PAIN & PARTICIPATION:
The two-way dilemma

MiOTA Conference
October 14, 2018

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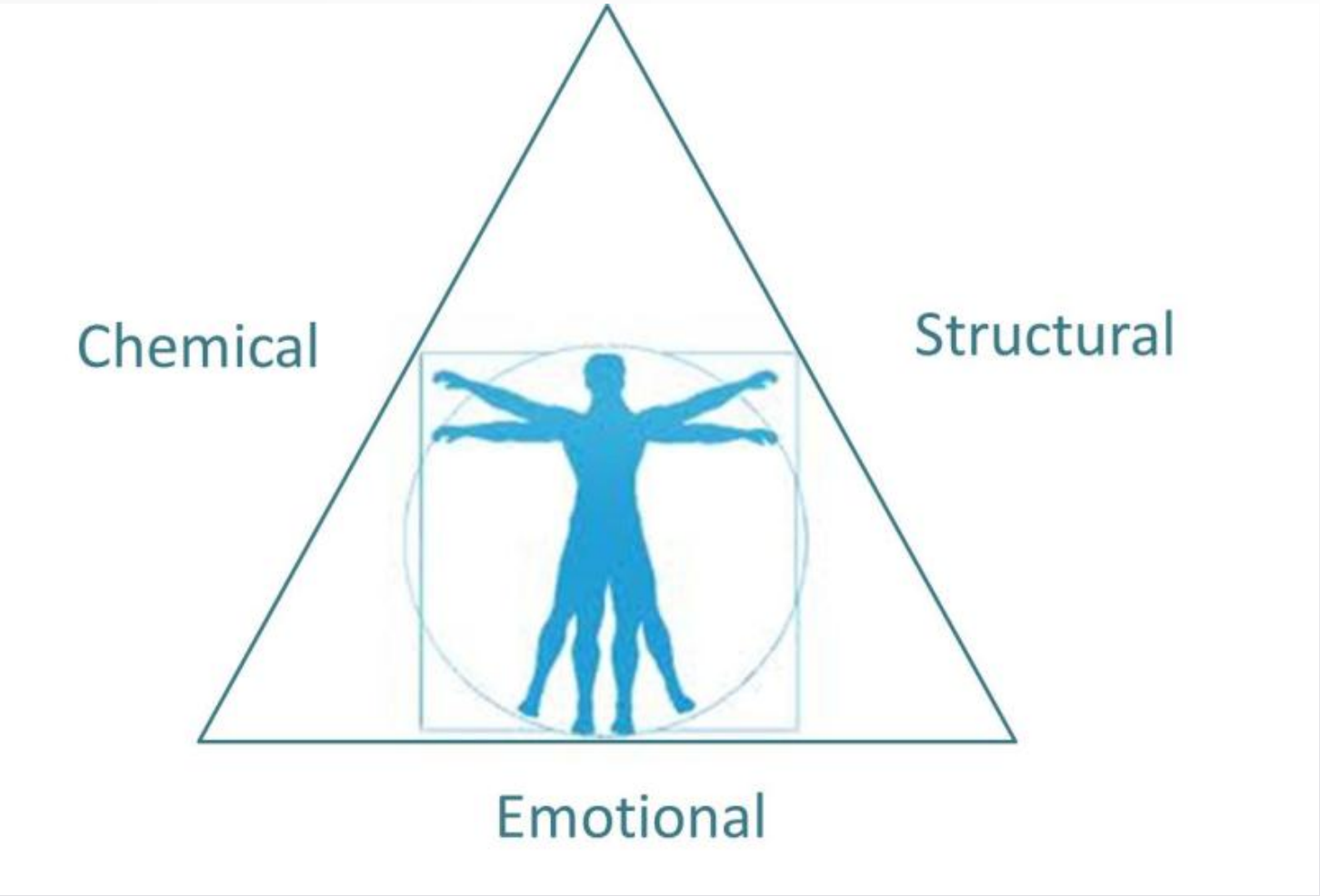
Objectives:

