

The Role of Emotions, Thoughts, and Meaning, in the Treatment of Persistent Pain: A Psychological and Neuropsychological Perspective

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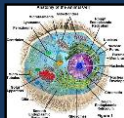
General Objectives for the Lecture

1. To explore the neurophysiological and neuropsychological dimensions of persistent pain
2. To demonstrate the role of anxiety and helplessness in the experience of persistent pain and how to address them
3. To demonstrate that effective pain management needs to be an integrated, dynamic process
4. To explore the role of emotions in the interpretation of pain
5. To demonstrate the critical role of meaning in the experience and management of recalcitrant pain

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Life in One Word...

Integration



3

Therefore...

The more integrated our approach
to a problem, the closer to life, the
more effective we are!

4

Therefore...

We need an integrated approach to
pain management:



5

The Definition of Pain

↓
“An unpleasant sensory and emotional experience associated
with actual or potential tissue damage, or described in terms of
such damage.”

(IASP, 1986)

6

The Definition of Pain (with a touch of...)

↓

“An unpleasant sensory and emotional experience, which is modulated by a sense of meaning or a lack thereof, associated with actual or potential tissue damage, or described in terms of such damage.”

7

We (can) give meaning to our pain!

8

Henry Beecher and the “Anzio Effect” (1956)



9

The “Anzio Effect”

“Most of the seriously wounded soldiers...experienced little or no pain as revealed through systematic questioning: only 32% of men requested medication to relieve pain. They appeared to be thinking clearly and showed no signs of shock.

Later, a comparative, survey study was conducted using a sample of male surgery patients, carefully selected to match the soldiers in terms of severity and location of tissue damage. Most of whom complained of great pain, and 83% requested medication...The civilians experienced their surgery as a depressing, even catastrophic event. In contrast, the wounded soldiers had escaped with their lives from an extremely dangerous battlefield.”

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The Meaning of Pain

“The intensity of suffering is largely determined by what pain **means** to the patient. This emphasizes the impossibility of appraising, by the current experimental techniques at least, the power of analgesic agents in [people]. It also means that the indiscriminate administration of powerful analgesics to all injured individuals is unsound” (p. 1609).

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A few more lines...

“...when anxiety was present, the incidence of pain increased...when anxiety was relieved, pain was relieved.”

“...pathological pain was encountered far more frequently in a situation filled with anxiety than in one in which tremendous anxiety [had] been greatly lessened.”

Beecher (1956, p. 1612)

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Anticipating a Scientific Breakthrough in Physiology of Pain

13

Pain is not Simply a Linear Phenomenon

“The Specificity Theory of Pain” vs. “The Pain Gate Theory”

↓
The severity of injury determines
the intensity of pain perceived
(Von Fry, 1895)

↓
Pain perception is a combination of
sensory, emotional, cognitive, and
motivational factors (Melzack &
Wall, 1965)

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The Pain Gate Theory

- It proposes that there are certain structures in the spinal cord that act as a gate for the painful stimulation that is being transmitted to the brain.
- If the gate is closed, one may experience little or no pain. If the gate is opened, one will experience pain. Information from the brain, descending information, can open or close the gate.
- Feelings, emotions, thoughts, previous experiences, depression, anxiety, and expectations can directly affect the pain through a descending pathway!

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The Definition of Pain

“An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage.”

(IASP, 1986)

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The First Response to Pain

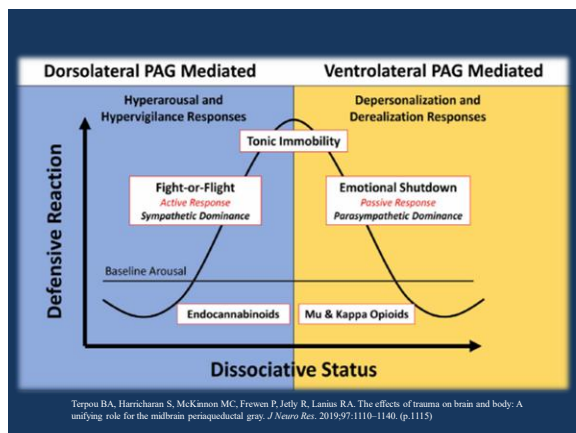
Fear

(Apprehension about a known source of threat)

Options:

Escape, Avoid, Seek Help

17



18

Dorsolateral PAG

Ventrolateral PAG

[illegible]

Can you capture the essence of anxiety in one word?

