



The Chiropractic Vertebral Subluxation

Part 10: Integrative and Critical Literature

From 1996 and 1997

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ABSTRACT

Objective: The purpose of this paper is to review and discuss the history of chiropractic vertebral subluxation (CVS) during 1996 and 1997. The literature during this period offered critical and integrative models emphasized by a need for research into operational and functional definitions.

Discussion: Several integrative approaches emerged, from Rome's 296 synonyms to Bergman's Pain/Tenderness, Asymmetry/Alignment, Range of Motion Abnormality, Tissue Tone, Texture, Temperature Abnormality, and Special Tests (PARTS) analysis adopted by the profession in the United States. Other noteworthy contributions included Ruch's *Atlas of Common Subluxations*, Epstein's introduction of network spinal analysis, and Kent's review of CVS models. Boone's introduction of the *Journal of Vertebral Subluxation Research* was accompanied by his 3-part model with Dobson. These years also included the paradigm statement of the Association of Chiropractic Colleges, which was adopted by the American Chiropractic Association, International Chiropractors Association, and World Federation of Chiropractic. Two other papers included Nelson's critique of the CVS paradigm and Keating's 1996 "Hunt for the Subluxation."

Conclusion: The CVS reached a new stage of complexity and critique and offered new directions for research, integration, and development. (J Chiropr Humanit 2018;25C:146-168)

Key Indexing Terms: *Chiropractic; History*

INTRODUCTION

The theories of chiropractic vertebral subluxation (CVS) may have reached an apogee in the literature between 1996 and 1997. Several streams of discourse from preceding decades were captured in articles focused on criticism,¹ terminology,² integration,³ consensus,⁴ new vertebral models,⁵⁻⁷ assessment procedures,⁸ reviews of models,⁹ and calls for various levels of research to study CVS.^{7,10,11}

Events in chiropractic history are highlighted in this paper because of their relevance to CVS. The first was the trend to develop consensus statements that continued during this period.^{12,13} In 1996, the presidents of the chiropractic colleges in North America agreed to a definition of CVS,⁴ which was endorsed by several national and international organizations.¹⁴ During this period an "atlas of subluxations" was published, and develops a new

perspective from the long tradition of dissection in chiropractic subluxation research.¹⁵⁻²⁰ Also, an assessment protocol became the methodology for CVS detection accepted by Medicare.^{8,21,22} Debates in the profession about the lexicon continued during these years. As well, during this short period, increased calls were heard for research to include validity studies and reliability studies in chiropractic.¹⁰ Keating also called for an operational definition for chiropractic,¹⁰ which was answered by Owens, Boone, and Dobson.^{5-7,23}

During this time, the *Journal of Vertebral Subluxation Research (JVSR)* was developed originally to publish papers dedicated to research, theory, and models of CVS.²⁴ The *JVSR* was sponsored by the Council on Chiropractic Practice,²⁵ which was developing evidence-based guidelines for chiropractic during that time.²⁶ The *JVSR* was an outgrowth of that process and represented a school of thought, which was outside of the academic mainstream in chiropractic during this period.²⁷ It is possible that limited distribution, in addition to social and political forces within the profession, kept the wider profession from evaluating the articles in the journal on their own merits. The first 3 issues of the *JVSR* included Boone and Dobson's *Vertebral Subluxation Model (VSM)*; Kent's review of subluxation models; and Epstein's first peer-reviewed article, "Network Spinal Analysis: A System of Health Care Delivery Within the

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Subluxation-based Chiropractic Model.”^{3,5-7,9} These articles represent at least 4 different streams of the CVS literature and contribute to the context of this period. Boone and Dobson’s articles followed the trends to describe CVS as complex and proposed new research strategies for the profession.⁵⁻⁷ Kent’s article reviewed the current literature,⁹ and Epstein’s article demonstrated a practical integration of models and theories and was the culmination of more than a decade of clinical and theoretical development.^{3,28}

The purpose of this paper is to review and discuss CVS in chiropractic just before the turn of the century. The goal is to capture the culmination of a century of debate, consensus, and theory development on CVS (Fig 1). This paper aims to offer insights into the context of the period's models, critiques, debates, and reviews.