- 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…



Harmony, Hitchin

Kinesiology: *the true definition…*

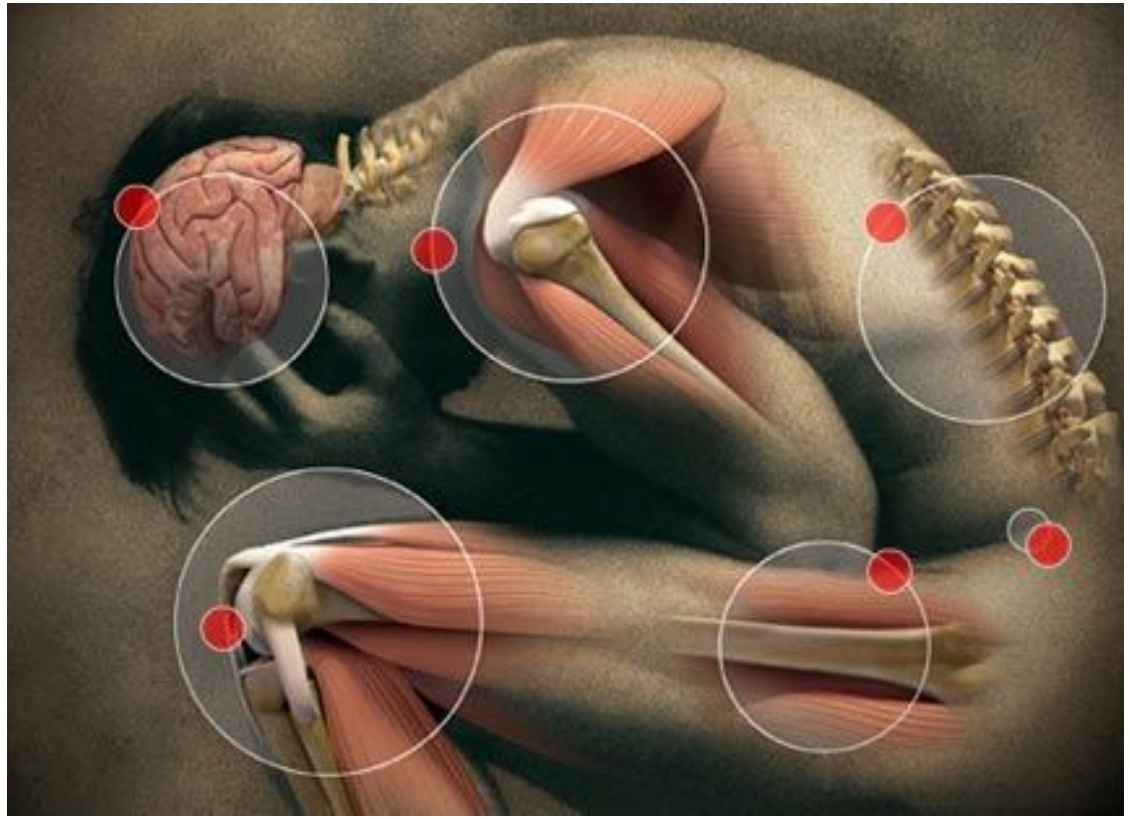
A complex triad of:

- **Anatomical**,
- **Physiological**, &
- **Psychological**

components that work together to impact functional movement

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

Neurowiki2014.wikidot.com

Cerebral Cortex

↑

Thalamus

↑

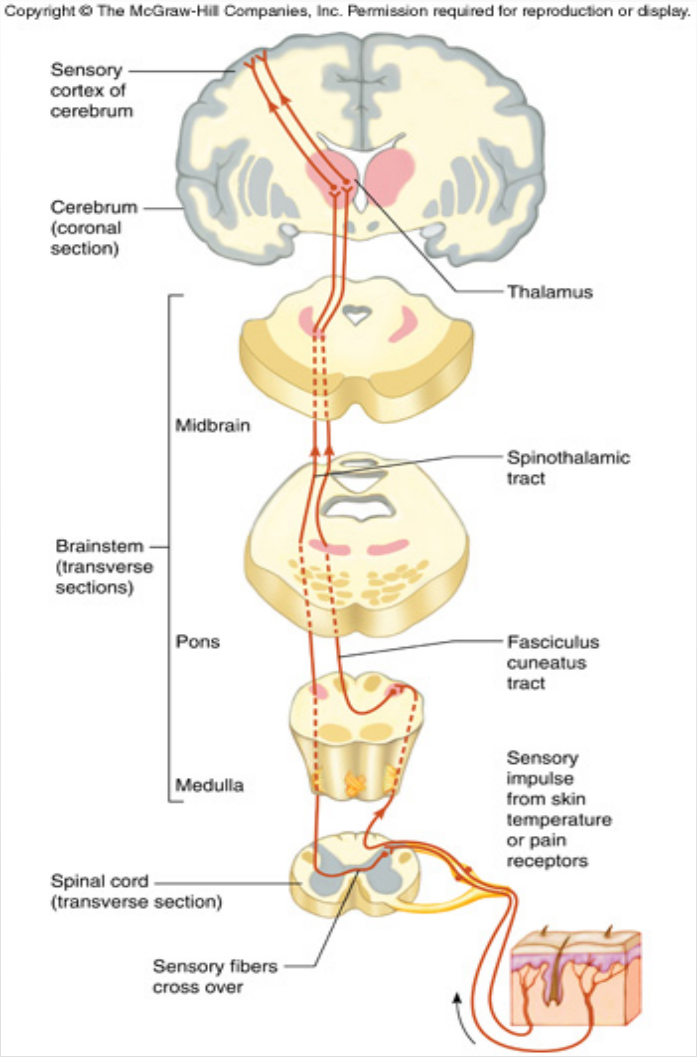
Brainstem

↑

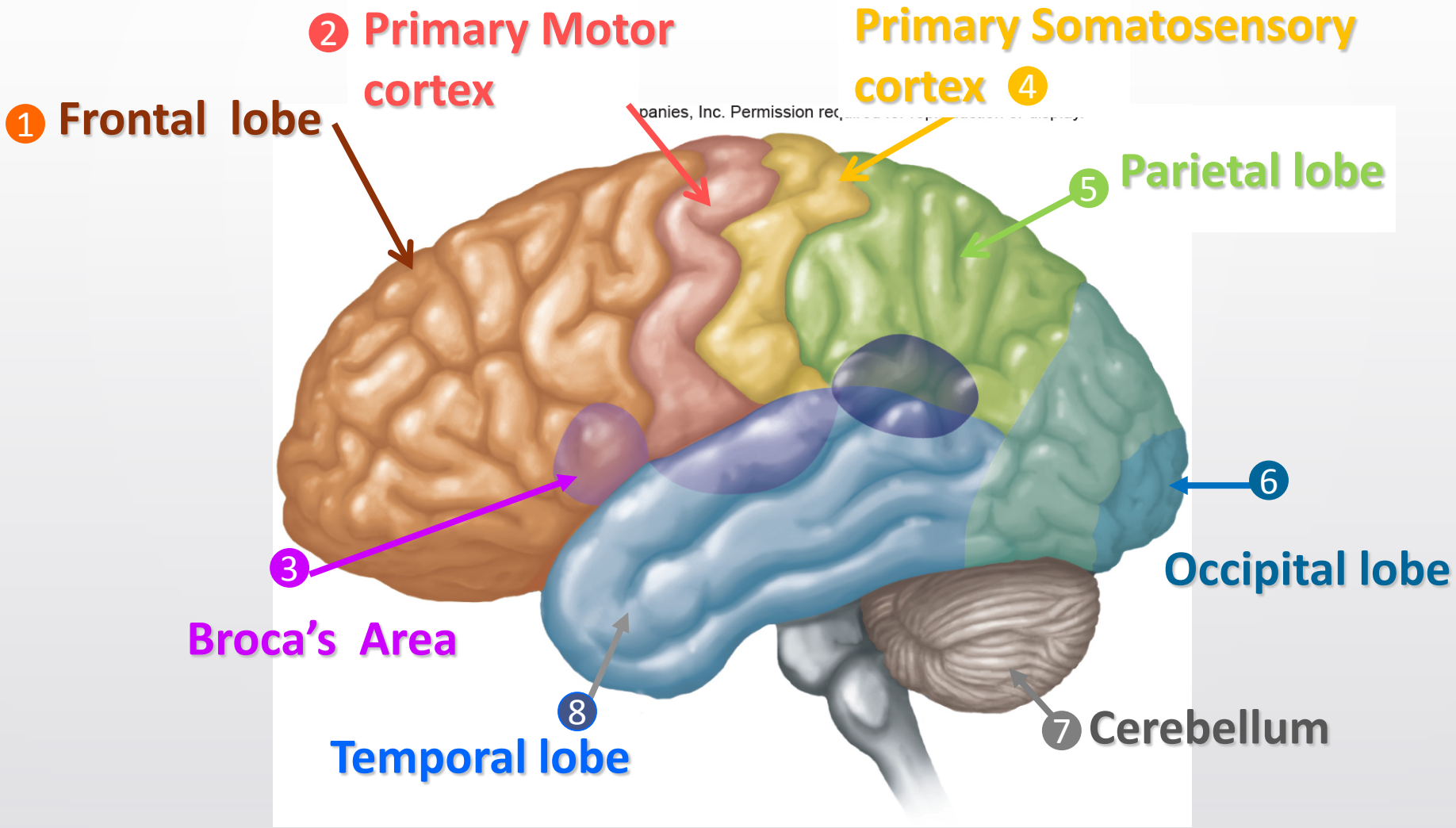
Dorsal Root Ganglia

↑

Pain Receptors

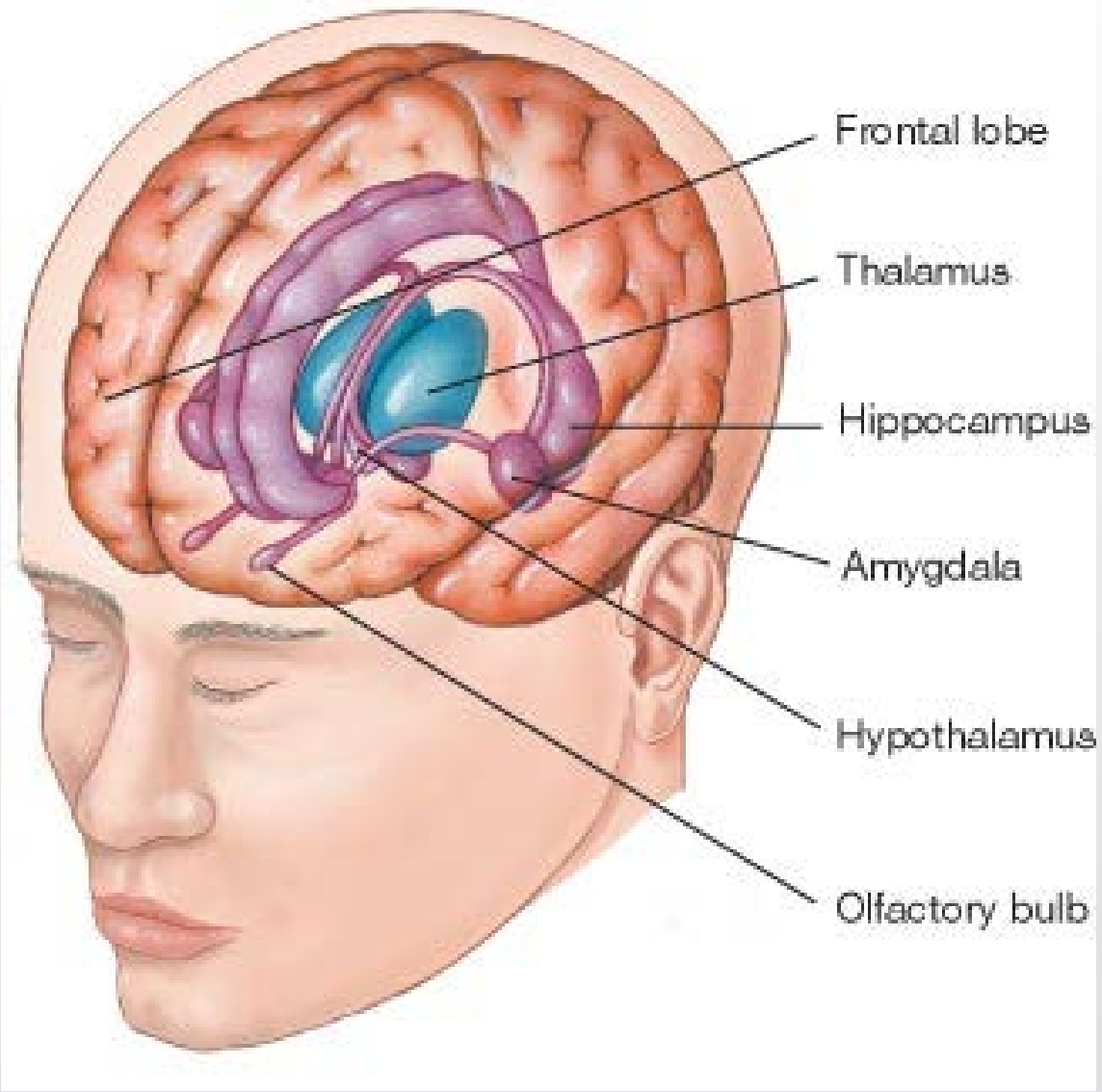


Where is Pain Processed?


