“Psychogenic Pain”: Real or Not
(Pain without nociception)

Daniel M. Doleys, Ph.D.
Cleveland Clinic Meeting
January, 2012

Objectives

1. Review the definitions and history of the concept of ‘psychogenic pain’.
2. Review present day meaning and utility of the term ‘psychogenic pain’.
Why Consider the Topic

The important thing in science is not so much to obtain new facts as to discover new ways of thinking about them.

- Sir William Lawrence Bragg
1915 Nobel Prize winner in Physics

Some Observations/History
“The mind is its own place, and in itself can make a heaven of hell.”

- John Milton, “Paradise Lost”

Somatic Sensations Associated with Sorrow and Despair: 586 B.C.

"Is it nothing to you, all you who pass by?  
Behold and see  
If there is any sorrow like my sorrow  
Which has been brought on me,  
Which the Lord has inflicted  
In the day of His fierce anger

From above He has sent fire into my bones,  
And it overpowered them;  
He has spread a net for my feet  
And turned me back; He has made me desolate  
And faint all the day"  

• The Prophet Jeremiah describing his emotional distress over the loss and destruction of Jerusalem in 586 B.C.  Lamentations: 1:12-13 Life Applications Bible
Stigmata are bodily marks, sores, or sensations of pain in locations corresponding to the crucifixion wounds of Jesus. Stigmata are primarily associated with the Roman Catholic faith. Many reported stigmatics are members of Catholic religious orders.

A depiction of St. Francis receiving the Stigmata by Cigolo.

Ecstasy of St. Catherine by Pompeo Batoni

Stigmata are bodily marks, sores, or sensations of pain in locations corresponding to the crucifixion wounds of Jesus. Stigmata are primarily associated with the Roman Catholic faith. Many reported stigmatics are members of Catholic religious orders.

Psychosocial **Factors** in Spine Pain: **1917**

“Even non-specialists know from experience during the war and the numerous publications about ‘war-neurotics’, that the psychogenic **component** is far more important as anyone would have expected.”

(M. Raether, **1917**)
“Psychogenic” (Sexually oriented) Causes of Spine Pain

Psychogenic reasons included: sexual neurasthenia, excessive masturbation, coitus interruputus, abnormal and exaggerated sexuality, fears and unfulfilled wishes.


The Disconnect Between Physical Pathology and Pain

- 30-40% asymptomatic patients can have abnormal imaging studies (Frymoyer 1988)
- “positive” discograms found in asymptomatic patients (Frymoyer 1988; Carragee et al. 2000)
- Epidural scarring not always associated with pain (Coskun, 2000)
- Multiple chemical mediators and morphological changes are associated with pain and can be independent of identified structural abnormalities (Mannion & Wolf, 2000)
Pain Sensation Without Noxious Stimulation: *Synesthesia (?)

- Amputee with increased pain when viewing another person in pain (Glummar & Bradshaw. Synesthesia for pain. In JA Pineda, ed., The role or mirror process in social cognition. Totowa: Use Humana Press Inc. 2008)
- Patient with parietal lobe damage experiencing pain in his finger upon seeing his wife cut her finger (Bradshaw et al. J Neurol Neurosurg Psychiatry, 2001, 70, 135-6)
- Builder reported severe foot pain after jumping onto a long nail: the nail passed between his toes (Fisher et al. Br Med Jr, 1995, 310; 70)
- A male suffering injuries during a London bomb attack reported re-experiencing the pain during flashbacks to the bombing (Whalley et Pain, 2007, 132, 332-336)

*Synesthesia: When the brain mixes-up sense, i.e. hears color, sees words etc

Melzack’s observations: What is the Origin of the Pain?

- General lack of correlation between pain and injury (soldiers vs ER patients, ala Beecher)
- ‘Phantom’ pain in a congenitally absent limb
- ‘Somatic delusions’ in psychologically normal person
- Intensification of ‘pain’ in the absence of peripheral stimulation ie emotional/ psychological processes, visual etc.
- Persistent pain even after involved nerves are blocked
- Persons with early childhood traumas experience relatively greater ‘pain’
- Patients report identical or nearly identical pain after the ‘pain generator’ i.e. disc, has been removed. ‘Phantom disc’?
- Depression ‘hurts’.
  (Melzack, R. Pain 1999, Sup 6, S121)
Definitions

• **Pain**: An unpleasant sensory or emotional experience associated with actual or potential tissue damage, or described in terms of such damage (IASP)

• This definition **allows for** the experience of ‘pain’ to occur in the absence of an external noxious stimulus or activation of the nociceptive system

Definitions: Agreement/Evolution?