DISCUSSION

Consensus and Terminology

Three important publications in the literature during this period include the consensus statement by the Association of Chiropractic Colleges (ACC)⁴; Rome's paper on CVS terminology²; and the Pain/Tenderness, Asymmetry/Alignment, Range of Motion Abnormality, Tissue Tone, Texture, Temperature Abnormality, and Special Tests (PARTS) method for CVS assessment and documentation.⁸

ACC Consensus (1996). The ACC was formed in 1985 from an association of college presidents. In March 1994, an expanded ACC Educational Conference was held in Las Vegas, Nevada. The meeting led to a consensus statement published in July 1996, as part of the ACC Chiropractic Paradigm. The paradigm was signed by all college presidents and adopted by several organizations, including the International Chiropractic Association, American Chi-

ropractic Association (ACA), and World Federation of Chiropractic. On May 23, 2001, at the World Federation of Chiropractic Congress in Paris, the ACC Paradigm was approved by the assembly.²⁹

The ACC definition stated, “A subluxation is a complex of functional or structural or pathological articular changes that compromise neural integrity and may influence organ system function and general health.”⁴ The definition captured the views based on the previous decades of research, model building, and theory in the literature. It was not designed as an operational definition to be tested, but as a consensus that could unify the many factions in the profession.

In a 4-part paradigm statement, part 4 reads:

Chiropractic is concerned with the preservation and restoration of health, and 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. A subluxation is evaluated, diagnosed, and managed through the use of chiropractic procedures based on the best available rational and empirical evidence.⁴

The ACC paradigm statement might be viewed as the latest in a long line of consensus statements on CVS dating back to 1966³⁰ and 1905.³¹

Rome's Synonyms (1996). Peter Rome, an Australian chiropractor who graduated from Canadian Memorial Chiropractic College in 1969, published a literature review on as many CVS terms as he could catalog.² He eventually had a list of 296 terms from 1688 to 1996 and onward. The paper captured much of the chiropractic literature to date.²

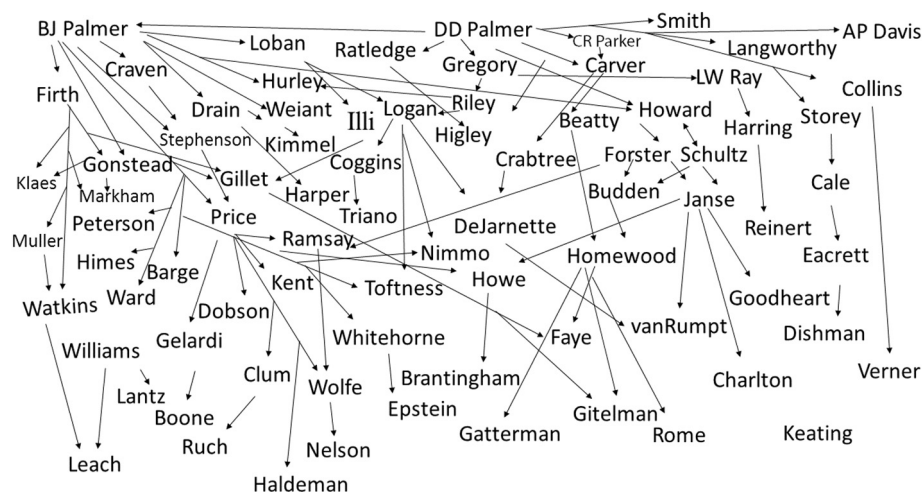


Fig 1. *Teacher-student relationships of subluxation theorists starting with D. D. Palmer.*



Fig 2. *Peter Rome.*

Rome came up with more than 500 terms since publication of the paper (Fig 2).^{32,33}

