Treatments for Chronic and Recurring Lower Back Pain Must be Informed by the Psychological Component

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1.1.0 Introduction

1.1.1 Statistics

The statistics of lower back pain in America are quite daunting. Roughly eighty percent of Americans will experience low back pain in their life,[1] and it is the most common cause of work-related disability in subjects under the age of 45.[2] Furthermore, "back pain is the second leading symptomatic reason for physician office visits in the United States, and medical back problems are the third most common reason for hospital admissions" as well as the "third most common reason to undergo a surgical procedure."[3]

1.1.2 The Definition of Back Pain

Lower Back pain can be loosely defined as "any back pain between the ribs and top of the leg from any cause."[4] Some causes of back pain are nerve-related, such as spinal stenosis or a herniated disk. Others include musculoskeletal problems, skeletal problems, and various tumors.[5] Ultimately, back pain is based on the patient's subjective report of pain and may or may not be related in any way to an injury, illness, or bodily trauma.[6]

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[1] Anthony H. Wheeler and James R. Stubbart, "Pathophysiology of Chronic Back Pain," 11 April 2005, <http://www.emedicinehealth.com/articles/4563-1.asp> (15 April 2005).
[2] Adams, Lemrow N., et al. The 50 Most Frequent Diagnosis-related Groups (DRGs), Diagnoses, and Procedures: Statistics by Hospital Size and Location (Rockvile: Agency for Health Care Policy and Research, Public Health Service, 1990), B.M. Berman and J.P. Swyers, "Establishing a Research Agenda for Investigating Alternative Medical Interventions for Chronic Pain" Primary Care, Vol. 24, no. 4 (1996): 744.
[3] Ibid.
[4] J.B. Feldman, "The Prevention of Occupational Low Back Pain Disability: Evidence-based Reviews Point in a New Direction," Journal of Surgical Orthopaedic Advances 13, no. 1 (2004): 2.
[5] Anthony H. Wheeler and James R. Stubbart, "Pathophysiology of Chronic Back Pain," 11 April 2005, <http://www.emedicinehealth.com/articles/4563-2.asp> (15 April 2005).
[6] G.M. Aronoff and W.O. Evans, "Evaluation and Treatment of Chronic Pain at the Boston Pain Center," Journal of Clinical Psychiatry 43, no. 8 pt. 2 (August 1982): 4.

1.2.0 Lumbar Spine Anatomy

Despite the vague and subjective nature of back pain, in order to best evaluate various treatments, we must first investigate lumbar spine anatomy and subsequently the various causes of back pain.

1.2.1 The Structure of the spine

The spine consists of "33 vertebrae including 7 cervical, 12 thoracic, 5 lumbar, 5 sacral (fused into one) and the 4 coccygeal (often fused into one)."[7] Because the five sacral vertebrae are fused into one and the four coccygeal are fused as well, practically speaking, we have "26 active vertebrae"[8] (see Fig. 1). These vertebrae are joined and supported by various ligaments, tendons, cartilage, and muscles.

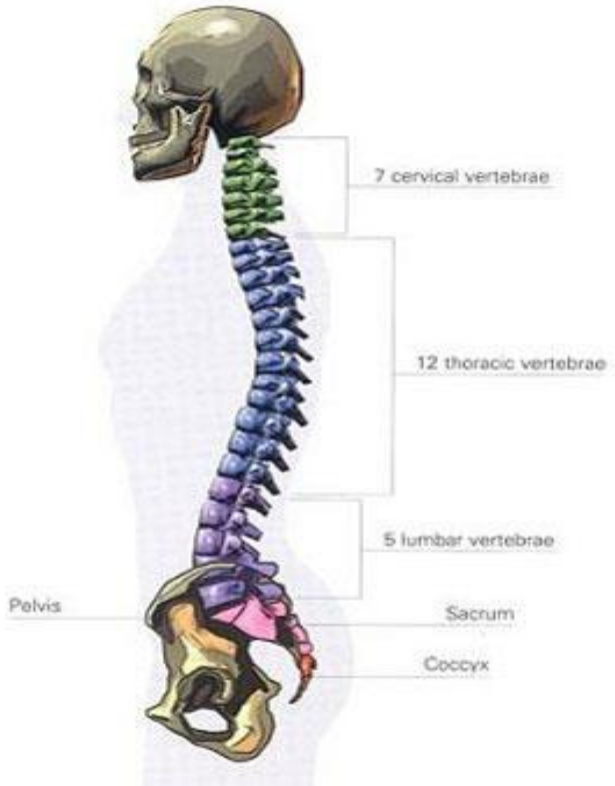

Fig. 1. The Vertebrae of the Spine (http://www.bbc.co.uk/health/images/300/vertebrae.jpg)

[7] Hugo A. Keim and William H. Kirkaldy-Willis, "Low Back Pain," Clinical Symposia 39, no. 6 (1987): 2.
[8] Ibid.

A closer look at the lumbar spine reveals that the lumbar vertebrae consist of a vertebral body, the transverse process, two superior and two inferior articulate facets, two lamina, two pedicles, and the spinous process (see Fig. 2). The vertebral body is the large weight-bearing portion of the spine and is larger in the lumbar spine since this bears the greatest amount of body and for this reason, most back pain is in the lower lumbar spine.

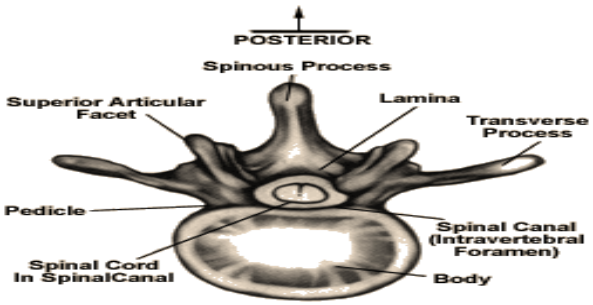

Fig. 2. Lumbar Vertebrae (http://www.espine.com/norma_anatomy.html)

Between each vertebra are many ligaments holding them in place (see Fig. 3). The transverse process, which protrudes to the right and to the left of the vertebra, and the spinous process, which extends posteriorly, both serve as attachment sites for many different ligaments (which attach bone to bone) and tendons (which connect the bone to muscles). Any one of these many ligaments and tendons can be sprained, which may bring the back muscles into spasm.

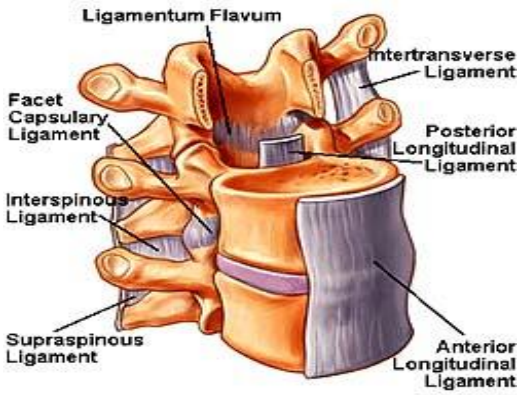

Fig. 3. Ligaments of Vertebrae (http://www.spineuniverse.com/displayarticle.php/article107.html)

The lumbar vertebrae consist of two types of joints--facet joints and intervertebral joints. The facet joints are formed by the two inferior articulate facets from one vertebrae fitting into the two superior articulate facets of the vertebrae below it (see figs. 4 and 5). These joints are synovial joints and as such are "subject to degenerative and inflammatory change with resultant enlargement that, in association with thickening of the ligamentum flavum, can contribute to [the narrowing of the spinal canal medically termed] spinal stenosis." [9]

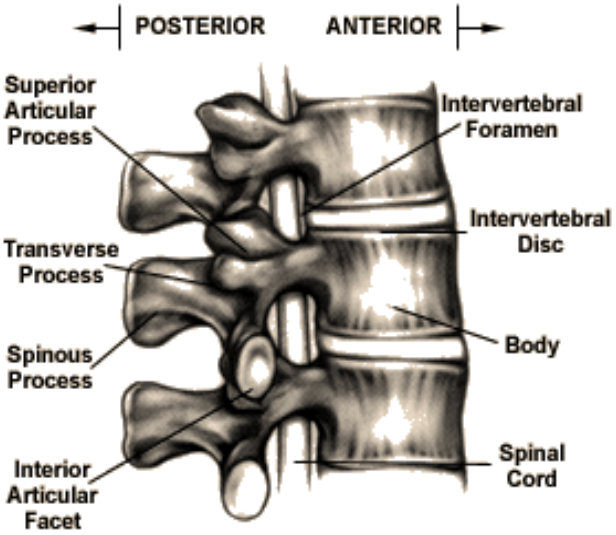

Fig. 4. Interlocking Facets (lateral view)
(http://www.espine.com/normal_anatomy.html)

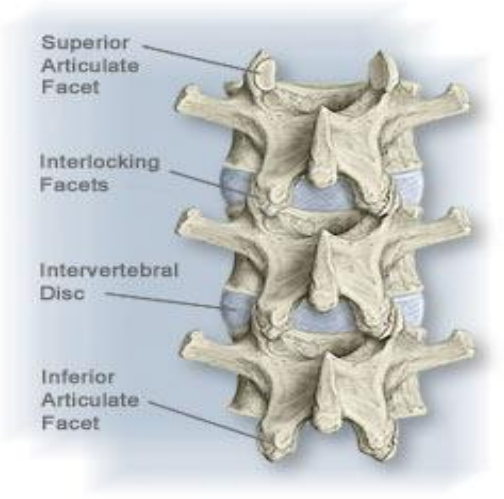

Fig. 5. Interlocking Facets (posterior view)
(http://www.scoi.com/spinanat.htm)

The intervertebral joint, the second type of joint, consists of the intervertebral disc, which is fibrocartilaginous and includes the nucleus pulposes, which is gelatinous, and the surrounding annulus fibrosus (see Fig. 6). Together the nucleus pulposes and annulus fibrosus serve as shock absorbers for the mechanical stress placed on the spine (see Fig. 7).

[9] Ibid., 4.

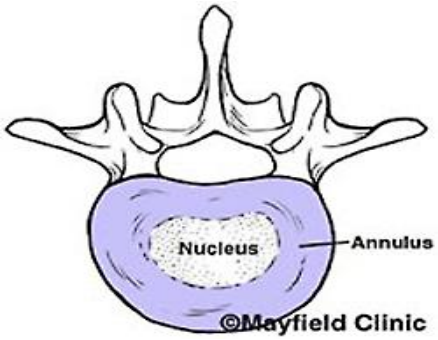

Fig. 6. Nucleus Pulposes surrounded by Annulus Fibrosus
(http://www.mayfieldclinic.com/PE-AnatSpine.html)

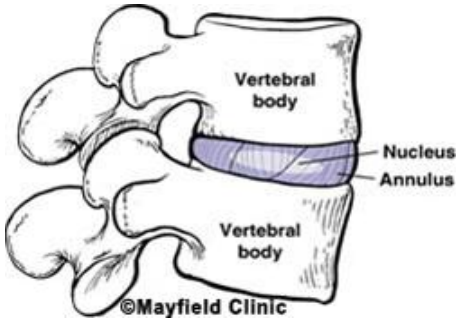

Fig. 7. Nucleus and Annulus as shock absorbers
(http://www.mayfieldclinic.com/PE-AnatSpine.html)

There are two openings between the vertebrae--the spinal canal and the foramen. The spinal canal is where the spinal cord--a bundle of nerves that relays information from various parts of the body to the brain-- passes through (see Fig.8). The spinal canal is formed by the intravertebral space between the lamina, ligamentum flavum, vertebral body, and pedicles. The foramen is where the spinal nerves (as well as blood vessels and the sinuvertebral nerve) branch off from the spinal cord to various parts of the body (see Fig.9). The intervertebral foramen is formed by the space between the vertebrae's pedicles. In this manner, the spinal cord remains protected by the vertebrae, while nerves can branch off to communicate with the entire body, providing both motor and sensation abilities.

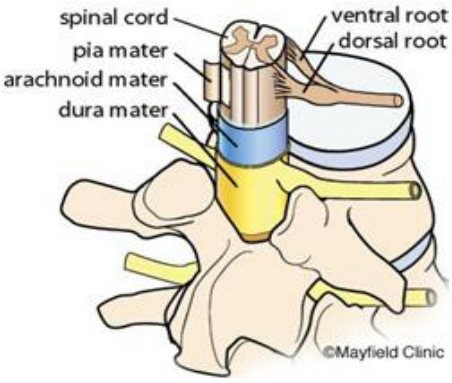

Fig. 8. Spinal Canal with Spinal Cord Running Through
(http://www.mayfieldclinic.com/PE-AnatSpine.htm)

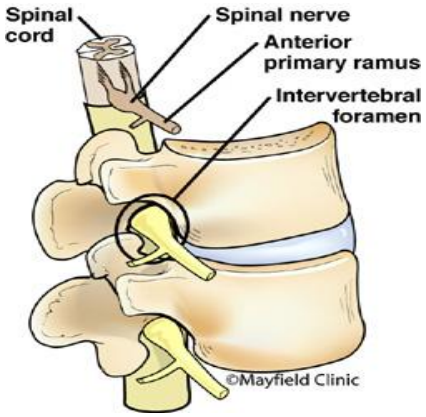

Fig. 9. Intervertebral Foramen with Nerves Branching Off
(http://www.mayfieldclinic.com/PE-AnatSpine.htm)

1.2.2 Muscles Supporting the Spine

The abdominal muscles as well as the back muscles are needed to support and stabilize the spine. Many of these are considered "postural muscles" and keep the vertebrae well-aligned as well as relieving some of the stress and strain placed on the spine, but especially during motion. It is thus critical to build strong and flexible muscles that will support the spine, which can be done through exercise and stretching. The critical abdominal muscles that support the spine anteriorly include the rectus abdominus as well as the more critical internal and external abdominal obliques and the deeper, transversus abdominus (see Fig. 10 and 11).

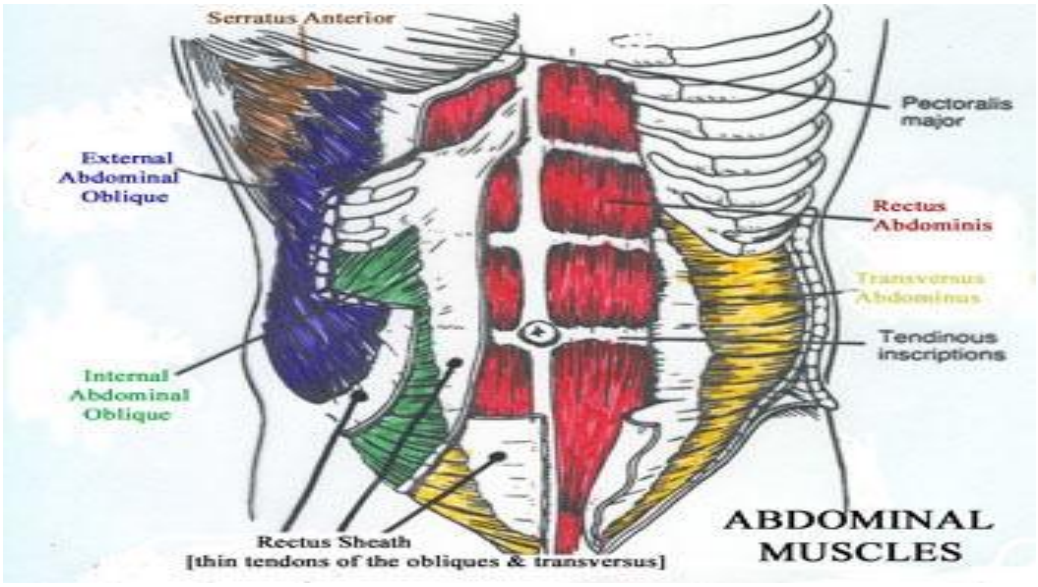

Fig. 10. Abdominal Muscles (http://www.sabrinasvard.com/PhenABS.htm)

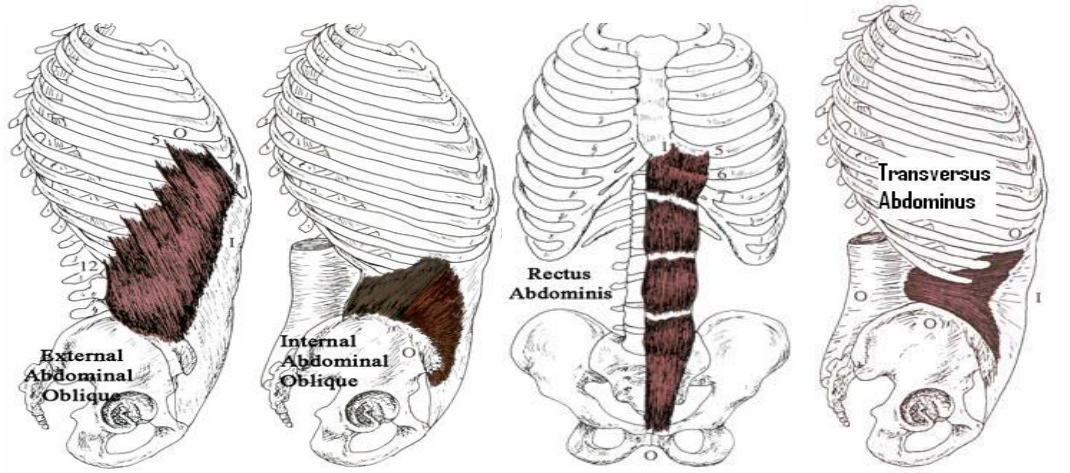

Fig. 11. Individual View of Abdominal Muscles (http://www.sabrinasvard.com/PhenABS.htm)

Posteriorly, the back muscles that serve a primarily postural function include:[10]

Splenius capitis and cervicis;

Erector spinae muscles-- Iliocostalis, Longissimus, Spinalis (see Fig. 12);

Transversospinales muscles-- Semispinalis, Multifidus and Rotatores (see Fig. 13);

Deep intrinsic muscles --Interspinales and Intertransversarii (see Fig.13);

Sub-occipital triangle muscles (see Fig. 14).

