Know Pain, Know Gain: Incorporating Education and Skills Training about Pain into Clinical Practice

Anne Harrison, PT, PhD
Arthur J. Nitz, PT, PhD, ECS, OCS
Tim Benedict, PT, DPT, OCS
Garrett Naze, PT, DPT, OCS, FAAOMT
Pain: Unintended Consequences

• Comprehensive Addiction and Recovery Act
  – Aimed at reducing opioid usage
  – Task force examining best practices for doing this

• Institute of Medicine
  – Transform our knowledge and perspectives of pain in order to provide adequate assessment and treatment.
Do No Harm

• Pain management without addiction?
  – Interdisciplinary team: Social workers, psychologist, doctors, therapists

• Shared Responsibility:
  – Develop approaches that are more efficient, more accessible, more effective, and do no harm.
Recovery of Function

• Goal of treatment: Recovery of function.
• Old adage: Pain is inevitable, but suffering is optional.
Three Perspectives

• Art Nitz, PT, PhD, ECS, OCS
  – Professor, Private Practitioner
• Tim Benedict: PT, DPT, OCS
  – Major, US Army
• Garrett Naze, PT, DPT, OCS, FAAOMT
  – Orofacial Pain Clinic UK College of Dentistry
Know Pain, Know Gain: Incorporating Education about the Neurobiology of Pain into Clinical Practice

Arthur J. Nitz, PT, PhD, ECS, OCS
Definition of Pain

• International Association for the Study of Pain – (IASP), 1986

• “an unpleasant sensory and emotional experience associated with actual or potential tissue damage”

• Patient’s: “I can’t define it, but I ........”
The History of Pain

• Pain is mentioned as a part of human experience from the start of recorded history

• Genesis 3:16

• “I will surely multiply your pain.......”

• The rest is history!
How Our Understanding of Pain Has Evolved Over Time
History of Understanding Pain - Antiquity

• Aristotle (and Plato) believed pain to be an emotion ("passion of the soul")
• Neither Aristotle nor Hippocrates believed the brain was involved in pain processing
• Considered the *heart* as the central organ for the sensation of pain
History of Understanding Pain: *Middle Ages to the Renaissance*

- **Galen** - 200 A.D.
  - Recognized the brain as the site of feeling
  - Described inflammation associated with pain

- **Avicenna** – 980-1037 A.D.
  - Muslim physician regarded as the first man to formulate the Specificity Theory
History of Pain Theories – Renaissance
René Descartes
Specificity Theory (Bell, Müller, von Frey and others from 1811 to 1st half of 20th century)
Schematic representation of the pattern theory.
A. Action potentials resulting from a touch stimulus(s) and recorded on a cathode ray oscilloscope (CRO). The resultant sensation is touch.
B. Action potentials resulting from a noxious stimulus and recorded on a cathode ray oscilloscope. The resultant sensation is pain.

Key: S=stimulus; R=receptor; CRO=cathode ray oscilloscope.
History of Pain Theories

• It is a shame that we possess such insufficient knowledge concerning the character of pain—those symptoms which represent the essential part of all bodily suffering of man (Goldscheider 1894).
Pattern Theory (1950s)

• Sinclair and Weddell
• All skin fiber endings are identical; pain is produced by intense stimulation of these fibers
• Ratio of large fiber: thin fiber signal determines pain intensity (‘pattern of stimulation’)
• This pattern (large:thin) modulates pain intensity
Note: Usual composition shown.

Prefixed plexus has large C4 contribution but lacks T1.
Postfixed plexus lacks C5 but has T2 contribution.
Place Head Here
3. Gate Control Theory of Pain

Melzack & Wall (1965)
Gate Control Theory
• Example:
  – Bumping the head
    • The initial trauma activates the A-delta and, eventually, C fibers
    • Rubbing the traumatized area stimulates the A-beta fibers, which activate the SG to close the spinal gate
    • Thus inhibiting transmission of the painful stimulus
Pathways for pain signals
Gate-Opiate Theory Combination
I can’t stand this!
THANK YOU!
Know Pain, Know Gain: Communicating About Pain in Clinical Practice

Tim Benedict, PT, DPT, OCS
Iraq Story: “All Clear!”
Disclaimer

The views expressed herein are those of the presenter and do not reflect the official policy or position of the U.S. Army Medical Department, the U.S. Army Office of the Surgeon General, the Department of the Army, Department of Defense or the U.S. Government.
Objectives

• Understand pain ≠ tissue damage
• Standardize the way we communicate about pain in a non-threatening manner
• Educate patients how their nervous system can become sensitized
Tissue Damage, NO Pain!