Rome offered 5 reasons for why chiropractors and other professions including the medical profession continue to come up with new words for subluxation, which included the need to create a new term, conflicts as to how the term should be defined, a lack of acceptance and understanding of the term, a need to build a bridge between the chiropractic definitions and medical definitions, and the semantic problem that the term *subluxation* already had a definition when chiropractors adopted it and gave it a new definition (Fig 3).² He wrote, “It is accepted that there is a defined scientific difference between a ‘medical subluxation’ and a ‘chiropractic subluxation.’”² Rome then described issues such as politics and communication surrounding terminology, and changing well-worn terminology. Rome explored the recent literature from Faye and Dishman’s subluxation complex to Gatterman’s subluxation syndrome,³⁴⁻³⁶ to Brantingham’s somatic dysfunction,³⁷ and to Leach’s segmental dysfunction and chronic neural dysfunction,³⁸ which included facilitation.

Rome argued that the disadvantage of trying to define new terms rather than retain an identifying term was detrimental to the profession’s identity.² He wrote:

Why create ambiguity by altering an established definition in the first place? Why confuse a reasonably well understood term? The effect of any major change can only dilute the identity of the chiropractic profession by questioning the very concept that it has been expounding for 100 years.²

He concluded that the term should be qualified but not discarded, as its historical use is rich for biology, clinical practice, and the history of the profession.² He suggested that there should be clarification between the term vertebral subluxation complex (VSC) for spinal dysfunction and subluxation complex for “articular derangements of the extremities.”² He also suggested there should be an explanation and dissemination of a broad and clear definition of the terms to other professions, publishers, medical dictionaries, journals, colleges, and associations.

Bergmann’s PARTS (1997). In 1998, the ACA coordinated a consensus panel to develop guidelines for CVS diagnosis without the need for x-ray analysis²¹ and to adequately document chiropractic services for Medicare as outlined in the Balanced Budget Act of 1997. The panel adopted Bergmann’s PARTS criteria, which included technique-specific tests.⁸ The ACA panel adopted PART, not PARTS.²¹ Medicare guidelines required 2 of the 4 PART criteria, 1 of which must be changes to asymmetry and alignment or abnormal range of motion.²¹

Bergmann and colleagues authored a textbook that included the PARTS concept. The book arose from the intercollegiate conferences around chiropractic technique,³⁹⁻⁴¹ which were linked to older conferences about the neurobiologic mechanisms of spinal manipulative therapy.^{12,41,42} For example, at the 1977 workshop that followed the 1975 National Institute of Neurological Disorders and Stroke conference, Greenman,

Rome’s 5 Reasons Chiropractors Comes up with new terms (quoted)
1. The chiropractic definition of a subluxation (vertebral subluxation, vertebral subluxation complex), with its many components, is not generally accepted, acknowledged, or understood.
2. Authors feel they can improve on the understanding or acceptance of terms between medical and chiropractic versions or interpretations.
3. The word and usage clashes with the traditionally understood use of the word and authors wish to clarify a semantic problem.
4. Authors wish to feel they have invented a new word, if only to fit their descriptive paper.
5. A lack of semantic agreement as to what meanings a term actually encompasses

Fig 3. *Rome’s 5 reasons for why chiropractors come up with new terminology.*

from the College of Osteopathic Medicine at Michigan State University, wrote, “The three diagnostic findings of somatic dysfunction are (1) asymmetry, (2) restricted motion, and (3) tissue texture abnormality.”⁴³ His description of tissue texture is similar to previous chiropractic approaches to palpation and instrumentation.^{44,45} Bergmann’s analysis can be linked to osteopathic diagnostic procedures and chiropractic literature on clinical and empirical analysis.

Keating’s Influence on Discourse

Keating’s influential article “To Hunt the Subluxation”¹⁰ was published in 1996 and summed up his viewpoint by defining types of validity tests.¹⁰ The paper reflects his ideas and is still cited in the literature.^{1,10,46-52} Keating’s arguments from the article laid the foundation for subsequent publications that are often cited in calls to dismiss the term *subluxation* from the chiropractic literature.^{47,52-54} By reviewing a chronology of Keating’s writings, we may more fully understand the perspective that he brought to his writings on chiropractic and better assess his work and impact.

