Graded Motor Imagery & Sensory Integration for Patients with Pelvic Pain

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Learning Objectives

• Apply and demonstrate two options for graded motor imagery in patients with pelvic pain and/or sexual dysfunction.
• Design an individualized plan for providing and progressing a sensory reintegration strategy to assist a patient with return to function.
• Explain what graded motor imagery is and why a patient might benefit from it.
• Use selected evaluative methods to determine which patients might benefit from graded motor imagery and neurodynamics, and where to start.

Acknowledgement

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Chronic Pain

• 1 in 4.5 adults in the United States experiences chronic pain
• >100 million adults
• Cost of chronic pain: $560-$635 billion annually
• Exceeds cardiovascular disease ($309 billion), cancer ($243 billion), injury and poisoning ($205 billion), endocrine/metabolic diseases ($127 billion), digestive system diseases ($112 billion), respiratory system disease ($112 billion)
• Significantly more work days missed (10.3 vs 2.8)
• Relationship with depression, anxiety, increased use of alcohol & drugs

Chronic Pain by Diagnosis

• Chronic fatigue syndrome-0.89%
• Fibromyalgia-7-14%
• Long COVID syndrome-33% of those infected
• Rheumatoid arthritis-2%

Patient Case

• 20 year old nonbinary AFAB with 4 year history of severe abdominal pain which is not tied to their menstrual cycle
• Diagnosed with Painful Bladder Syndrome
• Severe pain which prevents them from having sex & decreases their ability to masturbate at desired frequency. Does not worsen or relieve related to bladder function.
• Unable to wear pants, which they find extremely dysphoric; they either wear a long T shirt or a blanket around their buttocks
• Spends most of their time in bed lying on their back with their buttocks elevated on 2 yoga blocks
• The only thing that provides some minor relief is wearing a dildo at all times
Patient Case

- They came in with their mother, who provided approximately half of the history
- When I introduced myself, the patient burst into tears, stating they were having a bad dysphoria day and the PSR pointed them to the women’s room when they asked for a bathroom, which triggered severe dysphoria. It took approximately 10 minutes to calm the patient down.
- The patient/their mom reported symptoms were also aggravated as a car ride of any length caused severe/excruciating pain.
- The patient had an extensive history of trauma, PTSD, anxiety
- They were taking 3 different pain medications, 2 muscle relaxers (1 oral & 1 vaginal) and multiple medications for anxiety & depression

Patient Case

- They had been to pelvic floor PT before in our system, and reported their prior therapists were not as trans friendly as they needed them to be, and requested I not speak to them
- Extensive history of late cancellations & no shows
- Had been discharged from 1 therapist due to no shows
- The other discharged them with the suggestion of working with a psychologist or cognitive behavioral therapist
- They became very tearful about this, stating that in the past they had been abused, including “sneak conversion therapy,” by therapists and they were adamantly opposed to working with one
- They are currently seeing an emotional freedom therapist and an environmental counselor

Patient Case

- They clearly tied their pain to anxiety or emotional upset
- Reported rashes in dermatomal patterns, acne, and overall malaise when pain was worse/anxiety was worse
- They reported significant feelings of frustration that they were so limited in their ability to be active as they felt others their age were going to college, finding partners, and being productive while they were in bed all the time
- Their mother has MS and fibromyalgia

Patient Case-Objective

- Patient declined to walk, squat, or lie down, stating it would be too painful
- With permission, I attempted an abdominal palpation over clothing patient was unable to tolerate even very light touch/pressure
- Patient reported that previous attempts at deep breathing worsened pain
- They did feel that internal myofascial work improved their pain but reported they were currently unable to get into any position that would allow me to assess such
- Patient had regular menses and had undergone bilateral tubal ligation 1 year previously
- No hormone therapy

Definition of Pain

Pain is an unpleasant sensory and emotional experience which follows actual or potential tissue damage or is described in terms of such damage

Pain only occurs when you are injured?
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Major Challenge: Hypervigilant CNS

The BIG picture

In a Biopsychosocial Approach...

Threats...
The Growing body of evidence suggests strategies aimed at structurally increasing the brain as a means to treat chronic pain.

- Gray matter changes found in patients with chronic pain may not reflect true brain damage but rather a reversible consequence of the pain experience.
- Treatments aimed at altering information to the brain (affecting nociception, education, etc.) have shown the ability to restore gray matter to the brain in chronic pain states.

