Brain, Pain, Beliefs and Pleasure

Neuroplastic Transformation
Let the Good Times Roll
Neuroplasticity

- Definition—the anatomical and physiological changes in the brain/body that occur from new learning
- Special senses bring in constant brain altering data
- The Brain/Body—every cell is connected to the brain for input and output
- Neuroplasticity occurs in the PNS, spinal cord and brain
- This is a highly energetic process—brain uses 20% of the body’s energy
Short Term Potentiation
Short Term Depression
Long Term Potentiation
Long Term Depression
Neuroplasticity rules:
What is fired is wired

- Everything we learn causes new connections to form and old connections to break based upon this principle.
- The more we repeat something the stronger and more numerous the connections.
- More connections means that we have become more skilled in the learned activity.
- Every thing we do well has been improved by repetition and practice.
Neuroplasticity rules: Use it or lose it

- When we stop doing something, the connections melt away.
- The longer we stop doing something the more connections are lost.
- Some things are repeated frequently enough that even if we stop we maintain the ability to recapture the activity quickly when we start doing it again.
- Reading, riding a bike are examples.
Neuroplasticity rules:
When you make ‘em you break ‘em; when your break ‘em you make ‘em

- The brain uses 20% of the body’s energy supply.
- Synapses use energy to change electrical signals into chemical processes and back into electrical signals.
- Making or breaking a synapse uses energy.
- No new connections can be made without breaking old ones.
Head on Collision

- 56 year old woman with 30 years of back pain, due to scoliosis—once or twice a year it would be severe enough to put her in bed
- 13 years of neuropathic pain in right hand due to injury cutting all tendons and nerves
- CRPS secondary to the hand injury
- October, 2009 accident with severe head injury, brain surgery and deep coma for 2 and 1/2 weeks
Head on Collision
Head on Collision

- Awakened from coma
- 10th rib and 10th vertebra fractured and very painful
- Low back pain gone
- CRPS gone
- Neuropathic hand pain gone
- Rib and vertebra healed in two months—Low back, CRPS and Neuropathic pain never returned
- What happened?
Phases of Treatment: Reject the idea of the inevitability of persistent pain

1. Rescue Phase: Help the person out of unbearable pain
2. Stabilization Phase: Stabilize patient in a multimodal treatment program
3. Restorative Phase: Rebalance and focus on function
4. Transformative Phase: Replace pain with Pleasure
Every pain treatment alters the brain

- There is no peripheral treatment
- Pain is only perceived in the cerebral cortex
- If pain processing is not reduced there, pain cannot be decreased
- Pain can be successfully treated from the periphery to alter brain-based pain processing or from the brain to alter peripheral processes
- Ultimate successful treatment of persistent pain must alter the constantly cycling brain/body loop
SHRINK THE PAIN MAP BY FLOODING THE BRAIN WITH:

Thoughts.....Images.....Sensations.....Memories.....Soothing Emotions.....Movement......Beliefs

**Prefrontal**  
- Pain, Executive Function, Creativity, Planning, Empathy, Action, Emotional balance, Intuition, Morality

**Anterior Cingulate**  
- Pain, Emotional self control, Sympathetic control, Conflict detection, Problem solving

**Somatosensory 1 & 2**  
- Pain, Temperature, Pressure, Touch, Position, Vibration, Sensation of movement

**Posterior Parietal**  
- Pain, Sensory, Visual, Auditory Perception, Mirror neurons, Internal location of stimuli, Location of external space

**Supplementary Motor**  
- Pain, Planned movement, Mirror neurons

**Insula**  
- Pain, Temperature, Itch, Empathy, Emotional self Awareness, Quiets the amygdala, Sensual touch, Connects emotion with bodily sensation, Mirror neurons, disgust

**Amygdala**  
- Pain, Emotion, Emotional Memory, Emotional response, Pleasure, Sight, Smell, Fight, Flight, Freeze, Emotional extremes

**Posterior Cingulate**  
- Pain, Visuospatial cognition, Autobiographical memory retrieval
Thoughts

- Intention must be to change the brain back to normal pain perception and peripheral adjustment to the body.
- Direct intervention at the highest functioning brain, the associational corteces.
- The danger of damage with normal activity is nil.
- If the brain can learn persistent pain, it can relearn normal acute pain, an alarm that stops when danger passes.
- Use simple thoughts: “disconnect the network, shrink the map, no pain in the brain.”
Images

- Use images of the brain map expanded and raging in persistent pain
- Use another image of the brain without activated pain areas
- Animations of pain networks connecting and disconnecting, long term depression of pain signals
- Use these and other images to disconnect networks, shrink the pain map and stop long term potentiated pain signaling
- Focus on brain imagery and brain-body loop
Sensations

- Use peppermint to block pain transmitters and stimulate cold receptors to send signal to S1
- Use citrus scents to evoke pleasure
- Use brain music to slow constant pain nerve firing and make nerves harder to fire even after you stop listening
- Use music to stimulate and soothe
- Pay attention to pain stimulus to separate out pain from vibration, pressure, touch, movement, position, hot, cold
- Look at things that evoke pleasure
- Self-massage, soothing touch
Memories

