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Commentary

Historical overview and update on subluxation theories[☆]

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Abstract

Objective: This article presents a personal view of the historical evolution of theories of subluxation in the chiropractic profession.

Discussion: Two major themes emerge from this review: those related to the mechanical behavior of the spine and those related to the neurologic implications of these mechanical issues. Chiropractic subluxation theory is one of the few health-related theories whereby these mechanical and neurologic theories have been unified into a comprehensive theory of disorder of spinal function. For this disorder, doctors of chiropractic have used the term *subluxation*. These theories, and their unification in the “subluxation concept,” have undergone evolution in the profession’s history.

Conclusion: The “subluxation concept” currently faces challenges, which are briefly reviewed in this article. The only way forward is to strengthen our efforts to investigate the “subluxation concept” with high-quality scientific studies including animal models and human clinical studies.

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Introduction

Manual therapy has, arguably, best been described by a Polish medical manipulation practitioner, Arkuszewski,¹ as “a mechanical therapy with reflex effects.” The phrase *mechanical therapy* can be further characterized by noting that it is performed in the musculo-

skeletal (MSK) system. The phrase *reflex effects* can be further qualified, at the very least, to indicate that these are “health-beneficial.” Therefore, a revised version would read as follows:

“a manually-performed mechanical therapy to the MSK system with health-beneficial reflex effects.”

This formulation also provides a basis for describing the primary disorder posited by chiropractic theory: subluxation. Recognizing that, for chiropractic, the subluxation has always been viewed as the “thing for which adjustment (manual therapy) is done,” a first-pass definition of *subluxation*, a la Arkuszewski, would be “a mechanical problem in the musculoskeletal system with health-deleterious reflex effects.”

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Since the founding of chiropractic and the other manual therapy professions, 2 fundamental issues have vexed us:

1. What kind and location of mechanical problem in the MSK system qualifies as a *subluxation* (or any of the other terms used as synonyms within and outside of chiropractic)?
2. What kind of health-deleterious effects are specifically associated with subluxation?

The author recognizes that numerous others have attempted to review the subluxation concept, including recent excellent reviews by Gatterman,² Peters,³ and Ebrall.⁴ These previously published discussions are not reviewed here. What follows is a nonsystematic overview of selected developments in the profession that have addressed these 2 questions.

Discussion

The archetypal and founding event in the history of the chiropractic profession is Daniel David Palmer's first treatment of Harvey Lillard. From Palmer's original work,⁵ he describes his thinking leading up to this event as:

"Displacement of any part of the skeletal frame may press against nerves, which are the channels of communication, intensifying or decreasing their carrying capacity, creating either too much or not enough functioning [sic], as aberration known as disease."

"Pressure on nerves causes irritation and tension with deranged functions as a result. Why not release the pressure? Why not a just cause instead of treating the effects? Why not?"

"I claimed to be the first person to adjust a vertebra by hand, using the spinous and transverse processes as levers. I developed the art known as adjusting..."

"The basic principle, and the principles of chiropractic which have been developed from it, are not new. They are as old as the vertebrae.... I am not the first person to replace a subluxated vertebra, for this art has been practiced for thousands of years."

Palmer relates that he came upon this theory and applied it first to a man with deafness. Keating⁶ records this version of events:

"Harvey Lillard gave him the cue which opened a new field for research. Mr. Lillard was restored to hearing by two adjustments, a dorsal vertebrae was replaced in its normal position."

Here is Harvey Lillard's rendition of these events according to Palmer's newsletter:

"I was deaf for 17 years and I expected to always remain so, for I had doctored a great deal without any benefit. I had long ago made up my mind to not take any more ear treatments, for it did me no good. Last January Dr. Palmer told me that my deafness came from an injury in my spine. This was new to me; but it is a fact that my back was injured at the time I went deaf. Dr. Palmer treated me on the spine; in two treatments I could hear quite well. That was 8 months ago. My hearing remains good." Harvey Lillard, 320 W Eleventh St, Davenport, Iowa.⁶

Although Palmer articulated several versions of his theory, the archetypal elements of Palmer's theory follow a logical pattern, as follows:

1. Subluxation, which is a misalignment of one of the vertebrae, causes
2. pressure on nerves exiting around the vertebrae, causing
3. disease.

Therefore,

4. Removal of subluxation (by manually adjusting it to its correct position) causes
5. release of nerve pressure, causing
6. the restoration of health.