[10] Medical Information Education Center **"**Back Surface Anatomy, Vertebra Column and Musculature" <medic.med.uth.tmc.edu/ Lecture/Main/back-surf.htm> (17 April 2005).

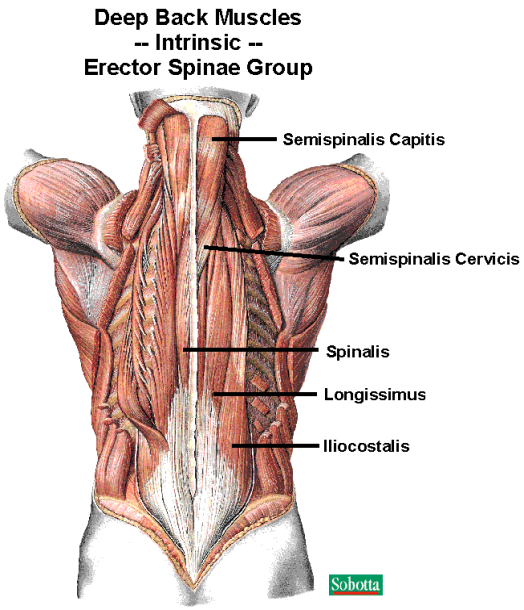

Fig. 12. Intrinsic Erector Spinae Group
(medic.med.uth.tmc.edu/ Lecture/Main/back-surf.htm)

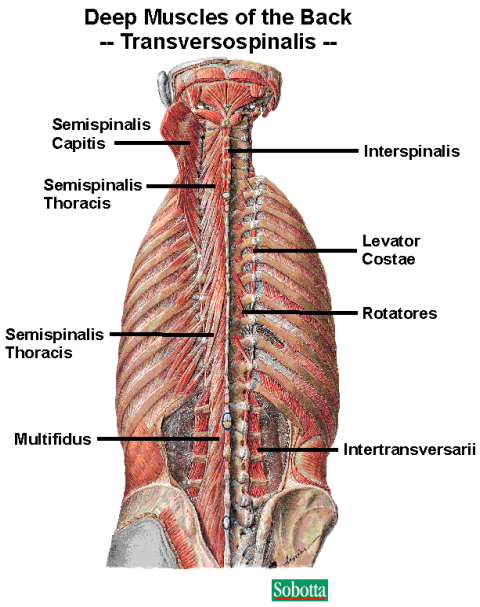

Fig. 13. Transversospinalis
(medic.med.uth.tmc.edu/ Lecture/Main/back-surf.htm)

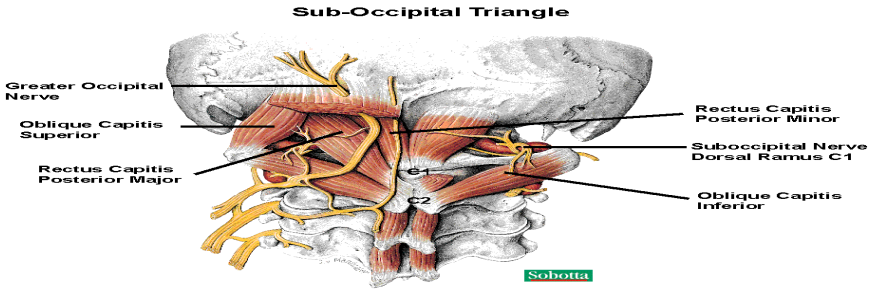

Fig. 14. Sub-Occipital Triangle (medic.med.uth.tmc.edu/ Lecture/Main/back-surf.htm)

In addition to the back and abdominal muscles that directly support the back, all the body's muscles, ligaments, and tendons have a critical role in maintaining alignment. Weakness in one muscle can create a cascade effect, as one tight muscle pulls on another or cannot support a movement, throwing the whole body out of alignment. This can create a vicious cycle whereby muscles are not being used and developed in a biomechanicaly efficient manner. This tightens and weakens certain muscles and forces others to overcompensate, thus reinforcing the bad habit and making the return to a neutral spine and biomechanical efficiency more and more difficult.

1.3 Causes of Back Pain

1.3.1 Biomechanical Causes

The chain of events that typically triggers back pain involves anterior pelvic tilt, where the gluteus sticks out posteriorly, thus forcing the lumbar spine into lordosis (extension/swayback) and causing the thoracic spine to compensate in the opposite direction and become kyphotic (flexion/hunched over). This is often the result of faulty posture as well as spending extended time in a seated position, something most American's are guilty of. Periods of extended sitting, especially when the body is slumped over, tightens and weakens the muscles into this "slumped position." Over time, there is a chain reaction whereby tight hip flexors and hamstrings as well as weak and tight back muscles cause one to slump further, thus causing the muscles to weaken and tighten even more.

Dr. Vladimir Janda explains this chain of events as starting with a tight psoas major, one of the hip flexors, which

> pulls the pelvis into anterior tilt, thereby increasing hip flexion and shortening all hip flexor muscles. Since the psoas has its origin on the lumbar spine vertebrae, when it shortens, it pulls the spine into extension. This causes the lumbar erectors and quadratus lumborum to shorten. The short/tight muscles will inhibit their antagonists. The gluteals, which contribute strongly to hip extension, will be inhibited by the psoas, causing the hamstrings to pick up the extra force. [This constant low-grade contraction of the hamstring muscle will cause them to become tight and weak.] The deep abdominal wall will be inhibited by the lumbar erectors, and their synergist, the psoas major. Due to the neurological connection,

other muscles in the deep stabilization mechanism may become dysfunctional. This may include the pelvic floor and lumbar multifidus. [11]

It is thus critical to stretch and strengthen these critical muscles creating pelvic tilt. Both stretching and strengthening are necessary because a muscle that is tight cannot function optimally since the muscle fibers cannot cross and contract properly, and as such can only function in an extremely limited range. Thus, after being stretched, these muscles must be strengthened as well. These muscles include the psoas major, quadriceps, lumbar erectors, quadratus lumborum, hip adductors as well as the pelvic extensors, the gluteus maximus, hamstrings, and deep abdominal muscles.

Exercise and stretching have the added importance of increasing bone mass density and thus creating stronger bones. While extremes of stress and strain on the spine are not favorable, moderate amounts of mechanical stress and strain are excellent when assisted by muscular strength and flexibility through gradually increasing the difficulty of the exercise and strength program. Sources of stress and strain include external factors such as gravity as well as internal factors such as muscles.[12] Over time, the body reacts by increasing the bone mass density. Conversely, bone mass will decrease in response to a lack of healthy amounts of stress and strain, to efficiently expend the amount of energy needed to maintain the minimum amount of bone for the given activity.[13] Thus, an active life style will increase the amount of bone as well as the supporting musculature, leading to excellent support and stabilization of the back, and a sedentary lifestyle will accomplish the opposite.

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[11]Dolfzine on-line fitness, "Faulty Alignment of the Pelvis," <http://www.dolfzine.com/page584.htm> (17 April 2005).
[12]Study World, "Hypogravitational Osteoporosis," <http://www.studyworld.com /newsite /ReportEssay/Science/Physical%5CHypogravitational_Osteoporosis-381754.htm> (17 April 2005).
[13] Ibid.

1.3.2 Anatomical Causes of Back Pain

The causes of back pain can be mechanical or systemic (disorders affecting the entire body). However, "more than 90% of back pain presentations are mechanical in nature." [14] Mechanical causes largely consist of musculoligamentous injuries, including ligamentous strain and muscle spasm. Musculoskeletal conditions, most often due to poor muscle tone and/or poor posture, are common causes of muscle and ligament strains.

As noted before, the spinal cord and nerves are surrounded by vertebrae and ligaments, so that disturbances of vertebrae or ligaments can press on these nerves, causing pain. The most common symptom is sciatica, a sharp radiating pain, or various other neurological problems with motor, reflex, or sensory dysfunctions of the lower extremities, numbness, or weakness. Mechanical causes of back pain that result in pressure on the nerve are termed nerve root syndromes. This is often caused by a herniated disc, where the nucleus pulposes, the central gel-like portion between the disks, emerges (often due to acute injury in younger populations or degenerative changes in older populations) (see Fig. 15). Lumbar canal stenosis, a general term for the narrowing of the spinal canal that is often caused by degenerative changes, can also cause the surrounding vertebrae and ligaments to press on the nerve (see Fig. 16).

[14] Joseph M. Grisanti, "Low Back Pain: Making the Diagnosis, Managing the Challenge," Pri-Med in Practice Institute 5 (Winter 2004): 2.

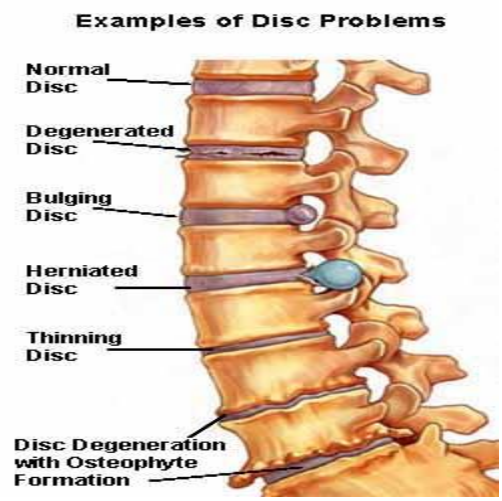

Fig. 15. Herniated Disc and Other Disc Problems Causing Pressure on Nerves
(http://www.spineuniverse.com/displayarticle.php/article1440.html)

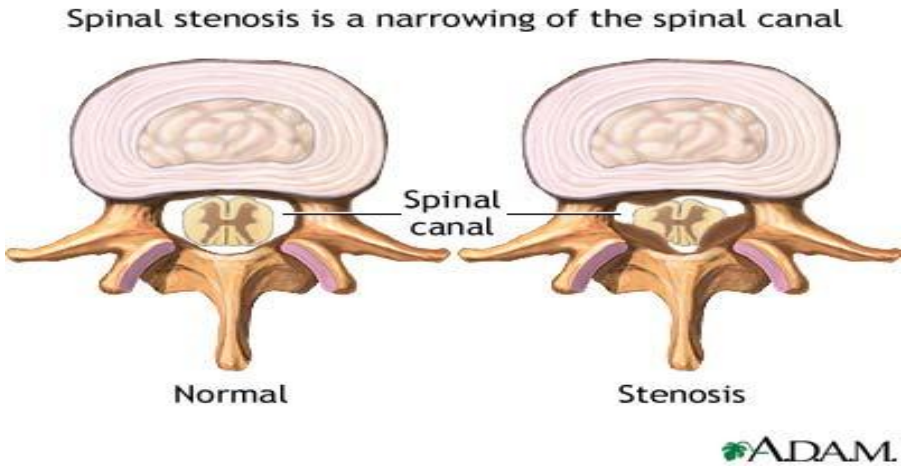

Fig. 16. Spinal Stenosis
(http://www.nlm.nih.gov/medlineplus/ency/imagepages/19527.htm)

Compression fractures involving vertebrae, most often occur in elderly patients with osteoporosis. Osteoarthritis is another cause of low back pain. Malalignment syndromes, often due to congenital disorders, are another source of back pain.[15] These congenital disorders are found in about "half of the population,"[16] so they are most often not the cause of pain. Tumors are another possible cause of mechanical low back pain.

[15] Ibid.
[16] Keim and Kirkaldy-Willis, "Low Back Pain," 8.

Although systemic causes of back pain are rare, they are critical to diagnose because the "deleterious consequences of delaying treatment for serious systemic illnesses can be profound."[17] These include cancer (which is the most prevalent cause of spinal infections), gynecological causes, seronegative spondyloarthropathies, renal causes, infection, Pagets' disease, and various miscellaneous causes.[18]

1.4 Pain

1.4.1 Overview of Pathway

Production and perception of pain is another critical component to understanding back pain. Pain can be defined as, "the responses associated with tissue injury."[19] However, the relationship between the patient's subjective perception of pain, and a tissue injury is not always as clear-cut as there are many other factors involved. As Helen Henderson explains, "It is no longer acceptable to regard pain as a symptom of disease. Pain has its own defined pathology, dependent upon biological, psychosocial, and spiritual influences."[20]

Pain has a distinct pathway in the nervous system that is separate from neutral sensation. All sensation is divided into one of two pathways. The nociceptive pathway is for pain and temperature (ventral spinothalamic tract) and the haptic-proprioception pathway for fine touch, pressure, and proprioception (dorsal spinothalamic tract). Nociceptive receptors consist of free nerve endings and include fast (40 mph) thinly myelinated (A delta) fibers and slower (3 mph) small diameter non-myelinated (C) fibers. Both nerve fibers terminate at the dorsal horn of the spinal cord.

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[17] Grisanti, "Low Back Pain: Making the Diagnosis, Managing the Challenge," 2.
[18] Ibid.
[19] P.T. Oharaa, J. Vita. and L. Jasmina, "Cortical Modulation of Pain," Cellular and Mollecular Life Science 62 (2005): 45.
[20] Helen Henderson, "Acupuncture: Evidence for its Use in Chronic Low Back Pain," British Journal of Nursing 11, no. 2 (2002): 1403.

In general, the free nerve ending of these nociceptors innervate both internal organs and the body's surface, so source of pain can affect or be confused with the other. According to Kolb et al., "The neurons cannot distinguish between these two sets of signals; nor can we."[21] For example, the neurons innervating the heart muscle also innervate the shoulder and upper arm, so that pain in the heart is felt as pain in the shoulder/upper arm area. This phenomenon is called referred pain.

Regardless of the exact source of pain, the nociceptive axons then ascend in the contra-lateral spinal cord. These axons innervate thalamic and cortical areas including the limbic system, which is involved in motivational and emotional behaviors. The limbic system is also involved in "regulation of the visceral [pertaining to the internal organs] motor activity";[22] thus it may effect and regulate autonomic systems and psychological emotional responses. Ohara et al. suggest that the pain pathway may have many connections to other stimuli,[23] so that pain is modulated by many various factors, some of which will be covered below and many of which are, as yet, unknown. For this reason, Ohara et al. suggest that the exact pathway (see Fig. 17) should be considered a "conceptual pathway rather than a physical entity,"[24] because "although it is clear that nociceptive information is conveyed by a very well defined class of fibers in the periphery, once these fibers enter the spinal cord, the path becomes muddied and not easily categorized." [25]

[21] Bryan Kolb and Ian Q. Whishaw, An Introduction to Brain and Behavior (New York: Worth, 2001), 387.
[22] Ibid.
[23] Oharaa et al., "Cortical modulation of pain," 45.
[24] Ibid.
[25] Ibid.

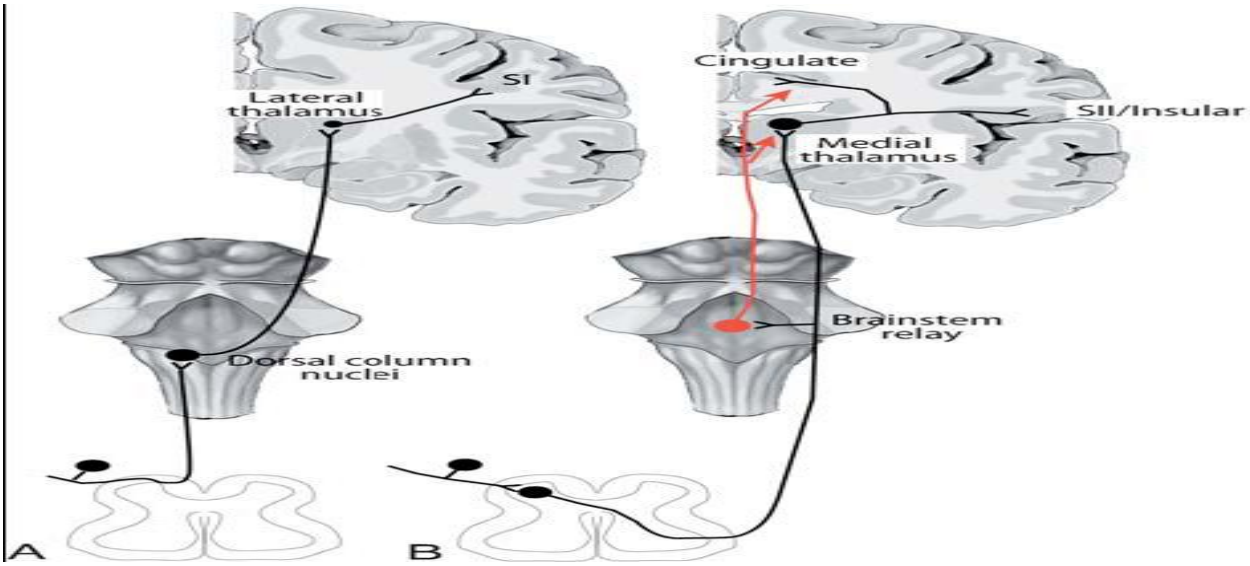

Fig. 17. Schematic Representation of the Conceptual Pathways Subserving Pain (Oharaa et al., "Cortical Modulation of Pain," 45.)