1 Frontal lobe
2 Primary Motor cortex
Primary Somatosensory cortex 4
panies, Inc. Permission rec
5 Parietal lobe
6
Occipital lobe
3
Broca's Area
8
Temporal lobe
7 Cerebellum

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.

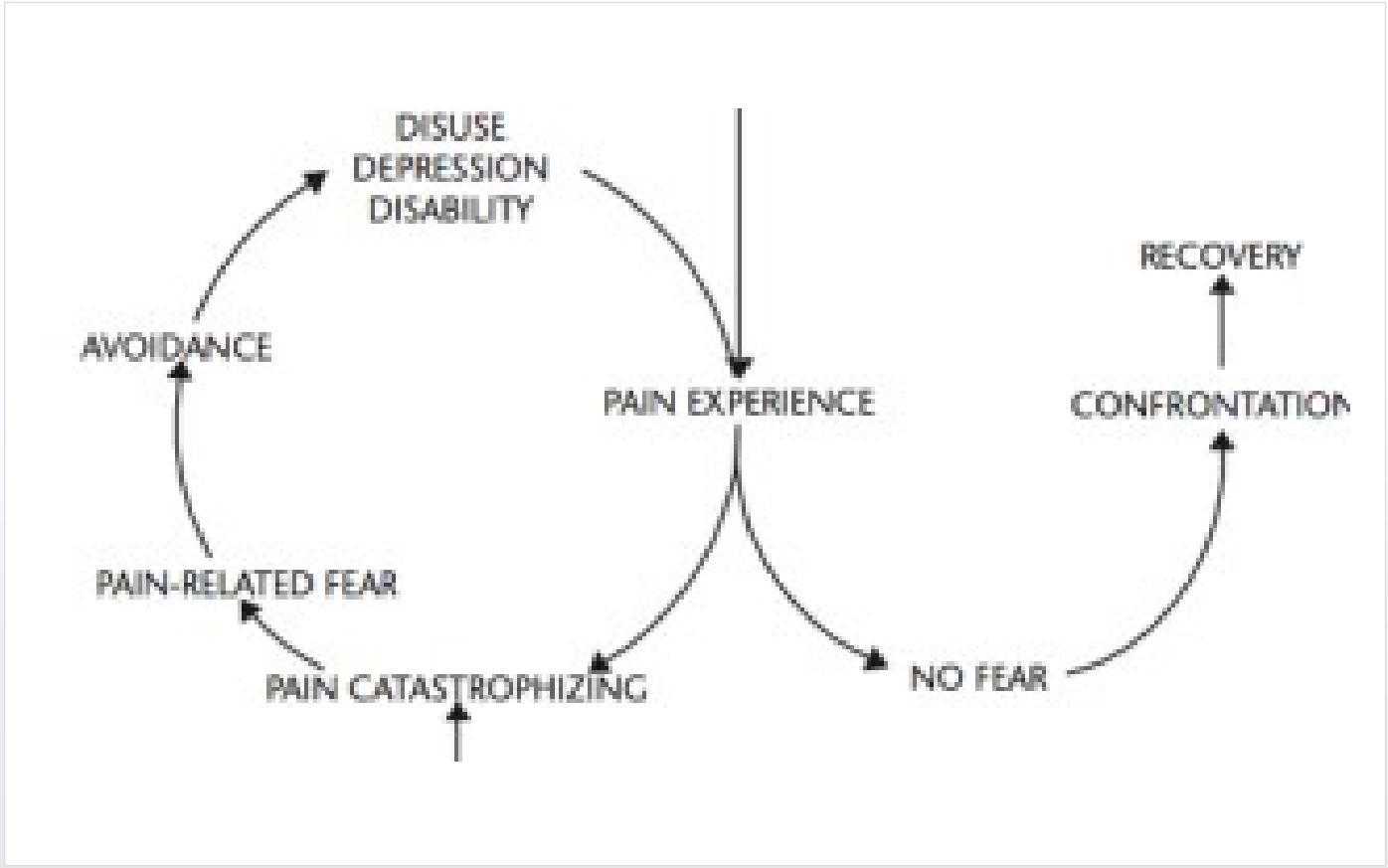
It also play a small role in olfactory response.