Fig 1 is a schematic depiction presenting this foundational chiropractic model. It also depicts the author's view of the evolution of this model through the 20th century. An important early advancement was the transformation of the understanding of the activity of the nervous system from a vitalistic interpretation, as the "flow of Innate Intelligence," to a mechanistic or physiologically-based understanding of function in the nervous system. It appears that this understanding was not fully mature, as it focused only on the efferent neural activity that could be compromised by nerve compression, that is, neural conduction and efferent innervation of end organs. This produced a formulation whereby nerve compression was understood to result in an interference or derangement of nerve function, as

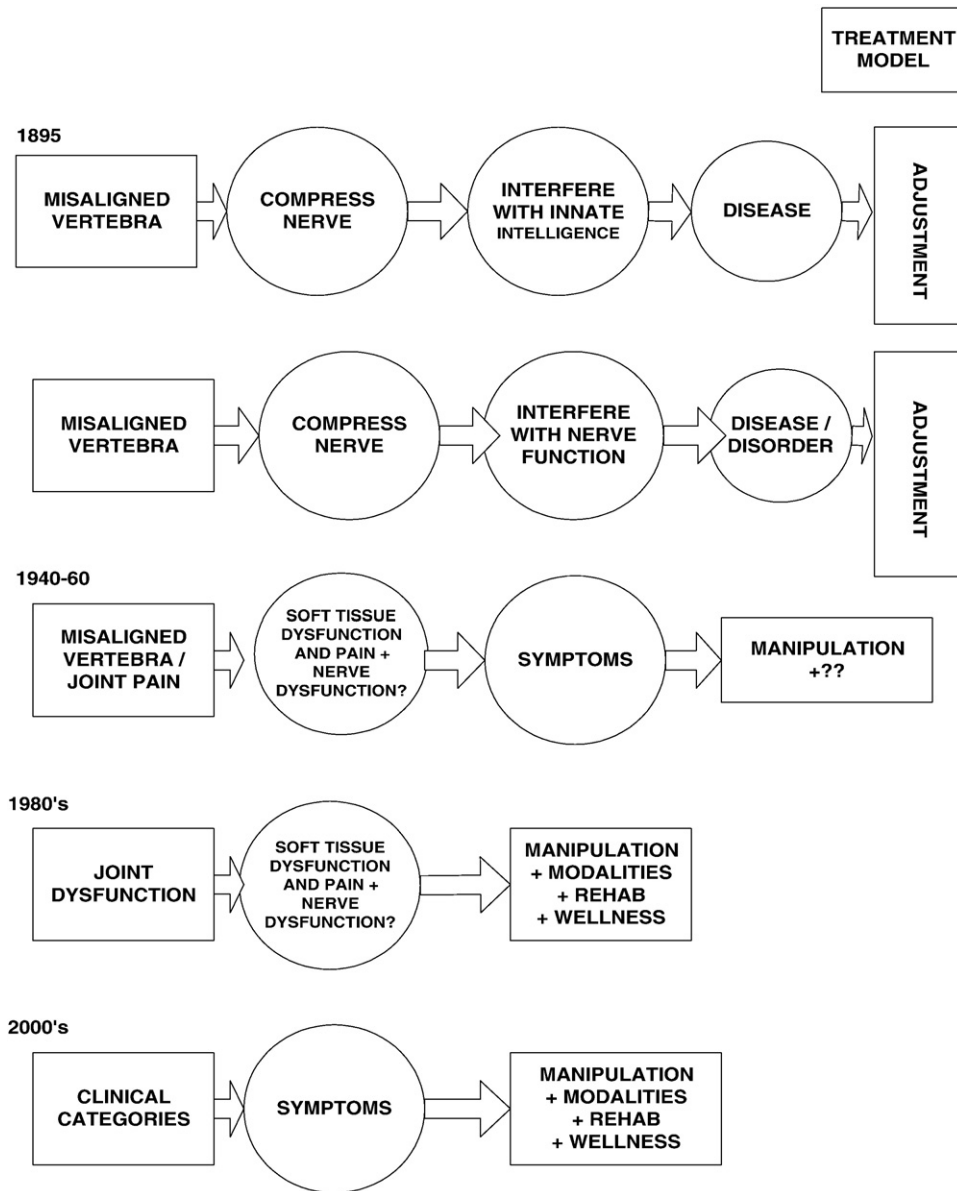


Fig 1. Historical evolution of the “subluxation model.”

understood in purely physiologic terms, which then resulted in end-organ dysfunction or disease. One manifestation of this approach was the development of the MERIC system by BJ Palmer and James C Wishart⁷ that organized this “physiologic view” of neural regulation according to the spinal segmental level of the peripheral nerves and their end-organ territories of innervation. This development allowed many chiropractors to leave their vitalistic heritage behind to its rightful place in the history of ideas and move into a solidly, if not fully, mature physiologic/pathophysiologic model (Fig 1).

Another important advancement came with a change in the conception of the type of mechanical derange-

ment that could constitute a subluxation. As noted above, for Palmer and the early chiropractors, this was ‘misalignment’ of the vertebra. By the 1920s, several chiropractic thinkers⁸⁻¹¹ had begun to shift their focus from static misalignment to some kind of “disturbance of function.” However, this required a fundamental change in thinking from a primary and very limited focus on “bone” (vertebra) to a more expanded focus on “joint” (spinal motion segment). This shift was critical in the evolution of a scientific model for chiropractors. It changed our practice, by emphasizing different technical procedures for the assessment of joint function, well beyond the limits of determining static misalignment of a bone. As well, it prepared the way

for the other major changes described below by grounding the theory of subluxation at the level of the joint, not the level of a single bone, and the pressure it could exert on nerves.

This led the way to the next important shifts that characterize the major theoretical advancement of the late 1940s to the 1960s: maturation of the understanding of effects on and contribution of the nervous system (ie, “reflexes”) related to the subluxation. This work is associated with Dr Irwin Korr et al¹²⁻¹⁹ and was echoed in chiropractic by many, including, but not limited to, Dr AE Homewood²⁰ in the late 1950s as well as his students, Drs R Gitelman^{21,22} and A Grice²³ from the Canadian Memorial Chiropractic College and Dr S Haldeman²⁴ from the Palmer College of Chiropractic.

This next step in the evolution of chiropractic thinking involved a shift from a focus solely on nerve compression to include the emerging understanding of the neural or reflex mechanisms that result directly from injury to the deep tissues of the vertebral motion segment. This shift incorporated the understanding of the effects of pain and inflammation from, for example, the facet joints of the spinal segments, on spinal cord mechanisms of sensory-motor integration and autonomic outflow. For Korr, this was termed the *facilitated segment* and led to his theory of “central excitatory state (CES)”.¹⁴⁻²⁰ The notion of “spinal irritability” had been developed as early as 100 years prior and had been part of the work of Head²⁵ and others in the early 20th century.²⁶⁻²⁹ The work of Korr, Denslow, Wright,¹²⁻¹⁹ and others revived this idea; and it was then applied in osteopathic and chiropractic thinking. Since that time, this model has come to be known as *central sensitization* (see below); and it has received enormous attention from pain researchers around the world.

A corollary to this development was the shift from a focus, especially in early chiropractic, which was solely on “efferent” or “downstream” neural mechanisms (those affected by compression), to a more comprehensive understanding of sensory-motor interactions within the central nervous system. In early chiropractic thinking, the “Big Idea” was to consider the action of “Innate Intelligence,” as it flowed through the nervous system, as working from “above-down, inside-out.” In this theory, blockage of a nerve by a misaligned vertebra resulted only in a blockage of the outward flow of health-giving “innate.” Once the shift of thinking beyond static misalignment of a vertebra to dynamic behavior of a spinal motion segment (joint) occurred, chiropractors could begin thinking about the sensory

implications of their “lesion.” Along with the shift away from spinal nerve compression mentioned above, this shift laid the groundwork for a much more sophisticated, fully scientifically grounded neural theory of “subluxation.”

Korr summarized these developments in his famous categorization of “impulse-” and “non-impulse-based” mechanisms of the spinal lesion. It is actually better to consider these as “nerve compression-based” and “non-nerve compression-based” mechanisms. It will be instructive to fill in some of the voluminous work that has ensued on these themes since that time. This follows immediately after the next section. Fig 2 summarizes some of the notable historical developments in the neurosciences of manipulation.

Contemporaneous with this work on the “neural side” of the subluxation story was the work on the mechanical side undertaken by such notables as Drs Fred Illi,³⁰ Joe Janse,³¹ Henri Gillet and his colleague Liekens,^{32,33} as well as their North American students, Drs L John Faye,³⁴ Ron Gitelman,²² and Adrian

- Formative models of the early chiropractors and osteopaths (late 1800's to early 1900's) propose effects of spinal manipulation (SM) on spinal nerves, with “neurologic” explanations for the clinical effects of SM.
- The work of Louisa Burns DO et al. (1920-1960) establishes the first animal models of spinal lesion effects, especially on nervous system.
- The work of I. Korr and colleagues (Denslow, Wright) (1948-1980's) establishes a model of “central facilitation” for the deleterious effects of spinal lesions and for the positive clinical effects of SM.
- A. E. Homewood DC publishes “The Neurodynamics of the Vertebral Subluxation” (the chiropractic term for the spinal lesion) in the late 1950's.
- S. Haldeman DC publishes study in JCCA in late 1960's on spinal nerve compression in the intervertebral foramen in frogs: studies conduction velocity and axoplasmic flow disturbances.
- NINDS Conference, 1975, includes presentations of neural effects of spinal manipulation.
- I. Korr holds conference in late 1970's on “Neurobiological Mechanisms of Spinal Manipulation”. Proceedings are published as landmark text.
- Triano and Schultz publish article in Spine in 1980 on “intermittent spinal nerve compression” in mice (pre-dates neuropathic pain model of Bennett and Xie).
- From 1980 on:
 - Numerous animal models of spinal pain as well as manipulation effects have been developed and published
 - Numerous studies of manipulation effects on pain, muscle activity and autonomic activity have been published
 - Several review articles exist on animal studies, human studies re: analgesia as well as neurophysiologic effects in general
 - Publications in Pain, neuroscience journals; presentations at IASP, Neuroscience conferences of chiropractic-related work
- Support for numerous DC's to pursue neuroscience PhDs: Pickar, Singh, Henderson, Bolton, Budgell, Vernon, Colloca, Murphy and others.
- 2000: Formation of the International Society of Chiropractic Neuroscientists.
- June 2005: NIH Conference on Biological Mechanisms of Manual Therapy.

Fig 2. Historical review of developments to subluxation theory.

Grice.²³ Notable developments in these mechanical approaches to the “subluxation” were:

- the development of motion palpation (although there is a history of interest in this going back to the 1930s with the work of Grecco and others)
- the development of concepts such as “joint play,” “end-feel,” etc (the work of Menzel³⁵ is also important in this regard)
- the elucidation of complex segmental motions by end-motion radiographs leading to an understanding of reference ranges of segmental motion, “coupled motion,” and axes of motion
- the use of spinal-pelvic cineradiography
- the use of weight scales and posturometers to assess full body posture
- interest in gait mechanisms
- an expanded biomechanical model that grounded single spinal subluxations within the larger context of the vertebral column and the locomotor system and considered the assessment and treatment of ‘patterns of findings’ (vs single separate findings) in these larger contexts. I call this model *structural wholism*.

Aside from this work representing a shift toward the dynamic, functional aspects of the spine, it also represented a shift away from single vertebral analysis (subluxation listings etc) to a more sophisticated analysis of, and interest in, the entire locomotor system. In fact, the definition of chiropractic developed at the Canadian Memorial Chiropractic College in the late 1960s was:

“A discipline of the scientific healing arts concerned with the pathogenesis, diagnostics, therapeutics, pain syndromes and neurological effects related to the statics and dynamics of the locomotor system, especially of the spine and pelvis.”³⁶

The emphasis on the phrase *locomotor system* is mine, showing how that term predominated in the thinking of that time. Notice that no mention of “subluxation” is found.

In a countermovement to this development, a new model called the *vertebral subluxation complex* was promulgated by Faye and Lantz.^{34,37} It is the author’s opinion that this model may have created unwanted and unnecessary complexity in the numerous categories and aspects of tissue and physiologic functioning applied to the concept of subluxation, such as histopathology, myopathology, neuropathology, etc. All tissue sites or structures in the body—somatic,

neural, and visceral—have these many dimensions or aspects (ie, all of these “ologies”). In the author’s opinion, this model did not contribute to the scientific advancement, especially the scientific elucidation, of the subluxation concept.

In the author’s opinion, another similar unfortunate development was the American Chiropractic Association paradigm statement on subluxation in 1996:

“Chiropractic ... focuses particular attention on the subluxation. A subluxation is a complex of functional and/or structural and/or pathological articular changes that compromise neural integrity and may influence organ system function and general health.” (from Gatterman³⁸)

This “definition” is too ambiguous and tentative, with its many “and/ors” and conditional assertions; and it has yet to be shown how this definition has contributed to the scientific development of the “subluxation concept.”

In more recent times, a consensus appears to have been reached in the manual therapy academic literature around the nature of the mechanical problem in the spine amenable to manual therapy, namely, hypomobility associated with a disturbance of joint function, hence, the terms *joint dysfunction* or, for the spine, *spinal* or *segmental dysfunction*. The International Association for the Study of Pain Classification of Chronic Pain includes a definition of segmental dysfunction (in each of the spinal regions), as follows:

“(spinal) pain, ostensibly due to excessive strains sustained by the restraining elements of a single spinal motion segment.

... features (spinal) pain, with or without referred pain, that can be aggravated by selectively stressing the particular spinal segment.

Diagnostic criteria (all of the following should be satisfied):

1. The affected segment must be specified.
2. The patient’s pain is aggravated by clinical tests that selectively stress the affected segment.
3. Stressing adjacent segments does not reproduce the patient’s pain.

Pathology: Unknown. Presumably involves excessive strain incurred during activities of daily living by structures such as the ligaments, joints or intervertebral disc of the affected segment.”^{39, p111}

Recent and current concepts

The following recounts the development of ideas on the neurologic and mechanical issues relevant to subluxation from the 1960s onward and includes a short list of recent developments that are important to the development of the modern “subluxation model.”

A. Neurologic mechanisms

A.i *Nerve compression–based mechanisms.*

1. Chiropractors received considerable and protracted scorn for the idea of a “pinched nerve.” Crelin’s⁴⁰ effort to debunk chiropractic focused directly on this phenomenon by putatively showing that there was ample room in the intervertebral foramen (IVF) for the nerve to never undergo such compression. The phenomenon of nerve compression became very strongly associated with disk herniation after Mixter and Barr’s 1934 article. The role of minor intervertebral joint derangement in compression on nerves and in referred back pain became greatly diminished in the “medical model.”
2. However, the link between herniated disks and nerve compression did eventually loosen so that, by the 1970s, the phenomenon of lateral entrapment of the spinal nerve root had become well accepted. The work of Sharpless,⁴¹ Sutherland,^{42,43} and Luttgies and Gerren⁴⁴ on nerve root compression susceptibility and the work of Rydevik et al⁴⁵⁻⁵³ “rehabilitated” the concept of the compressed nerve in spinal diagnosis.

Several chiropractic researchers investigated the effects of nerve root compression in the IVF by using animal models (see reviews by Vernon⁵⁴ and Henderson⁵⁵). Disturbances of nerve conduction velocity and neural axoplasmic flow were demonstrated. However, these studies only provided an animal model of what might occur if “the subluxation really did result in compressed nerves.” Actual compression of nerves by something that most would agree was a subluxation was not studied. The mechanical derangement of the subluxation is not easy to create in an animal model.

Most importantly, for our purposes of discussion in modern pain research circles, this type of research goes under the name of *neuropathic pain*. It is clear that compression/irritation of the peripheral nerves, either as nerve roots or as nerve trunks, results in profound changes in sensorimotor processing throughout the central nervous system, but especially in the spinal

cord. This means that, all along, compression of nerves was not just an “inside-out” matter. There is a whole dimension of “outside-in” (centripetal) processes that involve highly complex and clinically important changes in central sensorimotor processing that then results in profound changes in sensory, motor, and autonomic functions.

In other words, we now know that nerve compression/neuropathic pain is a much more complex matter than was originally conceived by the early chiropractors; and if, as part of the modernization of our thinking on subluxation, we believe that a role for nerve compression should be preserved, we should do so only with great respect and full regard for the body of data now available on the matter.

3. Recent work has shown that facet inflammation can induce compressive radiculopathy by spread of inflammatory exudate anteriorly into the IVF.⁵⁶ Therefore, spinal joint dysfunction/inflammation can lead to direct nerve compression (ie, neuropathic pain) and not just “reflex” effects from pain (see below). Ironically, this work convincingly refutes Crelin’s infamous report and finally provides confirmation of the oldest chiropractic theory: that relatively minor problems in the small joints of the spine can actually deleteriously compress or irritate the adjoining nerve!