• **Nociception**: Kyoto Conference, 2008

“The neural processes of encoding and processing noxious stimuli”… “Nociception and pain should not be confused because each can occur without the other”. Thalamic pain = pain without nociception. (p 473, 475, Loeser and Treede, 2008)

Sherrington: …covered **afferent and efferent** activity as well as the **integrative functions** of the neuroaxis and brain.

**Evolving Definition of Pain**

- “Pain is an *unpleasant sensory and emotional experience* associated with actual or potential tissue damage or described in terms of such damage” (IASP, 1986; updated by Loeser, Pain, 2008, 137)

- “It is no the duration of pain that distinguishes acute from chronic pain, but more importantly, the *inability of the body to restore its physiological functions to normal homeostatic levels*” (Loser JD, Melzack R. Pain: an overview. The Lancet, 1999; 53, 1607-1609)

- “…the realization that pain is a *destructive disease process* that should be treated” (Ballantyne, J. Opioids for chronic non-terminal pain. South Med J. 2006; 99(11):1245.)

- In humans, pain is a “… *Homeostatic emotion* … it is represented by the forebrain integration of both specific labeled lines and convergent somatic activity in a well-organized hierarchical system that subserves homeostasis… it is one aspect of the representation of the physiological condition of the body (interception)” (Craig, AD. Pain Mechanisms: Labeled lines versus convergence in central processing. Annu Rev Neurosci, 2003, 26, 1-30:p 1,4)

---

**Definitions**

*Psychogenic pain* Etymology: Gk, psyche, mind; L, poena, penalty: a *functional* pain that *does not have* any known *organic* cause. (Mosby’s Medical Dictionary, 8th edition. © 2009, Elsevier)

(Begs the question of ‘brain’ generated ‘pain’ = organic cause)

*Psychogenic pain* is the term for pain that is primarily caused by psychological factors, such as depression and anxiety. While psychogenic pain is *primarily psychological*, it is a *very real* type of chronic pain.
Definitions

- **Psychogenesis:**
  1) origination and development *within the ‘psyche/mind’*
  2) development of a physical disorder resulting from mental conflict verses organic cause

- **Psychic:**
  1) of or having to do with the psyche or mind
     (the mind is what the brain does?)
  2) *beyond natural or know ‘physical’ process*
  3) apparently sensitive to forces beyond the physical world


Dynamic Theories of *Unexplained* Pain and Suffering (Freudian)

- The underlying motivational force was the *gratification of biologically based instinctual drives*.

- **Chronic pain:** Results from a drive the individual is *unable to gratify* in a socially acceptable manner.

- **Origin of CP:** The *unconscious uses* the physical insult to stabilize a dynamic *conflict* created by awareness of *repressed urges* and to partially gratify drives and conflict via subjective pain, disability and emotional responses.
“Psychogenic Pain”: Origins

‘Psychogenic pain’ is a term discussed by Engel (1959) in the era of psychodynamic theory where-by pain takes on a central position in psychic development and function.

- intricately involved in human relationships
- linked to punishment early in development
- associated with aggression/power in childhood
- associated w/ actual/imagined loss of loved one
- associated with sexual feelings
- emphasis on ‘primary’ vs secondary gain

Given these potential meanings, the conditions under which it was likely to occur included:

1. When external circumstances fail to satisfy the unconscious need to suffer
2. A response to real, imagined or fantasized loss
3. Guilt evoked by intense aggressive/ forbidden sexual feelings


* Engel’s concept of a ‘pain prone personality’ was effectively discounted by Spear (Brit Med Jr, 1966) but continued to be perpetuated.
"Psychogenic Pain": DSM IV & IASP

• The term does not appear in DSM IV; has been replaced by ‘Pain Disorder’ (“… psychological factors are judged to play a significant role in the onset, severity, exacerbation, or maintenance of pain”) under Somatoform Disorder classification.

• IASP Classification of Chronic Pain 2nd edition (Merskey & Bogduk, 1994) 
  *Pain of Psychological Origin*

Pain of “Psychological Origin”: Result of Psychopathology State or Process

• **Delusional/Hallucinatory**: Pain of psychological origin and attributed by the patient to a specific delusional cause. Etiology: Manic-depressive, schizophrenia other psychoses

• **Hysterical, conversion, or hypochondriacal**: Pain specifically attributable to the thought process, emotional state, or personality in the absence of an organic or delusional cause or tension mechanism.