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"

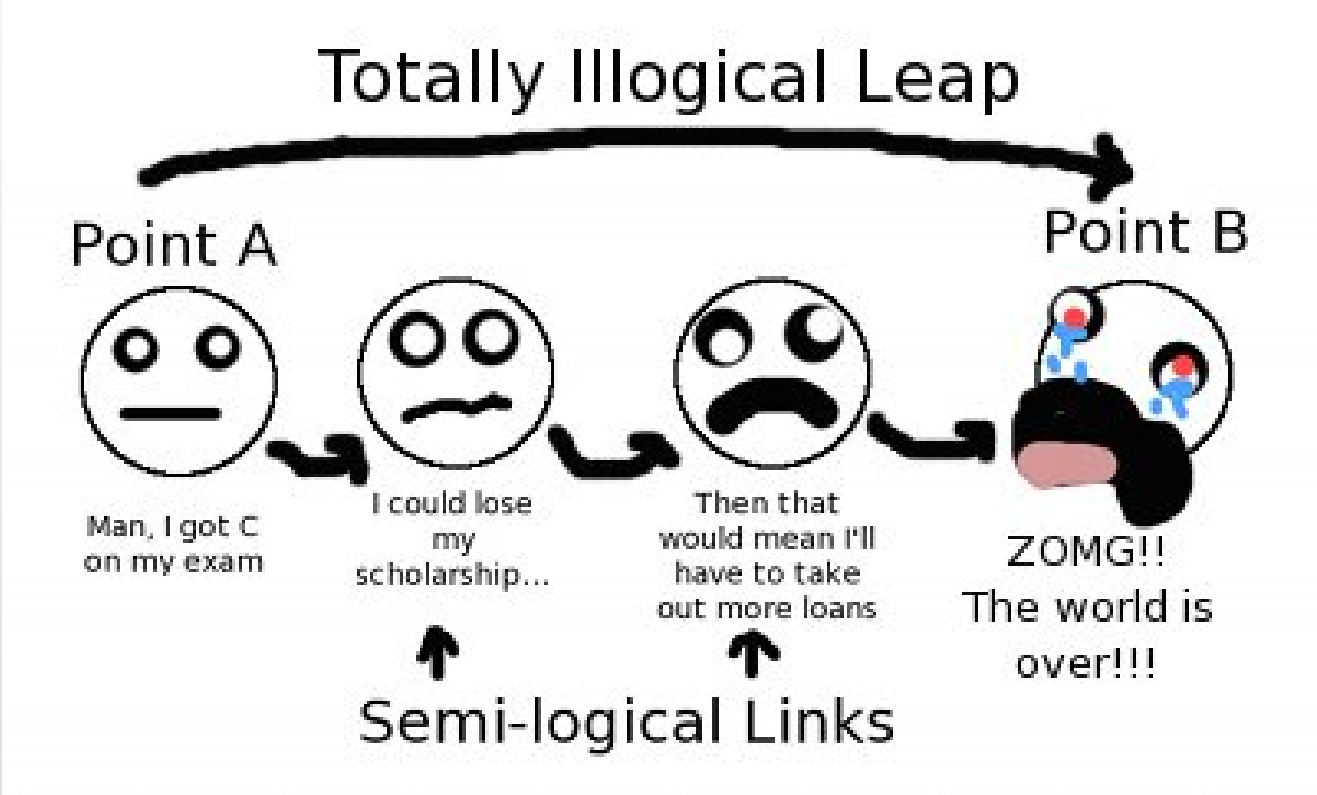


Tampa Scale of Kinesiophobia

- 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



Artofmanliness.com

Relationship between Pain & the Phases of Movement

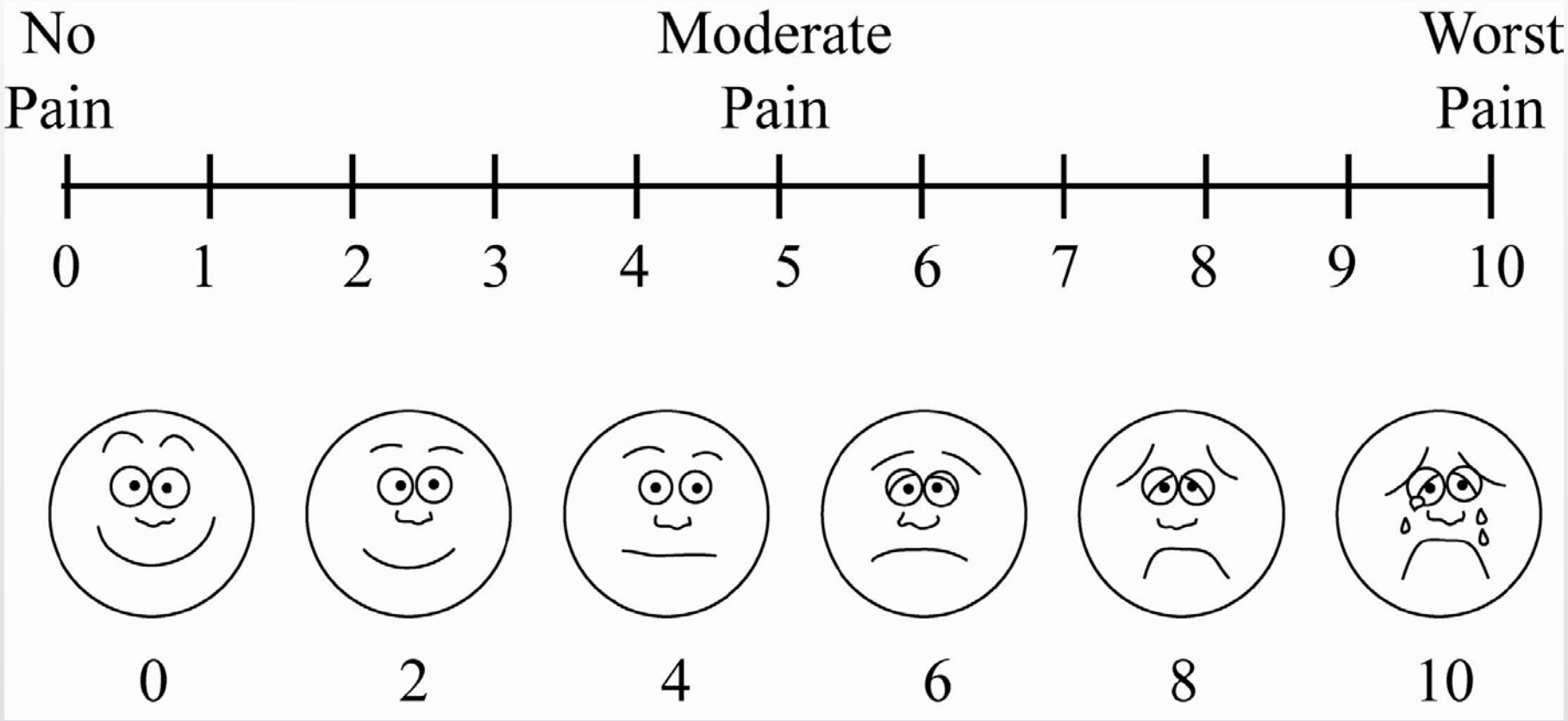
Phases of Movement:

- 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)

Rating of Perceived Exertion Borg RPE Scale		
6		How you feel when lying in bed or sitting in a chare relaxed. Little or no effort
7	Very, very light	
8		
9	Very light	
10		
11	Fairly light	
12		Target range: How you should feel with exercise or activity
13	Somewhat hard	
14		
15	Hard	
16		
17	Very hard	How you felt with the hardest work you have ever done.
18		
19	Very, very hard	
20	Maximum exertion	Don't work this hard!