If the Nature of Pain Remains Unknown

Anxiety
(Apprehension about an **unknown**
source of threat)

Options:

Historical data, Vigilance, Hypervigilance, Seek Help,
Withdraw
Memory (Hippocampus)

22

The Patient's Desperate Attempt to Turn Anxiety into Fear...

“Doctor, is it possible that this pain is
due to...?”

“Could this eventually cause...?”

“If I were to do the following..., would
it make the pain go away?”

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Anxiety
Contributing to
Pain

“The level of anxiety is important
in considering the production of
pain. The unfortunate and common
practice of administering powerful
analgesic agents to all injured
individuals is clearly unsound”
(Beecher, 1956, p.1612)

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Recalcitrant and Refractory Pain Leads to...

- Anxiety
- Anxiety leads to depression
- Anxiety leads to hypervigilance to paranoia
- Paranoia leads to psychosis

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Recalcitrant Pain as the Most Powerful Stressor

The SNS and the HPA Axes

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Hypothalamic-sympathetic-Adrenal Medulla Axis

Hypothalamus



Sympathetic

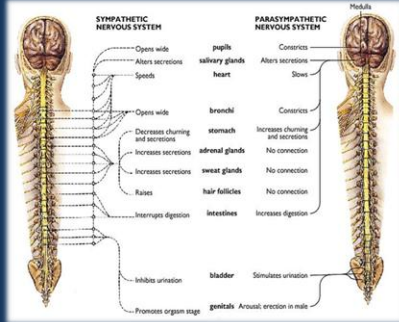


Adrenal Medulla



Catecholamines

27



In people who suffer from chronic conditions, we often see excessive sympathetic activation!

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Hypothalamic-Pituitary-Adrenal Cortex Axis

Hypothalamus



Corticotropin-Releasing Hormone (CRH)



Adrenocorticotrophic Hormone (ACTH)



Adrenal Cortex



Glucocorticoids

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Functions of Glucocorticoids (short-term)

- Increase energy (gluconeogenesis)
- Reduce inflammation
- Suppress the immune system

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Elevated Glucocorticoids (long-term)

- Weight gain
- Dysregulation of the immune system (e.g., autoimmune disorders)
- Damage to structural tissue (e.g., loss of muscle mass, arthritic changes, etc.)
- Changes in memory
- Personality changes
- Psychosis

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Not Comfort Food, Glucocorticoid Reducing Agents!



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The Limbic Connection

The role of emotions

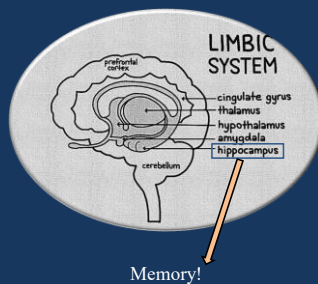
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Emotions

Motion (to move) away from pain (in the direction of pleasure)

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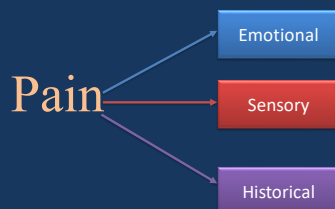
The Limbic System



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There are Three Basic Dimensions to Pain:

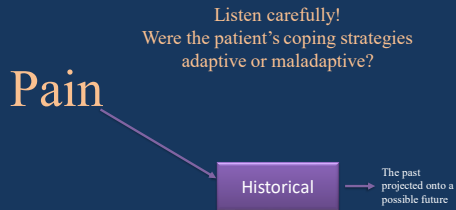
Only one Dimension is Emphasized and One is Often Neglected



36

There are Three Basic Dimensions to Pain:

Only one Dimension is Emphasized and One is Often Neglected

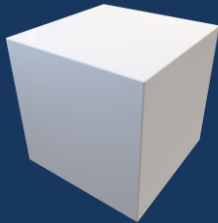


The last time you experienced this pain, how did you cope with it?
The last time you experienced this pain, what helped?