**Plasticity**

- Increasing body of evidence suggest strategies aimed at structurally reorganizing the brain as a means to treat chronic pain.

**Plasticity throughout the NS**

- Ion channels (PNS... another talk!)
- Spinal cord (up-regulation)
- Blood brain barrier (glia)
- Brain Maps (somatosensory homunculus)
- Neuromatrix (pain neurosignature)
- And more!

**From the PNS to the CNS...**

**Input into the CNS**

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Think of it this way...

Central Sensitization/Nociplastic

- C-fibers pull back
- A-beta fibers grow in
End-Result?

<table>
<thead>
<tr>
<th>Process</th>
<th>Consequence</th>
</tr>
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<tbody>
<tr>
<td>• Death of the inhibitory interneurons</td>
<td>• Decreased gating from the periphery</td>
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Injury to a peripheral nerve and electrical stimulation of C-fibers each cause an increase in the permeability of the blood-spinal cord barrier and blood-brain barrier...within hours!

Glia in the Spinal Cord

• Neuroglia (Greek for "glue"), classically = cells that provide metabolic and structural support, but also:
  • Establish and maintain synapses
  • Regeneration and plasticity
  • Myelin formation and repair
  • Immune function
  • Outnumber neurons >10 to 1

It happens fast

Neglect, Pain & Divorce


“This is not mine”

- Distortions of the mental image of their limb / body part
- Missing components or alterations in shape, posture, and temperature of the whole limb or of discrete parts of the limb / body part.

Virtual Disturbances

- People with longstanding CRPS tend to perceive their affected limb to be larger than it really is
- CRPS patient believes the hand feels 107% bigger
- Hurts more when it looks bigger
- Does not move different
- More swelling when it looks bigger

Threat

- Where is it?
- Looks bigger
- Low Threat
- High Threat
- Movement
- What isn’t it?

The Brain: “Tell me more…”

- Pain spreads
- Function declines
- Pain Neuromatrix: Let’s start with an Experiment
- Actually…”


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1. Nociception
2. Memories
3. Beliefs
4. Sounds
5. Anxiety
6. Smells
7. Sights

Nerves that fire together, wire together

Definition of Pain: Update

Facilitation

“Tell me more”
Inhibition

“Stop bugging me”

Descending Modulation...

Not great for intimacy...

Assessment and Treatment

What you should ask:

- Are these changes occurring in my patient?
- How do I test for it?
- If they’re present, what do I do for it?

Identifying Central Sensitization

- Symptom and sign cluster (486 times) for CS
- Disproportionate pain
- Disproportionate aggravating and easing factors
- Diffuse palpation tenderness
- Psychosocial issues
- Fear-Avoidance
- Pain Catastrophization
- Depression

Clinical Clues: CS

- Extreme pain
- Sensitivity to touch
- Widespread sensitivity
- Allodynia
- Hyperalgesia
- Central Sensitization/Nociplastic Pain
Clinical Clues: Plasticity

- Chronic pain
- Presence of CS
- Hyperalgesia
- Allodynia
- Spreading pain
- Mirror pain
- Problems with left/right recognition (since onset of pain)

Clinical Clues: Plasticity

- Neglect:
  - Body part does not “feel” the same as the other side
  - Body part feels like it does not belong
  - Statements about removal of the body part (to ease pain)
  - Feels like it’s in a different place/position
  - Size descriptions
    - Larger
    - Smaller

Clinical Clues: Plasticity

- “Outside of body” experiences
- Weird sensations – “fullness, swelling (without being swollen)
- Temperature changes
  - Warmer
  - Cooler
  - Other

Central Sensitization Inventory


Musculoskeletal Pain?

Disproportionate?

No CS

Diffuse Pain?

CS Inventory ≥ 40

No = No CS

Yes = CS

Smudging: Quick Screen?


“ I can’t find it!”
Testing Neuroplastic Changes

- In a research setting:
  - fMRI
  - PET
  - TMS
  - MEG
- In a clinical setting:
  - *Body chart
  - Laterality
  - Sensory testing
  - Two-point discrimination
  - Localization

Assessing Laterality

What’s normal?

- Accuracy of >80%
- 1.6 sec +/- 0.5 for necks and backs
- 2 sec +/- 0.5 for hands and feet
- Laterality testing for my patient case:
  - 25% accuracy feet/legs, 40% hands/arms
  - Speed: 5 seconds hands/feet

Localization testing...

- Where was I touched?
- Stimulus from clinician then identification from patient
- Impaired tactile acuity relates to impaired motor control

Localization testing
Treatement: Graded Motor Imagery...

GMI is a structured, sequential series of cortical exercises, aimed at reestablishing cortical changes in patients with the intent of decreasing CS and the pain experience.

Graded Motor Imagery...

GMI has been shown to decrease pain and sensitivity and improve movement and function in CS-dominant clinical presentations such as CRPS and chronic low back pain.

Graded Motor Imagery...

GMI utilizes various cortical remapping strategies such as normalizing a person's ability to recognize left or right body parts or movements (laterality), motor imagery or visualization of static and dynamic use of a body part and mirror therapy.

Graded Motor Imagery...

Focus placed on synaptic exercises and health
• Brain exercises versus muscle/joint
• The test becomes...the treatment

Sensory Discrimination

• Rather than “desensitization”
• Make the output match the input
  • Two-point discrimination
  • Graphesthesia
  • Localization
  • Sharp/dull
  • Directional
  • Textures
  • Sounds
  • Taste
  • Risa, beams
  • Etc.
Neuroplasticity Principles
✓ Use it or lose it – Training induced cortical changes in as little as 15-30 minutes
✓ Use It and Improve It – Perfect practice makes perfect
✓ Specificity - nature of training dictates nature of plasticity
✓ Repetition - requires sufficient repetition
✓ Intensity - requires sufficient training intensity

Classic Rehabilitation...
- Do part of movement but no painful part
- Do part of movement with painful part
- Do more
- Increase number
- Increase strength
- Add equipment

Proposed Treatment
- Pain Neuroscience Education
- Graded Motor Imagery
- Sensory Discrimination
- Movement, R.O.M.
- Motor Control
- Function
- Traditional therapy
- Regular Therapy
- Prehabilitation

Sequence?
It may work best if carried out in the sequence of:
- Laterality recognition
- Motor imagery
- Mirror therapy

GMI & Sensory Integration Treatment Options
- Laterality
  - Left/right touch
  - Flash cards
- Sensory discrimination
  - Stereognosis
  - Graphesthesia
  - Warm/cold/soft/firm/etc.
- Motor Imagery
  - Visualization of self or others doing activity
- Graded exposure
  - To painful activity
  - Mirror therapy
  - Can be used in conjunction with other activities
- Mindfulness
  - With a focus on sensory awareness
  - "Can you describe what you are feeling without using the word pain or a synonym for pain?"

Laterality
- Laterality:
  - Flash cards
  - Smartphone application
  - Magazines
  - Observing people’s left and right
  - 1-2 hours per day in short sessions using 20 images

Treatment Application - Patient Case

- Boundary set regarding appointment arrival via in person (cancel > 24 hours notice) or telehealth (switch > 2 hours notice)
- Pain neuroscience education (they were very receptive)
- Worked on slow breathing instead of deep breathing (6 sec inhale/exhale)
- Encouraged yoga as well as pursuit of their creative outlets (writing, dance)
- Started with feet
  - Sensory discrimination - warm/cool, firm (rice/beans)/soft (cotton balls)
  - Stereognosis (finding items in rice or beans)

Patient Case - Treatment

- After 3 sessions (1st in person, 2 via Zoom), patient was able to allow moderate and deep palpation to their abdomen
  - Added in graphesthesia to feet, abdomen, and back
  - Using hands placed at rib cage to visualize warming/melting sensation down to pelvis
  - Left/right discrimination using flash cards of feet
  - Mirror imagery using pants
  - Progressive use of pants
    - Touch
    - Vibration
    - Over feet
    - Over knees
    - Over hips
    - Varying fabrics & tightness

Outcomes

- Patient seen weekly x 12 weeks, every other week x 6 months
- Able to go for daily walks, spend time with friends, tolerate >6 hour car rides
- Still have pain during PMS (1-2 days) and during their trauma-versary and occasionally use dildo
- Able to wear pants, though during more painful days they avoid tight pants
- They have started community college classes

Lab

- Let's try it out!
  - Left/right discrimination
  - Graphesthesia
  - Stereognosis
  - Walking someone through visualization of a challenging experience (demo)
Questions?

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