Between 1984 and 1996, Keating published at least 25 articles on chiropractic.^{10,55-79} Keating’s first call for an operational definition for CVS came in the 1980s,⁵⁹ followed by several papers and a textbook exploring the epistemological rationale for his position and mapping out several areas of potential research for the profession.^{10,67,70} In 1990, Keating wrote:

But let us not continue to mistake private empirical support (even when recognized by governmental bodies, such as the NZC) nor basic science rationale (even when well referenced) for clinical research validation. Let us not confuse “science consistency” with scientific evidence of the effectiveness of a treatment, nor with scientific validation of a hypothetical construct (such as vertebral subluxation complex). The proof of the pudding in an applied discipline is the scientifically demonstrated utility of its theories and methods, and in that respect we are very much nearer the beginning than the end of our journey. There is great room for dialogue and debate.⁸⁰

Keating’s references in this statement are to the Royal New Zealand Commission (NZC) Report and Kaminski’s proposed evaluation procedures for chiropractic practices.^{81,82} He argued for several levels of validity studies throughout his career.^{10,70}

Keating’s Background and First Roles in Chiropractic. Keating completed his PhD in clinical psychology from the State University of New York (SUNY) at Albany in 1981. His dissertation was a behavioral approach to nocturnal enuresis written when Behaviorism was at the end of its dominance in psychology.^{83,84} After completing a residency, Keating taught as an adjunct professor at the Behavioral Medicine Clinic in the department of psychology at the University of

the Pacific in Stockton, California.⁸⁵ During that time, he was hired by Don Smallie to do research for the Stockton Foundation for Chiropractic Research.^{55,86} Smallie introduced Keating to Miller, the president of Palmer College of Chiropractic West (PCCW).⁸⁶ Keating was hired by PCCW in 1983 and was soon head of the research department. He eventually taught at several chiropractic colleges. Keating died on October 14, 2007 (Fig 4).⁸⁷

Keating and Mootz (1986-1989). Keating’s first review articles on chiropractic and CVS were coauthored with Robert Mootz, a 1980 Palmer College of Chiropractic (PCC) graduate who started working at PCCW in 1985 and later became dean.^{88,89} They collaborated on several papers in the late 1980s,^{60,61,66} some of which should be explored primarily in articles on philosophy and scope of practice and included discussion related to politics, medicine, and research. It seems that many of the arguments in these early writings formed the foundation for Keating’s later works.

In 1986, Keating, Mootz, and Jim Nelson presented a model of clinical, scientific, and educational development at the Palmer Research Forum.⁶⁰ They suggested that research in chiropractic was limited for several interlocking reasons. They proposed that the limitations were related to political struggle, medical ostracism, and “lack of funds for research, anti-scientific components of the philosophy, isolation from the scientific community, lack of university based chiropractic colleges, isolation from hospitals and other healthcare providers, lack of understanding of



Fig 4. Joseph Keating.

research methods, and lack of practitioner-scientist role-models.”⁸⁸ They developed a chart to depict the “pattern of inter-locking impediments to the development of chiropractic science” (Fig 5).⁸⁸ In these articles, Keating and Mootz seemed to be guided by David Barlow’s scientist-practitioner paradigm.⁹⁰ Barlow was a psychology professor at State University of New York, and it is suspected he may have been one of Keating’s professors.⁹¹

In 1989, Keating and Mootz described the values of clinician-scientists that should be instilled into the profession as a way to develop a “research consciousness.”⁶⁶ They suggested that such a consciousness should be promoted through dialogue with the leadership of associations, colleges, and technique organizations. They proposed it could then spread to the colleges. They recommend an open-minded caution in relation to new ideas and claims for efficacy as well as counsel to the future scientists, to be wary of the perceived public relations threat they may pose to political medicine and the “traditionalists” within the profession.⁶⁶

Keating and Mootz acknowledged the importance of model building and the understanding of CVS mechanisms to the future evolution of chiropractic, and they emphasized clinical research to evaluate chiropractic’s usefulness.⁶⁶ They stated that clinical trials should become a priority with a focus on placebo, neural circuitry, biomechanics, kinesiology, and prognostic indicators. However, they also emphasized that research was secondary to the promotion of health. Two examples they give are the lack of research on analgesic medications and hypnosis. Even though the mechanisms were not fully understood, both were recommended to patients.⁶⁶

Keating and Mootz recognized that clinical trials would be difficult and costly for chiropractors, and so they proposed single-subject and small-group research designs. Each practitioner could do a clinical “trial of one” and critically evaluate the literature by replicating data trials and thereby add to the literature. They suggested that “Each new patient becomes the

focus of a potentially new theory.”⁶⁶ Carefully controlled case studies could produce “field based descriptive clinical report(s).”⁶⁶ Their emphasis on well-designed case studies followed a similar recommendation made by Keating and Miller about the importance of case studies.⁵⁹

Keating and Mootz suggested, based on the historical record, defensive dogmatism developed in chiropractic from the pressures from political medicine, accounted for much of the infighting within chiropractic. They concluded that rigidly adhering to theories that are untested equates to “dogma” and that dogmatic thinking has hindered scientific development in chiropractic.⁶⁶

Keating’s Writings (1986-1995). In 1986, Keating initiated calls for an operational definition for CVS that were renewed throughout his writings.^{59,67,70} An operational definition could be used in randomized trials, placebo-controlled clinical trials, and other research designs. In 1992, Keating acknowledged that most of the chiropractic profession relied on CVS, but he did so by saying the “straights” believe in “subluxation” and the “mixers” believe in “spinal lesion.”⁷² He wrote, “Straight chiropractors have traditionally adhered to an unswerving belief in the meaningfulness of subluxation as a clinical entity... the mixer community, an unswerving belief in the significance of the chiropractic lesion.”⁷² Keating did not make the point that most of the leaders from the “mixer” side of the profession were CVS theorists and most of the profession was using the term *subluxation*, even though some were calling for new terminology and a new focus for the profession.^{12,13,37,92-101}

Keating concluded that CVS had questionable validity, was tentative, and was largely an untested hypothesis. He suggested that scientific development was impossible if CVS was defined as an “intrinsically deleterious clinical finding,”⁷² if symptoms were not used as a primary factor in its detection.⁷²

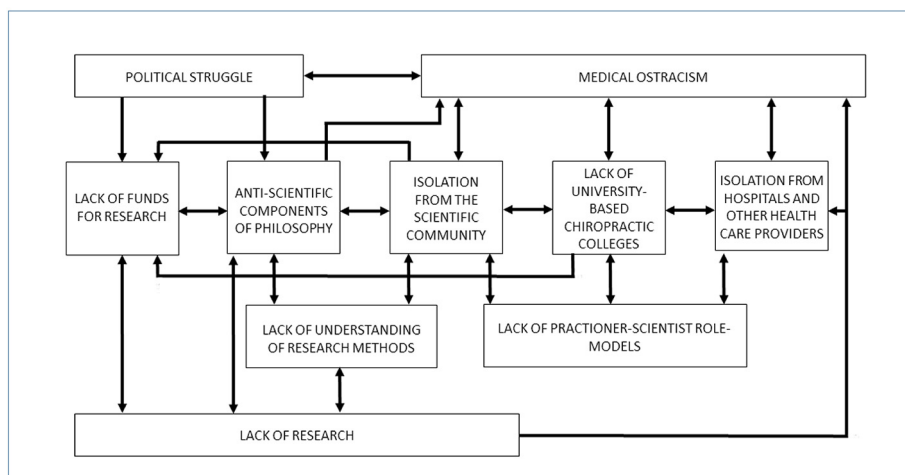


Fig 5. Redrawn from a replication of the original diagram from Mootz, Keating, and Nelson.