- Remember how your body felt before the persistent pain took over.
- Involve family and friends in talking about activities done before injury.
- Stop avoiding the memory of how they felt before they were injured.
- During pain spikes patients should flood the brain with memories of how they felt and who they were before pain. If this brings up negative emotions, reject them.
Soothing Emotions

- Identify negative emotions as being stuck in the amygdala paralyzing higher associational cortices.
- Taming the wild amygdala: insula, orbital frontal cortex, ventral medial prefrontal cortex, anterior cingulate cortex, posterior cingulate cortex have to be turned back on.
- Rewire by rewriting personal narrative. Reject negative emotions as counterproductive and having nothing to do with the your self-image and everything to do with promoting persistent pain.
- Serenity, relaxation, empathy, gratitude, calm.
Movement

- Movement is not dangerous
- Imitate healthy pain free body if pain is assymmetrical
- Start with a movement enjoyed in the past, but only in limited way, building up repetitions over time
- Plan movement consciously to evoke Supplementary Motor Area
- Move to change the brain-body loop
- If pain prevents movement, think about and visualize moving without pain
Belief

- We hold onto our beliefs fiercely, including our misconceptions about pain.
- Belief increases activity in the posterior parietal cortex, the primary somatosensory cortex and the secondary somatosensory cortex.
- The same part of the brain is a major pain processing area.
- Most important belief to bring up when pain spikes is that the pain can be stopped by believing it can be stopped.
- This belief allows patients to continue to practice opposing pain during early lack of success.
Pain

Belief
Transformation

- “We have to grab your full attention”
- “Right now your pain has your full attention”
- “You have to practice to change this pattern”
- “If you can train your brain to read you can retrain your brain to block the pain and break up the brain-body loop of constant pain.”
- “This is a treatment partnership. We succeed and fail together.”
- *Days of passive treatment are over.*
The Cure For Persistent Pain:
PERSISTENT PLEASURE

- Our basic imperative and that of all species is survival
- In its most elemental form this is accomplished by the avoidance of pain and the pursuit of pleasure
- People with persistent pain spend the vast majority of their time avoiding pain and pleasure
- For some, persistent pain induced brain change leads to avoiding pleasure and pursuing pain
Pleasure: Brain Hedonics

- This is a new field dedicated to studying Pleasure Circuits in the brain
- What gives us pleasure?
- How does the brain perceive pleasure?
- Is there a pleasure center?
What happens to people with persistent pain?

- Persistent pain leads to the trade off of the warm comfort of intimacy for the cold embrace of loneliness.
- Loneliness is not about being alone: It is about feeling unlovable, undesirable, untouchable, self-loathing, self-disgust.
- Intimacy is what we all strive for: feeling deserving of love, affection, contentedness, attunement, happiness.
- Pain is the absence of pleasure.
Pleasure circuits of the brain

- Amygdala is the conduit to and from regions below the thinking brain and thinking brain
- 3/4 of Amygdala is below thinking and 1/4 is thinking brain
- Pain and Pleasure are first perceived in the Amygdala
- From there they are essentially the same circuit
The Hedonic Brain

- The human Orbital Frontal Cortex is linked to determining if an experience is pleasant or unpleasant, sending this information back and forth to the Anterior Cingulate Cortex, Insula and Amygdala (hedonic circuit).

- All experiences have hedonic and emotional tones.

- GABA, endorphins, endocannabinoids, oxytocin, vasopressin are about pleasure (liking) and paint all the senses with a positive gloss.

- Human sexual response starts with the Amygdala and Orbital Medial Frontal Cortex and ends with a pan-sensory immersion in pleasure chemistry all over the brain.
Neuroplastic Transformation

- **Pleasure is the absence of pain**
  - Patient instructed to make a two column list: Pain I want to avoid/Pleasure I want to pursue
  - This is reviewed with the patient and suggestions made
  - Patient is asked to gather a Pleasure Pack using multisensory stimuli
  - One day a week is dedicated to going on a Pleasure Hunt and this is increased with each subsequent visit
The greatest pleasure: Loving and being loved

- In the Insula we experience the ability to read our own physical sensations and attach those to an emotional response
- Mirror neurons in the Insula allow us to experience our own physical and emotional sensations based upon what we observe and perceive in others
- Love lights up pleasure centers in the Orbital Frontal Cortex, Insula and Amygdala
- Nucleus Accumbens, Ventral Pallidum involved in romantic and maternal love, spinal shivers, pleasure of listening to music- only respond to pleasurable stimuli
“Love is all we need” - Lennon and McCartney

- What is Happiness?
- We can measure liking (hedonics), but not happiness
- Love is how we are first wired (loving maternal touch, sounds, vibrations, taste, smell, gaze, proprioception)
- Initial goal is to soothe the agitated infant
- Biological aim is to teach self-soothing
- Happiness is soothing the amygdala while stimulating it
Brain, Pain, Pleasure and Love: Love is all we need