Hands on, Hands off: Steadying the pendulum

Elaine Maisu
BScPT, MCSc (manual), FCAMPT

Objectives

1. To review the biopsychosocial (BPS) framework
2. To discuss the misconceptions surrounding the BPS framework and pain
3. To highlight the importance of clinical reasoning and evidence-informed practice
4. To review tissue and pain mechanisms
5. To present the current models on the mechanisms of hands on therapy and the evidence supporting its use
6. To introduce stratified models of care for low back pain (LBP)
7. To present the evidence for hands off treatment and pain neuroscience education
8. To stimulate discussion and integration of the concepts using two case histories of low back pain

Biopsychosocial (BPS) framework (Jull, 2017)

- 40 years old (Engel 1977)
- Widespread adoption & implementation
- Pendulum is still swinging between the biological (BIO) and psychosocial (PS) domains
- BIO – narrow focus on nociception and the tissues (dominant biomedical model) – “Hands on approach”
- PS – focus on psychosocial domains with behavioural treatment as the sole intervention – “Hands off approach”
- Cook (2018) – extreme views, not one approach has all the answers

MISCONCEPTION #1
BIO and PS are 2 separate and different entities

Cook (2018)
- Pain people on one side & MT people on the other side
- MT and Pain practitioners have the same views and similar goals – decrease pain and improve global outcome of patients
- Ment in both and patients often present with components of both

Louv (2018) - Webinar on BPS manual therapy
- “Remember that a brain has a body and that the body has a brain and they influence each other”

Jull (2017)
- Unreasonable to separate the person and their personal circumstances from their medical condition

MISCONCEPTION #2
The BPS framework depicted as 3 equal circles

Louv & ISPI (2018) with permission

- Relevance and contribution of each domain will change over time
- Not 3 equal circles – each domain can vary greatly from one patient to another


Based on Gifford, 1998
MISCONCEPTION #3
The BPS framework is only for chronic pain

The BPS framework has relevance for all musculoskeletal pain states – acute & chronic
More widely advocated in chronic pain disorders – more likely to have more PS factors
Acute pain – only B/O?
Chronic pain – only PS factors?
What is chronic pain?

MISCONCEPTION #4
Chronic conditions are automatically accompanied by dominant PS features

Pain neuroscience education has emerged to manage chronic pain (esp LBP) but chronic LBP patients often present with some B/O components (ex. deficiencies in motor and sensorimotor control)
Peripheral noception and inflammation can continue to play a role in many chronic pain conditions
Presence of maladaptive behavior (poor body awareness, poor movement patterns) can be a cause of ongoing noception

MISCONCEPTION #5
Pain is a reflection of what is happening in the tissues

In acute conditions, following an injury, the source of symptoms is often found in the tissues (tissue pathophysiological mechanisms), there is ongoing noception (inflammation, mechanical, ischemic)
In more chronic conditions, when healing of the tissues has taken place, pain is more often related to the hyperexcitability of the CNS and deconditioning of the tissues – a shift from noception activity to more a maladaptive & widespread reactivity & sensitivity (Gifford, 1998)

MISCONCEPTION #6
Chronic pain patients present with centrally mediated pain

Chronic pain patients, whether they present with dominant PS features or not, do not necessarily have centrally mediated pain (central sensitization (CS))
Only in a subgroup of LBP patients
NBJ (2000) CS – increased responsiveness of noception neurons in the CNS to normal and subthreshold afferent input; altered sensory processing in the brain; presence of hyperalgesia and allodynia
Gibbs (2015) - Treatment approach = hand-off intervention only?
Louw (2018) – graded mob approach, exposing pts to hands-on stimulus to help in the application of more active ex & activity

MISCONCEPTION #7
Pain neuroscience education (PNE) is only for patients with central sensitization

Patients with more PS issues &/or CS will require more PNE
Notion of de-education and re-education (knowledge, beliefs, experiences)
Patients with a great B/O component will not necessarily need PNE

- A reflexive process of inquiry and analysis – the thinking & decision-making associated with clinical practice
- Looking at the patient and his problem – an entity
- Collaborative exchange between the patient and therapist
- Understanding of the patient, the context, their clinical problems
- Shared decision-making regarding management

- Jensen (2003) – CR is situated within a BPS model of health & disability as it relates to the ICF framework