The dorsal column medial lemniscal pathway (A) innocuous sensation, including fine touch, vibration and proprioception. The spinothalamic pathway (B) nociceptive sensation. The classic pathway is indicated in black and includes relays through the spinal cord dorsal horn and medial thalamic nuclei before terminating in frontal and insular regions of the cerebral cortex. A parallel pathway in red arises from a number of sites in the brainstem, including the parabrachial nucleus, and eventually reaches the cortex either by direct projection or through relays in the thalamus and amygdala.[26]

1.4.2 Modulation of Pain

Pain is modulated in three major ways, through the ascending pathway to the brain, in the brain, and through the descending pathway from the brain to the spinal cord. In this way, pain is put into a functional context. For example, a constant non-dangerous noxious stimulus may be

[26] Oharaa et al., "Cortical Modulation of Pain," 45.

"tuned out" over time when it is understood not to be a dangerous stimulus necessitating some response.

Ascending pathway

One theory for the modulation of pain during the ascending pathway involves the "gate theory" of pain, whereby

> pain messages encounter "nerve gates" in the spinal cord that open or close depending upon a number of factors (possibly including instructions coming down from the brain). When the gates are opening, pain messages "get through" more or less easily and pain can be intense. When the gates close, pain messages are prevented from reaching the brain and may not even be experienced.[27]

While there are two different pathways, one for neutral (haptic-proprioceptive pathway) and one for painful (nociceptive pathway) sensations, "circuits in the spinal cord also allow haptic-proprioceptive and nocioceptive pathways to interact."[28] One method of interaction relates to the "gate theory of pain" whereby the "activity in the haptic-proprioceptive pathway can inhibit the pain pathway in the spinal cord."[29] Stimulus from another pathway, that of neutral sensation, thus "closes the gate" and allows less pain to "get through." Similarly, loss of oxygen "may first deactivate the large myelinated axons that carry touch and pressure information,"[30] and as a result, "ungated" sensory information can flow freely in the pain and temperature pathway. This may explain why sensations such as touch and pressure can reduce the amount of perceived pain. This may explain the success of such techniques as acupuncture and massage therapy in reducing pain.

[27] Kolb and Whishaw, An Introduction to Brain and Behavior, 387.
[28] Ibid.
[29] Ibid.
[30] Ibid.

Opioid drugs also work to reduce pain in the ascending pathway by blocking Substance P, which is a neurotransmitter released in response to pain. Opioid drugs may also be explained by the "gate theory of pain" since the "interneurons in the pain gate may use opioid peptide as a neurotransmitter" [31] to inhibit the pain signal.

Cognitive Aspect

The pain message may also be modulated by pain gates "located in the brainstem and the cortex in addition to the spinal cord,"[32] which might explain certain phenomena regarding pain perception. For example, pain can be reduced by "shifting attention" away from the pain by listening to relaxing music. The phenomenon "phantom limb," feeling sensation such as pain from a body part even after that part has been amputated, indicates that perception must depend on cortex activity; the pain receptors can no longer be the true source of pain as the limb and its associated receptors are no longer present.

One probable structure involved in emotional processing of pain is the Anterior Cingulate Cortex. The activation of the Anterior Cingulate Cortex in response to pain has been observed using PET and fMRI imaging techniques. This indicates an emotional response to pain as the Anterior Cingulate Cortex is involved in processing emotion. This is further supported by frontal lobotomy which severs the connection between the frontal lobe and the rest of the brain so that the anterior cingulated cortex can no longer communicate with the rest of the brain and consequently, reduces the emotional reaction associated with pain. Thus the Anterior Cingulate Cortex, among other structures, is involved in emotional processing of pain.

Another phenomenon indicating cognitive processing was an observation made by Dr. Henry Beecher:

[31] Ibid.
[32] Ibid.

> Dr. Henry Beecher, who worked with severely wounded soldiers during World War II, observed that only one out of five soldiers carried into a combat hospital complained of enough pain to require morphine. These soldiers were not in a state of shock, nor were they unable to feel pain—indeed, they complained when the IV lines were placed. But when Dr. Beecher returned to his practice in the United States after the war, he noticed that trauma patients with wounds similar to those of the soldiers he had treated were much more likely to require morphine to control their pain. In fact, one out of three civilian patients required morphine for pain from these wounds.[33]

This indicates that there is little if any direct relationship between wound severity and pain intensity, and thus there must be a mediating cognitive aspect. Dr. Beecher concluded that:

> the meaning attached to the injuries in the two groups explained the different levels of pain. To the soldier, the wound meant surviving the battlefield and returning home. Alternatively, the injured civilian often faced major surgery and a resulting loss of income, diminishment of activities, and many other negative consequences.[34]

Generally, acute pain is conducted via the fast A-delta fiber to the thalamus and cerebral cortex that prompts the brain to make the necessary action to avoid the threat or injury. Chronic pain is conducted via the slow C-fiber and is felt as dull, aching, burning, and cramping. The pain message goes through the hypothalamus, which can stimulate the release of stress hormones, and the limbic system, in charge of emotional and motivated behavior. This may be

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[33] William W. Deardorff, "Chronic Pain Theories," 11 March 2003, <http://www.spinehealth.com/topics/cd/pain/chronic_pain_theories/chronic_pain_theory01.html> (10 January 2005).

[34] Ibid.

"one reason why chronic back pain is often associated with stress, depression, and anxiety. The slow pain signals are actually passing through brain areas that control these experiences and emotions."[35]

Furthermore, pain can be divided into two components including a "sensory-discriminative component [that] provides information location, modality and intensity of stimuli and affective-motivational component and refers to the emotional responses (fear, distress etc.) and the urge to respond."[36] Given that the actual information part of pain is a separate process than the actual emotional response, it may be possible to separate the two. "It should not be forgotten that pain is necessarily such a focusing sensation because it draws attention to stimuli that are potentially life threatening," [37] However, if these two processes are separate ones, the goal might be to "retain the ability to recognize these stimuli but be able to prevent the attendant debilitating emotional effects."[38] "Examples where cortical control of pain affect would be useful are in the treatment of chronic pain, particularly when there is no apparent physical cause of the pain."[39] This example, in which there is "no apparent physical cause of pain" may apply to many cases of chronic and recurring lower back pain.

Descending Pathways from the Brain

Pain is also modulated by descending pathways. This is accomplished by endorphin, an endogenous opiate that acts as an analgesic and may inhibit activity in the PAG (periaqueductal gray). This increases serotonin levels, which inhibits pain transmission by blocking incoming

[35] Ibid.
[36] Oharaa et al., "Cortical Modulation of Pain," 44.
[37] Ibid., 50.
[38] Apkarian et al., "Chronic Pain Patients are Impaired on an Emotional Decision-making Task," Pain 108 (2004): 129.
[39] Oharaa et al., "Cortical Modulation of Pain," 50.

signals at the dorsal horn of the spinal cord. Factors involved in the descending pathway that open the pain gates and increase pain suffering include:[40]

- Sensory factors, such as injury, inactivity, long-term narcotic use, poor body mechanics, and poor pacing of activities.
- Cognitive factors, such as focusing on the chronic pain, having no outside interests or distractions, worrying about the pain, and other negative thoughts.
- Emotional factors, such as depression, anger, anxiety, stress, frustration, hopelessness, and helplessness.

Factors that close the pain gates and reduce suffering include:

- Sensory factors, such as increasing activities, short-term use of pain medication, relaxation training and meditation.
- Cognitive factors, including outside interests, thoughts that help the patient cope with the pain, and distracting oneself from the chronic pain.
- Emotional factors, such as having a positive attitude, overcoming depression, feeling reassured that the pain is not harmful, taking control of one's chronic pain and life, and stress management.

Overall, the complex pain system explains why "treatment of an underlying anatomic lesion may not always relieve the pain (and pain may be present with no anatomic problems) --

[40] William W. Deardorff, "Chronic Pain Theories**,"** 11 March 2003, <http://www.spinehealth.com/topics/cd/pain/chronic_pain_theories/chronic_pain_theory01.html> (10 January 2005).

rather, pain is a complex process that is experienced differently in various situations and is influenced by myriad factors."[41]

1.5.0 Clinical Evaluation

1.5.1 History

The doctor must integrate the above knowledge about lumbar spine structure, various causes of back pain, and the pain pathway to diagnose the cause of back pain and consequently suggest the best treatment strategy. One of the frustrations with dealing with pain, as Dr. Loeser explains, is that "You can't take an X-ray and see pain; you can't see it on a biopsy. All you have is a patient's statement that he hurts."[42] Furthermore, chronic back pain can be one of the more frustrating medical conditions to diagnose because of its allusive nature.

Despite this frustration, there is a general protocol for how to medically diagnose back pain. The first step is to take a careful patient history. This is critical because "evidence of fever, weight loss, prolonged morning stiffness, psoriasis, genitourinary symptoms, abdominal pain, or diarrhea may implicate the presence of a systemic illness,"[43] while "cyclic pain syndrome affecting women of reproductive years may be a clue to gynecologic causes of back pain."[44] Furthermore, certain conditions such as a previous history of cancer or a loss of bladder or bowel control may indicate the need for immediate surgery:

> Pain or paresthesias (Sensory loss; Paresthesias; Tingling and numbness) that radiate to the buttocks or legs are typical features of nerve root irritation, as seen with disk herniations….Bilateral radicular symptoms or pseudoclaudication are common features of central lumbar canal stenosis.

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[41] William W. Deardorff, "Chronic Pain Theories," 11 March 2003, <http://www.spinehealth.com/topics/cd/pain/chronic_pain_theories/chronic_pain_theory01.html> (10 January 2005).
[42] Rosenthal, Elisabeth. "Chronic Pain Fells Many Yet Lacks Clear Cause," The New York Times, 29 December 1992, sec. C1.
[43] Grisanti, "Low Back Pain: Making the Diagnosis, Managing the Challenge," 2.
[44] Ibid.

> Sudden onset of bowel or bladder incontinence, saddle anesthesia, and bilateral radicular symptoms are features of severe lumbar canal stenosis (cauda equina syndrome) and may represent a medical emergency.[45]

In most cases, the patient's history will show acute back pain due to musculoligamentous strain, resulting, for example, from a sports injury or performing some unaccustomed movement. Low back pain due to musculoligamentous strain has an excellent prognosis and will most often go away on its own after a few weeks. However, sudden onset of back pain may also be due to a bulging or herniated spinal disc.

While systemic diseases, as noted earlier, are not often the cause of back pain, it is critical to diagnose them. The most telling items for a systemic disease are a person's "age, a history of cancer, unexplained weight loss, duration of pain, and responsiveness to previous treatment."[46]

Often chronic pain is not associated with a tissue injury, especially if there is no systemic disease or musculoskeletal injury present. Therefore, various psychological factors must be considered, including inappropriate and widespread pain, pain not corresponding to innervation patterns, overreaction, and inconsistencies in performance during the physical examination, as well as failed previous treatments, substance abuse, and disability compensation. Thus even conventional medicine admits to a psychological component of back pain.

1.5.2 Physical Examination

"The physical examination of the back and peripheral nervous system should receive special emphasis; however, a general physical examination is also important to help identify patients with less common systemic causes of back pain."[47] The examination should note

[45] Ibid.
[46] Ibid.
[47] Grisanti, "Low Back Pain: Making the Diagnosis, Managing the Challenge," 3.

structural conditions such as spinal curvatures, leg lengths, and shoulder and pelvic positions, in addition to their effect on general range, movement and pain. Thus a detailed physical examination, using the dermatomes and myotomes, can inform the doctor which vertebral segment may be the cause of the pain.

The presence or absence of a herniated disc can be confirmed in the physical examination by looking at the areas of the body that are innervated by corresponding vertebrae in terms of sensation (the dermatome map), as well as movement (the myotome map). Injury to a specific vertebra in the lumbar spine will impinge on a sensation to a specific area in the lower extremities, because the lower extremities are innervated by the lumbar spine as seen on the dermatome map. Careful observation of this chart can indicate the exact location of irritation. One can then look at the myotome map, which maps motor skills, and see if there is a corresponding lack of motor movement innervated by nerves from specific vertebrae. More generally, pain on flexion is typical of disc herniation, whereas pain during extension is typical of spinal stenosis.[48] "Unilateral reflex abnormalities"[49] are also indicators of a herniated disk. Other indicators include "focal tenderness over a spinous process [which] suggests vertebral involvement, as seen with a fracture, a tumor, or an infection." The classic test for an irritated nerve root is the "straight leg test," in which "pain or paresthesias in the back, buttocks, or posterior thighs" [50] while the patient raises a straight leg, indicates "an irritated nerve root."[51]

[48] Richard A. Deyo, James Rinville, and Daniel L. Kent, "What Can the History and Physical Examination Tell us about Low Back Pain?" Journal of American Medical American. 268, no. 6 (12 August 1992): 763.
[49] Grisanti, "Low Back Pain: Making the Diagnosis, Managing the Challenge," 3.
[50] Ibid.
[51] Ibid.

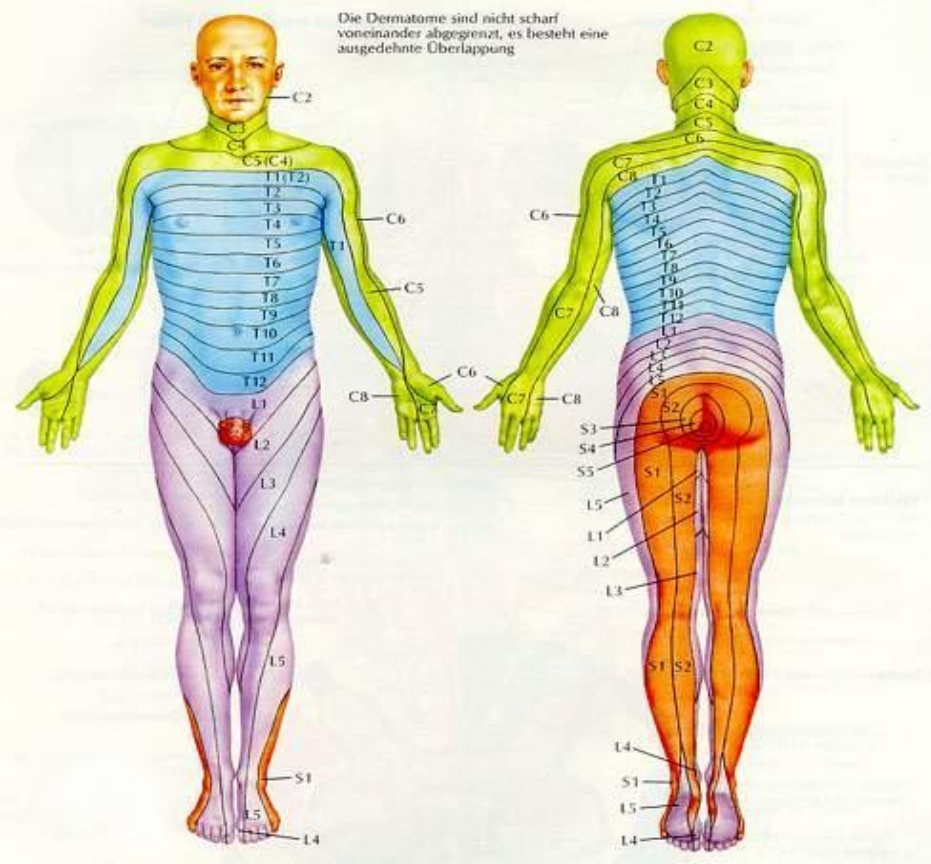

Fig. 18. Dermatome Map (http://www.tvk.ne.jp/~junkamo/new_page_18.htm)

Because of the difficulty of diagnosing back pain, research is currently being done on new diagnostic methods. For example, a kinematics biomechanical assessment technique that seems promising in diagnosing back pain includes observing "1) end range of motion during simple movements; 2) higher order kinematics (displacement, velocity, and acceleration) during complex movement tasks; and 3) spinal proprioception."[52] In this manner, the physician is less reliant on the patient's subjective perception of pain for diagnosis. However, one must remember that in the end all that matters is the patient's perception of pain, and not the specific cause of the pain, which may be completely psychological in nature but still must be addressed and treated.

[52] Gregory J. Lehman, "How Low Back Pain Sufferers Differ From Normals. Implications for Outcome Measures Research. Part I: Kinematic Assesments of Lumbar Function," Journal of Manipulative and Physiological Therapeutics (January 2004): 57.

1.5.3 Imaging Techniques

Plain radiographs are suggested for patients with a "history of cancer, fever, unexplained weight loss, neurological deficits, trauma, intravenous drug abuse, symptoms greater than 6 weeks duration, or who are over the age of 50."[53] More sensitive imaging studies, such as computed tomography, which will show "most bony and neural problems in and around the spine and spinal canal," and Magnetic Resonance Imaging, which "delineates soft tissue," should be taken in the case of "tumor, infection, or persistent neurological deficits in which surgical intervention is contemplated"[54] and "when an anatomic lesion is suspected. If nerve root dysfunction is a possibility, electromyography (EMG) and nerve root conduction studies may be more appropriate."[55] Various laboratory tests may also be taken, but they are only necessary in the case of 'malignancy, metabolic disturbance, or chronic infection."[56]

Unfortunately, physicians have "an inclination to trust technical diagnostic results more than clinical judgment."[57] MRI is an excellent diagnostic tool for "defining tumor, infection, and nerve compression."[58] However, even when a pathological cause is discovered, this is often not the cause of the patient's symptoms. Hannibal and Carrage have shown that the benefits of imaging may be largely psychological in nature. While "imaging does not appear to affect management overall," improvements in clinical outcome are "associated with an increase in clinicians' diagnostic confidence, particularly for non-specialists."[59] Hannibal and Carrage also note that it is of utmost importance for the physician to be careful when explaining the results of

[53] Bigos S. et al., Washington DC.Agency for Health Care Policy and Research, 1994 AHCPR publication no. 95-0642, quoted in Grisanti, "Low Back Pain: Making the Diagnosis, Managing the Challenge," 3.
[54] Grisanti, "Low Back Pain: Making the Diagnosis, Managing the Challenge," 3.
[55] Keim and Kirkaldy-Willis, "Low Back Pain," 8.
[56] Ibid.
[57] G.K. Lutz, M. Butzlaff, and U. Schultz-Venrath. "Looking Back on Back Pain: Trial and Error of Diagnoses in the 20th Century" Spine 28, no. 16 (15 August 2003): 1899.
[58] E.J. Carragee and M. Hannibal, "Diagnostic Evaluation of Low Back Pain," Orthopedic Clinics of North America 35, no. 1 (January 2004): 7.
[59] F.J. Gilbert et al., "Does Early Imaging Influence Management and Improve Outcome in Patients with Low Back Pain? A pragmatic randomized controlled trial," Health Technology Assessment (Winchester, England) 8, no. 17: iii (May 2004): 1.

the imaging tests "reassure [patients] about the absence of serious causes and to put incidental findings into perspective. [60] Again, given the cognitive component of back pain, if a patient believes that the imaging has revealed a serious back problem the prospects of recovery may be hurt. Furthermore, imaging techniques may not diagnose the underlying cause of back pain. As noted earlier, approximately half the population is born with various spine misalignments, and 20% to 30% without back pain show a herniated disc using imaging tests.[61] In other words, imaging tests may show a back problem, even a herniated disc, that is not causing back pain by itself. Imaging must be used together with the patient's history and a physical examination, including psychological factors, because they are often misleading in terms of finding a cause of the pain.

2.0 Treatments for Back Pain

2.1 Conventional Treatment

2.1.1 Surgery

The most invasive treatment is surgery and is most often suggested for specific cases with neurological symptoms, although it is often not needed, even in the case of sciatica, neurological symptoms, and disc herniation.[62] In a PBS special on back pain, Dr. Charles Feiger, a nuerosuergeon at Lahey Clinic Medical Center in Burlington, Massachusetts, explains that surgery is not necessary in 40% of cases, and a herniated or ruptured disc may need surgery "when it's pushed out of its normal position, and it's ruptured into the spinal canal, and it's pinching off a nerve or several nerves that run down the leg." However, he adds that "unless they are threatened with paralysis, even with a ruptured disc, I like to wait six weeks. People get

[60] M. Yelland, "Diagnostic Imaging for Back Pain," Australian Family Physician. 33, no. 6 (June. 2004): 415.
[61] Deyo et al., "What Can the History and Physical Examination Tell us About Low Back Pain?" 763.
[62] James N. Weinstein, "A 45-Year-Old Man With Low Back Pain and a Numb Left Foot," Journal of American Medical Association 280, no. 8, (26 August 1998)**:** 732.

better, even with a ruptured disc, people get better." Since this period of "waiting" may be extremely painful in the case of radiating pain, narcotic analgesics may be prescribed.

In the case of lumbar canal stenosis, however, "spontaneous resolution is uncommon. Most patients have persistent symptoms, and many patients gradually worsen over time."[63] "Decompression laminectomy [which removes bone and/or thickened tissue that is narrowing the spinal canal and squeezing the spinal cord and nerve roots] is useful for severe disease."[64] Surgery is generally suggested in cases where there is a ruptured disc, compressed nerve, pain shoots past knees, muscle power loss (especially bladder loss of control), or nerve function loss. If the disc was the cause of pain, according to Dr. Feiger, relief of pain should be immediate after surgery.[65]

2.1.2 Non-Surgical Techniques

Acute Back Pain

When it comes to acute back pain, Dr.Garfin explains, "By 4 to 6 weeks the vast majority of patients with acute low back pain are better, despite what we do."[66] Non-surgical treatments are effective in at least 90% of all patients.[67] Treatment for acute back pain involves pain killers such as nonsteroidal anti-inflammatory drugs (NSAIDs), a group that include aspirin and other salicylaes and corticosteroids, which may have long-term side effects and over time can create dependency on the drugs and greater pain.[68] Muscle relaxants[69] can also be used, although these

[63] Grisanti, "Low Back Pain: Making the Diagnosis, Managing the Challenge," 3.
[64] Ibid.
[65] As a side note, Dr. Rosomoff has pointed out an interesting neurological inconsistency: a herniated disc pressing on a nerve can not be the source of pain at all, because continued compression of a nerve will lead the nerve to stop relaying the pain message over time, and will lead to numbness rather than pain. Nevertheless, surgery is regularly done to stop the pain "caused" by a herniated disc (Sarno, Healing Back Pain: The Mind-Body Connection,101).
[66] S. R. Garfin**, "**A 50-year-old Woman with Disabling Spinal Stenosis," Journal of American Medical Association 274, no. 24 (December 1995):1954.
[67] Ibid.
[68] B.M. Berman and J.P. Swyers, "Establishing a Research Agenda for Investigating Alternative Medical Interventions for Chronic Pain" Primary Care 24, no. 4 (1996): 745.

are generally "poorly tolerated because of increased somnolence"[70] and have "adverse effects [that] require that they be used with caution."[71] Epidural corticosteroid injections are often used to reduce pain in patients with radiating pain. Ironically, "narcotic analgesics, NSAIDs, exercise, physical therapy, and epidural corticosteroid injections are often utilized, but there are few controlled trials on the use of these therapies."[72]

While acute back pain can be extremely painful, it usually goes away by itself. For this reason the subject of this paper will focus on treating sub-acute and chronic back pain, and on preventing acute back pain from becoming chronic or reoccurring back pain. To this effect, conventional medicine suggests education about the back, mainly regarding biomechanical efficiency to avoid continued strain, and a regiment of physical therapy[73] to prevent recurrence. Bed rest, however, is not suggested because it causes muscle atrophy, when if anything, the back may need strengthening to help prevent re-injury. Bed rest has another disadvantage in that it may lead to a feeling of psychological dependence, whereby the patient convinces himself of his "disability" regardless of the actual status of the back. This may actually cause sub-acute back pain to become chronic.

Sub-acute and Chronic Back Pain

The intermediate weeks, when sub-acute back pain generally occurs, is often seen as the critical transition point. Generally, the time frame is acute pain-- 0-3 weeks; sub-acute pain-- 4-12 weeks; and chronic pain-- 12 weeks or more. Even when back pain is not chronic, "up to three

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[69] As a side note, a new drug, "Etoricoxib, a new selective cyclooxygenase-2 inhibitor, has been shown to be effective in the treatment of chronic low back pain. This compound, currently available in Europe, is undergoing FDA review in the United States." (Grisanti, "Low Back Pain: Making the Diagnosis, Managing the Challenge," 3).
[70] Ibid.
[71] M.W. van Tudler et al., "Muscle Relaxants for Nonspecific Low Back Pain: a Systematic Review within the Framework of the Cochrane Collaboration," Spine 28 no. 17 (1 Sep 2003):1978.
[72] Grisanti, "Low Back Pain: Making the Diagnosis, Managing the Challenge," 3.
[73] Physical therapy includes many different techniques and varies depending on the patient's condition and the therapist. It most often includes exercises, stretches, hot or cold compresses, massage, and various other forms of manipulation.

quarters of patients suffer at least one recurrence of back pain over the course of a year. In another study, after four years, less than half were symptom-free."[74]

While "exercise is one of the few clearly effective treatments for chronic LBP,"[75] the optimal treatment plan is "unknown."[76] However, the general course of treatment includes exercises that strengthen and teach how to isolate the "multifidus (a back muscle), [the] transversus abdominus (a deep abdominal muscle), the pelvic floor, and "breathing control,"[77] in addition to teaching the patient general spinal stabilization exercises. As mentioned earlier, these muscles aid in stabilizing the spine and taking the stress and strain off the vertebrae. Exercise is critical for prevention of chronic back pain. Physically fit individuals also have a "lower incidence of CLBP and tend to recover more quickly from episodes of ALBP than unfit individuals."[78]

2.2 Treatments: Alternative Techniques

Despite considerable research on these various back problems, "in up to 85%...no specific cause can be identified"[79] by the medical community. It is not surprising then that patients with back problems often turn to alternative medicine to complement conventional treatment. [80] Americans spend billions of dollars on these treatments, and back pain is one of the major reasons for consulting a provider of alternative therapy.[81]

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[74] A.D.A.M. Heathcare Center, "Back Pain and Sciatica," <http://adam.about.com/reports/000054_4.htm> (14 April 2005).
[75] C.G. Maher, "Effective Physical Treatment for Chronic Low Back Pain," Orthopedic Clinics of North America 35 (2004): 58.
[76] Ibid.
[77] Ibid.
[78] "Low Back Pain," Devereaux Primary Care: Clinics in Office Practice 31(2004): 34.
[79] Anthony H. Wheeler and James R. Stubbart, "Pathophysiology of Chronic Back Pain," 11 April 2005, <http://www.emedicinehealth.com/articles/4563-1.asp> (15 April 2005).
[80] John A. Astin, "Why Patients Use Alternative Medicine: Results of a National Study," Journal of American Medical Association 279 (May 1998): 1548.
[81] David M. Eisenberg et al., "Unconventional Medicine in the United States -- Prevalence, Costs, and Patterns of Use," 328, no. 4 (28 January 1993): 246.

A recent study found that people generally turn to complementary and alternative medicine (CAM), because about half thought it would be interesting to try, 28% did not think that traditional methods would help them, and 13% thought conventional medicine was too expensive.[82] "2/3 of patients who seek alternative care did so in conjunction with traditional medicine."[83] However, conventional medicine practitioners are recommending alternative techniques more and more; Indeed, 26% of patients reported that they used CAM because a "conventional medical professional" suggested it.[84] Back pain was the most common reason for patients to turn to alternative medicine.[85] Patients also stated that one of the main reasons they turned to alternative medicine was their "need for more control over their own healthcare," a psychological component in which control often leads to a reduction of stress, but most often the case was general dissatisfaction.[86]

Some of the more prevalent alternative techniques to relieve back pain include acupuncture, chiropractic, massage therapy, yoga, Alexander Technique, and various psychological techniques. These are considered "Alternative Medicine" as they fit into the general definition of "all health systems, modalities, and practices other than those intrinsic to the politically dominant health system of a particular society or culture," which "includes all practices and ideas self-defined by their users as preventing or treating illness or promoting health and well- being."[87] In order to be effective as alternative techniques, Dr. Catherine

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[82] S.C. Shiflett, "Predictors of Usage of Alternative Therapies in the Physically Disabled," Annals of Behavioral Medicine (1999) <http://www.biomedcentral.com/1472-6882/2/7 > (17 April 2005).
[83] Ibid.
[84] C.E. Drivdahl and W.F. Miser, "The Use of Alternative Health Care by a Family Practice Population," Journal of American Board of Family Practice 11, no. 3 (May-Jun 1998): 193.
[85] Ibid.
[86] S. Nayak, R.J. Mathesi, S. Agostinelli and S.C. Shiflett, "The Use of Complementary and Alternative Therapies for Chronic Pain following Spinal Cord Injury: A Pilot Study," Journal of Spinal Cord Medicine 24, no.1 (Spring 2001): 54.
[87] D.J. Hufford, "Whose Culture, Whose Body, Whose Healing?" *Alternative Therapy.1* (1995): 94-95, in Jeremy Sugarman, and Larry Burk, "7 Physicians' Ethical Obligations Regarding Alternative Medicine," Journal of American Medical Associates 280 (1998): 1623.

Downey suggests that they fit into the following six generally accepted naturopathic principles including:

1. Do no harm;
2. Treat the whole person;
3. Treat the body in the correct order;
4. Help the body heal itself;
5. Identify and treat cause not just the symptom;
6. Physician and patient work as partners for prevention and education (which is considered the best "cure").[88]

An implied and self-evident seventh principle is that the treatment actually works. All six of the previously mentioned can be considered "effective" to some degree as defined by subjective patient satisfaction. While this typically takes the form of anecdotal evidence and may be scientifically unreliable, the ultimate goal of the treatment is to make the patient to "feel better." At the same time, it is important to distinguish between improvements in condition due to the actual technique versus placebo effects, in order to evaluate how these techniques are effective, their cost efficiency, and when one technique may be a more appropriate form of treatment than another. In order to understand how these techniques provide patient satisfaction, one must investigate the theories, mode of practice, scientific research support, biological mechanisms, practitioner training, and contraindications for all of these techniques.

[88] Donald Novey, Clinician's Complete Reference to Complementary and Alternative Medicine (St. Louis: Mosby, 2000), 5-7.

2.2.1 Alexander Technique

Overview

Alexander Technique is characterized by the hands-on guidance of the practioner, called a "teacher," through various everyday postures and movements. The goal is to achieve the body's natural alignment and biomechanical efficiency free of excessive strain and tension.

The technique was named after its founder, F.M. Alexander, a Shakespearean actor and vocalist born in 1869, who developed the technique after years of self-observation and attempts to cure his voice trouble. Alexander first went to his doctor, who could not diagnose the source of trouble but suggested that Alexander simply rest his voice for three weeks before his next critical performance. Despite this period of rest, Alexander lost his voice in the middle of the performance, and the curtain was quickly drawn. He then returned to the doctor:

> "is it not fair, then," I asked him, to conclude that it was something I was doing that evening in using my voice that was the cause of the trouble?" He thought a moment and said 'Yes, that must be so." "Can you tell me, then," I asked him, "what it was that I did that caused the trouble?" He frankly admitted that he could not. 'Very well," I replied, "if that is so, I must try and find out for myself."[89]

Alexander, determined to find the cause, bought three full-length mirrors and studied himself closely while singing. He discovered that his most prominent habits were to tighten his neck, throw his head back, and push his ribcage forward. Alexander spent the rest of his life observing his habitual actions. He then used this knowledge to educate others to develop a

[89] F. Matthias Alexander, Introduction, The Use of the Self: Its Conscious Direction in Relation to Diagnosis, Functioning and the Control of Reaction.(London: Orion, 2001): 25.

similar awareness in order to prevent harmful habitual actions. [90] This slow process of development of the Alexander Technique through self-observation and re-education largely influences how it is practiced today. Today, however, the individual is aided through this self-observation by a trained Alexander Technique teacher who provides guidance and feedback.

Several operational definitions evolved out of Alexander's process of self-evaluation. The first, "primary control," gives primacy to postural control through the head-neck relationship.[91] This concept was based on Alexander's observation that the habitual tensing action that prevented him from singing started when he tightened his neck and threw it back, which put the rest of his body out of balance. Alexander Technique works to re-establish the "inherent, balanced relationship between the head-neck-spine that comes first in every moment."

"Awareness," a second operational definition, implies that one should be aware of one's body and "more subtle proprioceptive sense" [92] so that one can "notice postural habits that interfere with balance and poise."[93] This simple awareness of everyday activity is what leads to self-corrections of an imbalance. It should be noted, however, that forcing the body to correct itself will not "undo" detrimental habits but only create new habits of tension, or cause to slip back to old habits since maintaining the new pattern is difficult and unnatural. This awareness and correction process is a subtle one but ultimately allows the body to assume its natural poise.

Inhibition refers to "pausing before acting, which allows time for releasing unnecessary habitual tension" and is followed by a set of directions, such as "allow the head to release forward and up."[94] Instructional words such as "allow" versus instructions to "do" is crucial, because, as previously discussed, forcing an action will only cause new undesirable patterns of

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[90] First Lesson: An Introduction to the Alexander Technique, Produced by Jane Kosminksy, directed by Molly McBride, edited by Jerry Firlan, Rob Hoffman, and Brian Lattera. New York: Wellspring Media, 1999. Videocassette.
[91] Novey, Clinician's Complete Reference to Complementary and Alternative Medicine, 351.
[92] Ibid.
[93] Ibid.
[94] Ibid.

tension to replace old ones. Instead of forcing an action and focusing on the end, termed "end-gaining" by Alexander, one should focus on the means and process of change.

Each teacher in the Alexander Technique goes through a full-time, three-year teacher training course, in which future practitioners are immersed in the technique, and both receive and give lessons. Trainees must have at least 1600 hours of training to graduate. Certification is given by the North American Society of Teachers of the Alexander Technique and associated local Alexander Technique centers.

There are practically no contraindications for Alexander Technique due to the simple, everyday self-pacing actions, principles of self-reeducation, individualized goals, and one-on-one teaching practice.

Practice

In a typical Alexander lesson, a student is guided through simple day-to-day activities of sitting, standing, lying down, and "the monkey," a half-squat. The teacher asks the student to make certain observations about his movement and to "let the neck be free, head to go forward and up, torso to lengthen and widen, legs to release away from, shoulders out to side float on ribcage." [95]

Certified instructor Alison Foley-Graham, a teacher of a group physical education class in Alexander Technique at Barnard College, explains:

> A private lesson in the Alexander Technique consists of working on an activity, much as we did in the chair demonstration, as well as laying down on a table while the teacher brings hands-on attention to different parts of your body and moves your arms, legs, and head gently while the student thinks into herself to prevent habitual tensing and allow for free

[95] First Lesson: An Introduction to the Alexander Technique.

> lengthening movement. We usually spend the beginning lessons on simple everyday activities such as sitting, standing, and walking, and then sometimes we work on more challenging activities such as dancing, playing an instrument, or whatever else a student wants to try with hands-on guidance.[96]

Foley-Graham seemed frustrated that many of her students evaluated the semester-long course as material they could have "learned in a week." This is due to the emphasis on deceptively simple activities such as the transition between sitting and standing. The student is asked to make passive observations without "doing" or "correcting" directly, which translates into a feeling that the student is doing nothing. However, over time significant and lasting, although subtle, changes in alignment are achieved. Foley-Graham also noted that this slow change was ideal and probably more beneficial and longer lasting than quick change techniques such as chiropractic and massage therapy where the practitioner manually forces the body into the correct position without letting the body do it by itself.[97]

While Alexander Technique helps to release tension and make movement more efficient/ easier, this does not mean that the body will not have to work to keep itself balanced. It is important to note that at first it may seem more difficult to sit upright, as the supporting musculature have not developed yet. Muscles of the torso and back, especially the upper back which is commonly "slumped over," will have to be trained. If used correctly, muscles will develop naturally over time, as the correct posture and use of body naturally strengthen muscles throughout everyday activity. Once developed, this strength will support one's posture and make everyday activity easier to perform. In fact, Alexander Technique teacher Debora Caplan

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[96] Allison Foley-Graham, <afoleygr@barnard.edu > "Alexander Class," 19 September 2003, personal e-mail to the author (19 September 2003).
[97] Foley-Graham, telephone interview by author, 21 November 2004.

explains that "good use is one of the best strengthening 'exercises' for the back." Alexander Technique also helps stretch the muscles to achieve a coordinated, lengthening of the body using natural postural reflexes to gravity.

While Alexander Technique seems like a simple postural adjustment that one can do on one's own, Alexander explains that "you can do what I did, if you do what I did."[98] In other words, only if you are willing to study yourself in a mirror for ten years can you make the same kind of changes that he did. Furthermore, a teacher is needed to identify reactions that have become so ingrained that only a trained eye can see them. Teachers generally recommend that student's take a minimum of ten classes and most suggest thirty lessons so that the individual can apply the technique to everyday life.

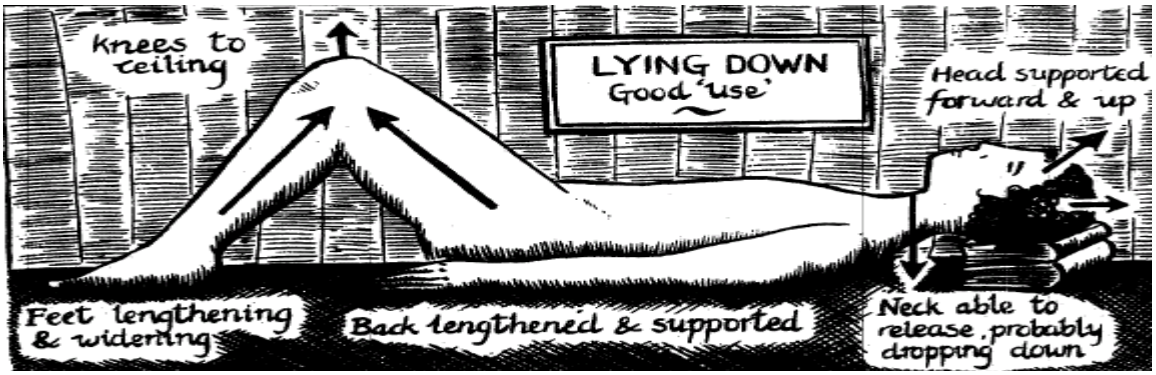

Fig. 19. "Good" postural alignment lying down after studying Alexander Technique
(Trevelyan "Alexander Technique" Nursing Times 89, no. 49 [1993]: 50.)

[98] Alexander, F. Matthias. IThe Use of the Self: Its Conscious Direction in Relation to Diagnosis, Functioning and the Control of Reaction. (London: Orion, 2001), 20.

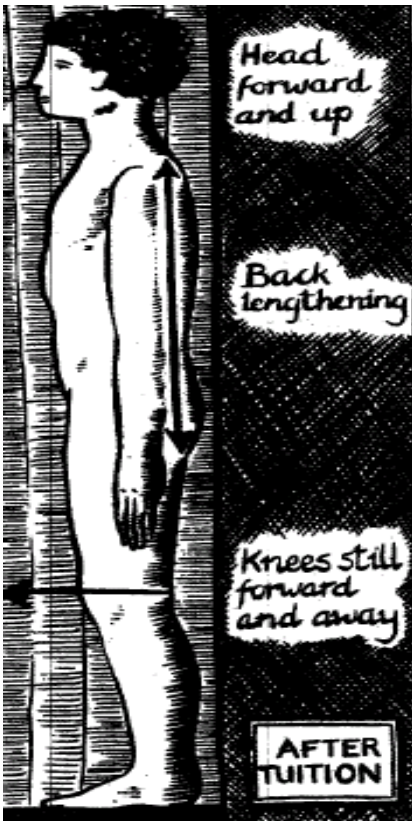

Fig. 20. "Good" postural alignment standing after studying Alexander Technique (Trevelyan "Alexander Technique" Nursing Times 89, no. 49 [1993]: 51.)

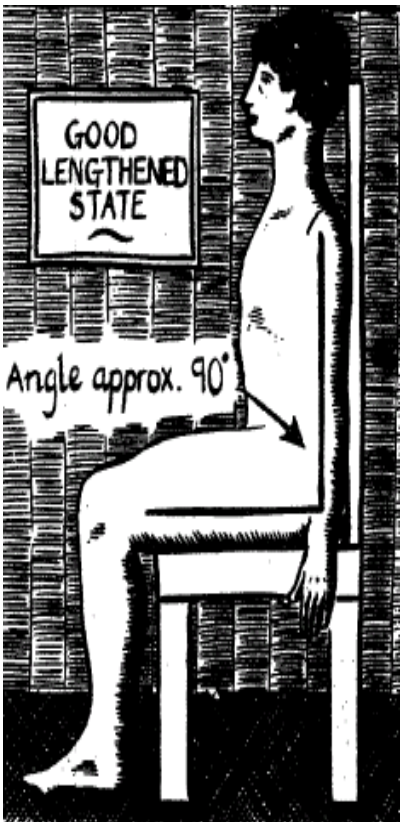

Fig. 21. "Good" postural alignment sitting after studying Alexander Technique (Trevelyan "Alexander Technique" Nursing Times 89, no. 49 [1993]: 51.)

Biological Basis and Science Support

The basic biological premise of Alexander Technique is that poor mechanics of posture and movement prevent muscles from functioning optimally and cause wear and tear on the facet joints. AT believes in addressing the general "problem" of standing on two feet, with a focus on the neck and head placement. This is especially crucial since the head is relatively heavy considering its position at the top of the spine with a small neck for support. Any misalignments will need to be compensated elsewhere in the body in order to sit or stand upright.

Additionally, Alexander Technique, has a significant psychological component. Alexander himself writes in his first chapter of The Use of Self that "it is impossible to separate

'mental' and physical' processes in any form of human activity."[99] While Alexander Technique superficially focuses on the physical component of postural alignment, the "hands on" approach and extensive one-on-one care from a practitioner have a significant psychological aspect. Alexander Technique believes in the fluidity between the psychological and physiological, and most practioners believe that physical posture and movement is a direct reflection of the individual's psychological state. Thus, by correcting postural alignment, the practitioner can address psychological issues and bring "mental calm and clarity."[100] Additionally, the patient plays an active role in realignment, which is closer to how the patient functions in everyday life and may prevent psychological dependence on the practitioner.

Most of the scientific research on Alexander Technique has been done by Frank Pierce Jones, a researcher at Tufts University and a teacher of Alexander Technique. Jones has spent twenty-five years researching the effects of Alexander Technique by monitoring simple actions such as standing, before and after Alexander Technique using electromyography, multiple image photography, and x-ray photography. His results show reduced muscle tone and a more efficient path of movement as a result of Alexander Technique.

2.2.2 Chiropractic

Overview

Chiropractic therapy includes a variety of techniques and theories held by various practitioners. There are three overarching principles within chiropractic philosophy. The first is that the vertebral column is intimately related to health since it houses the spinal cord, which mediates communication via the nervous system. The second and third principles follow-- that

[99] Alexander, The Use of the Self, 20.
[100] Alex Finley, "Posture Perfect," New Woman, January 1990, 98.

"mechanical and functional disorders of the spine can degrade health"[101] and that chiropractic adjustments can restore health.[102] Although chiropractic therapy is related to general health and not just back pain, almost 79% of patients come to a chiropractor for back or neck pain with the most common complaint being pain in the lower back.[103] The chiropractor puts the vertebral column "back in place" by using necessary physical manipulation to adjust the back.

Chiropractic is a growing field that many health insurance agents are beginning to cover. "More than 80% of American workers in conventional insurance plans"[104] have coverage for chiropractic work, although many health maintenance organizations (HMOs) as yet do not include this coverage. In fact, the popularity of chiropractic treatment has been significant enough to create competition with conventional treatment. This popularity initially caused some tension between chiropractors and the American Medical Association (AMA), but after a lawsuit in which the AMA was found guilty of impeding chiropractic business, the two have developed a better relationship. In fact, chiropractic therapy "is considered more a part of mainstream rather than alternative medicine."[105]

It is crucial for practitioners to undergo extensive training and practice since they must be able to detect the location of misalignments, apply force in the correct place, and correct direction. Otherwise increases in misalignment and serious injury can occur. Practitioners must undergo four years of training totaling about 4822 hours.

Some of the contraindications for chiropractic treatment include neurological problems, bone tumors, cauda equina, infection, fracture, cancer, and advanced osteoporosis.[106] Most risks

[101] F. Stanley Wainapel and Avital Fast eds. Alternative Medicine and Rehabilitation (New York: Demos, 2003), 60.
[102] Ibid.
[103] Ibid., 63.
[104] Novey, Clinician's Complete Reference to Complementary and Alternative Medicine, 313.
[105] Ibid.
[106] Ibid., 314.

are associated with cervical spine manipulation. Some mild side effects that have been reported include general discomfort, headaches, tiredness, radiating discomfort, and, more rarely, dizziness and nausea.[107] Deep massage can cause bruises or swelling as well. Special attention should be paid to an individual's condition, especially signs of neurological problems.

Overall, chiropractic therapy is relatively safe. However, there is a minor complication rate of "3% which is comparable to the risk rate of many surgical and medical procedures."[108] While this risk rate may be acceptable for surgery, which is considered a "last resort" treatment, it is high for an alternative technique, and chiropractic treatment is expected to have a lower risk rate. This relatively high rate, however, was identified by Terret as biased and part of ongoing discrimination by the medical community toward chiropractic therapy. Many, according to Terret, were performed by people other than chiropractors, including osteopaths, medical doctors, or therapists who were not knowledgeable about chiropractic technique, and indeed were not chiropractors at all, which led to the higher injury rate.[109]

Practice

A chiropractor works through a hands-on approach to assess musculoskeletal complaints, lesions, and misalignments called sublimations -- a "minor lunation or dislocation"[110] These sublimations "initiate or aggravate inflammatory or degenerative conditions and are amenable to manipulation and mobilization." Manipulation is generally defined as applying a force to a certain line of action that will "typically produce a "pop" in a sensorial joint."[111] The pop results in a realigned spine. The change created by the chiropractor is termed an "adjustment" in which

[107] Wainapel and Fast, Alternative Medicine and Rehabilitation, 64.
[108] Novey, Clinician's Complete Reference to Complementary and Alternative Medicine, 316.
[109] J. Terrett, "Misuse of the Literature by Medical Authors in Discussing Spinal Manipulative Therapy Injury," Manipulative Physiological Therapy, 18, no. 4 (1995 May): 203.
[110] Wainapel and Fast, Alternative Medicine and Rehabilitation, 60.
[111] Novey, Clinician's Complete Reference to Complementary and Alternative Medicine, 312.

"directed force is applied to the affected joint to alter its function."[112] Treatment frequency is most often two-five times a week for the first one-two weeks then once or twice a week for the next two--three weeks as follow-up. The injury is expected to be resolved after about two weeks.[113]

Chiropractors not only act on the back but take a medical history as a physician would, including vital signs and other detailed information, and use imaging techniques such as radiograph, MRI, CAT scan, and other scanning techniques. Chiropractors also give general health advice on exercise, nutrition, and stress management, thus expanding their role in the patient's well-being.

Biological Basis and Scientific Research

In terms of general efficacy, there is extensive research, although of low quality, supporting chiropractic efficacy on acute and chronic lower back pain.[114] Many studies have shown a physiological increase in range of motion and increase in function of surrounding muscles. These effects are not limited to the area of misalignment, but affect distal areas as well since "muscle activity mediated by nerves from the level of the spine being treated may be relaxed."[115] Other more indirect effects include increased immunity as measured by white blood cell count and associated change in substance P, a neurotransmitter in the pain circuit.[116]

The method of biological action is that "static misalignment or reduction of motion" are caused by "segmental variations" that "include entrapments of the facet joint menisci; entrapment of a fragment of posterior annular material of the intervertеblral disc, stiffness induced by adhesions, scar tissue and degenerative changes; and excessive activity, spasm,

[112] Ibid., 311.
[113] Ibid., 313.
[114] Ibid., 316.
[115] Ibid., 317.
[116] Ibid.

hypertonicity, of the deep intrinsic spinal musculature."[117] This results in increased "nerve irritation or release of chemical by products,"[118] which leads to pain that may or may not manifest in the visibly detectable form of inflammation. Chiropractic therapy works by realigning the spine and thus the various connective tissues so that the muscles and nerves are no longer compressed, resulting in pain.

2.2.3 Massage

Overview

Massage therapy can be defined as "the scientific manipulation of the soft tissues of the body for the purpose of normalizing those tissues" and consists of "manual techniques that include applying moving or fixed pressure and movement of the body."[119] Massage is most effective when done with the hands because the hands can assess the body's "asymmetry, restricted motion, bogginess, tenderness, and temperature changes."[120] Massage most often treats somatic dysfunction, which can be defined as a loss of motion through one's normal physiological range.