Keating summed up his ideas in his book *Toward a Philosophy of the Science of Chiropractic: A Primer for Clinicians*.⁷⁰ It is a thorough book in chiropractic on research design, philosophy, and the philosophy of science. It was published by the Stockton Foundation for Chiropractic Research. Keating built upon the scientist-practitioner paradigm and developed several detailed critiques and suggestions for the profession's research agenda to move forward.⁷⁰

Keating's "To Hunt the Subluxation" (1996). Keating's 1996 article "To Hunt the Subluxation: Clinical Research Considerations"¹⁰ has been cited 18 times in the indexed literature, according to Google Scholar, and 21 times in the *Cumulative Index to Nursing & Allied Health Literature* database.¹⁰² Two documents that reference this paper include Nelson's 1997 article and the preface to the fourth edition of Leach's book, published in 2004.^{1,46} Both have been cited in papers, according to Google Scholar.¹⁰² This paper is also cited by Keating, Charlton, Grod, Perle, Sikorski, and Winterstein in "Subluxation: Dogma or Science?" to support this statement: "there is today no scientific 'gold standard' for detecting these reputedly ubiquitous and supposedly significant clinical entities."⁴⁷ For this statement to be accurate, the references for the 1996 article would need to be comprehensive enough to support that claim; however, I suggest that they are not.¹⁰ Most references in the body of the paper point to reliability studies.¹⁰³⁻¹⁰⁸ Based on these references, Keating claimed there is no hard evidence for the validity of an operational definition for CVS.¹⁰ He argued that chiropractic researchers have not established a relationship between CVS and health problems and that "the validity of the chiropractor's 'subluxation complex' has not been studied by chiropractors or anyone else."¹⁰ Keating further stated that there was no standard to compare CVS detection methodologies.

Keating's call for an operational definition is an important contribution to the literature. An operational definition of CVS that could meet the rigorous demands of the scientific method around many types of research questions was needed.¹⁰ To address this issue, he proposed several types of research questions involving inter and intraexaminer reliability, concurrent validity, predictive validity, discriminant validity, and trial validity, and challenged the profession to operationalize CVS and begin to conduct validity research.¹⁰

Critique and Development of Theories

In 1997, Nelson published a critique on CVS and William Ruch an atlas.^{1,15} Nelson's critique built on previous arguments to do away with *subluxation* as a term and emphasized the need for an operational definition. Ruch's atlas bolstered previous models by establishing a new level of anatomical data to expand on CVS criteria.

Nelson's Critique (1997). Craig Nelson graduated from Northwestern Chiropractic College in 1974 and was a former instructor there. In 1997, Nelson wrote a critique of

Gatterman's book,³⁶ with some suggestions for future research.¹ Nelson's references included chapters from Gatterman's book,³⁶ Faye's notes,¹⁰⁹ papers by Lantz,¹¹⁰ the ACC paradigm,⁴ and Keating's 1996 article.¹⁰ Most of the paper consisted of Nelson's opinions and generalizations about the dichotomy in chiropractic around CVS along with some insightful suggestions for testing hypotheses.¹ The article explored the limitations of model building and the need for operational definitions. It is in part an attempt to discredit the extensive consensus processes that led up to Gatterman's book and the ACC paradigm.^{1,4,36}

Nelson criticized the semantic approach to deciding upon subluxation terminology and suggested that all of the models of the VSC are a tautology. He did not think that CVS should be described as more than one thing and certainly not as a complexity of many components or in terms of syndromes.¹ Nelson's critique pointed to the need for strong theory building and hypothesis testing. He noted the need for the literature in the chiropractic profession to demonstrate the differences between hypothesis and theory, and how to test them.

Nelson suggested that any theory should "bear some resemblance to its historical antecedents."¹ Further, he wrote, "Unless the profession is willing to declare that D. D. Palmer's ideas have no current relevancy, any subluxation theory should retain some connection to Palmer's formulation of subluxations. Otherwise, it's more appropriate and honest to simply abandon the term."

