BIOPSYCHOSOCIAL MANAGEMENT OF CHRONIC PAIN ACROSS THE LIFESPAN: IMPLICATIONS FOR THE PHYSICAL THERAPIST

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Objectives

• Describe the principles associated with pain neuroscience as related to examination and intervention by physical therapists.

• Identify psychosocial considerations for individuals with chronic pain across the lifespan.

• Utilize appropriate outcome measures to assess the client’s experience of chronic pain.

• Summarize the literature related to the efficacy of interventions utilized to address chronic pain across the lifespan.

INTRO

Chronic Pain

• The literature supports that patients with chronic pain demonstrate differences in CNS function than those without chronic pain.

• Can be thought of as "maladaptive neuroplasticity" (increased sensitivity)

"Longer you have pain, the better you system gets at producing it, pain is triggered more easily, painful events become more painful" Lotze & Moseley 2015

Chronic Pain

2. Associated with abnormal intracortical inhibitory mechanisms

• Bodily-related neural representations become less precise

Ultimately the increased sensitivity and decreased precision contribute to complexity of chronic pain.

Lotze & Moseley 2015
Chronic Pain

• Conventional rehab is often times unsuccessful in the chronic pain population.
  • Conventional pain treatment: focus is on finding pain-relieving medication or exercise or pain management strategy to manage life with constant pain.
  • Pain rehabilitation: biopsychosocial approach to provide patient with knowledge, understanding and skills to decrease pain and decrease disability.

Biomedical Model
  - Anatomy
  - Biomechanics
  - Pathoanatomy

Biopsychosocial Model
  - Biological
  - Psychosocial
  - Social factors

Lotze & Moseley 2015

Biomedical Model
  • Limited efficacy in regards to pain alleviation and resolution of disability (Bronn et al 2018, Kune et al 1995, Mean-Donlin & Harter 2005, Waddell 2003.)
  • May result in increased fear, anxiety and stress of an individual (Lock & Liedert 1985, Mean-Donlin & Harter 2005, Hechemson 1995, Patoneau et al 2006)

Biopsychosocial Model
  • Fear of movement, pain catastrophizing, anxiety and nervous system sensitization are often consequences of a primary pathology.
  • Considered main contributors to pain and disability (Doult et al 2007)
  • Treatment for chronic pain that incorporates a biopsychosocial model currently viewed as the most effective approach (Sanchel et al 2007, Menus et al 2006)

Pain Neuroscience Education (PNE)

• “PNE aims to explain to patients the biological and physiological processes involved in a pain experience and, more importantly, defocus the issues associated with the anatomical structures.”

• CONSIDER EXPANDING ON PSYCHOSOCIAL IMPACT OF PAIN

Louw, Zimney, Puentedura & Diner 2016
Chronic Pain in Children

Epidemic - 1.7 million
Conditions commonly reported as converting to chronic pain syndromes include:
- Headache
- Abdominal Pain
- Back Pain
- Musculoskeletal Pain

Prevalence ranges from 11-38% (King et al 2011)

The Impact of Chronic Pain in Children

- School performance and attendance
- Emotional well being
- Sleep
- Physiology
- Family functioning
- Social functioning
- Economic impacts

Children with Chronic Pain

Report feeling not heard, misunderstood and not believed (Carter 2002, Nutkiewicz 2008)

- Leads to frustration, loss of potential, isolation,
- Lowers belief that clinicians can help them

Families and Chronic Pain

- Children learn about pain from their families
- Family is responsible for the initial pain assessment and seeking proper evaluations and treatment
- Aggregation of pain in families (Groholt et al 2003, Saunders et al 2007)
- Mothers and daughters and site specific pain

Families and Chronic Pain

Parental Role Stress (Palermo & Eccleston 2009)

- Fear, helplessness, powerless
- Stress increases with decreasing age of child, chronicity of pain and child depressive symptoms (Eccleston 2004)

Parents and Chronic Pain

Parental Beliefs and Child Pain

- If they only believe the pain is physical or medical and don't subscribe to the biopsychosocial model the child is less likely to have the chronic pain resolve and more likely to have higher pain and disability (Guite et al 2009)
The Role of Operant Conditioning and Social Learning


- How do parents reinforce child pain behaviors? Are behaviors strengthened or extinguished?
- How do specific child variables interact with parental influences?