Skilled clinical reasoning (Jones, 2004)

Evidence based (informed) practice  
Sackett et al, 2000

- 3 components of Evidence-Informed Practice
  - Best research evidence
  - Clinical expertise – importance of clinical skills
  - Patient values/preferences

- Where are we with best research Е?
  - Clinical expertise – includes knowledge, technical skills, communication & interpersonal skills, cognitive/metacognitive proficiency, professional judgment & empathy

- Jul (2009) – CR, assessment and clinical practical skills – crucial link between patient, research evidence and successful outcomes

WHO ICF model (Jones, 2013)

Patient values/preferences  

- Patients want & expect to be touched during a physical examination, this must not be ignored, whether the patient has an acute or a chronic problem

- Importance of our clinical skills

- Human touch & fulfilling a patient's expectations can enhance therapeutic alliance thus positively influencing treatment outcomes

Concepts in manual therapy

- Many great leaders in manual therapy developed their concept in the 60's, 70's and 80's, mostly based on anatomy & biomechanics

- Maitland Concept
  - Based more on reproduction of the patient's symptoms
  - Making features fit (subjective and objective) to validate the BIO of a patient's pain presentation
  - Importance of the subjective examination – the skills involved in understanding the person & his problem
  - Grades of passive movement to modulate pain – grades I & II
  - Importance of education, facilitating pain-free movement, exercise
  - «There is something that hands can do that nothing else can do»
Manual Therapy is a Pain Modulator

Pain modulation is the process by which the body alters a pain signal as it is transmitted along the pain pathway.

Pain modulation is triggered by dedicated mechanisms that are responsible for clinical analgesia (reduced feeling of pain).

(Kirkpatrick DR et al 2015)
Peripheral Mechanisms

- Reduction of inflammatory mediators (blood and serum level cytokines, serotonin, B-endorphins) have been found post-
  manipulation which may impact on pain mediation post injury
- Production of endogenous cannabinoids
- Higher levels in neurotensin and greater increases in cortisol

(Kinghorn BF et al 2007, Tenderczyk-Ipuyen JA et al 2006)

Spinal Cord Mechanisms

- Mechanisms associated with spinal cord activity may potentially be associated with:
  - Hypoalgesia (diminished sensitivity to pain) secondary to segmental postsynaptic inhibition on the dorsal horn pathway (Herrera-de-la-Pena et al 2006)
  - Sympathoexcitatory response (change in blood flow, heart rate, skin conductance and skin temperature) (May et al 2002)
  - Decreased muscle hypertonicity secondary to reflexogenic inhibition from stimulation to the skin, muscle and articular receptors (Peer et al 2002, Chilcoat et al 2001)
  - Alterations in EMG muscle activity (local and distant) and reduced H reflex (Dishman et al 2000)

Centrally Mediated/Supraspinal Mechanisms

- Hypoalgesia can be evolved primarily by the dorsal periaqueductal gray (PAG) area and secondarily from the ventral PAG (Wright, 1993)
- Proproception improvements (Roisenberg et al 2006, Roisenberg et al 2006)
- Neuromuscular performance improvements - clinical symptoms such as spasm and hypertonicity may be altered by central mechanisms modulating the gain of the motor neuron pool (Marshall et al 2006 & 2010, Dishman et al 2002)

What does the research evidence say?

CONCLUSION: There is moderate-quality evidence that manipulation and mobilization are likely to reduce pain and improve function for patients with chronic low back pain, manipulation appears to produce a larger effect than mobilization. Both therapies appear safe. Multimodal programs may be promising options.
(Couhier ID et al 2018)

CONCLUSION: There is high quality evidence that suggests there is no clinically relevant difference between spinal manipulative therapy and other interventions for reducing pain and improving function in patients with chronic low back pain.
(Rubenstein SM et al 2011)

Placebo – Patient Expectations

Several studies have suggested that if a patient expects complete relief of symptoms from treatment for spinal pain, that patient has better long-term outcomes from that treatment both in self-ratings of disability and global ratings of change (GROC)
Clinical Practice Guidelines – Chronic non specific LBP (8 high-quality guidelines) (Wong et al 2017)

1. **MANUAL THERAPY**, including spinal manipulation or mobilizations. Recommended treatment frequency/duration was a maximum of 9 sessions over up to 13 weeks.