• **Associated with depression**: Pain occurring in the course of a depressive illness, usually not preceding the depression and not attributable to any other cause. Etiology: possibly reduction in cerebral monoamines

(Merskey and Bogduk, Classification of Chronic Pain, IASP Press, 1994)
Proposed Changes in DSM-V: Somatic Symptoms Disorders

- Elimination of ‘medically unexplained’ symptoms as a diagnostic criterion
- Somatisation
- Hypochondriasis
- Pain Disorder

If depressive disorder exists; code both

**Goals:**
(a) Eliminate any implicit reference to mind-body dualism
(b) Recognize shared common features of somatic symptoms and cognitive distortions

(Dimsdale & Creed J Psychosomatic Res, 2009, 66 (6), 473-476)

“Pain” Generators

“...Activity induced in the nociceptor and nociceptive pathways by a noxious stimulus is NOT pain, which is ALWAYS a psychological state even though we may well appreciate that pain most often has a proximate physical cause.”

(From Merskey and Bogduk, Classification of Chronic Pain, IASP Press, 1994, p 210 (capitals are mine))
‘Pain’ Generators: Begins to Remove Elements of Psychopathology

When the nociceptive drive is not evident and/or improved by pharmacological or surgical therapy or natural disease regression, the pain is ‘generated’ by

(a) *unidentified remnants* of the nociceptive drive or tissue damage
(b) *emotional or cognitive elements* within the brain
(c) *amplification or alteration* of nociceptive or non-nociceptive input, respectively due to sensitization within the nervous system
(d) or, the *patients’ imagination*’


“Pain” Processing

- Sensory/Discriminative
- Affective/Motivational
- Cognitive/Evaluative
- Nociception
- Primary pain affect
- Secondary pain emotion
- Behavioral response


Brain Regions that May Modulate Pain and Emotion\textsuperscript{1-4}


Data and Theory
Experimental Models for Behavior Therapy

- Classical Conditioning (Pavlov)
- Operant Conditioning (Skinner)
- Escape / avoidance; desensitization (Eysenck; Wolpe)
- Learned helplessness (Seligman)
- Shock/ “stress” induced aggression (Azrin; Doleys)

Conditioned Nociception and Analgesia

Valcone et al. Pharmacology, Biochemistry and Behavior, 1998, v 60
Paired an odor with either morphine (0.3,10,30 mg/kg or saline within a classical conditioning paradigm. The odor became associated with morphine-like analgesia but displayed a U-shaped function compared to the linear dose-response relationship with morphine.

Olfactory Cues and Conditioned Analgesia in Rats
Subjective ‘Reality’ of Pain (SRP): Pain without ‘Nociception’

- SS: 14 ‘suggestion-prone’ healthy subjects (F=11, M=3)
- Procedure: @ Ss exposed to suggestion for pain, suggestion for pain relief, painful laser, and low intensity laser. fMRI used. Ss rated pain intensity, unpleasantness and ‘reality’ i.e. imaginal pain (0) – (100) real physical pain associated with injury or pain stimulation.
- Results:
  - Laser stimulation - ↑ sensory parts of pain circuit (VAS = 65 for intensity, 57 for unpleasantness)
  - Suggestion induced - ↑ACC and medial PFC (VAS= 55 for intensity, 51 for unpleasantness)
  - Reality of pain: laser = 87, suggestion = 62;
  - SS cortex, ACC and insula activated in each condition. ACC more active in suggestion condition.
- Events often ‘feel’ real or unreal rather than ‘known’ to be real or unreal.

(Raj et al, PNAS,2/8/55,102(6),2147-2151: www.pnas.org/cgi/doi/10.1073/pnas.0409542102)

Pain and Depression

- 65% of patients with depression have unexplained pain; 37% of pain patients (5-85%) have clinically significant depression.
- The presence of pain negatively affects the recognition of depression.
- When pain, moderate-severe, (impairs function) it is associated with more depressive symptoms and worse depression outcomes.
- Depression in pts with pain is associated with more pain complaints and greater impairment.