The development of chronic pain is a little more complex...

- Social Learning Theory – children learn within a social context, which is facilitated by modeling and observation

Model for Understanding Pediatric Chronic Pain

- Health Habits
- Social
- Psychological
- Biological

Socio-Communications Model of Pain

CHILD

Pain Experience

Motor abilities

Pain Expression

CAREGIVER

Sensitivity

Knowledge

Attitudes

Assessment

of pain

Social display rules

KD Craig, 2002

Pain Expression in a Social Context

- Children as young as 9 are less likely to express pain in front of a peer (Zeman & Garber 1996)
- Children who catastrophize indiscriminately display pain where low catastro kids modulate their expression

The Social Context of Pain

Parent Behavior

Observational Learning

Directly

Indirectly

Encourage activity

Reduce activity

Increase activity

Optimism

- linked with lower pain reports in adolescents (Mannix et al 2009, Williams et al 2010)

Personality and Temperament

The trait of neuroticism:

- Associated with a heightened experience of bodily sensations (Watson & Pennebaker 1989)
- And, in particular, pain (Charles et al 2008)

Fearful temperaments:

- predictor of somatic complaints (Wolf et al 2010, Rocha & Prkachin 2007)

Optimism:
Pain-specific Cognitive Processes

The role of catastrophic thinking
- Focus on and exaggerate the threat value of painful stimuli
- Negatively evaluate one's own ability to deal with pain
- Linked with more intense pain and disability (Leeuw et al. 2007)
- Predictive of pain and disability (Linton et al. 2000)
- Gives rise to excessive fear of pain and injury (Goubert et al. 2004)

Pain Related Fear in Children

- Pain related fear accounted for 40% of the variance in pain related disability (Martin et al. 2007)
- Predicted physical activity limitations (Wilson et al. 2011)
- When decreased - lead to resumption of daily activities (Simons et al. 2011)

Pain Related Fear in Parents

- Parents who catastrophize may engage in behaviors that protect the child from the potential for pain
- These protective behaviors are associated with higher levels of child disability (Peterson & Palermo 2004, Simons et al. 2008), higher levels of parental distress (Caes et al. 2011), lower school attendance (Goubert et al. 2006), and increased healthcare utilization (Simons et al. 2011)

Interpersonal Fear Avoidance Model of Pain

Sleep and Pain

- 50% of children with chronic pain experience sleep disturbances (Palermo 2007, 2011)

<table>
<thead>
<tr>
<th>Sleep Related Symptoms in the Context of Pain (but not pain specific)</th>
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<tbody>
<tr>
<td><strong>Daytime Symptoms</strong></td>
</tr>
<tr>
<td>Irritability, hyperactivity, daytime sleepiness, fatigue, increased pain, behavioral problems, anxiety, lower frustration tolerance</td>
</tr>
<tr>
<td><strong>Bedtime Symptoms</strong></td>
</tr>
<tr>
<td>Delayed sleep onset, irritability, bedtime battles, anxiety, hyperactivity, increased pain</td>
</tr>
<tr>
<td><strong>Sleep Symptoms</strong></td>
</tr>
<tr>
<td>Wakefulness after sleep onset, lower sleep efficiency, fragmented sleep (microarousals), nightmares, worse parasomnias resulting from sleep fragmentation, right-time arousals, irritability, sudden awakenings, inconsolability</td>
</tr>
</tbody>
</table>

Dick et al. 2009

Behavioral Management of Pediatric Chronic Pain

- Pain Neuroscience Education (PNE)
- Cognitive Behavioral Therapy
- Sleep Management
- Exercise Therapy
PNE in Pediatrics

- Address misconceptions
- Emphasis on the dependence of meaning - the way the pain is perceived by the patient will influence brain pressing of pain signals
- Explanation of chronic pain and the nonproductive nature of persistent pain signals
- Heightened pain and continued avoidance lead to disability

Pediatric Pain Books

- Many directed towards parents:
  - Conquering Your Child’s Chronic Pain
  - Relieve Your Child’s Chronic Pain
  - When Your Child Hurts

Apple Apps for the Management of Pediatric Pain

Smith et al 2015

- Pain Tricks
- Chronic Pain Tracker Lite
- CatchMyPain
- CBT Tools for Kids

Developmental Considerations

- Materials must be tailored to the child’s cognitive-developmental stage and physical and affective state
- Resources available in multiple modalities to appeal to youth at different developmental stages
- Example - the importance of peer relationships in adolescents

Cognitive-behavioral Interventions (CBT)

Treatment focuses on:
- modifying the incorrect belief that pain cannot be controlled
- enhancing the ability to solve pain related problems
- Providing a set of skills for managing pain in an adaptive way (Logan et al 2010)

CBT

Research, when taken as a whole, demonstrates promise for improving:
- self-efficacy
- self management
- family functioning
- psychosocial well being
- pain severity
- school attendance
- feelings of hopelessness
Specific CBT Techniques

• Psychoeducation: clear explanation to child and family what chronic pain is, how pain signals are transmitted in the body, the role of the brain in processing pain information, and an explanation of the biopsychosocial model of pain and the transactional relationship between stress and pain.

• Also, a rationale for why CBT works

• Rarely delivered as a stand alone intervention - thus little research on this alone

Specific CBT Techniques

• Distraction - a powerful analgesic effect that alters the activity on pain processing pathways in the brain (Bantick et al 2002)

• Can involve behavioral (blowing bubbles) as well as cognitive (conversation) strategies

• For chronic pain, need to make sure the distractions are effective over time

• If possible, it is best if the child is involved in picking the distraction

Specific CBT Techniques

Cognitive Reframing

1. Identify negative thoughts
2. Challenge these thoughts
3. Modify these thoughts

Specific CBT Techniques

Positive self statements

• specifically targets catastrophizing
• positive self talk – “I can do this!”

Exposure and Psychological Desensitization

• Many children with chronic pain develop a pattern of avoiding activities they believe will increase pain (Martin et al 2007)

• Desensitization is used to reduce this avoidance pattern

• repeated gradual exposure to activities previously avoided

• belief disconfirmation - correction of fear expectancies, leads to extinction of fear and cognitive reappraisal

• Emerging research is supportive (Wicksell et al 2009)

Multicomponent CBT

• For children in chronic pain, psychologist will typically teach a broad range of CBT strategies within the context of multidisciplinary treatment which will also involve PT and pharmacy.

• Children are encouraged to develop a toolbox for dealing with pain
Research on Multicomponent CBT

- CBT superior to education only

Research on Multicomponent CBT

- Palermo et al 2009

Research on Multicomponent CBT

- Connelly et al 2006

Research on Multicomponent CBT

- Robins et al 2005

Training in Self-regulation

 Relaxation training, Biofeedback, Hypnosis
- all teach youth to regulate aspects of their own physiology, including heart rate, breathing rate, skin temperature and muscle tension

Parent Involvement

 Consultants
 Collaborators
 Co-clients
- teaching operant techniques to guide parents in responding to their child’s pain or helping the child to manage and cope with pain.
Interventions

- Measures for Sleep Habits
- Children’s Sleep Habits Questionnaire
- Pediatric Sleep Questionnaire

ADULT/AGING ADULT POPULATION

Psychosocial considerations for individuals with chronic pain

- Likely have seen several medical practitioners by the time they get to you
- Likely have had at least 1 negative encounter with a medical practitioner
- The pain/condition may have been discounted by someone they have encountered
- Common that they may have heard several different explanations for their pain, resulting in confusion
- Common that these individuals feel a sense of desperation

Where do we begin?