A.ii *Nonnerve compression–based mechanisms.*

4. Since the 1970s, a great deal has been learned about deep somatic pain mechanisms, that is, pain from deep somatic—muscle, joint, ligament—sources. This is an advance on the situation whereby the great preponderance of knowledge of pain mechanisms before that time came from studies of cutaneous sources only.

Deep pain mechanisms have been strongly associated with the development of central sensitization in the central pain transmission system: dorsal root ganglion cells, spinal cord dorsal horn, projection tracts to the brain, wide-ranging brain-based mechanisms in the medulla, midbrain, thalamus, and sensory cortex. As well, deep pain mechanisms are now known to evoke antinociceptive mechanisms local to the spinal cord as well as descending to the cord from midbrain nuclei.

5. Central sensitization involves such changes in dorsal horn neurons as lowered thresholds of excitation, prolonged after-discharges, spread of reactivity of dorsal horn neurons, increases in the peripheral receptive fields, and a host of

molecular and cellular/synaptic changes that underlie these functional changes. All of these changes are thought to be responsible for the clinical phenomena of spread of pain from an initial source, referral of pain from the original source, the development of allodynia and other hypersensitivity states, the development of chronicity of pain by virtue of the persistence of these changes (long-term potentiation), and the development of recurrence by virtue of the creation of persisting neural engrams or “pain memories.”

These changes are also now regarded as the mechanisms responsible for the efferent manifestations of the subluxation, as they were conceived in the theory of the “central excitatory state”: reflex muscular hypertonicity, reflex autonomic changes (somatovisceral mechanisms), and the functional changes that result from these manifestations, such as reduced mobility of the joints, contractures of muscles, altered patterns of joint use and function, altered tissue health, etc.

The fact that so much more is now known about the mechanisms of central sensitization and the particular mechanisms of deep somatic pain is owed to the advancement of animal models of joint and muscular pain.^{57,58} However, the vast majority of these studies, and therefore the vast majority of the data about these phenomena, comes from studies of the hind limbs of small animal models. Subcutaneous pain mechanisms typically involve the tissues of the hind paw; muscular mechanisms have involved mainly the gastrocnemius and soleus muscles; joint mechanisms have mainly involved either polyarthritic models of all the tissues of the hind quarters or, in monoarthritic models, the knee and ankle joints. This led one of the leaders in the field of muscle pain mechanisms, Siegfried Mense, to title an article in 2003 as “What’s different about muscle pain?”⁵⁹

6. There has been a conspicuous absence of work on deep pain mechanisms from spinal (paraspinal) tissues. This leaves us with a critical question. Is what is now known about deep pain mechanism from the MSK tissues of the peripheral limbs automatically to be applied to deep pain arising from spinal tissues? Are there no important differences? If not, there is no compelling reason to hold on to theories that make the spine distinctive in any way; and there is no reason to develop animal models of spinal deep pain. So I now ask the question, “What’s (or: Is there anything..) different about spinal muscular (and ligamentous) pain?”

Thankfully, there is a small but growing body of work on mechanisms of deep pain from paraspinal sources that is beginning to address this need. Chiropractic research in this area has been reviewed by Vernon⁵⁴ and Henderson.⁵⁵ A full list of chiropractic neurophysiological research is available from the Colloquium planners and is appended to this article. In addition, the works of Solomonow et al,⁶⁰⁻⁶² Indahl et al,⁶³ Tachihara et al,⁵⁶ and Taguchi et al^{64,65} must be recognized. All of these studies are elucidating the mechanisms of deep somatic pain of axial (spinal) tissues and helping to address the question of whether there are any unique features of such pain, especially those that might underlie the distinctive clinical phenomenology of spinal pain. The early results provide encouragement for the notion that there may be distinctive features of spinal pain mechanisms and that these might explain the distinctive features of spinal pain complaints in our patients.

B. Mechanical mechanisms

With respect to subluxation models, the recent work on spinal loading and spinal motor control patterns deserves mention. Notable models include the following:

- spinal buckling^{66,67}
- neutral zone⁶⁸⁻⁷¹
- ligamentomuscular reflexes^{60-62,72-75}
- multisegmental motor control patterns

With respect to integrating the concept of “subluxation” with more sophisticated motor control theories, an adage adapted from Korr (personal communication) is instructive:

Under normal, healthy conditions, spinal segments function in a multi-segmental pattern; no segment acts alone. Under conditions of pain and injury, segments can “act alone.” Therefore, we cannot expect to restore function by having injured segments move; they must be moved to accomplish this.

The notion of segments “acting alone” means that focal pain initiates

1. ligamentomuscular reflexes altering local segmental motor control, as well as
2. somatosympathetic reflexes altering local vaso- and sudomotor control (as well as distant end-organ function?).

Fig 3 depicts a comprehensive model of spinal dysfunction. Note that this is not a clinical model in the

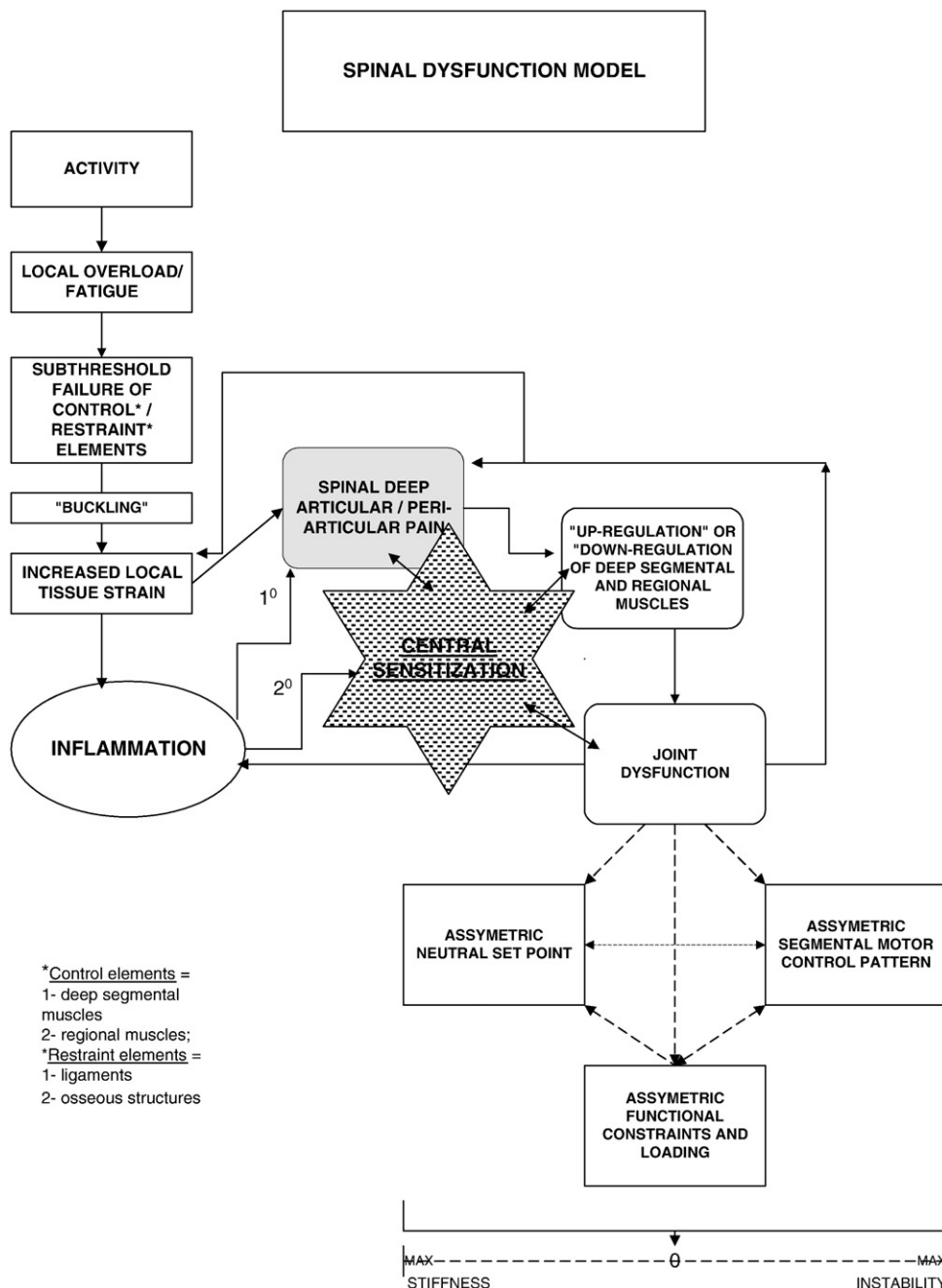


Fig 3. Comprehensive model of spinal dysfunction.

style of the vertebral subluxation complex; rather, it is a predictive model that, although based upon current knowledge, identifies areas of important future laboratory and clinical work.