“I honestly didn't feel the pain” – Kevin Ware
No Tissue Damage, PAIN!

Nail through boot!

Required sedation to remove!

(JP Fisher BMJ 1995 310:70)
Take away #1

• Pain does not equal tissue damage!
• Can be turned **down**
  *(endogenous inhibition)*
• Can be turned **up**
  *(nociceptive facilitation)*
Modern Understanding of Pain

“No Brain, No Pain.” (Lots of smart people 2016)

In many cases, pain is “A sensory illusion” (Latremoliere and Woolf 2009) “Chronic pain hurts the brain” (Baliki and Apkarian 2008) “Chronic pain is a disease of the brain.” (Borsook 2010)
Pain is a multiple system output activated by an individual’s specific pain neural signature. The neural signature is activated whenever the brain concludes that body tissues are in danger and action is required. (Mosely 2003).
Take away #2

• We must communicate in a way that does not increase *threat*
• Threat implies danger (Jackson 2005)
• Danger leads to more protection
• Protection = Pain
Communication with Ralph

• Words matter! (Darlow 2013)

• Well-meaning, let’s “fix” the problem
Ralph Thompson

“Degenerative Disk Disease” (Barker 2014)

“Weak Core” (Darlow 2013)

Not dangerous
No pain

Dangerous!!!
Pain

Danger meter
Ralph, your X-rays look great. From a surgical stand-point, there’s nothing more we can do for you.
Another failed treatment.

No one can figure out why I’m still in pain!

Danger meter

Ralph After Surgery

Not dangerous
No pain

Dangerous!!!
Pain
Take Away #3

• A top predictor of chronic, widespread pain is *multiple* treatments (Kindler 2010)

• Focus on anatomy: increases threat and pain (Moseley 2004).

• But, without implying “It is in your head.”
Lorraine Thompson

• Rheumatologist

Lorraine, many people with fibromyalgia want to know why they are in pain. Would you like to discuss this?
Chronic Pain Simplified...
“Smart” Alarm System
Crash!
Adaptation, Increased Sensitivity
Final Adaptation: Too Sensitive!
Sensitive Nerves
Take Away #4: Education *is* Therapy

- “Pretend I’m a good friend who doesn’t know much about pain. *Explain to me* in your own words how that story applies to your pain.”
- On a scale from 0 to 10, how sensitive do you feel your nerves are?
  – Why didn’t you pick a lower number?
Pain Communication Across the Continuum

Exercise is Safe!

My X-rays show normal results, it’s like gray hair!

Less Sensitive

Nerve Sensitivity

Extra Sensitive!
For More Resources


Conclusion: All Clear!
THANK YOU!
Know Pain Know Gain: Incorporating Skills Training into Clinical Practice

Garrett Naze, PT, DPT, OCS, FAAOMT
We can all handle a little mechanical stress.
Too much, too soon, leads to injury.
A little bit over time actually makes us stronger.

Adaptability: Callus vs. Blister
But things can also make us weaker.

Mechanical Stress

Poor Nutrition
Genetics
Sleep
Lack of Exercise
Poor Regulatory Capacity
Stress
Adaptation to Psychological Trauma

Poor Adaptability

NIDCR OPPERA Studies 2011, 2013
The goal of skills training is to help the patient make themselves more adaptable.
<table>
<thead>
<tr>
<th>Over the past 2-weeks, how often have you been bothered by the following problems</th>
<th>Not at all</th>
<th>Several days</th>
<th>More than half the days</th>
<th>Nearly every day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feeling nervous, anxious or on edge</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Not being able to stop or control worrying</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Little interest or pleasure in doing things</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Feeling down, depressed, or hopeless</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
Stress, Lack of Sleep, & Lack of Exercise

- Lorraine
  - Dry Mouth
  - Pain
  - Loss of Appetite/Constipation

- Ralph
  -

- You
  -

CLINICAL IMPACT SYMPOSIUM – 2016
Stress & Regulatory Capacity
Stress

BOO!