- Biopsychosocial focused assessment
- Includes both somatic & psychosocial assessment
- Wijma et al suggest using the PSCEBSM model
- Based on SCEBS model
- Includes pain and motivation assessment
- Individualized & patient-centered
- Includes Pain Neuroscience Education

PSCEBSM Model

- Differentiates between
  - Nociceptive pain
  - Neurogenic pain
  - Central sensitization (CS) pain
- Criteria for CS pain
  - Perceived pain/disability disproportionate to nature of injury/pathology AND
  - Diffuse/anatomically illogical distribution OR hypersensitivity present
- May utilize the Widespread Pain Index
- Maps pain locations
- Includes 19 body regions
- Score of 7 or greater suggests widespread pain
- Central Sensitization Inventory (CSI)
  - Cutoff score of 40 indicates possibility of predominant CS pain

Wijma, van Wilgen, Meeus & Nijs 2016
**PSCEBSM Model: somatic & medical factors**

- Somatic or medical factors that may be present
  - Illnesses/comorbidities that might influence CS
  - Nonuse or disuse of body parts
  - Changed movement patterns
  - Exercise capacity
  - Strength/muscle tone/tension during movement
  - Medication side effect

- Physical exam considerations
  - Keep in mind that clinical tests and assessment of muscle strength may be altered due to central sensitivity
  - Look out for the following
    - Bracing when bending, holding breath while moving, increased tone prior to movement, verbal or nonverbal signs of fear or inconsistent movement patterns

Wijma, van Wilgen, Meeus & Nijs 2016

**PSCEBSM Model: cognition/perception**

- Assessment of cognition/perception
  - Perceptions about physical and mental aspects of pain including consequences
  - Expectations for care
  - Expectations regarding prognosis of pain
  - Coherence
  - Emotional representation of pain

- Pain perceptions
  - Brief Illness Perception Questionnaire (Brief IPQ)
  - Assess the patient's perception of personal causes of illness, expectations for care, self-efficacy and worrying about and understanding pain

- Pain catastrophizing
  - Pain Catastrophizing Scale (PCS)
  - Assesses degree of catastrophizing

Wijma, van Wilgen, Meeus & Nijs 2016

**Indication for individual that may benefit from PNE**

- Score of ≥ 6 on "worrying about their pain"
- Score of ≤ 4 on "understanding their pain"

Broadbent, Petrie, Main & Weinman 2006

**3 distinct dimensions**

- Rumination
- Magnification
- Helplessness

- Score of greater than or equal to 30 indicates clinically relevant level of catastrophizing

**PSC EBSM Model: emotional factors**

Emotional factors include:
- Anxiety
  - State-Trait Anxiety Inventory (STAI)
  - Assesses trait anxiety and state anxiety
- Fear of Movement
  - Tampa Scale of Kinesiophobia (TSK)
  - Assesses beliefs about underlying and serious medical problems & activity avoidance
- Anger
  - Injustice Experience Questionnaire (IEQ)
  - Assesses presence of perceived injustice
- Depressive feelings
  - Patient Health Questionnaire (PHQ-2), PHQ-9 or Center for Epidemiologic Studies Depression scale (CES-D)
  - Posttraumatic Stress
  - Screen by asking if prior traumatic events result in the avoidance of situations that remind them of the event or have resulted in negative feelings or change in beliefs

Wijma, van Wilgen, Meeus & Nijs 2016

- **Score of ≥ 39-40 indicates clinically significant symptoms of anxiety**
- **Older adults Score of ≥ 54-55**

- **Score ≥ 37 indicates that patient likely has fear of movement**
- **Score ≥ 19 indicates that the patient would benefit from acknowledgment of the feelings of anger/injustice**
- Educate that these emotions perpetuate the pain signature in the brain

- **PHQ-2 Score ≥ 2 should be further evaluated with PHQ-9**
- **PHQ-9 Score ≥ 10 indicates depression**

- **Score ≥ 16 indicates more severe symptoms of depression**

![Image of emotional factors tools](https://example.com/emotional_factors_tools)

![Image of anxiety assessment tools](https://example.com/anxiety_assessment_tools)

![Image of anger assessment tools](https://example.com/anger_assessment_tools)

![Image of depression assessment tools](https://example.com/depression_assessment_tools)
PSCEBSM Model: behavioral factors

3 subgroups
- Healthy behavior
- Avoidance behavior
- Persistence behavior

- Most have a mixed pattern
- Question about work, home and recreational activities to determine what is being avoided or persisted
- May have individual utilize activity diary

Wijma, van Wilgen, Meeus & Nijs 2016

PSCEBSM Model: social factors

Social factors
- Housing or living situation
- Social environment
- Work
- Relationship with the partner
- Prior/other treatments

- Barrier to improvement would include poor social support
- PNE can improve social support