(Bair,MJ et al, Arch Intern Med, 2003,163,2433-2445)
Depression Makes Pain More Intractable and Vice Versa

- N = 483 neurology outpatients
- Evaluated at 0, 3, 12 mo
- Depression severity at f/u predicted by
  - Baseline depression severity
  - Baseline pain severity
  - Lack of pain improvement
- Pain severity at follow-up predicted by
  - Baseline pain
  - Depression severity
  - Lack of depression improvement
- Conclusion:
  Pain is more persistent in depression, and vice versa
  (Williams L et al. *Neurology*. 2004.)

Depression/ Anxiety: The meaning of pain

- Nociceptive sensations $\rightarrow$ perceived
  intrusion or threat $\rightarrow$ immediate pain unpleasantness i.e. distress, annoyance, fear
- Immediate pain unpleasantness $\rightarrow$ Second order appraisals i.e. interruption in activities, difficulty enduring pain, concern for future
- Second order appraisals $\rightarrow$ Extended pain affect i.e. depression, frustration, anxiety, anger

Pain, **Catastrophizing**: Brain Activity

- fMRI in 29 Ss w/ Fibromyalgia
- Coping Strategies Questionnaire Catastrophizing Subscale: high vs low
- “…pain catastrophizing, independent of the influence of depression, is significantly associated with increased activity in brain areas related to anticipation of pain (medial frontal cortex, cerebellum), attention to pain (dorsal ACC, dorsolateral prefrontal cortex) emotional aspects of pain (claustrum, closely connected to amygdala) and motor control. These results support the hypothesis that catastrophizing influences pain perception through altering attention and anticipation, and heightening emotional responses to pain.”

  (Gracely et al, Brain, 2004,127, p835)

---

**Dissociating Pain from Its Anticipation in the Human Brain**

The experience of pain is subjectively different from the fear and anxiety caused by threats of pain. Functional magnetic resonance imaging in healthy humans was applied to dissociate neural activation patterns associated with acute pain and its anticipation. Expectation of pain activated sites within the medical frontal lobe, insular cortex, and cerebellum distinct from, but close to, locations mediating pain experience itself. **Anticipation of pain can in its own right cause mood changes and behavioral adaptations that exacerbate the suffering experienced by chronic pain patients.**

Selective manipulations of activity at these sites may offer therapeutic possibilities for treating chronic pain.

“Expectation” (learning) and Pain

• Nonpainful warm stimuli were randomly intermixed with painful stimuli simulating unpredictable shooting pain like neuralgia
• Uncertain expectation of painful stimulation enhanced the transient brain response to nonpainful warm stimulation in ACC
• Expectation of painful stimulation amplified perceived unpleasantness of even innocuous stimulation, whereas it did not influence the perceived intensity
• The response to somatic stimuli in the CNS can be ‘exaggerated’ in patients suffering from pain

Sawamoto et al J Neuroscience, 2000, 20, 7438-7445
Flor et al, Neuroscience Letter, 1997, 224, 5-8
McCracken et al, Behav Res Therapy, 1998, 36, 621-630

Expectations

• Expectancies have been demonstrated to effect the activity of the pain modulatory system including the anterior cingulated cortex (ACC), thalamus, prefrontal cortex, and insula cortex (26, 27).
• Expectations related to either anticipated ‘good’ or ‘bad’ motor performance, influenced the outcome of sub-thalamic nucleus stimulation in patients undergoing deep brain stimulation (28).
• Price et al (29) noted the average placebo effect to be 2 units on a 0-10 pain scale in their total study population. However, it was as high 5 units in the placebo ‘responders’ (which varied from 20-55% depending upon the study).
“Mind”, thoughts, **beliefs** and the brain

- “Belief becomes biology” (Cousins, N; Adv. Mind-Body Medicine, 1989)
- Eric Kandel (Nobel Laureate Physiology/Medicine 2000) “Insofar as psychoterapy….produces long-term changes in behavior, it presumably does so through learning, **by producing changes in gene expression**… that **alter the anatomical pattern** of interconnections between nerve cells of the brain …the regulation of gene expression by social factors makes all bodily functions, including all functions of the brain, susceptible to social influences.” (Am Jr Psychiatry; 1998, p 460)

**PET Activation**

- Averaged from 11 sessions
- ACC is involved in pain affect, as well as attention and anticipation
  Sawamoto et al, J Neuroscience, 2000, 20,7438-45
Visceral Hyperalgesia