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Pain Has Several Other Dimensions:
By not Addressing them,
Pain Management is Oftentimes Ineffective

The Pain Cube



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Our Immediate Reflex to Address Pain...



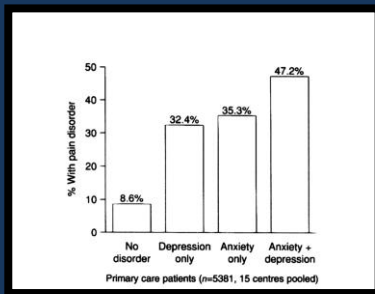
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“Flattening”
(From 3 to 2 Dimensions)



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The Relationship Between Pain and Depression by Korf and Simon (1996)
British Journal of Psychiatry, 168, 101-108



It is very likely that most chronic pain patients are experiencing depression and anxiety!

41

“Indeed, investigators have continued to present data that anxiety gives rise to local muscle contraction, which, if persists, causes pain” (Merskey, 1968, p. 298).

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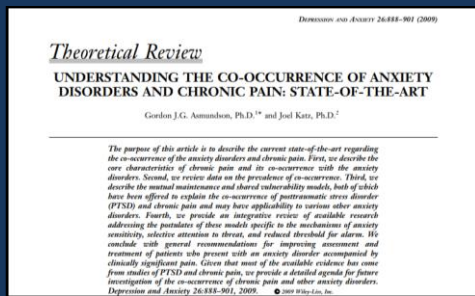
Pain, Anxiety, and Depression



It is very likely that most chronic pain patients are experiencing depression and anxiety!

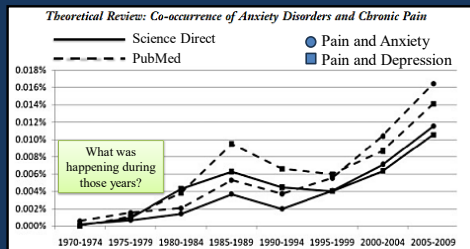
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Pain, Anxiety, and Depression



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Pain, Anxiety, and Depression



It is very likely that most of your patients are experiencing depression and anxiety!

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Exacerbation
of Pain by
Anxiety and
the
Hippocampal
Network



Exacerbation of Pain by Anxiety is Associated with Activity in a Hippocampal Network

Alexander Pfeiffer,^{1,2} Cheng He,^{1,2} Christian F. Bockers,¹ David Clark,¹ Rebecca Smith,¹ Richard Wills,¹ Paul M. Matthews,¹ J. Michael F. Roelofs,¹ and Ross Henson¹
¹Centre for Functional Magnetic Resonance Imaging of the Brain, Department of Clinical Neurosciences, University of Oxford, Oxford OX3 9DU, United Kingdom; and ²Department of Clinical Neurosciences, University of Cambridge, Cambridge CB2 3RU, United Kingdom

It is believed that memories that encode about past pain exacerbate the pain sensation. Using event-related functional magnetic resonance imaging (fMRI), we compared activation patterns in response to pain stimuli in healthy controls and patients with post-traumatic stress disorder (PTSD). We found that PTSD patients showed significantly greater activation in a network of brain regions, including the hippocampus, entorhinal cortex, and amygdala, in response to pain stimuli. This network was associated with the degree of PTSD symptoms. Our findings suggest that memories of past pain exacerbate the pain sensation in PTSD patients, and this may be mediated by a network of brain regions, including the hippocampus, entorhinal cortex, and amygdala.

Introduction

Pain is a complex experience that involves both sensory and emotional components. The sensory component of pain is mediated by the nociceptive system, which transmits information about the intensity of the pain stimulus to the brain. The emotional component of pain is mediated by the limbic system, which is involved in processing the affective aspects of the pain experience. The hippocampus, a structure within the limbic system, is known to be involved in memory formation and is thought to play a role in the emotional aspects of memory. It is believed that memories that encode about past pain exacerbate the pain sensation. This is because the hippocampus is thought to be involved in the formation of memories that encode about past pain, and these memories are thought to exacerbate the pain sensation.

Methods

We used event-related functional magnetic resonance imaging (fMRI) to study the brain activation patterns in response to pain stimuli in healthy controls and patients with PTSD. The participants were asked to rate the intensity of the pain stimulus on a scale from 0 to 10. The fMRI data were analyzed using a general linear model (GLM) to identify brain regions that showed significantly greater activation in response to pain stimuli in PTSD patients compared to healthy controls.

Results

We found that PTSD patients showed significantly greater activation in a network of brain regions, including the hippocampus, entorhinal cortex, and amygdala, in response to pain stimuli. This network was associated with the degree of PTSD symptoms. Our findings suggest that memories of past pain exacerbate the pain sensation in PTSD patients, and this may be mediated by a network of brain regions, including the hippocampus, entorhinal cortex, and amygdala.

Conclusions

Our findings suggest that memories of past pain exacerbate the pain sensation in PTSD patients, and this may be mediated by a network of brain regions, including the hippocampus, entorhinal cortex, and amygdala. This has implications for the treatment of PTSD, as it suggests that interventions that target the hippocampus, entorhinal cortex, and amygdala may be effective in reducing the pain sensation in PTSD patients.

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Exacerbation
of Pain by
Anxiety and
the
Hippocampal
Network

“Our finding suggests that accurate preparatory information during medical and dental procedures alleviates pain by disengaging the hippocampus. It supports the proposal that during anxiety, the hippocampal formation amplifies aversive events to prime behavioral responses that are adaptive to the worst possible outcome.”

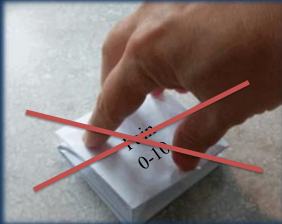
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Exacerbation
of Pain by
Anxiety and
the
Hippocampal
Network

“This would be consistent with the Gray–McNaughton theory of hippocampal function, which predicts that during anxiety, the hippocampal formation increases pain by sending amplifying signals to the neural representation of the pain stimulus.”

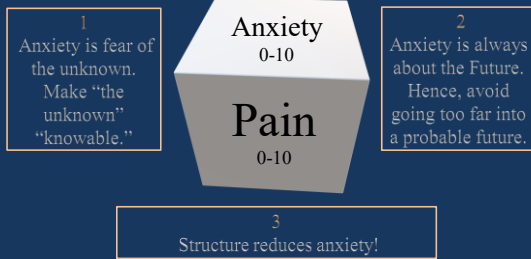
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A Limited (ineffective) Approach to Managing Chronic Pain



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Addressing the Anxiety Dimension of Pain



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Summary: Methods of Reducing Anxiety

1. **Education** helps make the unknown as knowable as possible, not by offering information but knowledge (and experience).
2. **Focus** on the task at hand, one step at a time. Avoid too many "what-ifs".
3. **Structure** reduces anxiety. Hence, clarify the steps involved in the diagnostic and treatment processes.

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A Quick Way of Measuring Anxiety

Self-Report

SELF-EVALUATION QUESTIONNAIRE
ANS Form 1-2

Please provide the following information:

Name _____ Date _____

Age _____ Gender (Circle) M ☐ F ☐ _____

DIRECTIONS

Circle a number from 0 to 4 that best describes how you feel about each item. 0 = Not at all, 1 = Mild, 2 = Moderate, 3 = Severe, 4 = Very Severe. Do not check any item unless you are sure you are answering for yourself. Do not check any item unless you are sure you are answering for yourself.

