Understanding the Brain: The BioPsychoSocial Model

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Sensory Receptor and Motor Activation Pathways

Kandel and Schwartz, Principles of Neural Science
Ascending Spinothalamic Tract

Kandel and Schwartz, Principles of Neural Science
Descending Pain Modulation Pathways

Kandel and Schwartz, Principles of Neural Science
Genotype, Epigenetics, and Phenotype

[Diagram showing the interplay between genotypes, epigenotypes, environments, and phenotypes, with specific paths labeled for quantitative and qualitative variations.]
Methods of Functional Neuroscience

Neurobiology:
- Neuroanatomy
- Neurophysiology

Neuroimaging Techniques
- PET/ SPECT
- MRI/fMRI
- EEG
- MEG

Evidence from Dysfunction
- Lesions
- Diseases of the CNS

Patient Reported Outcomes

Computational Approaches
Brief Pain Inventory – Pain Intensity

1. Please rate your pain by circling the one number that best describes your pain at its worst in the last week.

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Pain</td>
<td>Pain as bad as you can imagine</td>
<td></td>
<td></td>
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</table>

2. Please rate your pain by circling the one number that best describes your pain at its least in the last week.

<table>
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<tr>
<th>0</th>
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3. Please rate your pain by circling the one number that best describes your pain on average in the last week.

<table>
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<tr>
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4. Please rate your pain by circling the one number that tells how much pain you have right now.

<table>
<thead>
<tr>
<th>0</th>
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<td>Pain as bad as you can imagine</td>
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Charles Cleeland 1984
<table>
<thead>
<tr>
<th>Item</th>
<th>Scale</th>
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</thead>
<tbody>
<tr>
<td>Brief Pain Inventory</td>
<td></td>
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<tr>
<td>Pain Interference Scale</td>
<td></td>
</tr>
<tr>
<td>General Activity</td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td>Does not interfere</td>
<td>Completely interferes</td>
</tr>
<tr>
<td>Mood</td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td>Does not interfere</td>
<td>Completely interferes</td>
</tr>
<tr>
<td>Walking Ability</td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td>Does not interfere</td>
<td>Completely interferes</td>
</tr>
<tr>
<td>Normal work (includes both work outside the home and housework)</td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td>Does not interfere</td>
<td>Completely interferes</td>
</tr>
<tr>
<td>Relations with other people</td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td>Does not interfere</td>
<td>Completely interferes</td>
</tr>
<tr>
<td>Sleep</td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td>Does not interfere</td>
<td>Completely interferes</td>
</tr>
<tr>
<td>Enjoyment of life</td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td>Does not interfere</td>
<td>Completely interferes</td>
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</table>
Practical Model of the Nervous System Function

Model of Pain

- Physical State
- Environment
- Nociception
- Reflex Action
- Perception
- Response
- Memory and Expectations
- Affect (mood)
- Actions
- Evaluation
- Symptoms and Signs

Feedback Loop will Enhance or Suppress input
Definition of Pain

The unpleasant sensory and emotional experience of actual or potential tissue damage or an experience expressed in such terms.

Processes Involved in Pain and Pain Perception

- Past painful experiences
- Education
- Beliefs about pain
- Other
- Sensory discriminative
  - Intensity
  - Type
  - Spatial
  - Temporal
- Cognitive
  - Affective / motivational
  - Catastrophizing
- Aggravating / Relieving factors
- Impact on QoL
History of Pain – Simplistic View

• Pain is a subjective phenomenon

• Societies view of pain
  • No pain no gain
  • Grin and bare it
  • Cut out the painful process

• Pain without a lesion – “Not real”
  • Phantom limb pain
  • Healed surgical wound with ongoing pain
  • Chronic regional pain syndromes

• Functional imaging – game changer
  • Ended the debate that pain is “real”
  • Still not able to provide the severity of pain experience
Issues in Biopsychosocial Model

- George Engel helped elucidated the relationship of the mind and brain
- Psychological vs physiological
  - Seeing a possible sources of pain does not mean that is what hurts
  - Different people respond differently to the same stimulus
  - Pain (perception) is all in the head – imaging implies that the answer is yes
- But it is not only about what the patient thinks
  - More than about what patient feels or how they interpret their symptoms
  - Care-givers need to know that detailed explanations can help but also can hurt
  - Patients need to learn to live with the pain, not be controlled by seeking a cure
- Even if we knew every connection in the brain could not explain how it works
Advantages of Biopsychosocial Model

• Biopsychosocial clinical reasoning – figure out what is most important to the patient
• Multimodal approaches to the treatment of pain
• Multidisciplinary pain care adapted to specific populations
• Roles of psychosocial, socioeconomic, ethnicity, and gender factors can be as important as the underlying physiological components
• Cultural competence and cross-cultural factors
• Managing stress and gaining control of their lives
• Understanding the illness experience
• Communicating health information to patients and their families
• Facilitating motivation/behavioral change/movement
• Taking a modern approach to the culture of health-care
Biopsychosocial Approach - Learning to Live in Pain

• Validate our patient’s struggles with compassion
• Patients must understand and be involved in their own treatment
• Pain care is a collaboration between healthcare and patients – providing patients with a sense of self-control over their pain is a key feature
• Help patients set realistic expectations
• Transition patients from negative to positive thoughts – pain catastrophizing versus coping strategies
  • Change behaviors to pain to control perception and response
    • Negative (Catastrophizing) - Helplessness and a preoccupation with the negative consequences
    • Positive (Coping skills) - Relaxation exercises, distraction, and positive self-statements
  • Coping skills
    • Helps patients to take control of their pain
    • Rebuild self-efficacy and confidence, and allows them to get on with their lives

• Treat the whole patient, not just the symptoms or the pathology
Changing the State of the Brain

What do you see?
Thank you!

Useful Reference: