

Subluxation –Historical Perspectives

MERIDEL I. GATTERMAN

ABSTRACT: Subluxation is a term that continues to generate controversy into the 21st Century. This paper describes the controversy surrounding terminology arrived at through consensus in the latter part of the 20th century in addition to ongoing issues surrounding the use of the term subluxation.

INDEX Terms: (MeSH) CHIROPRACTIC; MANIPULATION, CHIROPRACTIC; MOBILIZATION. (Other): SUBLUXATION

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Introduction

A word is not a crystal, transparent and unchanged; it is the skin of a living thought and may vary greatly in color and content according to the circumstances and time in which it is used.

Oliver Wendell Holmes, Jr.

Historically subluxation has been central to the philosophy, science, and practice of chiropractic as the primary articular lesion treated by chiropractors. A number of issues have surrounded the use of the term subluxation including: terminology, the nature of the lesion (aberrant motion versus misalignment), and clinical, economic and political issues. The complexity of these issues precludes discrete discussion, classifying them as such, however, gives focus to much of the controversy.

Aberrant Motion versus Misalignment

The controversial nature of the chiropractic subluxation began as early as 1906 with the Palmers emphasizing vertebral displacement (misalignment)¹ at the same time that Smith Langworthy and Paxson emphasized aberrant motion as the primary characteristic of subluxation² They stated that :

“A simple subluxed vertebra differs from a normal vertebra only in its field of motion and the center of its field of motion.”²

The aberrant motion concept subsequently became more popular in Europe, However in North America, Budden³ was using the term “fixation” when referring to a subluxation at Western States Chiropractic College by 1930.

His definition described the vertebral fixation as:

“The fixation of a joint in a position of motion, usually at the extreme of motion.”³

In the 1940’s Leikans and the Gillet brothers in Belgium,⁴ independently of Carver⁵ and Vladef⁶ in the United States, were describing motion palpation as a method of detecting

spinal fixations. Homewood⁷ in his text *The Neurodynamics of the Vertebral Subluxation* while emphasizing the restricted motion component of subluxation preferred the term subluxation to fixation. In the late 70’s and early 80’s Grice⁸ at Canadian Memorial Chiropractic College in Canada and Faye⁹ through post graduate seminars in United States enlarged upon Gillet’s work by teaching motion palpation.

Consensus Terminology

An effort was made to develop chiropractic nomenclature through consensus in the early 1990’s.¹⁰ This project sponsored by the Consortium for Chiropractic Research was published in 1994. The ten terms agreed to include the definition of subluxation that included both the characteristics of misalignment and restricted motion as follows.

“Subluxation: a motion segment in which alignment, movement integrity, and/or physiological function are altered although contact between the joint surfaces remains intact.”¹⁰

This definition includes the term motion segment because it was found that this was the term used most commonly used in the clinical literature related to the spine. The term spinal motion segment was defined as:

Two adjacent vertebrae and the connecting tissues binding them to each other.¹⁰

The spinal motion segment is a three joint complex that forms the functional unit of the spine.¹¹ This concept is central to understanding spinal motion and how restriction of motion at one joint affects the other two joints of that segment.¹¹ Motion segment is the literal translation of the German *Bewegungssegment* popularized by Junghanns following his introduction of this concept in 1971.¹² It is unfortunate that it was translated into English as “motor unit”^{12,13} and confusion arose because of the prior use of this term by physiologists to designate *a motor nerve and the muscle fibers that it innervates*. Motor unit was the term presented at the conference on the research status of spinal manipulative therapy in 1975¹⁴ and it is still used to designate the spinal motion segment by those schools influenced by the National College of Chiropractic now National University of Health Sciences (NUHS).¹⁵ A 2008 NUHS task force on the use of the term “subluxation” states that “the entity that is called a manipulable lesion” is to be referred to as a *functional*

Meridel I. Gatterman, MA, DC, MEd
Chiropractic Consultant
Florissant, Colorado

*articular lesion defined as: an abnormally functioning motor unit involving the spine, pelvis or extremities.*¹⁶

Before we leave the semantic confusion in the chiropractic profession surrounding the term subluxation it should be noted that the chiropractic profession has the propensity to use whatever term they can devise to refer to subluxations. Rome¹⁷ documented 296 synonyms for subluxation in 1996. Do we hear 500 in 2009? Unfortunately, when it comes to the word subluxation, too many chiropractors act quite like Humpty Dumpty in Lewis Carroll's *Through the Looking Glass ...* 'When I use a word,' Humpty Dumpty said, in rather a scornful tone, 'it means just what I choose it to mean - neither, more nor less. ...'¹⁸

Early Medical Use of the Term Subluxation

The origin of the word subluxation comes from the root words combining the Greek sub and lux, meaning "less than a dislocation." In 1746, Hieronymus described a subluxation, identifying the following characteristics:¹⁹

...subluxation of joints is recognized by lessened motion of the joints, by slight change in position of the articulating bones and pain. ...

This does not differ significantly from the consensus definition agreed on by the nominal and Delphi panels of the Consortium for Chiropractic Research.¹⁰ (See above)

In 1821 Harrison²⁰ included physiologic dysfunction, which he described as follows:

When any of the vertebrae become displaced or too prominent, the patient experiences inconvenience from a local derangement in the nerves of the part. He, in consequence, is tormented with a train of nervous symptoms, which are as obscure in their origin as they are stubborn in their nature. ...

In 1824²¹ he considered alignment and motion when describing subluxations as:

...the articular motions are imperfectly performed, because the surfaces of the bones do not fully correspond.

Both Palmers focused on the neurologic effects produced by a subluxation in addition to vertebral misalignment. Within a decade of its inception, the chiropractic profession was arguing over the definition of subluxation and the primary focus of chiropractic treatment. Was it misalignment, altered motion, or joint dysfunction? Why not any one, two, and/or all three as the early medical definitions indicated?

Subluxation as a Manipulable Lesion

Following the 1975 conference on the research status of spinal manipulative therapy,¹⁴ and the 1979 New Zealand report of the Royal Commission of Inquiry into Chiropractic,²² interest in the nature of the lesion responding to manipulation increased both within and outside the chiropractic profession. While some preferred that the term subluxation be abandoned,²³ the use of the term subluxation when labeling the manipulable lesion appears in the medical literature in the late nineteen seventies and eighties.

In 1977 Turek,²⁴ an orthopedic surgeon, wrote that "sacroiliac subluxation" implies that:

...ligamentous stretching has been sufficient to permit the ilium to slip on the sacrum.

He described the mechanism as:

an irregular prominence of one articular surface becoming wedged upon a prominence of the opposed articular surface, with the ligaments taut, reflex muscle spasm intense and pain severe and continuous until reduction is effected.

He noted that the pain of sacroiliac subluxation is often:

relieved dramatically and suddenly by manipulation.

In 1980²⁵ Keim and Kirkaldy-Willis used the term subluxation when describing the lesion that produces low back pain that responds to chiropractic manipulation. They concluded that:

The facet syndrome, which can cause severe back pain, consists of a subluxation or partial dislocation of a lumbar vertebral facet joint. This is the condition most likely to be relieved when a chiropractor manipulates the spine.

This concept and the term subluxation as a lesion responding to manipulation appears in texts on managing low back pain well into the 1980's.^{26,27}

The Non Manipulable Subluxation

Not all subluxations respond to manipulation and one of the reasons given for abandoning the use of the term subluxation when referring to a manipulable lesion is that to the orthopedic surgeon subluxations are usually considered to require surgical repair. It is understandable that given this use of the term, the introduction of a forceful adjustment or manipulation would seem contraindicated as a treatment for the orthopedic subluxation. The non manipulable subluxation therefore is one in which manual thrust procedures are not indicated. Subluxations most often seen on radiographs by orthopedic specialists are often nonmanipulable or pathologic subluxations that are not reversible except through surgery. The treatment of these subluxations is seen as being the orthopedist's turf.²⁸ It is important that when describing subluxations, that the concept should be broad enough to include the surgical or pathological subluxation that is a non manipulable lesion. (Table 1)

In the 1990s recognition of subluxation as the lesion successfully treated by chiropractors, largely disappeared from both medical and chiropractic literature. This is especially noticeable in the peer reviewed scientific Journals.²⁹ Of necessity, those seeking grants from eternal agencies must use the terminology preferred by the reviewers and subluxation as used by the chiropractic profession was used less and less by those seeking external funding.

In 2003 Wenban²⁹ surveyed the leading chiropractic scientific journals from 1990 to 1999. He found that only 6.3% of the original research published during this period included the term *subluxation* in titles, abstracts or clinical trials. Among the possible explanations for this he suggested that the chiropractic research community may have conducted subluxation-related research but abandoned the term, and except for a handful of chiropractic researchers,

Table 1

CRITERIA FOR DEFINING NONMANIPULABLE SUBLUXATIONS

Condition	Characteristics	Manipulation
Hypermobility	Excessive motion (reversible)	Nonrepetitive
Instability	Insufficient soft tissue (irreversible)	Contraindicated
Congenitally blocked or surgically fused segment	Motion absent (irreversible)	Contraindicated

Modified from: Peterson CK, Gatterman MI. The nonmanipulable subluxation. In Gatterman MI. Ed. Principles of Chiropractic: Subluxation 2nd Ed St Louis. Mosby 2005 169-90.

Table 2

CHIROPRACTIC TERMS RELEVANT TO THE SPECIFIC INTEREST OF DIFFERENT CHIROPRACTIC DOMAINS

Term	Characteristics	Domain
Subluxation	Articular Lesion	Researchers
Subluxation Complex	Theoretical Model	Educators
Subluxation Syndrome	Signs and symptoms	Practitioners
Motion Segment Dysfunction	Common Currency	Politicians
Medical Subluxation	Unstable Motion Segment	Surgeons

Modified From: Gatterman MI. Guest editorial: subluxation revisited. Chiropr J Aust. 2003; 33: 41-2.

who seemed to publish predominantly in the *Chiropractic Research Journal*, most largely abandoned research of the entity that many practitioners call subluxation. A show of hands at a 2003 research agenda conference (RAC) following a presentation on the usefulness of the term subluxation demonstrated a preference by the research community to abandon the term; just one researcher eloquently making the case for the continued use of the term subluxation.³⁰

There has been a preference to abandon the term subluxation amongst the radiology community and also the use of radiographs as the sole criteria to detect subluxations. The American College of Chiropractic Radiologists has opposed the routine use of radiographs solely for the detection of subluxation, and most chiropractic radiologists believe that an x-ray examination is performed primarily for pathological evaluation.³¹

Domains of Chiropractic

In 2003 following the RAC conference it was noted that a single definition of subluxation fits all is not pragmatic. Nonetheless, it was considered that different expressions of the same concept must be consistent across cultural domains.³² (Table 2) What is useful to the educator may not be entirely appropriate for the researcher; similarly what expresses the focus of the chiropractic clinician as we have seen may be inappropriate for the orthopedic surgeon. Politicians may prefer to use a different term altogether, one that has greater colloquial familiarity or lacks political or legal coloring. The premise that “different expressions of subluxation are needed with relevance to different cultural domains” was central to the consensus process used to develop chiropractic nomenclature published in 1994.¹⁰

Subluxation Complex

The subluxation complex as indicated under the different chiropractic domains is a tool utilized by educators to describe the various components of subluxation related to different disciplines.³² It was defined through the consensus process as: *a theoretical model of motion segment dysfunction (subluxation) that incorporates the complex interaction of pathological changes in nerve, muscle, ligamentous, vascular, and connective tissues.*¹⁰ Drawing on the disciplines of kinesiology, pathology, histology and biochemistry, Faye in 1967 developed a heuristic model that he termed the *subluxation complex*. He included the potential contribution of each discipline to subluxation theory,³³ by building on the work of Gillet, Illi, Homewood, and Janse. Faye formulated a theory that the chiropractic spinal adjustment/manipulation restores normal joint motion, which in turn normalizes physiologic function.

Lantz, in 1988, expanded on the Faye model under the concept of *immobilization degeneration*,³⁴ later incorporating this emphasis into the vertebral subluxation complex (VSC)³⁵ By 1995, he noted that critics of the term subluxation viewed the concept of the vertebral subluxation complex as just another veiled rationalization of a cultist group using unproven procedures.³⁶ There was justification for this view given that some practice building entrepreneurs in the 1990’s were presenting the VSC model scientific fact rather than the theoretical model that the developers put forth. This prompted the terminology consensus panel members to insist that the subluxation complex be defined as a theoretical model.¹⁰

Leach noted in 2003 that the consensus definition of the subluxation complex should include:

*may influence organ system function and health.*³⁷

He thought that the consensus definition overlooked the Palmerian concept that subluxation may affect organ function and general health, a concept that had been discussed at the 1975 conference that examined the research status of spinal manipulation.¹⁴ A further addition to the model was made by Ebrall in 2004 when he added the biopsychosocial component to the model.³⁸ The suffering accompanying the VSC was suggested earlier by Lantz, who discussed the effects that pain produces through nervous system irritation.³⁶

Clearly, a comprehensive theory to test the subluxation complex hypothesis exists. The question arises: "If the term *subluxation* is not used by researchers testing the components of the subluxation complex theory then are the critics of subluxation theory justified in saying that there is no research to support subluxation theory?" It seems that the continued use of nomenclature unique to the chiropractic profession is a conundrum when most researchers are not studying the nature and effects of subluxation.

Basic Research

To many chiropractic basic researchers studying subluxation the articular lesion is the object of their study. Scholars both inside and outside the chiropractic community see animal models of the subluxation necessary to allow researchers to evaluate the effects predicted by chiropractic theory.³⁹

Writing in 1975 Goldstein¹⁴ noted that:

The lack of a relevant and reproducible animal model may be one important obstacle to clarification of these issues...Thus, subluxation remains a hypothesis yet to be evaluated experimentally.

In 1990 White and Panjabi,⁴⁰ wrote:

The concept of chiropractic subluxation remains a hypothesis yet to be evaluated experimentally. We believe that this has been one of the most frustrating aspects of certain views of the pathology that is purported to be altered with spinal manipulative therapy. When one is correcting a 'subluxation' that cannot be perceived by independent scientific observers, it is difficult to convince those observers that the treatment is effective.

The Basic Research Work Group Report from the National Workshop to Develop the Chiropractic Research Agenda⁴¹ stated that:

Studies to address these kinds of questions (autonomic effects of adjustment) are hampered by the absence of a reliable animal model "and " If the subluxation consists, at least in part, of fixation of the Z joints(zygapophyseal joints), then an animal model that mimics such fixation is clearly needed.

Basic Research Review

Henderson has reviewed³⁹ animal model studies of subluxation and manipulation from 1964 to 2004. He

examined the evidence categorizing the studies as those looking at biomechanical change, nervous system change and the effects on organ or tissue function or symptom change. Table 3 summarizes the major chiropractic studies from 1964 to 2007. The external link model (ELM) developed by Henderson in the Palmer University Lab at Davenport⁴² in collaboration with Cramer at NUHS has demonstrated the effects of induced hypomobility and demonstrates the effects of restricted motion on the zygapophyseal joints of the spine. This series of studies⁴²⁻⁴⁴ also demonstrates the practicality that a line of research can attain when funding and cooperation from more than one chiropractic institution is obtained. Employing the ELM animal model these two labs have demonstrated the characteristics of induced hypomobility, the reversibility of induced hypomobility time dependent articular surface degeneration, adhesion development, and involution of synovial fold within the restricted joints.⁴⁵ Preliminary data also suggests that chronic vertebral hypomobility at L4 through L6 in the rat model affects synaptic density and morphology in the dorsal horn of the of the L2 spinal cord level.⁴⁶ This series of studies suggests that biomechanical lesions (in the form of induced hypomobility) can produce both functional and pathological changes in the spinal motion segments.

Clinical Indicators for Manipulation of a Subluxation

The clinical indicators of subluxation are amongst the most controversial issues surrounding the subluxation as a manipulable lesion.³² A mnemonic classification for indicating subluxation (joint dysfunction) was developed by Bergmann in 1992.⁴⁷ (Table 4)

This classification is used by the US Medicare Office⁴⁸ to reimburse chiropractors for the manual treatment of subluxation, replacing the original criteria that required evidence of subluxation on radiographs for reimbursement of the treatment subluxation. The original classification of criteria was agreed to at the Houston Conference published by the American Chiropractic Association in 1977 (Table 5).⁴⁹ This requirement became an impediment with the lack of evidence in the 1970's and 1980's that supported the original criteria. Part of the ongoing political controversy¹⁶ surrounding the use of the word subluxation stems from the previous criteria that visual evidence of subluxation must be demonstrable on radiographs. This is a red herring given that subluxation was both defined and described prior to the advent of radiographic imaging.

The role of radiography in the evaluation of the chiropractic spinal subluxation has evolved considerably over the years.^{50,51} From 1918 until 1936, full spine techniques were developed.⁵⁰⁻⁵² In addition technique systems using spinographic analysis were developed by several chiropractors including Gonstead⁵³ and Logan.⁵⁴ A fundamental criticism of measuring misalignments on radiographs is the vagaries of anatomic asymmetry.⁵⁵ Taylor has suggested, however that with proper patient selection, careful attention to technical detail, and use of several technologic advancements, full spine radiography is a diagnostic an analytic procedure with an acceptable risk/benefit ratio.⁵¹

Functional Radiography

Functional radiography that evaluates segmental spinal

Table 3

CHIROPRACTIC ANIMAL STUDIES 1964-2007

Year/Author /Year	Study Characteristics	Source
1981: DeBoer KF: <i>An attempt to induce vertebral lesions in rabbits by mechanical irritation</i>	Study demonstrated the difficulty of developing reliable verification procedures (palpatory /radiographic). Grostic gun produced edema and muscle splinting	J Manipulative Physiol Ther 4:119-27
1984 DeBoer KF: <i>Gastrointestinal myoelectric activity in rabbits with vertebral lesions: a preliminary report</i>	EMG data inconclusive: gut sounds very noisy/ visual analysis no obvious changes Results inconclusive	European J Chiropractic 32:131-42
1988: DeBoer KF, Schutz M, McKnight ME: <i>Acute effects of spinal manipulation on gastrointestinal myoelectric activity in conscious rabbits</i>	a strong inhibition of gut EMG activity by manually displacing spinous processes Provides support that visceral problems can be related to seg. specific s. (Meric s)	Manual Medicine 3:85-94
1988: DeBoer KF, Mcknight ME:: <i>Surgical model of a chronic subluxation in rabbits</i>	Only 50% success rate in producing a surgically induced vertebral lesion Palpation poor outcome measure / radiographic data equivocal	J Manipulative Physiol Ther 11:366-72
1993: DeBoer KF, Hansen J: <i>Biomechanical analysis of an induced joint dysfunction (subluxation-mimic) in the thoracic spine of rabbits</i>	Vertebral lesion effects observed at necropsy (restricted motion) Radiographic changes not statistically significant.	J Manipulative Physiol Ther 16:74-81
1984: Sato A, Swenson RS: <i>Sympathetic nervous system response to mechanical stress of the spinal column in rats</i>	Reported clear and concise decrease in blood pressure but heart rate decrease inconsistent. Produced with lateral flexion stress with clamped lower T upper L spine Decrease in renal and adrenal nerve activity	J Manipulative Physiol Ther 7:141-7
1994: Budgell B, Sato A: <i>Somatoautonomic reflex regulation of sciatic nerve blood flow</i>	Noxious stimulation of forepaw or hindpaw produced an increase in blood pressure and sciatic nerve blood flow. Warned that conclusions cannot be drawn the effects of noxious stimulation at other sites	J Neuromuscular System 2:170-7
1991 Brennan PC, Kokjohn et al: <i>Immunological correlates of reduced spinal mobility: preliminary observations in a dog model</i>	Monitored the respiratory burst of polymorphonuclear neutrophils in adhesion fused and sham groups. Animals in the fused group exhibited early functional impairment of immune function. Prelim study	Proceedings Intern'l Conf Spinal Manip 11-21
1993: Hu JW, Yu XM, Vernon H et al: <i>Excitatory effects on neck and jaw muscle activity of inflammatory irritant applied to cervical paraspinal tissues</i>	Demonstrated that irritation of deep cervical paraspinal tissues results in a strong activation of both jaw and neck muscles	Pain 55:243-50
1993: Gillette RG, et al: <i>Characterization of spinal somatosensory neurons having receptive fields in lumbar tissues of cats</i>	Demonstrated "hyperconvergence"of nociceptive input from many different deep somatic structures indicating poorly localized pain as opposed to precisely localized pain.	Pain 54: 85-98
1995: Pickar, JG McLain RF: <i>Responses of mechanosensitive afferents to manipulation of the lumbar facet in the cat</i>	Demonstrated that group III & IV afferents located in tissues throughout the low back region respond in a directionally sensitive fashion (direction of the applied load) to movement of a lumbar facet joint.	Spine 20:2379-85

HISTORICAL PERSPECTIVES
GATTERMAN

<p>1995: Budgell B, et al: <i>Spinovisceral reflexes evoked by noxious and innocuous stimulation of the L spine</i></p>	<p>Examined how spinal articular paraspinal afferents mediate somatovisceral reflexes supporting clinical observation that many visceral problems improve with spinal manipulation</p>	<p>J Neuromuscular System 3:122-31</p>
<p>1997: Budgell B, et al: <i>Responses of adrenal function to stimulation of lumbar and thoracic interspinous tissues in the rat</i></p>	<p>Demonstrated that irritating L interspinous tissue with capsaicin modified sciatic nerve blood flow, a somatovisceral effect, via both segmental and suprasegmental mechanism</p>	<p>Neuroscience Research 28:33-40</p>
<p>1998: Budgell B, et al: <i>Reflex response of bladder motility after stimulation of interspinous tissues in the anesthetized rat</i></p>	<p>The urinary bladder is innervated by parasympathetic fibers. This study demonstrated that stimulating the sympathetic NS by pinching the hindpaw did not activate bladder motility</p>	<p>J Manipulative Physiol Ther 21: 593-9</p>
<p>1998: Gillette RG, Kramis WJ: <i>Suppression of activity in spinal nociceptive "low back" neurons by paravertebral somatic stimuli in the cat</i></p>	<p>Suggested a mechanistic explanation for relief of LBP following spine manipulation: a local, somatically induced suppression of low back nociceptive neurons by mech. stim. of spinal and paraspinal structures</p>	<p>Neuroscience Letters 241:45-8</p>
<p>1999: Pickar JG: <i>An in vivo preparation for investigating neural responses to controlled loading of a lumbar vertebra in the anesthetized cat</i></p>	<p>Demonstrated the value of his experiment setup in the study of sensory info arising from the lumbar paraspinal tissue during loading of the spine</p>	<p>J Neuroscience Methods 89:87-96</p>
<p>2000 Henderson CNR et al: <i>In vivo biomechanical assessment of a small animal model of the vertebral sub.</i></p>	<p>Demonstrated that an external link system (ELM) could produce spine fixations and the links could easily be removed to allow measurement of spinal stiffness</p>	<p>Proceedings Intern'l Conf Spinal Manip</p>
<p>2007: Henderson et al: <i>Introducing The external link model for studying spine fixation and misalignment</i></p>	<p>Because the ELM is a long term survival model it may be used to study the putative chronic effects of spine fixation and misalignment as well as therapeutic interventions.</p>	<p>J Manipulative Physiol Ther 2007; 30:239-45.</p>
<p>2007: Henderson et al: <i>Introducing The external link model for studying spine fixation and misalignment Part I-Need, rationale, and application</i></p>	<p></p>	<p>J Manipulative Physiol Ther 2007; 30:239-45</p>
<p>2001: Pickar JG, Wheeler JD: <i>Response of muscle proprioceptors to spinal manipulative-like loads in the anesthetized cat</i></p>	<p>Demonstrated that muscle spindles and Golgi tendon organ afferents in the paraspinal mm. respond to vertebral loads with force time profiles similar to spinal manipulation</p>	<p>J Manipulative Physiol Ther 24:2-11</p>
<p>2001: Pickar JG, Kang YM: <i>Short-lasting stretch of lumbar paraspinal muscle decreases muscle spindle sensitivity to subsequent muscle stretch</i></p>	<p>Demonstrated postural positions prior to spine motion bias spindle based info about joint motion that can interfere with normal biomechanics & predispose to injury</p>	<p>J Neuromuscular System 2:170-77</p>
<p>2002: Kang YM, et al: <i>Stimulation of chemosensitive afferents from multifidus muscle does not sensitize multifidus muscle spindles to vertebral loads in the lumbar spine of the cat</i></p>	<p>The data from this study do not support the "pain-spasm-pain" mechanism as has been suggested as one cause or perpetuator of subluxation</p>	<p>Spine 26:1528-36</p>
<p>2003: Song X J, et al: <i>Onset and recovery of hyperalgesia and hyperexcitability of sensory neurons following intervertebral foramen volume reduction and restoration</i></p>	<p>Spinal manipulation of the effected segments speeds recovery from IVF and nerve root inflammation, Manipulation of of segments above does not indicating importance of manipulating specific segment</p>	<p>J Manipulative Physiol Ther 2003,26:426-36</p>

Table 4

CLINICAL INDICATORS FOR IDENTIFYING THE
SUBLUXATION (PARTS)

- Pain/tenderness
- Asymmetry/misalignment
- Range of motion/ movement abnormality
- Tissue/tone changes
- Special Tests

Bergmann T. Chiropractic Technique. In Gatterman MI. Ed. Principles of Chiropractic: Subluxation 2nd Ed St Louis. Mosby 2005 p143

motion has proven more useful in the cervical region⁵⁶⁻⁶⁰ than other areas of the spine.⁵¹ Spinal motion segment movement has also been evaluated by videofluoroscopy and cineradiography. These have the advantage of monitoring movement throughout the entire range of movement and motion patterns as well as the end range of movement evident on plain films overlays.⁶¹ Concern for the amount of radiation exposure prevents routine use of this form of imaging. The use of functional MRI shows promise for identifying persistent lesions, particularly in the cervical spine.⁶²

Mathematical and Engineering Models of Subluxation

Documented by Ebrall,³⁸ the flames of the controversy over x-ray marking systems have been fuelled by the ongoing discourse between those who have applied mathematical and engineering models to the detection of subluxation. This approach to subluxation detection was promoted by Suh⁶³ during the 1970's and 1980's through the application of computer-aided biomechanics for the detection of spinal subluxation. Funded by the International Chiropractic Association during this period, Suh focused on an upper cervical model that was then followed by other mathematical and engineering models. Subsequently this approach to subluxation detection led to much controversy.⁶⁴⁻⁷⁴

Along with radiographic indicators of subluxation, palpation for pain, tenderness and asymmetries (misalignment) have been traditionally utilized. Table 6 summarizes a few of the studies that have evaluated these procedures. Palpation for pain and tenderness has demonstrated the greatest inter as well as intraexaminer reliability but lacks supporting evidence of validity. One would expect good agreement between examiners if the subjects are consistent in their response to palpation reporting on the site of pain and tenderness to palpation. Problematic is that pain and tenderness can come from lesions other than subluxation including various forms of pathology, fractures and infections. Palpation for temperature changes to monitor subluxations are outlined in Table 7.

The most frequently used and studied procedures included in the parts examination for the detection of subluxation is palpation for segmental motion. (Table 8) More than 40 reliability studies have been conducted on movement palpation demonstrating mixed results. This is due in part

Table 5

RADIOGRAPHIC CLASSIFICATION OF
SUBLUXATION

A. Static Intersegmental Subluxations

1. Flexion malposition
2. Extension malposition
3. Lateral flexion malposition-left or right
4. Rotational malposition left-or right
5. Anterolisthesis and/or spondylolisthesis
6. Retrolisthesis
7. Lateralisthesis-left or right
8. Altered interosseous spacing
9. Osseous foraminal encroachment

B. Kinetic Intersegmental Subluxations

1. Hypomobility-fixation subluxation
2. Hypermobility-subluxation
3. Aberrant motion

C. Sectional Subluxations

1. Scoliosis and/or alteration of curves secondary to structural asymmetries
2. Scoliosis and/or alteration of curves secondary to muscular imbalance
3. Decomensation of adaptational curves
4. Abnormalities of motion

D. Paravertebral Subluxations

1. Costovertebral/costotransverse disreleationships
2. Sacroiliac subluxation-primary or secondary

to poor study design and the use of asymptomatic subjects. Overall intra-rater reliability is fair to good with inter- rater reliability poor to fair.(Table 8) Only a few studies have tested validity using facet joint blocks and congenitally blocked vertebra (Table 8). Used with other procedures motion palpation has been found to be useful in the detection of subluxations. The recommendation that when a number of studies are conducted together the reliability improves. (Table 10). This is consistent with the US Medicare requirements for the detection of subluxation that is *no single procedure has demonstrated enough sensitivity or specificity to be relied upon solely as a clinical indicator for the detection of subluxation and that more than one procedure be relied upon for the application of the adjustment/manipulation*. Tables 6-9 present only a small portion of the studies that have evaluated the clinical indicators for adjustment /manipulation of subluxations. ***It is important that future studies emphasize clinical verification of the validity of specific subluxation detection/analysis systems including comparison of the effectiveness of reduction or elimination of subluxations.***

HISTORICAL PERSPECTIVES
GATTERMAN

Table 6

PALPATION OF ASYMMETRY, PAIN AND TENDERNESS TO DETECT SUBLUXATION		
Year/Author/Title	Comments	Source
1990: Keating J, <i>et al</i> : <i>Interexaminer reliability of eight evaluative dimensions of L. segmental abnormality</i>	Examined for osseous pain, temp, visual observation, motion & static p., tension, misalignment Marginal to good reliability for palpatory pain over osseous structures.	J Manipulative Physiol Ther 13 :463-70
2000: Vander Wurff, <i>et al</i> <i>Clinical tests of the sacroiliac joint. A systematic methodological review. Part I: reliability</i>	Reliability not demonstrated for mobility tests of SIJ 2 studies showed reliability for pain provocation tests	Manual Therapy 5:30-36
2002: Christensen HW, <i>et al</i> <i>Palpation of the upper thoracic spine: an observer reliability study</i>	3 types of palpation (sitting & prone MP and palpation for paraspinal tenderness). Good intra observer reliability for all 3 procedures and good interobserver reliability for tenderness	J Manipulative Physiol Ther 25(5) 285-92
2005: Degenhardt B, <i>et al</i> : <i>Interobserver reliability of osteopathic palpatory diagnostic tests of the L spine: Improvements for consensus training.</i>	Examiners assessed 1st group for palpation and tenderness. Following training assessed 2nd group. K poor in 1st assessment, improved with training. Training improves interobserver r.	J Am Osteopathic Assn 105:465-73
2006: Stochendahl MJ, <i>et al</i> <i>Manual examination of the spine: a critical systematic lit. review of reproducibility</i>	Data looked at motion/static palpation, osseous pain, & soft tissue changes Strong evidence that interobserver reproducibility of osseous/soft tissue pain is acceptable	J Manipulative Physiol Ther 29:475-85

Table 7

Temperature Studies to Detect Subluxation		
Year Author/ /Title	Comments	Source
1991: Plaughter G, <i>et al</i> . <i>The inter and intraexaminer reliability of a skin temperature differential instrument.</i>	Tested thermocouple device Fair/good intraexaminer agreement C4-T2 Good agreement T4-T8 Interexaminer reliability fair	J Manipulative Physiol Ther 14: 361-7
1992: Plaughter G. <i>Skin temperature assessment for NMS abnormalities of the spinal column</i>	Literature review 1966-1990 Not systematic review/meta-analysis Use of thermocouple devices for identification of subluxations inconclusive	J Manipulative Physiol Ther 15: 365-81
2004: Owens J. <i>Paraspinal skin temperature patterns: and interexaminer and intraexaminer reliability study</i>	High inter and intraexaminer reliability No gold standard for validity comparison	J Manipulative Physiol Ther 27:155-59

Table 8

STUDIES EVALUATING SPINAL SEGMENTAL MOTION		
Year/ Author/Title	Comment	Source
1988: Boline, <i>et al</i> <i>Inter-examiner reliability of palpatory evaluations of the lumbar spine</i>	MP, soft t. pain and muscle hypertonicity Weak support for inter- on MP Stronger concordance on pain	Am J of Chiropr Med 1:5-11
1995: Haas M, <i>et al</i> <i>Reliability of manual end play palpation of the thoracic spine.</i>	Sitting motion palpation of the thoracic spine Intraexaminer agreement moderate interexaminer agreement poor	Chiropractic Technique 7: 120-4
1987: Carmichael JP <i>Inter-and intra-examiner reliability of palpation for sacroiliac joint dysfunction</i>	Intraexaminer reliability fair especially for upper contacts; slight concordance for interexaminer reliability	J Manipulative Physiol Ther 10: 164-71
1989: Hertzog, <i>et al</i> <i>Reliability of motion palpation procedures to detect sacroiliac fixations</i>	Graded sacroiliac fixation as 1=mild, 2=moderate, 3= complete Intraexaminer agreement significant, interexaminer poor Should be used with other procedures	J Manipulative Physiol Ther 12:86-92
1994: Paydar. <i>Intra- and Interexaminer reliability of certain pelvic palpatory procedures and the sitting flexion test for sacroiliac joint mobility and dysfunction</i>	Palpated tenderness and sitting forward flexion Tenderness to palpation showed significant agreement both intra and interexaminer sitting flexion had poor to fair intra and interexaminer concordance	J Neuromuscular System 2:65-9
1988: Jull G, <i>et al</i> <i>The accuracy of manual diagnosis for cervical zygapophyseal joint pain syndromes.</i>	Used Cervical Facet joint blocks as gold standard/ compared it to motion palpation and tenderness Demonstrated good specificity and sensitivity	Med J Aust 1988; 148:233-6.
2004: Humphreys BK, <i>et al</i> <i>An investigation into the validity of c spine motion palpation using subjects with congenital block vertebrae as a gold standard</i>	Used cervical congenital fusion as gold standard/ compared it to motion palpation and tenderness Substantial overall agreement sensitivity ranged from 55%-78% Specificity 91-98%	BMC Musculoskeletal Disorders 5: 19

Table 9

SUBLUXATION DETECTION USING MULTIPLE PROCEDURES

<p>1990:Keating <i>et al</i> <i>Interexaminer reliability of eight evaluative dimensions of lumbar segmental abnormality</i></p>	<p>Eight parameters evaluated by 3 examiners. Examined for osseous pain, temp, visual observation, motion & static p., tension, misalignment. Pain findings had substantial reliability, static and motion palpation had poor reliability</p>	<p>J Manipulative Physiol Ther; 1990;13:463-70.</p>
<p>1999 Hawk C, <i>et al</i> <i>Preliminary study of the reliability of assessment procedures for indication of chiropractic adjustments of the L spine.</i></p>	<p>Examiners could use anything they would use in practice including static & motion palpation, tissue texture/tone tenderness and temperature to determine the segment they would adjust. Interexaminer reliability poor to slight, intra examiner reliability fair to substantial.</p>	<p>J Manipulative Physiol Ther 1999; 22:382-9.</p>
<p>2007: Stuber <i>Specificity, sensitivity and predictive values of clinical tests of the sacroiliac joint: a systematic review.</i></p>	<p>5 of 6 tests had good specificity and sensitivity for detecting SI injury. Validity for thrust procedure not determined</p>	<p>J Can Chiropr Assoc 2007; 51:30-41.</p>

Subluxation as a Risk Factor

In 2005 Hawk suggested that subluxation may be a risk factor.⁷⁵ Rather than suggest that subluxation is a risk factor for all disease as Palmer⁷⁶ noted, it is more practical to begin with the study of subluxation as a risk factor for musculoskeletal conditions most commonly treated by chiropractors (Table 10). Since there is evidence that subluxation syndromes are relieved by the adjustment/ manipulation rather than leaving these types of studies up to other disciplines it is important that this type of research be pursued by the chiropractic profession.

Common Subluxation Syndromes

A subluxation syndrome has been defined as:

*an aggregate of signs and symptoms that relate to pathophysiological or dysfunction of spinal and pelvic motion segments or to peripheral joints.*¹⁰

It appears from studies that have linked subluxation to specific aggregates of signs and symptoms this would be a fruitful area for further chiropractic research. It also appears that subluxation of one region of the spine is a risk factor for signs and symptoms different from those of subluxation in another spinal area. Clinical observations suggest that different subluxation syndromes are associated with different spinal areas.⁷⁷ Greater pattern recognition of the aggregates of sign and symptoms that accompany the different subluxation syndromes can be enhanced by case series as well as RCTs

*The profession that will be recognized as “owning subluxation and its correction will not simply be the first or loudest proclaimer. Rather it will be the profession that is recognized for understanding the subluxation and converting that understanding into demonstrable clinical outcomes.”*³⁹

Historical Perspective

The final issue is not whether subluxations exist given the consensus definition or whether there is evidence to support their detection according to the PARTS criteria, but whether chiropractors will continue to use nomenclature to describe the lesion that has characterized the profession for over a century. It has been important to the survival of chiropractic that chiropractic pioneers did not let other disciplines determine the direction of their profession. Central to this has been the term subluxation.

*The word subluxation has been daubed in a kaleidoscope of colors and embodied with a multitude of meanings by chiropractors for over 100 years.*³⁰

*To some it has become a holy word;⁷⁸ to others, an albatross to be discarded.*⁷⁹

The notion that by changing the word subluxation to another term we will somehow change the clinical, political, and philosophical connotations of the concept central to chiropractic practice is simply not rational. Changing the term used for the articular lesion treated by chiropractors (subluxation) does not eradicate the clinical, political, and philosophical issues that surround the construct; it obviously evades the issues.³⁰

Conclusion

It is dangerous to reject something on the basis of lack of evidence for lack of evidence is not evidence against. Even worse is to ignore the evidence and declare that there is none or to hide a political agenda behind a pseudoscientific argument. Rather than falling prey to this political ploy, Chiropractors must look at the evidence and support the concept basic to the chiropractic profession.

Table 10

COMMON SUBLUXATION SYNDROMES

AUTHOR/TITLE	SUBLUXATION SYNDROME	SOURCE
Vernon H, Gatterman MI. <i>Cervicogenic Headache.</i>	Headaches from subluxations in the upper cervical complex are responsive to adjustive and manipulative procedures.	In Gatterman MI. ed. Principles of Chiropractic: Subluxation. 2nd ed. St Louis MO: Mosby; 2005. p. 376-396.
Nilsson N. <i>A randomized controlled trial of the effect of spinal manipulation in the treatment of cervicogenic headache.</i>	Cervicogenic headache from upper cervical subluxation is characterized by neck and suboccipital pain that may project to the forehead, temples, vertex and ears.	J Manipulative Physiol Ther 1995;18:435.
Boline P et al. <i>Spinal manipulation vs. amitriptyline for the treatment of chronic tension type headaches: a randomized clinical trial.</i>	Tension type headache from subluxation respond to the adjustment /manipulation	J Manipulative Physiol Ther 1995;18: 148.
Tuchin P, Pollard , Bonello R. <i>A randomized controlled trial of chiropractic spinal manipulative therapy for migraine.</i>	Migraine headache caused by subluxations respond to manipulation of the upper cervical vertebrae	J Manipulative Physiol Ther 2000;23:91-5.
Nelson CF et al. <i>The efficacy of spinal manipulation, amitriptyline and the combination of both therapies for the prophylaxis of migraine headaches.</i>	Manipulation of upper cervical subluxation can be a prophylaxis in the prevention of migraine	J Manipulative Physiol Ther 1998; 21:511.
Cohen M, Arroyo J Champion G et al. <i>In search of the pathogenesis of refractory cervical brachial pain syndrome.</i>	Subluxations of the lower cervical vertebra and first rib affect the ipsilateral upper extremity producing sensory symptoms including paresthesia, hypoesthesia, hyperesthesia, vasomotor changes, weakness and arm pain that can be relieved by the adjustment/manipulation.	Med J Aust 1992; 156:432-6.
Jull G, Sterling M, Falla D, Treleven J, O'Leary S. <i>Differential diagnosis of cervicobrachial pain.</i>	Victims of whiplash injuries may develop symptoms in the upper extremities from subluxation of the lower cervical spine and first rib that can be considered risk factors for cervical brachial problems.	Whiplash, headache, and neck pain. Churchill Livingstone 2008; 131-144
Arroyo JF, Jolliet P, Junod AF. <i>Costovertebral joint dysfunction: another misdiagnosed cause of atypical chest pain.</i>	The sharp pain that accompanies thoracic and rib subluxations is aggravated by movement, respiration, coughing or sneezing and can cause untold anxiety and suffering because the main symptom is chest pain that often is mistaken for a heart attack.	Post Grad Med J 1992; 68:655-9.
Keim HA, Kirkaldy Willis WH. <i>Facet Syndrome.</i>	The facet syndrome, which can cause severe back pain, consists of a subluxation or partial dislocation of a lumbar vertebral facet joint. This is the condition most likely to be relieved when a chiropractor manipulates the spine.	Clinical symposia: Low Back Pain CIBA 1980; 32:13
Turek SL. <i>Sacroiliac Subluxation</i>	The pain of sacroiliac subluxation is often removed dramatically and suddenly by manipulation.	Orthopedics; Principles and their application. 3rd ed. Philadelphia. J.B. Lippincott Co. 1977. 380.
Kirkaldy-Willis WH, Cassidy JD. <i>Spinal manipulation in the treatment of low back pain.</i>	In an observational study of over 1,200 patients with low back pain and buttock pain sacroiliac dysfunction was diagnosed in 22.55 %of the cases.	Can Family Physician 1985; 31:535-40.
Rome PL. <i>Neurovertebral influence upon the autonomic nervous system: some of the somato-autonomic evidence to date</i>	The literature relating to somatic impact upon the autonomic nervous system and the effect that it has on internal organic function is extensive.	Chiropr J Aust 2009; 39:2-17.

HISTORICAL PERSPECTIVES
GATTERMAN

Table 11

COMMON SUBLUXATION SYNDROMES		
Author/Title	Subluxation Syndrome	Source
1977: Turek SL. <i>Sacroiliac Subluxation</i>	The pain of sacroiliac subluxation is often removed dramatically and suddenly by manipulation	Orthopedics; Principles and their application. 3rd ed. Philadelphia. J.B. Lippincott Co. 1977. 380.
1980: Keim HA, Kirkaldy Willis WH. <i>Facet Syndrome.</i>	The facet syndrome, which can cause severe back pain, consists of a subluxation or partial dislocation of a lumbar vertebral facet joint. This is the condition most likely to be relieved when a chiropractor manipulates the spine.	Clinical symposia: Low Back Pain CIBA 1980; 32:13
1985: Kirkaldy-Willis WH, Cassidy JD. <i>Spinal manipulation in the treatment of low back pain.</i>	In an observational study of over 1,200 patients with low back pain and buttock pain sacroiliac dysfunction was diagnosed in 22.55 %of the cases.	<i>Can Family Physician</i> 1985; 31:535-40.
1992: Arroyo JF, Jolliet P, Junod AF. <i>Costovertebral joint dysfunction: another misdiagnosed cause of atypical chest pain.</i>	The sharp pain that accompanies thoracic and rib subluxations is aggravated by movement, respiration, coughing or sneezing and can cause untold anxiety and suffering because the main symptom is chest pain that often is mistaken for a heart attack.	<i>Post Grad Med j</i> 1992; 68:655-9.
1992: Cohen M, Arroyo J Champion G <i>et al. In search of the pathogenesis of refractory cervical brachial pain syndrome.</i>	Subluxations of the lower cervical vertebra and first rib affect the ipsilateral upper extremity producing sensory symptoms including paresthesia, hypoesthesia, hyperesthesia, vasomotor changes, weakness and arm pain that can be relieved by the adjustment/manipulation.	<i>Med J Aust</i> 1992; 156:432-6.
1995: Boline P <i>et al. Spinal manipulation vs. amitriptyline for the treatment of chronic tension type headaches: a randomized clinical trial.</i>	Tension type headache from subluxation respond to the adjustment /manipulation	<i>J Manipulative Physiol Ther</i> 1995; 148:18.
1995: Nilsson N. <i>A randomized controlled trial of the effect of spinal manipulation in the treatment of cervicogenic headache.</i>	Cervicogenic headache from upper cervical subluxation is characterized by neck and suboccipital pain that may project to the forehead, temples, vertex and ears.	<i>J Manipulative Physiol Ther</i> 1995; 18:435.
1998: Nelson CF <i>et al. The efficacy of spinal manipulation, amitriptyline and the combination of both therapies for the prophylaxis of migraine headaches.</i>	Manipulation of upper cervical subluxation can be a prophylaxis in the prevention of migraine	<i>J Manipulative Physiol Ther</i> 1998; 21:511.
2000: Tuchin P, Pollard , Bonello R. <i>A randomized controlled trial of chiropractic spinal manipulative therapy for migraine.</i>	Migraine headache caused by subluxations respond to manipulation of the upper cervical vertebrae	<i>J Manipulative Physiol Ther</i> 2000; 23: 91-5.
2005: Vernon H, Gatterman MI. <i>Cervicogenic Headache.</i>	Headaches from subluxations in the upper cervical complex are responsive to adjustive and manipulative procedures.	In Gatterman MI. ed. Principles of Chiropractic: Subluxation.2nd ed. St Louis MO: Mosby; 2005. p. 376-396.
2008: Jull G, Sterling M, Falla D, Treleven J, O'Leary S. <i>Differential diagnosis of cervicobrachial pain.</i>	Victims of whiplash injuries may develop symptoms in the upper extremities from subluxation of the lower cervical spine and first rib that can be considered risk factors for cervical brachial problems.	Whiplash, headache, and neck pain. Churchill Livingstone 2008; 131-144
2009: Rome PL. <i>Neurovertebral influence upon the autonomic nervous system: some of the somato-autonomic evidence to date.</i>	The literature relating to somatic impact upon the autonomic nervous system and the effect that it has on internal organic function is extensive.	<i>Chiropr J Aust</i> 2009; 39: 2-17

Currently, subluxation has been the most loved and hated, hotly debated, and consecrated term used by chiropractors.³⁰ Why then do we persist in using the term subluxation when it has become so “overburdened with clinical, political, and philosophical meaning and significance for chiropractors, that the concept that once helped to hold a young besieged profession together”⁷⁸ now divides and keeps it quarreling over basic semantics? The obvious answer was provided by Terrett:⁸⁰

The concept of vertebral subluxation is central to chiropractic.

If we accept evidence that restricted joint movement and misalignment (subluxation) has deleterious effects,^{42, 45-46} it is essential that the chiropractic profession study the affects that restricted spinal movement has on specific symptoms and overall health. Separating dogma from science when evaluating the subluxation concept has been a worthy goal of chiropractic scholars.⁸¹

*There is nothing inherently dogmatic or anti-scientific in the notion that an articular lesion may have health consequences, or that correction of joint dysfunction may relieve symptoms and/or improve health.*⁸¹

The removal of spinal subluxations in effort to promote health has been central to the chiropractic profession from its inception. The uniqueness of chiropractic practice has been the elimination of such subluxations. Predicting the effects of subluxation and the benefits of subluxation-correction should, if it is the focus of 21st century, provide an exciting history to this charged construct.

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