- Symptoms *previously considered psychogenic or due to anxiety*
- IBS, noncardiac chest pain, non-ulcer dyspepsia
- From *encoding innocuous stimuli as pain*
- Multiple surgeries for “adhesions”
- Visceral hyperalgesia easier to elicit in genetically high anxiety rats

(Gunter WD, et al. Physiol Behav 2000)
Visceral Hyperalgesia

- Rat pups
- 3 hrs/d maternal separation postnatal days 2-14
- At 2 mo:
  - ↑ visceromotor responses to colorectal distension
  - ↑ stress-induced fecal pellet output
- Conclusion:
  Early life events predispose to visceral hyperalgesia and increased colonic motility in response to psychological stress


Risk Factors

1. **Physical Abuse**: if patient received intentional physical injury
2. **Sexual Abuse**: if any adult abused or exploited the patient for that adult’s sexual stimulation.
3. **Alcohol or drug abuse in a primary caregiver**: the primary caregiver had problems with the use of alcohol or drugs.
4. **Abandonment**: present if the patient suffered loss of primary caregiver in a manner that the patient perceived as abandonment.
5. **Emotional neglect or abuse**: primary caregivers were not available for emotional support or they actively and persistently criticized, neglected, or invalidated the patient’s emotional needs as a child.
Pain: Empathy

- Rodents demonstrate hyperalgesia to experimental stimuli after viewing a conspecific receiving a painful electric-shock. The effect is modulated in part by social variables as it occurs predominately in cages-mates of 7-14 days.

- Human subjects show hyperalgesia to experimental stimuli after viewing painful conspecifics. The effect greater in females and males and is modulated in part by ‘likability’ and ‘fairness’ of the conspecific.
Empathy for Pain: Does it ‘HURT’ to look at these pictures? If so where?

Conclusions and Recommendations
“Psychogenic Pain”: *Is REAL*

“The highly overlapping central structures processing ‘real’ versus ‘virtual’ pain (from the standpoint of the uninformed observer) shows that *pain can also be fully internally generated instead of driven by afferent input*.”  

(Grunel and Tolle’s chapter. In Carr et al. (eds.) Narrative Pain and Suffering, 2005, IASP, Press)

**Neural Basis of ‘Psychogenic’ Pain**

- **Anticipation and expectation** of pain active pain-related regions such as S1, ACC, PAG, IC PFC, and cerebellum (Beydoun et al, 1993; Ploghaus et al, 1999; Hsieh et al, 1999; Sawamoto et al, 2000; Porro et al 2002; Villimure & Bushnell, 2002)
- **Anticipation via ‘priming’** with pain-related adjectives enhance EEG activity (Miyazaki et al, 1994; Dillmann et al, 2000)
- **Emotional states** enhance pain perception, negative emotion involve ACC and IC (Phillips et al, 2003)
- **Hypnotic suggestion** altered pain-evoked activity that was ‘region specific’ based on the nature of the suggestion (Rainville et al, 1997; Faymonville et al, 2000; Hofbauer et al, 2001)

(* For the detail of these and other related references see: Apkarian et al, Eur J Pain, 2005, 9, 463-484)
Somatogenic vs Psychogenic

• “… disease and distress both produce physical symptoms. It is not productive to dichotomize symptoms as “somatogenic” and “psychogenic” because physiologic and psychological process are involved in all symptom production and perception. “Rule out” diagnostic strategies that search for either a medical or a psychiatric cause of a physical symptom are not supported by epidemiologic findings of high rate of medical and psychiatric comorbidity.”


Psychogenic: Summary (ala Lewis, 1972)

• Psychogenic and neurotic, psychogenic and ‘non-organic (functional?), psychogenic and reactive, are by some writers substituted for one another as though they are synonyms. These are surface difficulties; at the bottom there are the mind-body problems, and admitted ignorance about etiology.

• Because of the fundamental issues of causality, dualism, and normality, it “would be as well at this stage to give it (the term psychogenic) a decent burial, along with some of the fruitless controversies whose fire it has staked”.

(Lewis, A. “Psychogenic”: a word and it mutations. Psychological Medicine, 1972, 2 200-215)
Summary

- Can there be pain in the absence of the activation of peripheral nociceptive system? Yes
- Is “psychogenic pain” real? Yes. Especially to the one experiencing it.
- Is “psychogenic pain” a useful concept? Yes. But we should abandon the term.
  Perhaps considering “brain-o-genic”

The emphasis should be on determining which and to what degree psychological factors and/or processes are relevant at a given time and how they may change over time.

Thank You