Wijma, van Wilgen, Meeus & Nijs 2016

PSCEBSM Model: motivation

- Psychology Inflexibility in Pain Scale (PIPS)
- Stage of change model
- Assess state of motivation for change
- Tailor PNE to current stage of change

Wijma, van Wilgen, Meeus & Nijs 2016

Patient Education

13 RCTs from 2002-2015

Results
- Improvements in pain ratings, pain knowledge, disability, pain catastrophization, fear-avoidance, attitudes and behaviors regarding pain, physical movement and healthcare utilization
- Strong evidence
- All studies 6/10 or higher on PEDro scale

Louw, Zimney, Puentezdu & Diener 2016
PNE

- *De-education* prior to *re-education*
- Shift from biomedical education model
- Avoid using terminology that increases fear and anxiety
- *“tissue”, “degeneration”, “inflammation”, “wear and tear”, “degeneration”*
- They way we assess pain can ignite the pain neuromatrix
- Suggested to sparingly use the word “pain” (Diener, Kargela, Louw 2016)
- PNE is most successful with the use of metaphors, examples and pictures
- Utilizing compassion and empathy, share data to overcome misbeliefs
- I.e. 40% of individuals with similar “bulges” have no pain and continue on with life

Louw, Zimney, O’Hotto & Hilton 2016

“Alarm System”

Louw, Zimney, O’Hotto & Hilton 2016

Effectiveness of exercise in individuals with chronic pain

- PNE combined with exercise or manual therapy is far superior (Louw, Zimney, O’Hotto & Hilton, Moseley, Schiltenwolf, Cashin, Davies & Hubscher 2017)
- Discuss patient perception of exercise/fears associated with exercise

- Unclear whether aerobic or resistance exercise is superior in chronic conditions (Booth, Moseley, Schiltenwolf, Cashin, Davies & Hubscher 2017)
- Exercise induced changes include reduced fear, anxiety & catastrophization, improved self-efficacy, exercise-induced analgesia & positive functional/structural adaptations in the brain (Booth, Moseley, Schiltenwolf, Cashin, Davies & Hubscher 2017)

Biopsychosocial approach to exercise

- Guiding principle for exercise and physical activity
  - Must be perceived as safe and meaningful
  - May need to temporarily stop or modify specific activities per patient tolerance
  - Take caution not to draw frequent attention to pain
  - Provide frequent reassurance that becoming active gradually is safe
  - Implement principles of Graded Exposure

Booth, Moseley, Schiltenwolf, Cashin, Davies & Hubscher 2017

Consequences of significantly increasing pain during/following 1st session

- Erase confidence with movement/exercise
- Decrease participant motivation for movement/exercise
- Strengthen relationship between movement and pain

Booth, Moseley, Schiltenwolf, Cashin, Davies & Hubscher 2017

Principles for exercise prescription

- Provide the patient with a treatment expectation
  - Focus on improving function, quality of life and reducing impact on pain
- Establish baseline of activity within first session
  - What can be completed without causing significant increase in symptoms
- Discuss activity pacing
  - Breaking up daily activities into manageable portions without exacerbating symptoms
  - Continue to provide patient education
  - “Flare-ups”
- Utilize activity tracker/diary to monitor physical activity

Booth, Moseley, Schiltenwolf, Cashin, Davies & Hubscher 2017
Mode of exercise

Aerobic Exercise
- 20-60 minutes
- 2-3 times a week for 6 weeks
- "Turn down the pain volume or dampen the pain response"

Resistance Exercise
- Familiarize patient with the exercise
- Engaging non-painful body parts can have a positive impact on pain

Land vs Aquatic
- Land-based exercises may facilitate greater improvement in muscle function
- Aquatic program may be necessary for individuals with very poor functional tolerance or heightened pain/distress
- Ultimate goal would be to transition to land-based program

Dosage

HEP

4 simple tasks

1. Questions
   - Regarding pain or PNE discussed
2. Exercise
   - Key exercises while focusing on breathing and relaxation
3. Aerobic exercise program
   - Exercise of choice with duration dependent on current functional level
4. Goals
   - A list of 5 goals
   - "If I could flip a switch, and get rid of your pain, what would you do again?"

References