2. **ACETAMINOPHEN OR NSAIDS** as therapeutic options while considering side effects and patient preferences.

3. **MULTIMODAL REHABILITATION** that included physical and psychological interventions (e.g. cognitive-behavioral approaches and exercise) for patients with high levels of disability or significant distress. Recommended treatment frequency/duration was around 60 hours over a maximum of up to 8 weeks.

Clinical Practice Guidelines – Chronic non specific LBP (8 high-quality guidelines) (Wong et al 2017)

Conclusions:

- Among patients with acute low back pain, spinal manipulative therapy was associated with modest improvements in pain and function and with transient minor musculoskeletal harms.

- Multidisciplinary Biopsychosocial Rehabilitation (MSR) will do better than if they receive usual care, but it is not clear whether they do better than people who receive some other type of treatment.

However, the available research provides mainly low to very low-quality evidence, thus additional high-quality trials are needed before we can describe the value of MSR for clinical practice.

(Marin TJ et al 2015)

### Pain Pattern Recognition

**Pain Pattern Recognition**

**Walton DW et al 2018**

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**Walton DW et al 2018**

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Keele STarT Back Tool

9 questions:
1. Referred leg pain
2. Comorbid pain elsewhere
3. Disability (walking)
4. Disability (dressing)
5. Fear of movement
6. Anxiety
7. Catastrophising
8. Depression/mood
9. Overall impact

Modified from Foster NE et al 2017

Stratified Care Approaches

Matched Treatments

Revised Treatment Based Classification System

Case History #1

- A healthy 45 year old nurse complaining of right sided low back pain radiating into the right postero-superior thigh.
- Initial onset occurred following an awkward movement in flexion/right side flexion while transferring a patient 4 months ago.
- Continuing to work
- Has had previous episodes of low back pain in the past 5 years related to minor lifting injuries
- She estimates 8-10 days off work over the years due to her back pain – has not lost work for this past episode
- Has had physiotherapy in the past and these episodes resolved quickly
- She has not had any treatment for this latest episode
Case History #1

- She has 2 children aged 7 and 9 and has a supportive husband and extended family
- She is quite active and walks their family dog daily, works out at the gym and participates in weekly yoga classes but has had to stop her yoga classes and her workouts at the gym because of her back pain
- No complaints of bowel/bladder dysfunction, no pain with cough/sneeze and no numbness or paraesthesia into her legs

Self Report Outcome Measures

Patient Specific Functional Scale (PSFS)
- Standing 55 minutes = 5/10
- Lifting = 6/10
- Sit to stand = 5/10

Oswestry Disability Index (ODI) = 23% (moderate disability)

Physical Examination

Neurological:
- Conduction - negative
- Neuro mechanosensitivity - R SLR 75 degrees, pulling sensation R post thigh (R)

Biomechanical Examination:
- Decreased unilateral flexion on the R at L4/L5, L5/S1
- PA on L4 and L5 on the R - increased resistance, PI reproduced

Motor Control:
- poor recruitment of core muscles and gluts, holds her breath on recruitment and does change with modification of the breathing pattern

Palpation:
- local atrophy of the segmental muscles L4, L5 and L5/S1

Behaviour of Symptoms

- P1: intermittent right-sided low back and buttck pain, provoked by standing >15 min, transition sit to stand, prolonged forward flexion for >5 min and lifting. NPRS 5/10 and can go as high as 9/10.
  - Relieved by change in activity, application of heat for 15 min and taking Tylenol.
- P2: intermittent right-sided aching, burning or tightness in the posterolateral thigh, provoked by standing for >30 min, often worse at the end of a shift. P2 is related to PI. NPRS 3/10 and can go as high as 5/10. Relieved by change in activity or position.

Physical Examination

Observation:
- Sway-back in standing. Increased thoracic kyphosis, poor tone in trunk muscles

Active ROM:
- P1 reproduced on flexion, increased with PSFS, ROM full
- P2 reproduced on extension, ROM 3/4, some anterior shearing at L4/L5

Functional Stability Tests:
- One Leg Standing (OLS) – failed load transfer on the right
- Active SLR – positive on the right – compensatory pelvic rotation and abdominal bulging

Case History #1

Treatment approach?
Evidence-Informed Hands Off Treatments

More than just pain neuroscience education

- Any hands-off interventions that can decrease sensitization, decrease pain, enhance ease of movement or decrease disability
- Also, any interventions addressing barriers to recovery such as knowledge, beliefs, emotional factors, and body awareness

Evidence

- Pain neuroscience education
- Visualization, kinaesthetic imagery and mirrors
- Mindfulness
- Slow breathing
- Body awareness

What is the goal of Pain Neuroscience Education?