SN
S
HR
BP
RR

Good

SN
S
HR
BP
RR

Poor

Schmidt & Carlson 2009
Heart Rate Variability (HRV)
Reducing Sympathetic Tone

1. Breathe with the Diaphragm
   - As you inhale, your stomach should move out
   - When you exhale, your stomach should relax to normal
   - Exhale in a relaxed manner
   - Focus on keeping your chest still
   - Train to criterion (see next slide)
   - Begin in laying and progress to standing

Schmidt et al 2013
Reducing Sympathetic Tone

2. Breathe Slowly
   • Goal #1: Breathe between 3 and 7 breaths per minute
   • The rest should come after the exhale — not holding on the inhale
   • Practice sessions should begin at 5-minutes; adding 1-minute each day
   • Goal #2: 2 x 20 minutes sessions per day
Precautions

Cardiovascular/Pulmonary Disease
- Asthma
- COPD
- Etc.

Diabetes
- Ketoacidosis

Musculoskeletal Conditions
- Increased pain with performance
Sleep
Poor Sleep leads to Pain.
Keys to Good Sleep

**Consistency:** Same bed and wake up time

**Resolve Dilemmas:** Make a to-do or worry list to clear your mind

**Bed = Sleep:** Associate bed with sleep only; don’t do other activities in bed – sex is the only exception

**Get Comfortable:** Find pillows/mattress that work for you

**Relax:** Start preparing for bed 1-hour ahead of time; relaxing bath or breathing techniques; turn down lights and quiet the environment

Irish et al. 2015
Keys to Good Sleep

**Avoid Stimulants/Sleep Inhibitors:** caffeine, alcohol, nicotine, antihistamines, beta blockers, alpha blockers, antidepressants, blue light, engaging tasks (books, internet, TV, chores, exercise)

**Only Lay Down When Tired:** Focus on quality of sleep, not quantity; if you cannot fall back asleep get out of bed and perform a boring task (read an instruction manual)
Cognitive Behavior Therapy for Insomnia (CBTi)

• Standardized 4-session package performed by mental health providers
• Shown to be as effective as sleep medications
• Shown to be effective delivered via distance

Mitchell et al 2015; Seyffert et al
Exercise
Fibromyalgia

Chronic Non-Specific LBP

Chronic Non-Specific Neck Pain

Aerobic

Strength

Busch et al, Hayden et al 2005, Gross et al
Aerobic

Strength

HRV

Neurotransmitter

Support

Routledge et al

Bement & Sluka 2016, Javadian et al
ACSM Guidelines - Cardiorespiratory Exercise:

150 min moderate-intensity exercise per week

• 30-60 min moderate-intensity (65% VO₂ max) 5 days per week

• 20-60 min vigorous-intensity (80% VO₂ max) 3 days per week

• Continuous or multiple shorter sessions (of at least 10 minutes)

• Gradual progression of exercise time, frequency, and intensity
<table>
<thead>
<tr>
<th>Modified Borg Scale</th>
<th>Borg Scale</th>
</tr>
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<tbody>
<tr>
<td>0- at rest</td>
<td>6-</td>
</tr>
<tr>
<td>1- very easy</td>
<td>7- very, very light</td>
</tr>
<tr>
<td>2- somewhat easy</td>
<td>8-</td>
</tr>
<tr>
<td>3- moderate</td>
<td>9- very light</td>
</tr>
<tr>
<td>4- somewhat hard</td>
<td>10-</td>
</tr>
<tr>
<td>5- hard</td>
<td>11- fairly light</td>
</tr>
<tr>
<td>6-</td>
<td>12-</td>
</tr>
<tr>
<td>7- very hard</td>
<td>13- somewhat hard</td>
</tr>
<tr>
<td>8-</td>
<td>14-</td>
</tr>
<tr>
<td>9-</td>
<td>15- hard</td>
</tr>
<tr>
<td>10- very, very hard</td>
<td>16-</td>
</tr>
<tr>
<td></td>
<td>17- very hard</td>
</tr>
<tr>
<td></td>
<td>18-</td>
</tr>
<tr>
<td></td>
<td>19- very, very hard</td>
</tr>
<tr>
<td></td>
<td>20-</td>
</tr>
</tbody>
</table>