There are many different types of massage, each of them focusing on a different aspect. Swedish massage is a gentle massage of the superficial layers of muscle, stroking toward the heart, and is used for "general relaxation, improved circulation, range of motion and to relieve muscle tension."[121] Deep tissue massage applies pressure to the deeper levels of muscle to release "chronic patterns of muscular tension."[122] Neuromuscular massage is also a deep massage but works on specific trigger points. Acupressure is a type of massage in which the

[117] Ibid., 311.
[118] Ibid., 311.
[119] Ibid., 339.
[120] Wainapel and Fast, Alternative Medicine and Rehabilitation, 10.
[121] Novey, Clinician's Complete Reference to Complementary and Alternative Medicine, 340.
[122] Ibid.

finger or thumb applies pressure to acupuncture points, and Shiatsu is the Japanese version of Acupressure. Manual lymph drainage uses "light, rhythmic strokes"[123] to "improving [the] flow of lymph,"[124] while CranioSacral corrects "cranial and spinal imbalances or blockages."[125] Zero Balancing uses "gentle pressure at key areas of the skeleton"[126] to balance the body's "energy."[127]

There are many various accredited massage programs. Generally the accepted standard is a minimum of 500 hours of classroom training. Twenty-nine states require a license to practice massage therapy.

Some consider "spondylolisthesis and acute herniated nucleus pulposus with radiculopath"[128] a contraindication. In general, however, "soft tissues, muscle energy, indirect, and myofascial release kinds of manipulation have few contraindications."[129]

Practice

The massage therapist will take the patient's medical history and review the patient's goal in getting a massage. A massage session generally lasts between thirty and ninety minutes and may be done with oil of lotion.[130] In most cases of "long-term improvement a short course of treatment is needed (four to six treatments over two to three weeks), combined with an exercise program in which [the participant] must actively participate."[131]

Biological Basis and Scientific Research

[123] Ibid.
[124] Ibid.
[125] Ibid.
[126] Ibid.
[127] Ibid.
[128] Wainapel and Fast, Alternative Medicine and Rehabilitation, 21.
[129] Ibid., 22.
[130] Novey, Clinician's Complete Reference to Complementary and Alternative Medicine, 345.
[131] Wainapel and Fast, Alternative Medicine and Rehabilitation, 53.

The act of massage on muscles manually stretches fascia and breaks up adhesions and abnormal crosslinks that are created by the body as it attempts to repair damaged tissue after an injury. Massage thus lengthens the muscles, joints, ligaments, and other soft tissues, thus altering the amount of tension and force within the connective tissue that has become shortened due to poor postural habits, an injury, or protective guarding of the area following an injury. When the body heals in a restricted position, massage can also be used to deliberately tear tissue, so that the connective tissue can re-heal in a more functional position without the previous restrictions in mobility. After soft tissue manipulation, mobility is restrained, and the patient can use this mobility to maintain the muscle in its elongated form. Massage thus serves to restore normal anatomical alignments, thus resulting in improvement in mechanical efficiency.[132]

Massage also improves circulation of both the vascular and lymphatic system and eases the movement of synovial fluid. It thus decreases edema and swelling and allows increased nutrient delivery and decreased metabolic waste. While synovial fluid is needed for nutrients, if the fluid builds up, the pressure will increase, generating more pain. Redistribution of interstitial, intracellular, and intravascular fluids by compressing various areas and by removing tissue obstructions helps to increase nutrient delivery and decrease metabolic waste and decrease pressure build-up, thus aiding the healing process.[133] Manipulation also transiently increases

[132] There are two general methods of increasing range of motion--direct and indirect techniques. With direct technique you move and stretch past the barrier or obstruction in the range. Examples include Myofascial release, CranioSacral, and High-Velocilty-Low-Amplitude techniques (HVLA). Indirect techniques are a bit counterintuitive as you move the restricted joint away from the barrier. An analogy to indirect techniques is moving a drawer that is stuck back in, to get it on the correct railing, and then trying to re-open it. Biologically, indirect techniques are probably best explained by neurological effects of these actions. An example is the strain-counterstrain method whereby the restricted joint is moved away from its restriction and held for 90-120 sec then slowly returned. Isometric muscle contraction, where one engages the muscle against a stationary object, includes components of both direct and indirect techniques. Most massage techniques use a direct technique to increase range of motion but may use indirect techniques of manipulation as well (Wainapel and Fast, Alternative Medicine and Rehabilitation, 5).

[133] Wainapel and Fast, Alternative Medicine and Rehabilitation, 6.

"immunological response markers such as antibodies, interferons, and white blood cells."[134] Massage may also increase local blood flow by other mechanisms such as triggering histamine release[135] or reflexes that cause "vasodilation in deeply seated visceral organs."[136]

Massage also acts on the endocrine system, which may account for the longer lasting effects of massage.[137] Massage triggers the release of "endogenous opiates such as enkephalins,"[138] including B-endorphin and serotonin. Endorphins, as noted earlier, are the body's natural way of reducing pain. Massage also promotes deep sleep, which can reduce pain by "increasing somatostatin release and the inhibition of substance P."[139] Manipulation may also "indirectly contribute to the healing process by stimulating the metablock activity of chondrocytes, fibroblasts, and other connective tissue progenitors."[140]

Massage can also be done together with various forms of manipulation to take advantage of neurological mechanisms. Although the exact mechanisms are sometimes unclear, most theories ascribe manipulative success to reflexes mediated by the spinal cord.[141] One theory is that manipulation works to reset the body's "peripheral proprioceptors and their associated spinal reflexes."[142] Proprioceptors are sensory receptors that detect movement and the position of the body or limb in space. Manipulative techniques take advantage of the body's natural proprioceptive responses.[143] In direct thrusting techniques massage "exploits the GTO and the

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[134] Ibid., 9.
[135] Ibid., 86.
[136] Ibid., 87.
[137] Ibid.
[138] Ibid., 89.
[139] Ibid.
[140] Ibid.
[141] Ibid., 10.
[142] Ibid.
[143] The main detectors for proprioception include muscle spindles, Golgi tendon organs (GTO's), joint receptors and skin nerve afferents. Muscle spindles react to involuntary movements by detecting the relative change in length of muscles. Involuntary movements include errors in judgement such as picking up something that was heavier or lighter than you thought, or during passive stretching. Muscle spindles will send a signal to the CNS resulting in contraction of the stretched muscles, so that it does not continue to stretch "involuntarily" and to the antagonist,

joint reflexes by directly stretching hypertonic muscle fibers and mobilizing restricted joints."[144] This action "pulls on the GTO receptors and reflexively inhibits the same muscles contraction."[145]

Using direct manipulative techniques, isometric contraction of a muscle will reflexively inhibit that same muscle, taking advantage of the GTO natural response and allowing for a deeper stretch. Other direct manipulative techniques may exploit the muscle spindle. Indirect manipulative technique, which moves the muscle away from its barrier, may work by decreasing the response of the muscle spindle reflex. By moving the muscle away from its barrier, the muscle spindle decreases its signal to contract. The practitioner then slowly returns the muscle to neutral, with a maintained lower response rate of the muscle spindle. This action must be done slowly, because muscle spindles are sensitive to sudden changes of length and any sudden changes will cause the muscle spindle to increase its signal as before.

In fact, dysfunctional proprioceptors may be the dominant cause of the continued pain, according to the Van Buskirk, model of pain showing pain to be of a cyclical nature. This theory is partially based on the fact that the nociceptors are connected to the spinal cord and to the peripheral tissue, and innervated by the autonomic nervous system which affects the viscera as well as immune systems. In Van Buskirk's model, a noxious stimulus stimulates the nociceptors, which causes vasodilation, tissue edema, autonomic activation, and spinal cord reflexes. These

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opposing muscle to relax. Muscle spindles are innervated by gamma motor neurons as well, and are responsible for much of muscle tone and coordination. Golgi tendon organs (GTO's) detect change in force, and ensure that the body does not overcontract. These sensory receptors are located within muscle tendons so that when muscles contract, tendons are stretched which compresses the GTO and activates them. GTO's then signal the CNS to inhibit that same muscle from further contracting. Thus they prevent the body from overcontracting and "blowing out" a muscle. Joint receptors are involved in proprioception as well as "nociceptive feedback" and they also "mediate postural muscle tone through other complex reflex pathways" Skin nerve afferents are involved in finer proprioception such as, "surface tension, pressure, and the movement of solids and liquids across the skin" (Wainapel and Fast, Alternative Medicine and Rehabilitation, 11.)

[144] Ibid., 12.

[145] Ibid.

produce more pain, thus continuing the nociceptive stimulation causing the release of substance P, an inflammatory neuromodulator in the dorsal horn of the spinal cord. This, in turn will increase by causing inflammation and by making the involved spinal segment even more sensitive to stimulus and hyper-responsive, thus further lowering the pain threshold.[146] This low threshold causes the muscle to increase its sympathetic tone, leading to changes in connective tissue that are biomechanicaly inefficient and painful. This pain further stimulates the nociceptors, which further increases sensitivity in the painful areas. The original noxious stimulus causing this chain reaction can be a musculoskeletal injury, "ongoing disease processes elsewhere in the body, or even generalized physiologic or psychological stress."[147]

This cycle can be stopped by working on the hyper-responsive proprioceptors causing pain and increased sympathetic tone and by decreasing sympathetic muscle tone that leads to painful somatic dysfunction, including muscle spasms, cramps, and tender spots. One method, discussed earlier, is by working on the proprioceptors to reset them, which also helps to stretch connective tissue that has become restricted. Massage also disrupts this cycle of pain in accordance with the gate theory of pain, by "stimulating mechanoreceptors in muscles and joints" and by blocking pain at the dorsal horn of the spinal cord. Thus an analgesic effect is achieved when the sensory neurons stimulated by massage cause the "pain gate" to close.

Additionally, an important psychological aspect of massage is the development of a trusting relationship between patient and practitioner; this relationship allows the body to relax, furthering the healing process.

[146] Ibid., 13.
[147] Ibid., 10.

7.4 Acupuncture

Overview

Acupuncture reflects a holistic, Eastern philosophy of medicine, which is unlike conventional Western medicine and many alternative techniques that focus on a specific illness and work to treat the "source" of pain directly. For example, in order to fix a back problem, the chiropractor works on the bones of the spine, while the massage therapist works on the muscles supporting the spine. Similarly, Alexander Technique works on movements that have a direct role in the back as well. On the other hand, Eastern medicine focuses on "symptoms in the context of the life of the individual" and the "constitutional make-up interacting with life events"[148] to address complex emotional, physical, spiritual, and mental balances that must be in place for optimal health.

In Chinese medical thought, illnesses are due to an imbalance of Qi, which is a "vital force"[149] that flows through the body. There are three subdivisions of Qi: Defensive "Wei Qi," Nourishing "Rong Qi," and Original "Yuan Qi." Wei, as the defensive force, is comprised of the integumentary system, the immune system, and the muscles and tendons. Rong, the nourishing force, "is created from the energy extracted from food and air"[150] and maintains homeostasis. Yuan, the original source, is "the foundation"; "inherited from one's parents, it is not replenishable."[151]

For the body to be in harmony, "Qi" must be balanced. This balance can be explained in terms of the "Ying" and "Yang" aspect of Qi. Qi that flows from the fingers down the back can be considered the "Yang" aspect, and Qi that flows up the front of the body the Yin aspect. Yang

[148]Ibid., 245.
[149] Ibid., 246.
[150] Ibid.
[151] Ibid.

is considered the "functional aspect of the organ," while Yin is "the actual flesh of the organ itself."[152] In terms of illness, Yang is "symbolized by the bright, sunny side of the mountain," and its symptoms include "high fever, acute swelling, or sudden severe muscles spasms made worse with movement and pressure."[153] Yin, as its complement, is the "shady side of the mountain," in which ailments are internalized, and the individual is often "pale and frail," and the problem becomes "chronic in nature and poorly defined."[154]

Acupuncture works to free up the flow of Qi so that Ying and Yang are balanced. Acupuncture uses specific points along "Jing Luo," where Jing are the vertical channels and Luo the horizontal ones. This system of flowing "Qi" leads to treatments along various channels instead of at a specific site or directly at the sight of injury. For example, if a patient complained about back pain the doctor might treat the patient as having a "bladder channel problem," because the back is in the "anatomic sphere of influence of the bladder channel."[155] It is interesting to note that as odd as this bladder-back and other connections along a "Jing Luo" may seem in comparison to conventional medicine, the bladder is controlled by nerves branching from the lumbar spine, and as noted earlier, loss of bladder control is a red flag for immediate surgery. Therefore, the concept of the back being in the "anatomic sphere of influence of the bladder channel"[156] in actuality should not be such a foreign concept to conventional physicians.

Acupuncture certification is available through the National Certification Commission for Acupuncture and Oriental Certification Medicine (NCCAOM). Certification involves completion of a three-year year acupuncture training program, and "1350 hours of entry-level acupuncture

[152] Ibid., 247.
[153] Ibid.
[154] Ibid.
[155] Ibid.
[156] Ibid.

education, including at least 500 clinical hours." Additionally, apprenticeship and "professional practice"[157] is required of all practitioners.[158]

Although acupuncture is a fairly safe and minimally invasive form of care, complications such as infection, bruising, exacerbation of symptoms, and pneumothorax have been reported.[159] Acupuncture can also interact with alcohol and drugs.[160] Other adverse reactions to acupuncture include "vasovagal faint"[161] from the use of needles, pneumothorax, "bruising by hitting capillaries and veins,"[162] and a "transient increase in symptoms."[163] The major contraindication for acupuncture is pregnancy as well as Cauda Equina syndrome.[164]

Practice

The acupuncturist will first thoroughly examine the patient both to screen out patients with contraindications and to get a better sense of the person as a whole, an integral part of Eastern holistic medicine. The standard procedure in the United States is to use needles with twisted handles and then insert them into the skin at specific acupuncture points. This initial puncture is called "de Qi,"[165] which may cause an "aching sensation"[166] initially that should quickly subside. The needles may be left in place, twisted slowly or rapidly. Various frequencies of electrical impulses can be applied as well; for chronic pain, often twelve to sixteen treatments

[157]Novey, Clinician's Complete Reference to Complementary and Alternative Medicine, 200.
[158]Ibid.
[159] Helen, Henderson, "Acupuncture: Evidence for its Use in Chronic Low Back Pain," British journal of Nursing 11 (2002): 1401.
[160] Novey, Clinician's Complete Reference to Complementary and Alternative Medicine, 198
[161] Ibid.
[162] Ibid.
[163] Ibid.
[164] Cauda equina (CE) is formed by nerve roots caudal to the level of spinal cord termination. Cauda equina syndrome (CES) has been defined as low back pain, unilateral or usually bilateral sciatica, saddle sensory disturbances, bladder and bowel dysfunction, and variable lower extremity motor and sensory loss. (http://www.emedicine.com/emerg/topic85.htm).
[165] Wainapel and Fast. Alternative Medicine and Rehabilitation, 249.
[166] Ibid.

are needed, with the average time of each treatment being twenty minutes.[167] Besides puncturing the skin, "heat, pressure, friction or impulses of electromagnetic energy"[168] may be used.

Acupuncture is often accompanied by several methods of stimulation. One is moxa, "powdered leaves of Artemisia vulgaris or mugwort, which are burned near or on an acupuncture site."[169] Another is electric stimulation using either the body's own electricity, called ion pumping cords, in which copper cords are attached to needles between two points with no outside electric stimulation, or by applying an outside source of electricity. This is usually 2 to 4 hertz, to stimulate C fibers in charge of transmitting chronic pain, and 150-200 hertz, to stimulate A fibers in charge of transmitting acute pain.[170]

Biological Basis and Scientific Research

Many scientific studies have been done to reconcile acupuncture with conventional medicine. One method is to show the specificity of acupuncture points. For example, one study found that 71% of these correlate with myofascial trigger points.[171] Other studies have shown that "histologically, acupuncture points show an increased neuronal innervation….Histochemically acupuncture points have larger amounts of substance P in the skin….Electrophysiologically, these points have 'higher electrical conductivity.'"[172]
Thus, acupuncture has the potential to work in a variety of ways, including directly on the nervous system, by way of the neurotransmitter Substance P in the pain pathway, and by working on the body's bioelectrical field by creating changes in the electric current.

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[167] Ibid.
[168] Brian M Berman, and James P. Swyers. "Establishing a Research Agenda for Investigating Alternative Medical Interventions for Chronic Pain." MA Primary Care 24, no. 4 (1996): 746.
[169] Novey, Clinician's Complete Reference to Complementary and Alternative Medicine, 195.
[170] Ibid.
[171] Wainapel and Fast, Alternative Medicine and Rehabilitation, 250.
[172] Ibid.

Acupuncture is also supported by neuroimaging techniques such as MRI. After acupuncture, MRI shows activation of "deep brain tissue, especially the limbic system." These studies suggest that "central acupuncture pathways might bypass superficial sensory cortex activity to act on deep brain structure." Another neuroimaging study using fMRI, or functional magnetic resonance imaging (when a subject is scanned while doing some activity or "function") revealed that the sphere of influence of individual acupuncture points related to the neural correlate of the area. For example, stimulating an acupuncture point on the foot related to the visual system activates the occipital lobe, responsible for vision, in the brain.[173] Another interesting finding was that the lines designated as acupuncture channels had lower resistance and higher capacitance,[174] which by the rules of physics, allows for better conductivity, or channels of "communication."