C. Current challenges to subluxation

In this final section, some of the very current challenges to the subluxation model are reviewed.

For almost all of its history, chiropractic has posited that neurologic or reflex effects do result

from subluxation and that it is these effects that underscore the importance of subluxation in the health of the patient. It is this proposal—or this side of the “Arkuszewski-like” formulation with which we began this article—that received the greatest amount of criticism from opponents of the profession. Throughout this time, the mechanical side of our original formula was not overly criticized, although the concept of “misalignment” has lost most of its favor.

Recent developments in manipulative sciences have created a unique challenge to the very concept of a “specific mechanical problem” toward which manipulation is directed.

1. Studies on the reliability of palpation of segmental motion have reported mixed results.⁷⁶ This has led some to discard this procedure in their analysis of spinal pain. This has led others to go further and become skeptical that a “segmental mechanical problem with a disturbance of motion” actually exists.
2. A small number of studies on the validity of palpation for segmental motion or for segmental findings have reported questionable results. These studies have taken the form of randomized clinical trials of a single session of manual therapy—manipulation,⁷⁷ mobilization,⁷⁸ and manual traction⁷⁹—in which one group receives a single palpation-specific procedure and the other group receives the same procedure at sites distant from the target segment. The immediate clinical outcomes of these studies show no significant difference between groups, calling into question the need to identify a specific segment at all. The combination of 1 and 2 led some to suggest that the whole idea of a mechanical lesion is invalid and should be discarded.
3. Recently, classification-based approaches to treatment of spinal disorders based on apparently validated prediction rules (predicting positive outcome of treatment from symptom profiles) have been developed.⁸⁰⁻⁸² Some of these either exclude or downplay the results of palpatory examination for spinal hypomobility.⁸⁰⁻⁸² On the other hand, some of them do the opposite and strongly emphasize the findings of “motion palpation” for “spinal fixation.”⁸³ Clinicians are now able to choose among these predictive models, with one option being to discard, or at least greatly downplay, the role of a mechanical lesion.
4. A few recent studies on healthy subjects appear to indicate that cavitations occurring during spinal manipulations are not localized to the segment putatively identified as the “lesion” and as the “target” of the maneuver.⁸⁴ This has been interpreted by some to mean that, even if a “specific mechanical lesion” does exist and even if it can be reliably identified in clinical assessment, such an exercise may be fruitless if the treatment cannot match this level of specificity.

The older challenge faced by the chiropractic profession was largely to the second half of our initial formulation of subluxation: “the health-deleterious effects.” Our critics have persistently questioned the premise that chiropractic subluxations caused anything more important than local, benign pain. The entire historical chiropractic project of attaching health-significant effects to subluxation (such as the Association of Chiropractic College’s statement including the phrase *that compromise neural integrity and may influence organ system function and general health*) was challenged by these critics.

The newer challenge is now to the first part of our statement: “A subluxation is a mechanical problem in the musculoskeletal system...” Recent research appears to challenge this premise as well; and some, within and outside of the profession, have adopted a completely skeptical view of the entire “subluxation project.” “If it doesn’t exist in the first place,” they say, “how can it have any effects? If we can’t find it, why look for it and why include it in our clinical decision-making? If we can’t localize our treatment to one segment, why be concerned to do so?”

Conclusion

These challenges to the “subluxation concept” are in their early days and, in many instances, are based on only one or a few studies. In several instances, these studies have involved healthy subjects or those with relatively mild symptom severity. In several studies, the manual therapy intervention might be regarded as nonspecific and, therefore, would not qualify as an “adjustment.” On the other hand, critiques could be made of the quality of many of the studies that formed the basis for what might be called the “standard model” in chiropractic and the other manual therapy professions, including those which extend back several decades. Indeed, some of the modern challenges, especially in the area of manual diagnostic procedures, appear to derive precisely from the poorer quality of prior studies. The only way forward is to strengthen our efforts to investigate the “subluxation concept” with high-quality scientific studies including animal models and human clinical studies.

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