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

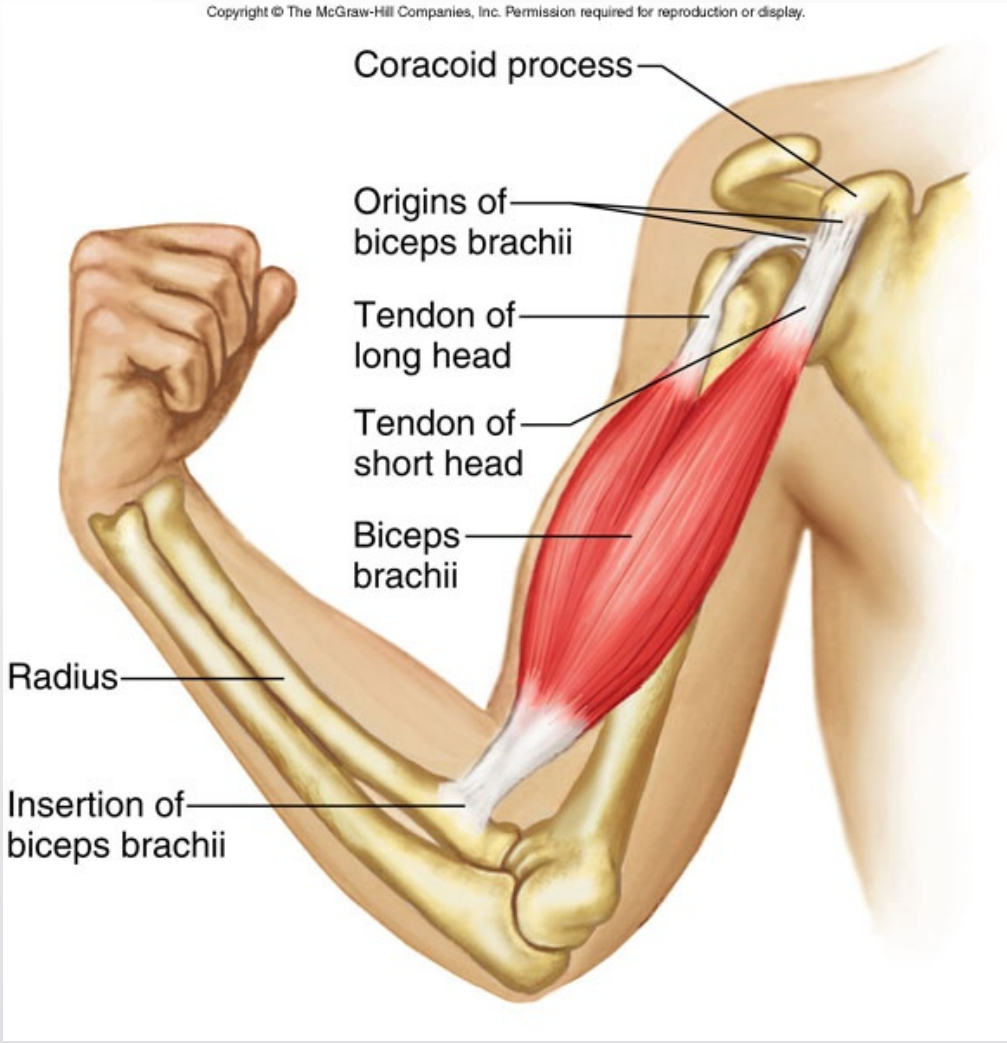
Terminology:

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

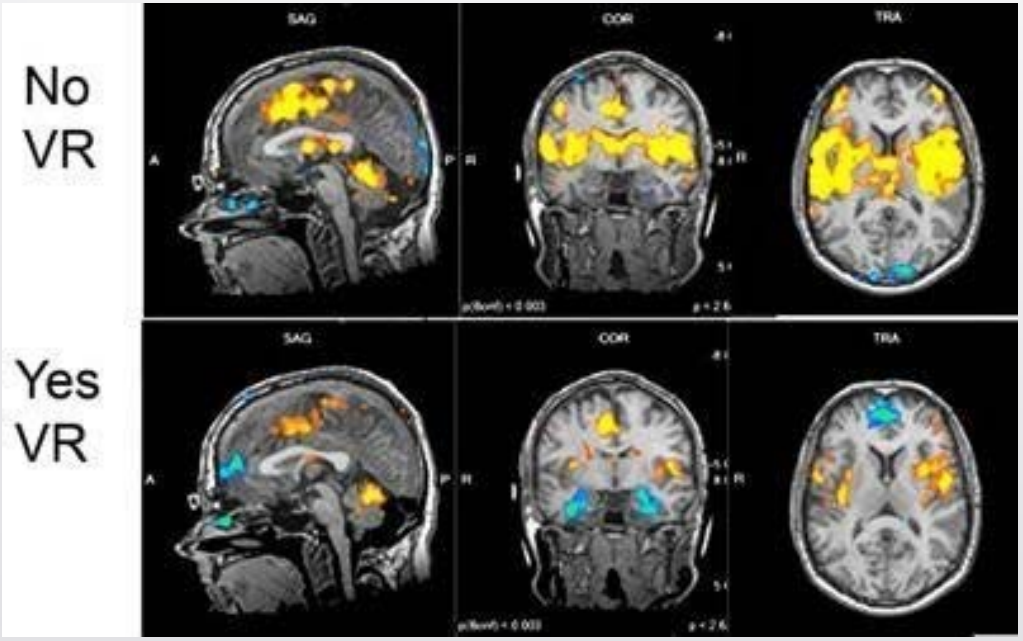
How can VR reduce perceived pain?

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

pain.jpg

Virtual Reality



Dr. Sam Sharar/University of Washington)

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

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)

Q&A

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