1. I feel nervous	0	1	2	3	4
2. I feel anxious	0	1	2	3	4
3. I feel worried	0	1	2	3	4
4. I feel tense	0	1	2	3	4
5. I feel shaky	0	1	2	3	4
6. I feel restless	0	1	2	3	4
7. I feel nervous	0	1	2	3	4
8. I feel anxious	0	1	2	3	4
9. I feel worried	0	1	2	3	4
10. I feel tense	0	1	2	3	4
11. I feel shaky	0	1	2	3	4
12. I feel restless	0	1	2	3	4
13. I feel nervous	0	1	2	3	4
14. I feel anxious	0	1	2	3	4
15. I feel worried	0	1	2	3	4
16. I feel tense	0	1	2	3	4
17. I feel shaky	0	1	2	3	4
18. I feel restless	0	1	2	3	4
19. I feel nervous	0	1	2	3	4
20. I feel anxious	0	1	2	3	4
21. I feel worried	0	1	2	3	4
22. I feel tense	0	1	2	3	4
23. I feel shaky	0	1	2	3	4
24. I feel restless	0	1	2	3	4
25. I feel nervous	0	1	2	3	4
26. I feel anxious	0	1	2	3	4
27. I feel worried	0	1	2	3	4
28. I feel tense	0	1	2	3	4
29. I feel shaky	0	1	2	3	4
30. I feel restless	0	1	2	3	4
31. I feel nervous	0	1	2	3	4
32. I feel anxious	0	1	2	3	4
33. I feel worried	0	1	2	3	4
34. I feel tense	0	1	2	3	4
35. I feel shaky	0	1	2	3	4
36. I feel restless	0	1	2	3	4
37. I feel nervous	0	1	2	3	4
38. I feel anxious	0	1	2	3	4
39. I feel worried	0	1	2	3	4
40. I feel tense	0	1	2	3	4
41. I feel shaky	0	1	2	3	4
42. I feel restless	0	1	2	3	4
43. I feel nervous	0	1	2	3	4
44. I feel anxious	0	1	2	3	4
45. I feel worried	0	1	2	3	4
46. I feel tense	0	1	2	3	4
47. I feel shaky	0	1	2	3	4
48. I feel restless	0	1	2	3	4
49. I feel nervous	0	1	2	3	4
50. I feel anxious	0	1	2	3	4
51. I feel worried	0	1	2	3	4
52. I feel tense	0	1	2	3	4
53. I feel shaky	0	1	2	3	4
54. I feel restless	0	1	2	3	4
55. I feel nervous	0	1	2	3	4
56. I feel anxious	0	1	2	3	4
57. I feel worried	0	1	2	3	4
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59. I feel shaky	0	1	2	3	4
60. I feel restless	0	1	2	3	4
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66. I feel restless	0	1	2	3	4
67. I feel nervous	0	1	2	3	4
68. I feel anxious	0	1	2	3	4
69. I feel worried	0	1	2	3	4
70. I feel tense	0	1	2	3	4
71. I feel shaky	0	1	2	3	4

[illegible]

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A Quick Question...

If you were to incorporate into your practice one concept you have learned so far, what would it be?

(Half a page, double-spaced, no references required. Don't forget to add a title page. Due at midnight. Late submission will not be graded).

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Emotions

Motion (to move) away from pain (in the direction of pleasure)

What if that is not an option?

Helplessness

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Manifestations of Learned Helplessness

The Motivational Element: Individuals who have been exposed to inescapable stress for a period of time fail to initiate escape responses in the presence of the stressor.

Cognitive Element: Individuals who have been exposed to inescapable stress for a period of time begin to lose the ability for problem solving

Emotional Element: Individuals who have been exposed to inescapable stress for a period of time tend to experience anxiety, phobic anxiety, and despair. These individuals have a greater chance of developing hypertension and gastric ulcers.

Sympathetic over-activity

55

Manifestations of Learned Helplessness

Erratic, desperate, maladaptive, at times destructive behavior with the hope to find a way out, followed by exhaustion, withdrawal, and more maladaptive behaviors to ensue.

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The “Secret” of Modulating Neurotransmitters of Helplessness

- Changes in serotonin levels as one example
- The classic study by Religh, Brammer, McGuire, Yuwiler (1985) demonstrated that passive and helpless (submissive) monkeys had much lower levels of serotonin than their more dominant counterparts.
 - As the sense of control increased in the helpless monkeys, their serotonin levels went up
 - As the dominant monkeys lost their social position and experienced helplessness, their serotonin levels plummeted

Other neurotransmitters?

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Avoidance, Helplessness and Chronic Pain Disability

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The “Secret” of Reversing Helplessness

- Give them a sense of control
 - Start with small, achievable, goals

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Think in Terms of the Dimensions of Pain



A 3D cube diagram illustrating the dimensions of pain. The top face is labeled "Anxiety 0-10". The left face is labeled "Pain 0-10". The right face is labeled "Control 0-10".

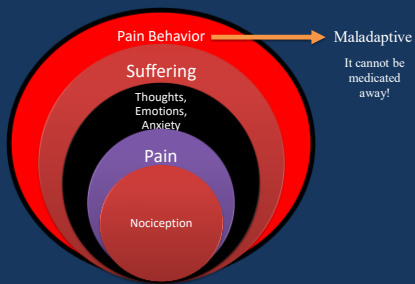


Suffering is...

...an all-consuming, utter sense of meaningless helplessness...

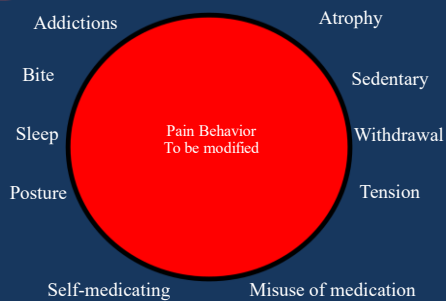
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Loesser's 'Onion' Model



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The Face of Chronic Pain



63

A Quick Question...

If you were to incorporate into your practice one more concept you have learned so far, what would it be?

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Other Dimensions of Pain...



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Think in Terms of the Dimensions of Pain



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Sleep has Analgesic Properties

RAPID PUBLICATION

Sleep Loss and REM Sleep Loss are Hyperalgesic

Timothy Roehrs, PhD¹; Mason Hyde, BS¹; Brand Stansel, MD¹; Mark Overstreet, PhD²; Thomas Roth, PhD¹

¹Henry Ford Health System, Sleep Disorders and Research Center, Detroit, MI; ²Department of Psychiatry and Behavioral Neuroscience, School of Medicine, Wayne State University, Detroit, MI

Study Objectives: Disturbed sleep is observed in association with acute and chronic pain, and some data suggest that disturbed and shortened sleep enhances pain. We report the first data showing, in healthy, pain-free, individuals, that modest reductions of sleep time and specific loss of rapid eye movement (REM) sleep produce hyperalgesia the following morning.

Design: Two repeated-measures design protocols were conducted: (1) a sleep-loss protocol with 8 hours time-in-bed, 4 hours time-in-bed, and 0 hours time-in-bed conditions and (2) a REM sleep-loss protocol with 8 hours time-in-bed, 2 hours time-in-bed, REM deprivation, and non-REM yoked-control conditions.

Setting: The studies were conducted in an academic hospital sleep laboratory.

Participants: Healthy pain-free normal sleepers, 7 in the sleep-loss protocol and 6 in the REM sleep-loss protocol, participated.

Measurements: Finger withdrawal latency to a radiant heat stimulus tested at 10:30 am and 2:30 pm and the Multiple Sleep Latency Test conducted at 10:30 am, noon, 2:30 pm, and 4:30 pm were measured.