Acupuncture is probably best proven as an analgesic or painkiller.[175] The mechanism for this most likely involves blocking the pain message via the pain-gate theory explained earlier.

More generally, "the Scientific Mechanism of Acupuncture" in Integrative Medicine Consult (15 January 1999) concluded that acupuncture worked by "electric, neurologic, humoral, lymphatic (as a medium for the electroionic flow along fascial planes); and wave propagation."[176] Various researchers have also reported acupuncture to stimulate the immune, hormonal, cardiovascular, and gastrointestinal systems as well as to affect opoidergic pathways. Acupuncture may also work by stimulating vasodilation, using both local and distal needling, in

[173] Ibid.
[174] Ibid.
[175] Ibid., 252.
[176] Novey, Clinician's Complete Reference to Complementary and Alternative Medicine, 193-194.

the injured muscle.[177] Vasodilation leads to increased blood flow in the area for better oxygenation and waste removal from that area.

The extensive research, although much of it is poorly done, and anecdotal evidence, has established acupuncture as a valid technique in medical communities.[178] In 1994 the FDA decided that acupuncture needles were "a standard medical device to be used by a qualified practitioner,"[179] giving acupuncture more credibility as a health form. More strikingly, in 1997 the National Institute of Health announced that a comprehensive review of experimental research and case studies revealed that acupuncture was an "acceptable alternative"[180] that could be "included in a comprehensive management program"[181] for low back pain, among other illnesses.

7.5 Yoga

Overview

The word yoga "comes from the same Sanskrit root as the word for yoke; it implies harnessing oneself to a discipline or a way of life"[182] or a "union of the personal self with the Divine source."[183] Dr. Andrew Well explains that yoga is "the joining of the mind, body, and spirit to enrich the quality of one's life and to enhance one's health"[184] as well as to "balance all

[177] Wainapel and Fast, Alternative Medicine and Rehabilitation, 253.
[178] Novey. Clinician's Complete Reference to Complementary and Alternative Medicine, 192.
[179] Ibid.
[180] Ibid.
[181] Ibid.
[182] Nirmala N. Nayak and Kamala Shankar, "Yoga: a therapeutic approach" Physical Medicine Rehabilitation Clinic of North America 15 (2004): 783.
[183] Novey, Clinician's Complete Reference to Complementary and Alternative Medicine, 141.
[184] Ibid., 141.

parts of the body."[185] Yoga "began as the science of quieting the mind"[186] and includes eight different "limbs" of classical Indian philosophy:[187]

1. Yama--"universal moral commandments having to do with our relations with others," including nonviolence, truth, honesty, temperance, and noncovetousness.
2. Niyama-- "individual moral directives," including purity, contentment, introspection, and dedication to a higher being.
3. Asana-- the actual postures and positions and what is commonly known as "Yoga."
4. Pranayama-- the technique of breathing. Through control of breath one can control "subtle energies within the body and finally gain full control over the mind."
5. Pratyahara- -control of the senses.
6. Dharana--focus on a still point, after previous levels are achieved.
7. Dhyana--"total dedication to the goodness of the world."
8. Samadhi-- the destination of the yogi's journey, a liberation or enlightenment.

There are four paths of yoga to reach "self-realization":[188]

1. Bhakti yoga is the way of devotion or love, the surrender of the self to the Divine or supreme spirit.
2. Karma yoga aims to bring about union with the supreme Spirit through right action, that is, action undertaken with unconditional selflessness and with no intention of reward.

[185] Ibid., 141.
[186] Wainapel and Fast, Alternative Medicine and Rehabilitation, 139.
[187] Ibid.
[188] Novey, Clinician's Complete Reference to Complementary and Alternative Medicine, 142.

3. Jnana yoga aims to find union through knowledge and realize the truth about life.

4. Hatha yoga is the system of physical postures or asanas, which is the best known form in Western culture.

There are various general positions including sitting, standing, and inversion poses. Inversion is when the body is placed upside-down allowing the effect of gravity to pull down on the body with the lumbar spine in the same line in reverse. The muscles are thus strengthened and stretched in a complimentary manner, and blood is redistributed to new areas. An odd psychological component may also be present; "because of the "unusual viewpoint" they afford the practitioner," inverted poses "are often suggested to relieve anxiety."[189] Standing poses in yoga are especially helpful for strengthening the muscles and increasing the individual's balance as well. During standing, the individual is forced to balance and learn coordination, to prevent himself from falling, while stretching in various positions. This dynamic balance is needed for everyday movements. Sitting poses are very useful as well, since they can be easily controlled for slow and sustained stretches. It is ironic that excessive sitting with little movement, as is prevalent in American society, is often the cause of pain, yet yoga seated positions are healing. This is due to the twisting and turning movements that take the body through a full range of motion instead of it remaining stationary.

Each style of yoga offers some kind of teacher training, and, currently, progress is being made in creating some national standardized certification.

Generally, yoga is safe for all ages and levels as it can be modified to fit the current needs and abilities of the individual.

Practice

[189] Wainapel and Fast, Alternative Medicine and Rehabilitation, 162.

Generally, asanas that stretch and strengthen the back are suggested for back pain. More specifically, Nayak and Shankar suggest "Salabasana, Dhanarasana and Shavasana"[190] for back pain. The Ekapadajanusirsana is another good pose for back pain as it stretches and relaxes the entire back and hamstrings, improving lumbar flexion and promoting "coordinated relaxation and eccentric contraction,"[191] while the muscle is being stretched at the same time. The resulting increase in flexibility helps to increase range of motion and to relax muscles in spasm and muscles in pain due to overuse or injury.[192]

Other movements that help patients with back pain include twisting poses because they "produce and sustain rotation or torque on the thoracic and lumbar spine," [193] which helps increase strength and flexibility of these muscles through a different range.

[190] Nayak and Shankar, "Yoga: A Therapeutic Approach,"Physical Medicine Rehabilitation Clinic of North America 15 (2004): 795.
[191] Wainapel and Fast, Alternative Medicine and Rehabilitation, 143.
[192] Ibid.
[193] Ibid.

Fig. 22. Shavasana (http://yoga.paramatman.ru/yoga-sequence.html&asana=111-shavasana)

Fig. 23. Salabasana
(http://www.integral-yogacentre.co.uk/images/Salabasana%20Mirror.gif)

Fig. 24. Dhanarasana
(http://www.yogawithateeka.com/images/asanas/dhanurasanaL.jpg)

Fig. 25. Ekapadajanusirsana
(http://www.yoga.com/ydc/enlighten/enlighten_document.asp?ID=262&section=9&cat=0)

Fig. 26. Marichyasana
(Twisting Motion Example)
(http://www.yoga.com/ydc/enlighten/enlighten_document.asp?ID=262&section=9&cat=0)

Symmetrical stretching is recommended for patients who might "go astray or 'cheat'"[194] the stretch. Stretches such as Ustrasana, or camel pose, and Suptavirasana stretch the iliopsoas and quads simultaneously.[195] These stretches are good for back pain because they decrease

[194] Ibid., 146.
[195] Ibid.

lumbar lordosis by relaxing the lumbar spine.[196] Although, the back is actually in a position of increased lumbar extension, these stretches in a relaxed, passive position will relax the muscles and, more importantly, stretch the hip flexors, which in conjunction with tight hamstrings, are a primary cause of lordosis. Thus, stretching the hip flexors as well as the hamstrings will reduce the pull on the back in such a way as to decrease lumbar lordosis and thus the strain on the back.

Fig. 27. Ustrasana/Camel pose
(www.lizowenyoga.com/ ClassesWorkshops.htm)

Fig. 28. Suptavirasana
(http://www.yogacom/ydc/enlighten/enlighten_document.asp?ID=262&section=9&cat=)

Finally, the lotus position is a classic yoga pose that, after stretching the correct muscles, will be "extremely comfortable, producing a restful attitude in the practitioner."[197] This position is extremely useful for relaxation and meditation purposes.

Fig. 29. Lotus Position
(www.yogawithmeghan.com/ private.html)

[196] Ibid.
[197] Ibid., 170.

While some of these poses may seem extreme, an experienced teacher can help modify and provide an easier version of the positions as needed. Needless to say, the back should not be further strained by being forced into a position before it is strong and flexible enough to maintain it with the correct technique. In this manner, strength and flexibility should be gained gradually with the guidance of an experienced teacher. Other more subtle considerations must also be taken into account by the teacher. For example, it is sometimes more beneficial to stretch one side or muscle at a time because simultaneous stretching "often leads to poor patient compliance."[198] This is because the "high forces needed to accomplish the task" [199] may be especially challenging, physically and psychologically, to the injured site.

Scientific Evidence and Biological Support

Most yoga styles work by sustaining relaxed stretch positions. While Golgi Tendon Organs will continue to send inhibitory messages to reduce the amount of stretch on the muscles. The muscle spindles, which detect the speed of the stretch, will reduce their firing as the stretch continues, allowing for a greater stretch. For this reason, most stretches are held for about one minute. By maintaining the asanas for long periods of time, the body will slowly relax into a deep stretch. This physical relaxation is linked to the psychological component of mental relaxation as well. Other benefits include countering the effects of osteoporosis by placing a "dynamic load" on the muscles, their origins and insertions, as well as improved distribution of "circulatory volume" and circulation.[200]

These stretching and strengthening exercises have a significant impact on the range of motion and thus the amount of stress placed on the spine. A small difference in flexibility of the spine makes a big difference, since "If just 3 degrees of flexion were added to each of the spine's

[198] Ibid., 145.
[199] Ibid.
[200] Ibid., 144.

vertebrae, it would amount to more than 90 degrees of additional motion."[201] This added motion makes everyday movement more efficient and for some individuals, possible.

The yoga positions as well as other forms of exercise for the back are thought able to heal a herniated disc by increasing circulation and thus supply needed oxygen and nutrients to the area and by gently easing protruding material from the disc such as the nucleus pulposes. Alternatively, the protruding disc material may dry and retract over time. All of these mechanisms, aided by exercise, help the herniated material back into its place so that it is no longer pressing on a nerve and causing pain. Yoga also works to stretch muscle and pull the nerve that is being pinched out of the way, while opening up the joint. In this way the nerve can move without being pinched.[202]

Yoga also has a significant psychological component. The asanas abet both mental and physical relaxation, thus aiding in pain management. This most likely works by taking advantage of the body's proprioceptive system discussed earlier. Also, deep breathing and stretching counter both the tightening of the body and the alteration in breathing that may accompany pain or stress. Since yoga can be done at home after the basic moves have been learned, this increases the patient's "functional competence"[203] and independence as well.

3.0 Psychological Component and Conclusions

3.1 Purely Psychological Techniques

3.1.1 Sarno's Approach

Conventional medicine and the alternative techniques discussed above acknowledge a psychological component to back pain. However, the Sarno and Cognitive Behavioral Approach

[201] Ibid., 151.
[202] Ibid., 166.
[203] Ibid., 170.

suggest that the psychological components are the dominating if not the only cause of lower back pain.

Dr. John E. Sarno, a professor of Clinical Rehabilitation Medicine at the New York University School of Medicine and attending physician at the Howard A. Rusk Institute of Rehabilitation Medicine at New York University Medical Center, takes the extreme position that most back pain is purely psychological. He argues that the body has the ability to heal itself so that back pain cannot be due to some injury from years past,[204] and that one incident, such as picking up a heavy item in an awkward position, is a "trigger" not a cause of back pain,[205] even if the patient hears "a crack, a snap, or a pop." [206] He also turns to the epidemiology of back pain and concludes that if back pain were structural, then an older population would be more prone to it whereas, "77 percent of the patients fell between the ages of thirty and sixty."[207] Sarno explains the prevalence of back pain in this younger age group as reflecting its greater stress, an explanation he uses to support his theory that it is purely stress that causes back pain. However, Sarno cannot prove causation. For example, he overlooks the fact that the younger group may be more active, more likely to work long hours during the week, and the women more likely to be childbearing.

Sarno calls the prevalent cause of back pain "Tension Myotitis Syndrome" (TMS), which he defines as a "change of state in the muscle that is painful." TMS is a result of stress/ tension, often repressed in the unconscious. To cure back pain, his patients take a lecture course teaching that the causes of back pain are purely psychological, resulting in oxygen deprivation and pain. The only purpose of back pain, according to Sarno, is to distract the person from repressed

[204] John E. Sarno, Healing Back Pain: The Mind-Body Connection (New York: Warner Books, 1991), 13.
[205] Ibid., 12.
[206] Ibid., 15.
[207] Ibid., 5.

emotion. Pain prevents the individual from acknowledging stress, so if the patient acknowledges tension, stress, will release the repressed feelings and end the back pain. Sarno believes that back pain turns chronic because it "becomes the primary focus of [people's] lives."[208] Therefore, patients are encouraged to resume normal physical activity and even asked to discontinue physical therapy because this reinforces dependency and the idea that the problem is physiological, when it is really a psychological phenomenon.

The biological explanation for this phenomenon proposed by Sarno is that back pain is caused by oxygen deprivation. Stress affects the autonomic nervous system, which decreases blood flow to certain areas leading to ischemia: "the tissue involved is getting less than its normal complement of blood."[209] As a result of this reduced blood flow, the tissue does not receive sufficient oxygen, which leads to "pain, numbness, tingling and sometimes weakness."[210] Sarno also compares back pain to similar muscle spasms caused by temporary oxygen deprivation in athletes.

Although Sarno's approach seems extreme in ascribing back pain to a purely psychological cause, it has some valid points. Research has shown that simply talking about pain can increase a patient's "level of electrical activity in the muscles underneath the electrodes" to "seven times normal." Turk, a psychologist at the University of Pittsburgh, concludes, "That tells you that just thinking can affect your physiology and your pain." Furthermore, this approach is powerful in that the patient is take control of their lives. Control plays a large role in the amount of stress one perceives. Thus, even if there are biomechanical causes of back pain as well as psychological aspects, the sense of complete control will help the patient to reduce stress levels both in life in general and regarding back pain. This approach has the added advantage of

[208] Ibid., 25.
[209] Ibid., 60-61.
[210] Ibid., 61.

returning the patient back to regular activity so that the muscles do not atrophy. Furthermore, patients will be less likely to "guard," or protect the injured areas, in ways that transiently reduce pain but ultimately lead to various hunched and biomechanicaly inefficient positions that will further exacerbate back pain. "Moreover, the secondary negative consequences of pain such as social isolation and decreased physical stamina are largely caused by individual behavior." [211]

Furthermore, Sarno's attitude may help prevent the patient from developing chronic pain syndrome. As noted before, exercise is one of the few things shown to be effective for lower back pain; however, as Sarno points out, a patient who believes his back pain is mechanical and listens to warnings such as "don't run, don't bend, don't lift, lift with a straight back"[212] is convinced that "the back is a fragile, delicate structure, easily injured and perpetually vulnerable."[213] As a result the patient will develop fear surrounding physical activity, and this decreased physical activity can lead to depression, causing a vicious cycle.

Sarno's ideas are supported by Linton's research that concluded that psychosocial variables are strongly linked to the transition from acute to chronic pain disability, having more impact than biomedical or biomechanical factors.[214] Chronic pain syndrome may also include a "disability conviction"[215] shaped by patients' "beliefs about their condition, what they can do about it, and what is in their best long term interest."[216] It has been suggested that "undue intervention in this early stage can unwittingly reinforce disability and generate iatrogenic

[211] Arie Dijkstra, "The Validity of the Stages of Change Model in the Adoption of the Self-Management Approach in Chronic Pain," Clinical Journal of Pain. Special Topic Series: Cognitive-Behavioral Treatment for Chronic Pain 21, no.1 (January/February 2005): 27.
[212] Sarno, Healing Back Pain: The Mind-Body Connection, 54.
[213] Ibid.
[214] Feldman, "The Prevention of Occupational Low Back Pain Disability: Evidence-Based reviews Point in a New Direction," 7.
[215] Ibid., 3.
[216] Ibid.

illness."[217] It may be advisable to attribute back pain to psychological causes whether or not this is the sole cause of back pain.

