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Pain Modulation Through Spinal Manipulation/Mobilization

November 8, 2019
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Chiropractic Breakout

Pain is not a simple sensation(s) but rather a complex neurobehavioral event(s)


- Individual neurophysiology
 - Neural adaptation
 - Example pinch finger for 5 minutes - Pain sensation decrease?
- Individual discernment or perception of the stimulation of specialized nerve endings which transmit information concerning potential or actual tissue damage (nociception)
- Individual's reaction to this perceived sensation and stimuli (pain behavior)

Pain is perfect misery, the worst of evils; and excessive, overturns all patience.
—John Milton, Paradise Lost 1667

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Oxford's Medical Dictionary
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- Types of pain in lateral spinothalamic tract
- Neurophysiology of pain
- Effects of manipulation/mobilization on pain
 - Biomechanical
 - Peripheral
 - Chemical
 - Central



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Types of Pain

Fast pain

- Sharp
- Pricking
- Acute
- Electric

Generally elicited by **mechanical** and **thermal** types of stimuli

Slow pain

- Slow burning pain
- Aching pain
- Throbbing Pain
- Nauseating pain
- Chronic Pain

Generally elicited by **chemical** types of stimuli; also chronic mechanical and thermal

Guyton, Textbook of Medical Physiology, 11th Edition, pp. 588-606

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Three Types of Stimuli to Activate Nociceptors

Mechanical

- Over-stretch of a muscle
- pinching
- Pressure
- Tissue deformation
- Tension
 - Axial
 - Torsional

Thermal

- Heat
- Cold

Chemical

- Exposure or external
- Released by local damaged tissue
- Released by peripheral nerves

Atkin, Module 1: pathophysiology of pain and pain assessment, 2007

Guyton, Textbook of Medical Physiology, 11th Edition, pp. 588-606
<https://img.mediacapsule.com/articles/742278/704607.jpg>

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Mechanical

Results of mechanical tissue damage

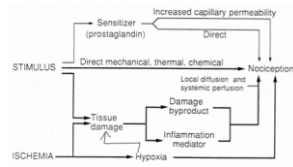
- Local
 - Soft tissue inflammation which restricts motion of proximal joints
 - Spasm of muscles
 - Contractile tissue repair – adhesions
- Global
 - Pro-inflammatory chemicals

Guyton, Textbook of Medical Physiology, 11th Edition, pp. 588-606
<https://img.mediacapsule.com/articles/742278/704607.jpg>

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Peripheral Pain Transduction



http://fileconnection.s3.amazonaws.com/2802/healthedu/028022802.png?server_chd_2013-04-23_at_105551_aml136680305703.png

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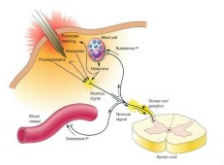
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Chemical

Cellular damage and inflammation increase concentrations of other chemical mediators:

- Prostaglandins
- Bradykinin
- Histamine
- Substance P
- Cortisol

Peripheral Chemical Mediators of Pain

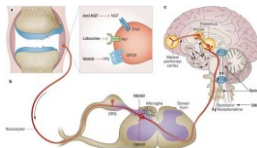


Quintan: Textbook of Medical Physiology, 11th Edition, pp. 588-605
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2802280/>
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2802280/>

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Central neurophysiology of pain



Review: Rheumatology volume 13, pages 76–79 (2007)

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Bringing it all together

Biomechanical

- Nerve irritation causes muscle spasm

Peripheral

- Local soft tissue inflammation

Chemical

- Prostaglandins released

Central

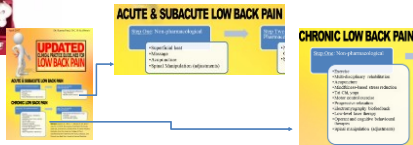
- C Fiber receptor is activated
- Secondary synapse via Substance P sending pain signal up spinothalamic tract

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Now that we know how pain is produced what can we do to modulate and reduce pain?



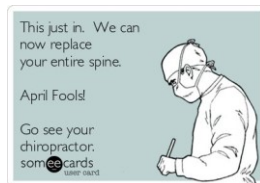
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Ann Intern Med. 2017;166(7):514-530

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What do chiropractors do?



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Manual Therapies used in pain modulation:

- Manipulation/Mobilization
- Trigger point therapy
- Myofascial Release Therapy
- Graston
- Active Release Therapy
- Strain/Counter Strain
- Neuromuscular Re-education
- Traction

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<https://medical-dictionary.thefreedictionary.com/spinal-manipulation>

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Spinal manipulation is an intervention performed by applying a force through spinal articulations such as:

- z-joints/Facet
- atlanto-occipital
- atlanto-axial
- cervical/thoracic/lumbar/lumbosacral/SI
- costovertebral/costovertebral joints.



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Spinal manipulation Therapy (SMT)

- Activator technique
- Manual technique
 - Popping sound
 - "cavitation"



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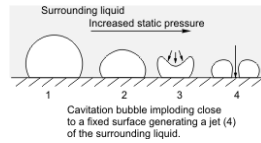
J Manipulative/Physiol Ther. 2011 Jan; 34(1): 2-54.

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Cavitation

- Synovial fluid contains the gases oxygen, nitrogen and carbon dioxide
- Gas is rapidly released



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Manipulation - Pain modulation via peripheral effect

- Effects muscle spindle afferents and Golgi tendon organ afferents
- **Stimulates primary afferent touch sensation neurons** from paraspinal tissues, the motor control system and pain processing.
- Leads to transient **suppression of motor neuron excitability**

Spines I, 2003 Sep-Oct;20(5):557-71, Fisher JS

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Manipulation - pain modulation via mechanical effect

- Produces a **reflex reduction in pain** muscle hypertonicity and improvement in functional ability
- Consistent and systematic reflex response both in muscles local to the manipulated joint and also in more distant muscles (**Global effect**)
- Distension of the facet joint – **inhibits alpha motor neuron activation**
- Increased joint mobility – **silenced gamma motor neurons**



J Manipulative Physiol Ther. 2002 Jan;25(1):1-6, Dolan P, Bell SA, Burke J

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Manipulation - pain modulation via central effect

- Numerous studies show that spinal manipulation increases pain tolerance or its threshold
- Alters central sensory processing by removing subthreshold mechanical or chemical stimuli from paraspinal tissues
- Effects the inflow of sensory information to the central nervous system

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Spine J. 2002 Sep-Oct;13(9):957-71. Fisher SJ

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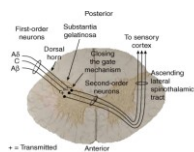
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Gate Control Theory of Pain

Ascending Pain Modulation

- A-Beta fibers

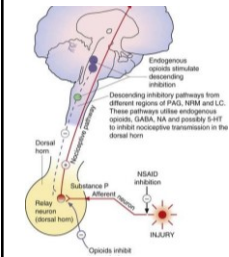


Source: Prentice WB, Quillen WB. Underwood P. Therapeutic Modalities in Rehabilitation. 6th Edition. www.accesschiropractic.com.
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- Relieving pain may be mediated by three hormonal metabolites:

- Beta endorphins
 - Enkephalins
 - Nor-epinephrine
 - Serotonin
- Oxytocin
- Neurotensin

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Descending Pain Control Mechanisms

- Ascending neural input from Aδ and C-fiber afferents and possibly central biasing stimulates periaqueductal grey region in midbrain which stimulates raphe nucleus in pons and medulla thus activating descending mechanism in dorsolateral tract



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Current Research supports manipulation for back pain


- Manipulative Therapy in conjunction with standard medical care offers significant advantage at decreasing pain and improving function.
- Acute low back pain: spinal manipulation was significantly better than non-steroidal anti-inflammatory (mobility, function, time off work).
- Manipulation provides greater short-term reductions in self-reported disability and pain compared with usual medical care. 94% of the manual-thrust manipulation group achieved greater than 30% reduction in pain compared with 69% of usual medical care.
- Significant amount of current research demonstrates early conservative intervention (manipulation, physical therapy) improves patient outcomes, patient satisfaction and decreases cost

Ann Intern Med. 2012;156:5-10.
Journal of Chiropractic and Environmental Medicine. 2014;June, Vol. 56, Issue 6, 604-620.
Spine J. 2014;24(7):1210-16.
Ann Intern Med. 2012;156(7):514-530.

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April 2017 Dr. Karma Patel, D.C., B.Sc.(Hons)

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ACUTE & SUBACUTE LOW BACK PAIN

- First-line treatment:**
 - Physical Therapy
 - Massage
 - Heat
 - Medication (if needed)
- Second-line treatment:**
 - Spinal Manipulation
 - Acupuncture
 - Yoga
 - Exercise
 - Home care stretching and ergonomic recommendations

CHRONIC LOW BACK PAIN

- First-line treatment:**
 - Physical Therapy
 - Exercise
 - Home care stretching and ergonomic recommendations
 - Spinal Manipulation
 - Acupuncture
 - Yoga
 - Medication (if needed)
- Second-line treatment:**
 - Spinal Manipulation
 - Acupuncture
 - Yoga
 - Exercise
 - Home care stretching and ergonomic recommendations

References: Cassidy, J., Bly, T., Maitland, R. D., et al. (2015). Systematic Review of the Effectiveness and Clinical Use of Back Pain in Clinical Practice. *Journal of the American Medical Association*.
 Chiropractic Treatment for Back Pain: A Review of the Evidence. *Journal of the American Medical Association*.

Ann Intern Med. 2017;166(7):514-518. AllinaHealth

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Provider Locations



- Cambridge - Dr. Jenna Therrien
- Isanti - Dr. Jenna Therrien
- Coon Rapids (Courage Kenny) - Dr. Derek Doty
- Woodbury (PGIHH) - Dr. Timothy Hammer
- Edina – Dr. Molly Magnani
Dr. Doug Pernula
Dr. Rochelle Rougier-Maas
- West Health – Dr. Steve Dandrea
- Nicollet Mall – Dr. Dean Bruns

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