Results: Finger withdrawal latency was shortened by 29% after 4 hours of time in bed the previous night relative to 8 hours of time in bed ($p < .05$), and REM sleep deprivation relative to a non-REM yoked-control sleep-interruption condition shortened finger withdrawal latency by 32% ($p < .02$).

Conclusion: These studies showed that the loss of 4 hours of sleep and specific REM sleep loss are hyperalgesic the following day. These findings imply that pharmacologic treatments and clinical conditions that reduce sleep and REM sleep time may increase pain.

Keywords: REM sleep deprivation, sleep time reduction, pain threshold. **Citation:** Roehrs T, Hyde M, Stansel B et al. Sleep loss and REM sleep loss are hyperalgesic. SLEEP 2006;29(2): 145-151.

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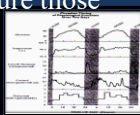
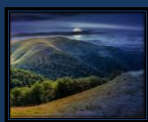
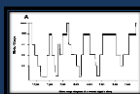
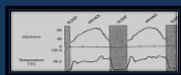
Is There a Single Dimension of the Pain Syndrome That Can Improve Coping?

- Improve sleep!

“92% (n=412) of chronic pain patients suffered from chronic insomnia.”

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Chronic Pain in One Word...



Patterns
Then, why don't we measure those patterns?

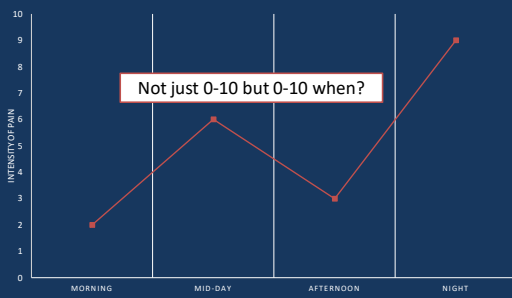
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Cycles and Patterns of Pain



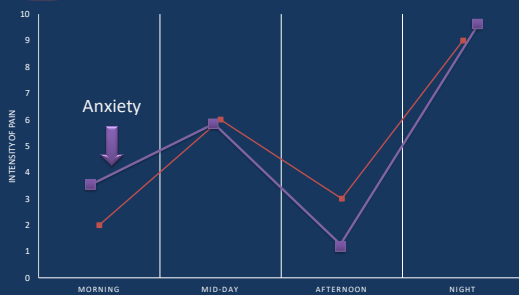
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Patterns of Chronic Pain

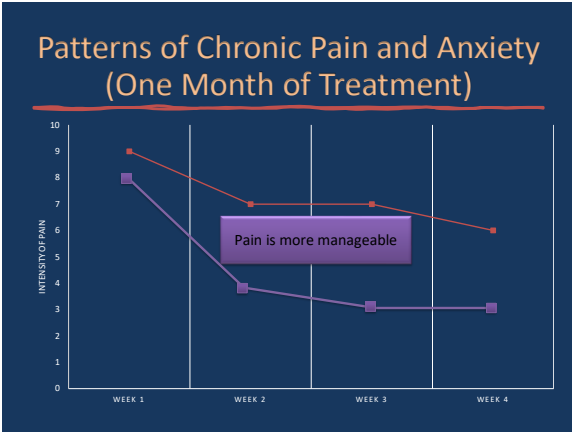


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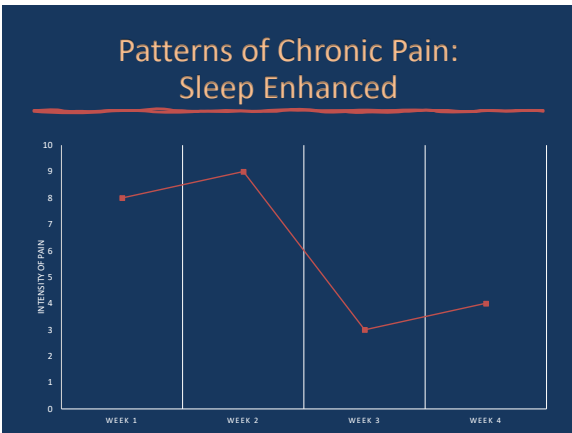
Patterns of Chronic Pain and Anxiety