3.1.2 Cognitive Behavioral Approach

Another psychological approach that has been used with some success is the Cognitive Behavioral. This is based on an operant model[218] and the contingency between rewards involved in pain behavior, especially those involving social and family interactions, and back pain. Individuals are encouraged to change behaviors and actively participate in treating their problems. In a study by Morley et al., the Cognitive Behavioral approach was found to make significant improvements in "pain experience, cognitive coping, and appraisal (positive coping measures) and reduced behavioral expression of pain."[219]

3.2 Low Quality of Scientific Research Supporting these Techniques

Because of the widespread use and potential benefits of alternative medicine, much more research must be done in this area. Furthermore, existing studies are often poorly designed and carried out, resulting in low reliability, and validity.[220] Some of the reasons for these problems include limited financing, the fact that practitioners are often unfamiliar with experimental design, and the bias of researchers to validate their technique. Problems include selection bias, no principles of randomization, inappropriate or no controls, invalid tests, over-interpretation of data, assuming that correlation implies causation, method of taking measurements, placebo effects, interactions with other diseases not taken into account, vague or inappropriate definitions, and no long-term follow-up. Furthermore, who is doing the study and funding the

[217] Ibid., 12.
[218] The Operant Model of conditioning is based on Skinner's principle that when a response is followed by a reinforcer, it is more likely to happen again. The opposite is also true.
[219] S. Morley, C. Eccleston, A. Williams, "Systematic Review and meta-analysis of Randomized Controlled Trials of Cognitive Behaviour Rherapy and Behaviour Rherapy for Chronic Pain in Adults, Excluding Headache," Pain 80 (1999): 1.
[220] Reliability refers to the accuracy of the measurements and validity to the ability to measure what the study is trying to measure.

study can lead to an expectancy effect- where expectations of the practioner and/ or patient are biased. There also may be a publication bias, in that different publications may selectively publish studies based on their results. An example of such bias can be seen in publications on acupuncture whose success rate in Asian publications is 100 percent, but much lower in publications elsewhere.[221] Additionally, variability in independent/dependent measures (especially variability in measures of psychological components) makes meta-analysis, in which various studies are pooled together to increase the significance of the results, difficult if not impossible. For example, different studies have very different methodological approaches and different definitions of lower back pain recurrence as well as various follow-up times.[222]

In the 1990s, congress established the Office of Alternative Medicine (OAM) within the National Institute of Health (NIH) "for the purpose of conducting research on unconventional therapies that were being ignored or maligned by mainstream medicine."[223] This has improved research in alternative medicine, but there are still many problems with researching these techniques that seem intrinsic to alternative medicine. For example, the very nature of alternative medicine, which calls for a highly individualized approach to the problem, does not lend itself well to precise categories of treatment. Even more problematic is the near impossibility of creating a control group that accounts for a placebo effect. For example, how does one create a control group for massage so that people think they are getting a massage but are not? There are also problems with recruiting human subjects, since a subject who is willing to undergo a certain treatment for back pain may already have an inclination and belief that this technique will work. In addition to the myriad physiological effects that this belief may have, it may also prejudice the

[221] Wainapel and Fast, "Alternative Medicine and Rehabilitation," 300.
[222] R.Wasiak, G.S. Pranskey, and B.S. Webster, "Methodological Challenges in Studying Recurrence of Low Back Pain," Journal of Occupational Rehabilitation, 13, no. 1 (March 2003): 21-31.
[223] Wainipel and Fast, "Alternative Medicine and Rehabilitation," 277.

subjective rankings for how much better the patient feels. Needless to say, subjects cannot humanely be put at random in control or placebo groups or even in various treatment groups that are deemed less able to reduce pain.

There are studies done for all the techniques in question that "prove" their effectiveness in treating back pain. However, for the reasons discussed above, these studies are not reliable. More objective meta-analysis studies seem to indicate that for chronic pain, only exercise and multidisciplinary techniques (a combination of several of the above techniques) are effective.[224] A multidisciplinary approach, however, can be quite expensive, and in the end beneficial outcomes are "clearly related to psychosocial factors."[225]

Nevertheless, these other techniques should not be discarded, especially since there are a significant number of individual cases in which these various conventional and alternative techniques provided pain relief for patients. As Berman and Swyers explain, "Although anecdotal case studies are no substitute for controlled clinical trials when it comes to making decisions regarding the efficacy and safety of therapy such information should by no means be completely disregarded when making clinical decisions. Rather such information should be considered as a piece in the overall puzzle to determine how best to treat these complex conditions."[226]

[224] C.G. Maher. "Effective Physical Treatment for Chronic Low Back Pain." Orthopedic Clinics of North America. 35, 1 (January 2004): 59.
[225] O. Elkayam, "Multidisciplinary Approach to Chronic Back Pain: Prognostic Elements of the Outcome," Clinical and Experimental Rheumatology 14 (1996): 281.
[226] Berman and Swyers, "Establishing a Research Agenda for Investigating Alternative Medical Interventions for Chronic Pain," 755.

3.3 Psychological Component

3.3.1 Proof of a Significant Psychological Component

There is quite a gamut of conventional and alternative treatment options, and while there is anecdotal evidence for all of them, there is no conclusively proven treatment for chronic or re-curing back pain. Furthermore, once the patient has experienced acute back pain, chances are high that a patient's back pain will recur or turn chronic. Despite the fact that these treatments have not been proven and that these techniques may only serve as temporary "pain modulating modalities,"[227] Americans nevertheless spend $26 billion dollars a year on various cures for back pain.[228]

Sarno explains this "therapeutic eclecticism" as "a sign of diagnostic incompetence."[229] As he suggests, the root of this back pain epidemic may lie in an inability to properly diagnose back pain. Despite the prevalence of back pain in society, detailed physiological knowledge of mechanical and systemic causes of back pain, and considerable research on back pain "97% of LBP is called "non-specific"[230] or "strain/sprain" by doctors precisely because the source of the pain is unknown.[231]

Even in the case of surgery, where the cause is presumably known, "Surgery fails in about 20% of patients," [232] while in others there is only temporary or partial relief from pain. These surgeries indicate that there must be additional causes or an altogether different cause than the one treated with surgery. Furthermore, "despite the development of many new and expensive

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[227] A. Indahl, "Low Back Pain: Diagnosis, Treatment, and Prognosis." Scandinavian Journal of Rheumatology, 33, no. 4 (2004): 199.
[228] Xuemei Luo et al., "Estimates and Patterns of Direct Health Care Expenditures Among Individuals With Back Pain in the United States," Spine, 29, no.1 (1 January 2004): 79.
[229] Sarno, Healing Back Pain: The Mind-Body Connection, 120.
[230] Feldman, J.B. "The Prevention of Occupational Low Back Pain Disability: Evidence-based Reviews Point in a New Direction," 1.
[231] Ibid.
[232] Elkayam, "Multidisciplinary Approach to Chronic Back Pain: Prognostic Elements of the Outcome," 287.

surgical techniques, much surgical treatment of lumbar spine surgery is still not substantiated by good scientific evidence."[233] Most likely this is due to a misdiagnosis, additional undiagnosed causes of back pain, or a psychological component that has developed.

Many researchers agree that there is some confounding psychological aspect to back pain that may explain the difficulties in diagnosis and thus, ultimately, in treatment. Ohara acknowledges that while the original cause of back pain may have been physiological, the "factors that maintain the pain problem can be different from those that have initiated it. Pain behaviors may be subject to a graded shift from structural/mechanical to functional/ environmental control." In other words, back pain may start off as physiological in nature, that is, as acute back pain, but later shifts to being psychological in character as in recurring and especially chronic back pain.

Furthermore, in the case of chronic back pain, research on the efficacy of various alternative and conservative treatments indicates that psychological aspects of back pain play an especially large role. In one such study the "perceived credibility of the treatment was one of the stronger predictors of outcome irrespective of the treatment condition they were assigned to."[234] Similarly, Kalauokalani et al. found that there was "a straightforward interaction" [235] between treatment expectation and treatment condition, where "patients own beliefs in the effectiveness of treatment and their perceived ability to learn to cope with the condition were better predictors of rehabilitation status at 6 months."[236] This effect was not simply because patients with better attitudes were more likely to stick to their prescribed exercises, since "attitudes were better predictors of post-treatment functioning than adherence to prescribed behaviors such as walking

[233] Feldman, "The Prevention of Occupational Low Back Pain Disability," 6.
[234] Ibid., 1.
[235] D. Kalauokalani , D.C. Cherkin, K.J. Sherman, et al., "Lessons from a trial of acupuncture and massage for low back pain: patient expectations and treatment effects." Spine 26 (2001): 1418.
[236] Feldman, "The Prevention of Occupational Low Back Pain Disability," 1.

and exercise regiments."[237] Indeed the patient's own beliefs were often better predictors of progress than "professional judgments."[238] Even the amount of training and clinical experience of the therapist had "little value in predicting outcome in patients with low back pain."[239] The best way to explain these phenomena whereby a patient's attitude, expectation, and belief override the type of treatment/therapy, the skill level of the therapist, and even professional judgment is that psychological factors are a dominant cause of chronic low back pain.

3.3.2 Problems with Scientific Research

As mentioned earlier, alternative and conventional treatment plans, possibly even including surgery, have not been proven to "work." Nevertheless, there is anecdotal evidence for all of them. This inconsistency in treatment plans may be attributed to the psychological components inherent within these techniques. Since part of what makes a technique "effective" may be the patient's belief that the technique is effective, randomly assigning people to treatment groups and other features of a "good" scientific study will remove this psychological dimension as well as the patient's feeling of control and treatment input. These aspects are especially important in alternative medicine with its injunction to "Treat the whole person" and where the physician and patient work as partners for prevention and education (which is considered the best "cure").[240] Alternative medicine stresses the importance of the patient as a unique individual, the patient as a partner in the treatment plan, and gives the patient more control of his treatment. All these are critical psychological components that may be great contributors to healing back pain but are not present in a "scientific" study.

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[237] Ibid., 8.
[238] Ibid., 3.
[239] L. Resnik, D.L. Hart. "Using clinical outcomes to identify expert physical therapists," Physical Therapy 83 (2003): 990.
[240] Novey, Clinician's Complee Reference To Complementary and Alternative Medicine, 6.

3.3.3 Psychological Explanations for these Techniques

"Hands-on" treatment, in which the therapist uses his hands to treat the patient, may also have a psychological effect on emotion and the perception of pain and ,as suggested earlier, can enhance the therapeutic alliance between the practioner and the patient. Several studies have shown that massage and other forms of touch decrease anxiety, depression, anger, and insomnia.[241] Stress may also have general effects on limbic activity as well as help the patient sleep better.[242] Stress and anxiety are important elements to address as they lead to increased tension in various muscle groups that can lead to pain, rigidity, biomechanical inefficiency, and general decreases in immunity. Manual techniques can also aid a patient to "regain a sense of whole body awareness and control."[243] Furthermore, many of the alternative medicine techniques state outright that they are based heavily on psychological issues, which can effect musculoskeletal balance, or explain their efficacy at least partially as having a psychological component. For instance, "if the ribcage is restricted because of a musculoskeletal injury, there may be a tendency for the patient to feel anxious or emotionally distressed,"[244] and vice versa. The connection between physical problems and psychological is a belief shared by practitioners of manipulation therapy, including massage and chiropractic work as well as Alexander Technique. Since physical and psychological effects are a two-way street, it is therefore crucial to address both the physical and psychological components. Even surgery, presumably without a psychological component, may work at least partially as "a powerful placebo"[245] due to the surgeon's confidence that the back will be "fixed" after the surgery.

[241] Wainapel and Fast, Alternative Medicine and Rehabilitation, 17.
[242] Ibid.
[243] Ibid., 18.
[244] Ibid., 322.
[245] John E. Sarno. Healing Back Pain: The Mind-Body Connection (New York: Warner Books, 1991), 125.

3.3.4 Biological Mechanism for Physical/ Psychological Interaction

There are many mechanisms whereby the psychological could affect physiological pain. For example, cortisol is a hormone released in times of stress that will decrease immunity as well as the body's ability to heal itself. In fact, the entire pain pathway, as described earlier, is heavily influenced by stress at all three levels, ascending, cognitive and descending, which can increase perception of pain. As discussed earlier, other mechanisms, such as restrictions in movement due to depression or anxiety, can decrease range of motion and the strength of muscles in the affected area, further instigating back pain. In addition to the many possible mechanisms explaining how psychological causes can create pain as well as maintain and heighten the injury and/or perception of pain, there are almost certainly many other connections as yet unknown. "What we have yet to discover, and it is probably beyond our mental horizons to do so at this time, is how emotional phenomena can simulate physiologic ones. That they do is unquestionable."[246]

3.4 Closing Recommendations

In conclusion, I offer several recommendations regarding the back pain epidemic. First and foremost, psychological factors must be addressed. Psychological effects are especially prevalent in chronic back pain, which is the most debilitating as well as the most difficult type of back pain to treat. It is critical to look at the entire milieu or context in which the back pain occurs, including "Patient characteristics, health care providers and the health system environment," which all "contribute and interact to promote the development of persistent pain."[247] It is critical for the therapist to "remain confidant, positive and reassuring. They should encourage activity, discourage fear avoidance behavior, and consider rehabilitation early before

[246] Sarno, Healing Back Pain: The Mind-Body Connection, 169.
[247] C. H. Thomas and D. MacAdams, "Back Pain Rehabilitation." Australian Family Physician. 33, no. 6 (June 2004): 427.

illness beliefs become entrenched."[248] Because "fear avoidance behavior has been shown to be part of the disabling pathway in chronic low back pain,"[249] therapists are encouraged to "give the patient the confidence that the back is robust even if it hurts."[250] The patient's chronic pain may simply be due to "excitatory responses occurring long after the normal healing process, and not responding to routine treatments of medications, physiotherapy, epidurals or surgery."[251] This is especially critical since the mind has a predominant effect in pain perception, behavior, physiology, and other as yet uninvestigated connections.

In order to make proper psychological assessment and intervention, the assessment must include an extensive developmental and medical history.[252] This enhances the "relationship and alliance with each patient" and is a "fundamental and critical component of psychotherapeutic intervention."[253] In diagnosing the patient, the practioner must ask himself whether there is a significant social or psychological cause "that may amplify or prolong pain."[254] Generally this can be answered on the basis of history and physical examination alone, although a minority of patients requires further diagnostic testing.[255]

In order for therapy to work, the patient should be actively involved with the treatment for several reasons. First, in addressing psychological issues, it is crucial that the patient feel comfortable with psychological aspects as a contributing factor to illness, and not reject it for fear of being considered "crazy." Only then will the patient be able to open up and relieve some of the stress, tension, and emotions contributing to the pain. Furthermore, the placebo effect is an

[248]Ibid.
[249]A. Indahl, "Low Back Pain: Diagnosis, Treatment, and Prognosis," 199.
[250] Ibid.
[251] Helen Henderson, "Acupuncture: evidence for its use in chronic low back pain," British journal of Nursing 11, no. 2 (2002): 1403.
[252] Wainapel and Fast, "Alternative Medicine and Rehabilitation," 322.
[253] Ibid.
[254] Deyo et al., "What Can the History and Physical Examination Tell us About Low Back Pain?" 760.
[255] Ibid.

extremely powerful force: for this reason it is a standard and required aspect of research to have a control group to account for it. Thus, while the link between the psychological and physical is sometimes not fully addressed or acknowledged by medical professionals, it has been scientifically proven as having a strong effect on healing and treatment outcomes. A patient who believes in a treatment is much more likely to get better or improve, while the opposite is also true. Thus, the patient must be involved in the treatment plan, and patient acceptance of the program is more important than the "right treatment."[256]

The feeling of being in control of a situation reduces stress levels significantly, while absence of control will increase stress levels. As emphasized earlier, if stress and psychological factors have serious somatic consequences, this stress should be reduced by giving patients control over their illness. The unfortunate alternative is that the patient becomes increasingly preoccupied with his back pain, stressed about treatment and whether he will ever return to normal functioning, and pessimistic and depressed about lack of mobility. All of these responses will heighten and prolong the psychological forces contributing to back pain.

It is interesting to note that psychological effects can play a beneficial role in conventional as well as alternative medicine. Alternative medicine, however, because of its structure, may be more conducive for instigating somatic changes through the mind. In all cases, dependence on the practioner and feelings of disability should be discouraged. In fact, practioners must take special care not only in terms of what they do or prescribe but also in terms of how they do it. A confident practitioner with a positive outlook can work wonders for a patient. In fact, in many cases, conversion of acute back pain to chronic back pain is often

[256] Wainapel and Fast, "Alternative Medicine and Rehabilitation," 324.

iatrogenic,[257] with strong psychosocial factors, so that not only what to do but also what not to do become important public health issues.[258]

As to specific treatment recommendations, all of alternative and conventional techniques discussed can be useful, depending on the patient's condition or belief in a particular technique. In fact, many share the basic principles of strengthening and stretching the back and body as a whole, helping to relieve psychological stress, and encouraging the patient to return to everyday activities. These are all valuable aspects to relieving back pain. There may be certain cases in which one specific technique, for example surgery, is highly recommended for an individual's condition. However, it is more important that the basic principles of strengthening and stretching the back and postural muscles, relieving psychological stress, and encouraging the patient to return to everyday activity are addressed. In conclusion, although conventional mainstream medicine seems to have a more logical approach to treating back pain, and some alternative techniques are better proven than others, psychological effects such as the patient-practitioner relationship and how and whether the above-mentioned basic principles are addressed are the most critical aspects for relieving chronic lower back pain.

[257] "Iatrogenic" means "induced inadvertently by the medical treatment or procedures of a physician" (http://www.hivpositive.com/f-PainHIV/Pain/glossary.html)
[258] G.E. Ehrlich, "Back pain," Journal of Rheumatology 67 (August 2003): 26.

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