DPT, PhD³ • PAUL E. MINYKEN, PT, DPT⁴

Use of Pain Neuroscience Education, Tactile Discrimination, and Graded Motor Imagery in an Individual With Frozen Shoulder

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[CASE REPORT]

ERIC E. SAWYER, PT, DPT¹ • AMY W. MCDONVITT, PT, DPT¹ • ADRIAN LOUW, PT, PhD²
EMILIO J. PUENTEDEURA, PT, DPT, PhD³ • PAUL E. MINYKEN, PT, DPT⁴

Use of Pain Neuroscience Education, Tactile Discrimination, and Graded Motor Imagery in an Individual With Frozen Shoulder

- A 54-year-old woman with a diagnosis of frozen shoulder was referred by an orthopaedic surgeon following lack of progress after 4 weeks of intensive daily physical therapist care.
- A “top-down” approach using PNE, tactile discrimination, and graded motor imagery was used for weeks 1-5
- Weeks 6-8 used “bottom-up” impairment-based approach, starting with CT spine/regional interdependence, then MT to shoulder

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TABLE 3 TREATMENT PROGRESSION AND OUTCOMES

Treatment Phase	Week	SPADI (Mean [SD])	Pain (Mean [SD])	ROM (Mean [SD])
Initial exam	0	57.0 (9.7)	62	27
Neuroscience education	1	57.0 (9.7)	62	28
Latency	2	47.0 (8.0)	50	37
Motor imagery	3	37.0 (5.0)	35	25
Tactile training	4	37.0 (5.0)	32	34
Tactile discrimination	5	37.0 (5.0)	28	38
CT spine	6	27.0 (3.0)	15	42
CT shoulder/MT	7	37.0 (5.0)	32	40
MT shoulder	8	37.0 (5.0)	28	32

- Patient had already been through 4 weeks of intensive PT; pain + disability worsened
- During the first 6 weeks using top-down approach, positive changes were seen in the patient’s pain, function, and ROM
- Allowed for progression to the use of manual therapy and exercise during weeks 6-8.

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Updated Systematic Review

(Louw et al., 2016)

The efficacy of pain neuroscience education on musculoskeletal pain: A systematic review of the literature

Adriaan Louw, PT, PhD¹, Kory Zamney, PT, DPT¹, Emilio J. Puente deura, PT, DPT, PhD², and Ina Diener, PT, PhD³

¹Hortemotional Spine and Pain Institute, Stary City, IA, USA; ²Department of Physical Therapy, School of Health Sciences, University of South Dakota, Vermillion, SD, USA; ³Department of Physical Therapy, School of Allied Health Sciences, University of Nevada, Las Vegas, Las Vegas, NV, USA; ⁴Department of Physiotherapy, Stellenbosch University, Stellenbosch, South Africa

ABSTRACT
Objective: Systematic review of randomized control trials (RCTs) for the effectiveness of pain neuroscience education (PNE) on pain, function, disability, psychosocial factors, movement, and healthcare utilization in individuals with chronic musculoskeletal (MSK) pain. **Data Sources:** Systematic searches were conducted on 11 databases. Secondary searching (PEARling) was undertaken, whereby reference lists of the selected articles were reviewed for additional references not identified in the primary search. **Study Selection:** All experimental RCTs evaluating the effect of PNE on chronic MSK pain were considered for inclusion. **Additional Limitations:** Studies published in English, published within the last 20 years, and patients older than 18 years. No limitations were set on specific outcome measures. **Data Extraction:** Data were extracted using the participants, interventions, comparison, and outcomes (PICO) approach. **Data Synthesis:** Study quality of the 13 RCTs used in this review was assessed by 2 reviewers using the PEDro scale. Narrative summary of results is provided for each study in relation to outcomes measurements and effectiveness. **Conclusions:** Current evidence supports the use of PNE for chronic MSK disorders in reducing pain and improving patient knowledge of pain, improving function and lowering disability, reducing psychosocial factors, enhancing movement, and minimizing healthcare utilization.

ARTICLE HISTORY
 Received 12 November 2015
 Revised 19 December 2015
 Accepted 26 January 2016

KEYWORDS
 Chronic pain; exam pain; pain neuroscience education; therapeutic education; neuroscience education

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Updated Systematic Review

(Louw et al., 2016)

- PNE delivered by Physical Therapists for multiple pain conditions
 - Low back pain
 - Chronic Fatigue Syndrome
 - Fibromyalgia
 - Lumbar Radiculopathy
 - Pre-operative Lumbar Surgery
 - Chronic Neck pain
- Duration of PNE Varied
 - Longest: 4 hours (Moseley, 2003)
 - Shortest: 30 minutes (Louw et al., 2014)

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Updated Systematic Review

(Louw et al., 2016)

- Adjunct Treatments
 - **Manual Therapy**
 - **Trigger point dry needling** (Télez-García et al., 2014)
 - **Mobilization and manipulation** (Moseley, 2002)
 - **Soft tissue massage** (Moseley, 2002)
 - **Movement-based activities**
 - **Paced/graded exposure** with activities of daily living (Meeus et al., 2010; Vibe Fersum et al., 2013)
 - **Muscle and neural mobilization** (Beltran-Alacreu et al., 2015; Moseley, 2002)
 - **Circuit-based aerobic exercise** (Ryan et al., 2010)
 - **Trunk stabilization** (Moseley, 2002, 2003c; Ryan et al., 2010)
 - **Movement exercises** (Vibe Fersum et al., 2013)
 - **Neck stabilization exercises** (Beltran-Alacreu et al., 2015)
 - **Aquatic exercise program** (Pires et al., 2015)
 - **None (PNE only)** (Iltersum et al., 2014; Louw et al., 2014; Moseley et al., 2004; VanOosterwijck et al., 2013)

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Updated Systematic Review

(Louw et al., 2016)

Key Takeaways: PNE is effective with

- Improving pain knowledge
- Decreasing pain ratings
- Minimizing pain catastrophization, fear-avoidance
- Increasing function and minimizing disability
- Encouraging physical movement
- **PNE + manual therapy + exercise helps to changing attitudes and behaviors regarding pain**

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Integrating Manual Therapy + Modern Pain Concepts

"Manual therapy has purpose: to get people up and moving with confidence, and when explained in a way that aligns with PNE, can support self efficacy."

Three rules for manual therapy:

1. Do not hurt the patient -
2. Use language consistent with modern pain education/biopsychosocial approach
3. Don't do anything that the patient cannot do themselves.


- Sarah Haag

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Takeaway points

- Patients should be educated about manual therapy according to the current understanding of its mechanisms of action
- In addition to peripheral effects (i.e. increase in range of motion), MT has may generate (temporal) activation of descending inhibitory pain mechanisms
- Pain is complex and unlikely to be resolved by a single modality of treatment
- Combination of manual therapy and PNE in combination helps to change attitudes AND behaviors surrounding the pain experience.
- PNE should be applied before manual therapy



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Thanks for Listening!

Any Questions?



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