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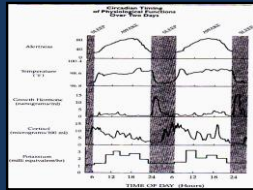


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Tonight's Episode:
The Case of Burning Mouth Syndrome
(Think in terms of patterns of pain)

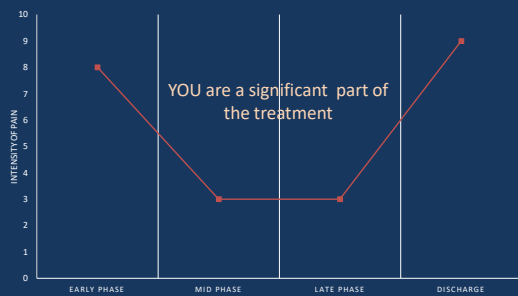
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Tonight's Episode: The Case of Burning Mouth Syndrome (Think in terms of patterns of pain)



76

Patterns of Chronic Pain: Course of Treatment



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“...as termination approaches, patients are bound to regress temporarily.”
(Yalom, 2012, p. 137)

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Think in terms of and collect data about

- Patterns of Pain



- Dimensions of Pain



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Other Dimensions of Pain?



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The Missing Dimension of Pain: Not Just Intensity and Frequency



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The Role of Meaning

Suffering may be related as much to the meaning of pain as to its intensity. Persistent helplessness and hopelessness may be the root causes of suffering for patients with chronic pain yet be reflected in a report of high pain intensity.

Intensity of Chronic Pain — The Wrong Metric?

Jane C. Ballantyne, M.D., and Mark D. Sullivan, M.D., Ph.D.

The New England Journal of Medicine (2015), vol. 373

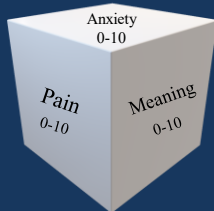
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The Role of Conversation

pain for a particular patient. For this purpose, nothing is more revealing or therapeutic than a conversation between a patient and a clinician, which allows the patient to be heard and the clinician to appreciate the patient's experiences and offer empathy, encouragement, mentorship, and hope.

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Think in Terms of the Dimensions of Pain



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We (can) give meaning to our pain!

85

Pain as Punishment

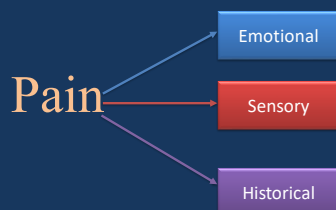
86

Pain as self-transcendence

87

There are Three Basic Dimensions to Pain:

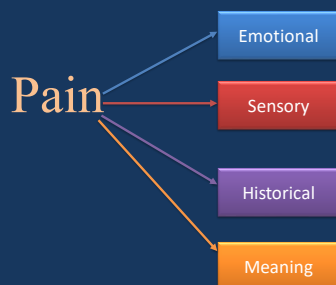
Only one Dimension is Emphasized and One is Often Neglected



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There are Four Basic Dimensions to Pain:

Only one Dimension is Emphasized and One is Often Neglected



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Consequences of Chronic Pain

Physiological consequences
Cardiovascular disorders
Musculoskeletal disorders
Gastrointestinal disorders

Psychological consequences
Anxiety
Depression
Maladaptive behaviors
Changes in personality
Insomnia

Psychosocial consequences
Interpersonal tension
Social isolation
Alienation
Loss of social support

Existential consequences
Loss of purpose and direction
Loss of meaning

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“One should not treat the disease but
the patient who is suffering from it.”

Maimonides

Do the science, but don't lose sight of the human who is suffering.

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Life in One Word...

Integration
(Think in terms of collaboration)

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A Final Message...

“...cure sometimes, relieve often, comfort
always.”

Edward Livingston Trudeau

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