% MHR = 0.6463 x % VO2max + 37.182
MHR = 220 - age

Minimum Cardiovascular Benefit
50% VO2 Max
70% HR Max
(Lorraine 70% ~ 108 bpm)

National Council on Strength and Fitness
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</table>

\[ \%\text{MHR} = 0.6463 \times \%\text{VO}_2\text{max} + 37.182 \]

\[ \text{MHR} = 220 - \text{age} \]

**Aerobic Limit**

- 60-65% \( \text{VO}_2\text{max} \)
- 75-80% \( \text{HR Max} \)
  
  (Lorraine 75% ~ 115 bpm)

**Talk Test ~ 65% \( \text{VO}_2\text{max} \)**

(Quinn & Coons 2011)

**National Council on Strength and Fitness**
ACSM Guidelines - Resistance Exercise:

- Train each major muscle group 2-3 days per week; 48-hr between sessions

- 2-4 sets of each exercise, repetitions as follows:
  - 8-12 = strength and power
  - 10-15 = strength (middle-age & older persons starting exercise)
  - 15-20 = muscular endurance

* Very light or light intensity for older persons & sedentary adults starting exercise
Building Exercise Tolerance (Graded Exposure):
1. Pick an activity – Example: walking
2. Find your baseline
   • How long can I walk before flaring up?
     30 minutes – I’ll pay for it
     10 minutes – probably, but definitely not up hills
     5 minutes – probably
     3 minutes – definitely
3. Plan your progression
   • Walk slightly further each day for the next week → 4 ½ minutes

Butler & Moseley
Exercise Testing:

Not participating in regular exercise

No cardiovascular, metabolic, or renal disease, AND no signs or symptoms suggestive of these diseases

Medical clearance not necessary beginning with light-moderate exercise

Aerobic Tests

Strength Tests
“Sedentariness is detrimental even among individuals who meet current physical activity recommendations.”
Behavior Change
**Transtheoretical Model (Stages of Change)**

- **Pre-contemplation**
- **Contemplation**
- **Preparation**
- **Action**
- **Maintenance**

*Prochaska & Norcross 2010*
## Brief Interventions Work

<table>
<thead>
<tr>
<th>Condition</th>
<th>Study</th>
<th>Intervention</th>
<th>Number of Visits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headache</td>
<td>Holroyd et al 2001</td>
<td>Cognitive Behavioral Therapy</td>
<td>3-4</td>
</tr>
<tr>
<td>Alcohol Use</td>
<td>Chapman &amp; Huygens 1988</td>
<td>Confrontational Interview</td>
<td>1</td>
</tr>
<tr>
<td>Orofacial Pain</td>
<td>Dworkin et al 2002</td>
<td>Self-Care</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Carlson et al 2001</td>
<td>Physical Self-Regulation</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Gatchel et al 2006</td>
<td>Cognitive Behavioral Therapy</td>
<td>6</td>
</tr>
</tbody>
</table>
“On a scale of 0 to 100%, what percent chance are you likely to do this?”

“60%”

“Why did you say 60% and not 50?”
Educational Materials

Visual

Auditory

Read/Write

Kinesthetic

Leite et al

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Culturally Competent Health Education (Badarudeen & Sabharwal 2010)
The quick brown fox jumped over the lazy dog.

Flesch Reading Ease: 60-70 = 8th and 9th grade
Summary

Multi-Systemic Symptoms

Brief Interventions
Readiness to Change
Education Level
Learning Styles

TRAINING

Poor Stress Management
Lack of Sleep
Lack of Exercise

CIS
CLINICAL IMPACT SYMPOSIUM – 2016
PRACTICE WHAT YOU PRESCRIBE BE
THANK YOU!