- Moseley – to reconceptualize pain (Moseley 2007)
- Given that pain and pain-related-disability depend on the balance between danger and safety
- And, that knowing about pain decreases danger
- Then, reconceptualizing pain decreases pain and disability

Components of Pain Neuroscience Education

- Information
  - The purpose of pain
  - Nociception and pathways
  - Neurons and synapses
  - Spinal inhibition and facilitation
  - Central sensitization
  - Peripheral sensitization
  - Neuroplasticity

Does PNE Change Pain?

- Four studies show immediate significant decrease in pain intensity after pain education (Moseley 2002, 2003, Ryan 2010, Vibe 2013)
  - In CLBP - an immediate mean decrease in VAS of 3.1 (Moseley 2003)
  - In WAD - an immediate mean decrease of 4.35 (van Oosterwijck 2011)
- One study showed VAS remained lower than control group at 3 months, and another at 1 year
Does PNE Change Function?

- Immediate increase in function
  - Two studies - SLR and forward bend in CLBP
  - One study - neck ROM in WAD
- Immediate decrease in perceived disability
  - CLBP
  - One study - WAD
  - Lasting improvements at 1 yr > control group

Two studies found no immediate change in perceived disability

Does PNE Change Fear?

- One study showed decreased fear (Tampa Scale of Kinesiophobia - TSK) in WAD
- Two other studies did not show any change in TSK
- One study showed the people whose perceived ability changed the most were those with the highest pretest PCS

Does PNE Change Sensitization?

- One study showed significant decreases in pressure pain threshold in the trapezius and calf muscle in people with WAD (van Oosterwijck 2011)

PNE Evidence

- Immediate pain relief – as powerful as opioids and mindfulness*
- Lasting pain relief better when combined with movement therapy
- Changes in pain beliefs, sensitization, catastrophizing, perceived disability

*https://www.retrieval.com/publication-66

Key concepts learned

- Pain is complex
  - Simple solutions might not work

- Pain is not an accurate indicator of tissue health
  Therefore,
  - Pain by itself should not be used as a guide for how much to exercise/move
  - It is possible to change pain without ‘fixing’ tissue

Key concepts learned

- Pain is changeable
  - This addresses the important negative effects of uncontrollable pain

- Individuals have the ability to change pain
  - Impacts control, anxiety, self-efficacy, ...
What are we actually doing in Pain Neuroscience Education

- Reconceptualizing
  - Pain
  - Pain management
  - Possibilities for future pain, movement and quality of life
- We are asking people to be curious
  - Providing ‘opportunities’ for people to ‘think about what they think about pain’
  - Impacting the Default Mode Network?

Is experience the most powerful educator?

- Teach using metaphor
- Teach using story
- Teach using lived experience
  - What do the immediate effects of hands-on therapy provide opportunity to teach?
  - What does moving with more ease teach the patient?

Pain Neuroscience Education in acute pain

- No evidence for benefits
- Yet the language we use must be based on our current understanding of pain and pain management
  - And some patients present with sensitization long before chronic time frame
- (based on Moseley) if we change our language and our message only when a person is not progressing as expected or when 90 days has passed, this will negatively impact the patient and outcomes

Pain Neuroscience Education in Transition from acute to chronic

- No specific studies addressing this
- Clinical suggestion - provide questionnaires to guide education, and to assess biopsychosocial factors
  - Neuropathology of pain vs. knowledge
  - Tampa Scale of Kinesiophobia – fear of movement, fragility
  - Fear Avoidance Beliefs Q -
  - Pain Stages of Change – readiness to change
  - GAD7 or PHQ9 – anxiety, depression

Pain Neuroscience Education in Transition from acute to chronic

- Do not ignore the ‘why’
  - Manual therapy is education – lived experience that pain is changeable, i.e., the pain is something that can be controlled
  - Manual therapy is reassurance – to the patient, when you change their pain and ease of motion this is an experience that you know what the problem is and how to fix it, i.e., the pain is explainable
- Provide interventions that educate
  - Pain is changeable
  - The individual has a role in pain management and recovery

