PAIN & PARTICIPATION: The two-way dilemma

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Objectives:

1. Define kinesiology principles that provide a basis for common occupational therapy interventions.
2. Identify the relationship between pain response and levels of functional participation.
3. Apply kinesthetic approaches that may have an impact on reducing the initial pain response and facilitating overall positive outcomes for clients across the lifespan.
Pain hurts, but muscle disuse leads to...
Kinesiology: the true definition...

A complex triad of:
- Anatomical,
- Physiological, &
- Psychological components that work together to impact functional movement

Harmony, Hitchin
The Relationship between Pain & Movement
Pain: defined
Pain Receptors / Nociceptors

- Free nerve endings that respond to damaged tissue, changes in chemical levels, mechanical damage, temperature extremes, oxygen levels, and blood flow
- Role = to protect the body
- Very minimal adaptation – once a pain receptor is activated, it continues to send impulses to the brain
Pain Receptors / Nociceptors

• Found in:
  ✓ dermis of the skin,
  ✓ connective tissue membranes,
  ✓ muscles,
  ✓ tendons,
  ✓ organs

...NOT in the brain
How is Pain Sensed?
Pain Pathway

The Pain Pathway

1. Site of injury
2. Spinal cord
3. Brainstem
4. Cerebrum (coronal section)

Cerebral Cortex

Thalamus

Brainstem

Dorsal Root Ganglia

Pain Receptors
Where is Pain Processed?
**Limbic system:**
found in the medial parts of the frontal and temporal lobes and connects with the hypothalamus, thalamus, basal nuclei, and other deep nuclei.

**Function:**
Controls our emotional experience, our expression, and how we react when threatened, upset, angry, etc.

It also play a small role in olfactory response.
Limbic System - Influence on Participation

1. Fear prevents the willingness to move at full capacity
   a) Kinesiophobia
   b) Catastrophizing

2. May be used in the process of bypassing painful sensation and/or fear of pain
   a) Placebo effect
   b) Virtual reality
Kinesiophobia: “Fear of movement”
Tampa Scale of Kinesiophobia

• Originally developed for patients with musculoskeletal pain.
• Consists of 17 statements capturing the idea that pain is a signal for (re)injury because of physical activity or certain movements.
• Respondents are asked to indicate their level of agreement on a 4-point rating scale.
Catastrophizing

- is an irrational thought resulting in the belief that something is far worse than it actually is
- Two different forms:
  - making a catastrophe out of a current situation
  - imagining making a catastrophe out of a future situation
Relationship between Pain & the Phases of Movement
Phases of Movement:

• 1. Preparation
• 2. Initiation
• 3. Action
• 4. Follow through
Motivation to Move

✓ Gain Trust
  ✓ Acknowledge patient’s current perception of their pain
  ✓ Allow them to express their fear of pain
  ✓ Share your knowledge and understanding of the pain pathway
  ✓ Establish agreements & stick to what is decided

✓ Utilize a team approach (i.e. medication regiment)

✓ Be a cheerleader & coach

✓ Incorporate FUN into treatment as much as possible
Pain Scale
**Borg RPE Scale (Rate of Perceived Exertion)**

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
<th>Note</th>
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<tbody>
<tr>
<td>6</td>
<td>Very, very light</td>
<td>How you feel when lying in bed or sitting in a chair relaxed. Little or no effort</td>
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<tr>
<td>7</td>
<td>Very light</td>
<td></td>
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<tr>
<td>8</td>
<td>Fairly light</td>
<td></td>
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<tr>
<td>9</td>
<td>Somewhat hard</td>
<td>Target range: How you should feel with exercise or activity</td>
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<tr>
<td>10</td>
<td>Hard</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Very hard</td>
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</tr>
<tr>
<td>12</td>
<td>Maximum exertion</td>
<td>How you felt with the hardest work you have ever done.</td>
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<td>19</td>
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<tr>
<td>20</td>
<td></td>
<td>Don't work this hard!</td>
</tr>
</tbody>
</table>
Interventions

I. Kinesiotaping

II. Virtual Reality
   i. Non-immersive
   ii. Immersive

III. Mirror Biofeedback Therapy
Kinesiotaping - Purpose

• Reduce inflammation
• Reduce pain
• Promote circulation and tissue healing
Kinesiotaping - General Principles

- Use of ‘I’, ‘X’, ‘Y’, or modifications
- Direction
  - Rehabilitative
  - Supportive
- Amount of stretch
- Location
How does kinesiotaping reduce pain?

- Lifting properties to increase circulation
  - Lymphatic fluid
  - Blood flow
- Does not limit range of motion
Terminology:

**Origin:**
fixed end of the muscle; the attachment on the bone that does not move.

**Insertion:**
site of attachment of the muscle on the bone that moves.
Virtual Reality

- **Non-immersive Virtual Reality** - senses are only partially subsumed, leaving peripheral awareness of the environment outside of the stimulation
  - Mirror feedback
  - Wii / video games
  - Smart clothing (watch for this in the future – Xenoma)

- **Immersive Virtual Reality** - uses stereoscopic goggles that provide 3D imagery through a tracking device to capture head and body movement or a data glove that tracks hand movements
How can VR reduce perceived pain?

• Theory:
  • Humans have a limited capacity to attention and therefore must attend to a painful stimulus to perceive pain
  • If the individual is attending to another stimuli away from the noxious stimuli they will perceive the painful stimulus as less intense
How can VR reduce perceived pain?

VR is the “ultimate distractor” because it:
1. integrates multimodal (visual, auditory, and tactile) sensory distractions
2. requires total attention
3. Requires active emotional involvement
4. Is able to compete with the noxious stimulus
Virtual Reality

- Studies show that VR can be a useful analgesic to increase active ROM and participation
  - Short duration only
  - During early onset of pain

Dr. Sam Sharar/University of Washington
Virtual Reality

Found to have positive effects on pain reduction with patients who have experienced:

- Burns
- Invasive procedures/surgeries
- Amputations
- Cancer related pain
Virtual Reality - Potential Side Effects

- Dizziness
- Emotional discomfort
- Depressive mood
- Muscle twitching
- Simulator sickness
Mirror Biofeedback Therapy

• First introduced on patients with phantom limb pain in 1996.
• Since 2015, MT has been recognized as a treatment that induces changes in the cortical activity of the brain.
• Also found to be helpful in reducing pain for patients who have been diagnosed with:
  • Spinal cord injury
  • Complex regional pain syndrome
  • CVA hemiparesis
How can MT reduce perceived pain?

- Visual input dominates other somatosensory efferent signals for proprioceptive perception in the brain.
- In fact, the motor cortex becomes activated even by looking at the movement of another person’s extremity.
- MT causes the brain to recognize the reflected visual feedback as a well-functioning limb image, thereby inducing neuro-plasticity of the part of the brain that is in charge of the contralateral body part.

Koo et.al (2018)