Pain Neuroscience Education in chronic pain

- Guided by patient history
- Guided by patient’s approach to treatment, moving and recovery
- Questionnaires
- Multimedia
Case History #2

- 35 yr old female grade school teacher presenting with complaints of LBP since her early 20s
- aggravation of back pain, with referral into her right posterior thigh and a new thoracic pain 4 months ago, for no specific reason
- still working because she can’t afford to be off work but is unable to participate in any school activity after class
- She has 3 young children 3 and 5 years old; her husband travels for work and is only there on the weekends.
- Has been pregnant for a few years because she feels that exercise or physical activity will aggravate her back.
- Has tried massage and acupuncture with no change to her symptoms.
- Has tried different analgesics and NSAIDS with very little change in her symptoms.
- Has had an MRI which shows degenerative changes at L4/L5 and L5/S1 and a disc protrusion at L4/L5 and shows a list of concern about these changes.
- No loss of BM/Bi, pain on coughing/breathing, no numbness/paresthesia in the limbs.

Behavior of Symptoms

- P1: constant right sided LBP 24/7 at rest, aggravated by forward flexion, sitting for more than 30 min, any household activities requiring flexion, lifting and particularly stress at work and at home. NPRS varies from 3/10 to 5/10. Relieved by standing, sitting, lying prone, bending backwards, meditating, avoiding any flexion movement and ice for 15 minutes.
- P2: intermittent, burning, tightness in right posterior thigh, provoked by forward bending, driving and stress. NPRS varies from 3/10 to 5/10. P2 is related to P1. Relieving factors are the same as for P1. When she doesn’t sleep well P2 is aggravated.
- P3: constant aching pain 24/7 at rest, aggravated by sitting at the computer for 15 min, sustained forward flexion for a few minutes and stress. Relieved by lying down for 15 min and relaxing.

Self Report Outcome Measures / Screening Tools

Patient Specific Functional Scale (PSFS)
- Bending over desk = 3/10
- Lifting = 2/10
- Sit to stand = 3/10

Osseous Disability Index (ODI) = 26% (moderate disability)

Tempa Scale of Kinesiophobia = 52

Patient Health Questionnaire 9 = 7 (minimal symptoms)

SLANNS = 8 (not neuropathic)

Physical Examination

Observation:
- Hypertonicity of her back muscles; stands very rigidly

Active ROM:
- Flexion 23° ROM, shows apprehension, increases P2, ± SF = 34°, ROM, slight increase in P1, extension = 14

Functional Stability Tests:
- One Leg Standing (OLS) - no failed load transfer
- Active SLR - positive on the right, leg feels much heavier; worse with any compression on the pelvis

Neurological:
- Conduction = negative
- Neuromechanoactivity
  - Right SLR 70 degrees with reproduction of P2; Slump Test reproduction of P1 on P2 with thoracic and lumbar flexion, no significant change with knee extension on either side

Biomechanical Examination:
- Unable to assess segmental mobility due to muscle tone and patient intolerance very tender to slight pressure with PA pressures throughout lumbar spine

Motor Control:
- Lots of bracing, co-contraction of her abdominals, tends to breathe apically

Palpation:
- Presence of hyperalgesia in low back and posterior right thigh

Case History #2

- Treatment approach?
Conclusion

- Time for the pendulum to steady – finding an equilibrium between hands on and hands off in the best interest of our patients (Ull, 2017) - Need to explore the notion of co-existence of hands on & hands off approach
- New clinical models (Walton & Elliot, 2013) should make treatment decisions easier by quickly identifying the primary drivers of the patient’s pain experience to direct management
- Need to align manual examination skills and manual therapy (MT) interventions with contemporary pain science – appropriately timed MT
- Manual examination skills – data that we could not get otherwise
- Our best outcomes will occur when we match treatment to the individual and recognize the bidirectional nature of influences. For example, we can use the bio to impact the psychosocial and use cognists, and relationships to influence the bio.

Reid (2017)

“It is not one intervention but a combination of interventions that may best direct the patient towards recovery, based on the practitioner’s sound clinical reasoning and the patient’s trust in both the clinician’s skill and their own capacity to recover.”

THANK YOU FOR YOUR ATTENTION