However, Nelson did not cite the current theories, which were built upon the models and research of Verner,¹¹¹ Homewood,⁴⁴ Watkins,³⁰ and Harper.¹¹² All of those theorists cited D. D. Palmer and integrated his theories into their models.¹¹³ The paper did not contain this historical context. A similar critique of Nelson's paper was written by Faye, who acknowledged that his own definition of the VSC in 1967 was inspired by the consensus definitions published in the *Journal of the ACA* in the 1960s.¹¹⁴

Ruch's Atlas of Common Subluxations of the Human Spine and Pelvis (1997). William Ruch graduated from Life Chiropractic College West in 1986 (Fig 6). Ruch dissected over 250 cadavers while teaching in the human spinal dissection laboratory at Life Chiropractic College West from 1987 to 1993. He has worked in the anatomy department as an adjunct faculty since 1997.¹¹⁵ Ruch's photo atlas was based on his dissection research.¹⁵ The second edition was published in 2014.¹⁵

The atlas viewed CVS from the perspective of degeneration by including photographs, x-ray imaging, computed tomography scans, and magnetic resonance imaging. Ruch proposed that the degenerative process owing to changes in alignment of the spine leads to impaired blood and cerebral spinal fluid dynamics; pain; loss of neurological control; and alterations of the cord, brainstem, and central nervous system (CNS). The emphasis of the book is on the normal biomechanics of the CNS and how movements of the spine, cord, and



Fig 6. William J. Ruch. With permission from Life Chiropractic College West.

associated tissues are affected by CVS. To help explain his extensive observational images, Ruch relied on the literature on spine and cord dynamics.^{15,116}

Ruch's *Atlas* was written following the chiropractic tradition that started with D. D. Palmer's osteological lab,¹¹⁷ Swanberg's work inspired by Smith,^{17,118} Forster's early dissection research to define subluxation,¹¹⁹ Janse and Illi's study of the lumbar and pelvis,^{19,120} and Winterstein and Bachop's intervertebral foramen studies.²⁰ Ruch developed a complex view of CVS that furthered the paradigm, integrating Breig's biomechanics of the spinal cord and CVS.^{15,116,121-124}

Epstein's Integrative Approach

In 1996, Donald Epstein published his model and protocols related to his network spinal analysis (NSA).³ Epstein referred to his approach with the term *network*, because it was his attempt to include a wide variety of models, theories, and techniques; to capture the idea of a distributed network; and to include Pert's theory of a somatopsychic network, which included her observation of high concentrations of neuropeptides in the dorsal horn of the spinal cord.¹²⁵⁻¹²⁷ Since 1996, Epstein has continued to develop his theory and methods.^{128,129}

Epstein graduated from New York Chiropractic College in 1977, during which time Napolitano (a Palmer graduate) was president (Fig 7).⁸⁸ In 1983, Epstein taught and published articles on his NSA.^{124,130-134} Between 1989 and 1996, Epstein's model and clinical protocols evolved.^{126,127,135-140}

In 1983, Epstein described using instrumentation, which included classic paraspinal thermal pattern work from the Palmer school, leg checks, and palpation. His intention was to develop an analysis that could be used with any chiropractic technique.¹³⁰ Central to his analysis was the differentiation between what he termed class A or *structural subluxations* and class B or *meningeal subluxations*, which he later termed the *facilitated subluxation*. He proposed that class A comprised

primarily of fixations and meningeal subluxations because of more complex neurological phenomenon usually related to chemical and emotional etiology. He linked class B to B. J. Palmer's concepts of torqued meningeal occlusion and multiple cord pressures by tension.¹⁴¹

Epstein related the class B functionally to Speransky's neurodystrophic process,¹⁴² physiologically to a global CNS response affecting cerebrospinal fluid transport and circulation, and biomechanically to the meninges.¹³² He hypothesized that the CNS response involved referred tension patterns throughout the spinal and meningeal system, which may relate to areas of pain and altered movement to "the major site of neurological insult"¹²⁴ (Fig 8).³

Network Chiropractic Analysis was a combination of reflex techniques such as Logan and Sacro-Occipital Technique,^{143,144} full-spine structural techniques such as Pierce-Stillwagon,¹⁴⁵ and upper cervical techniques.¹⁴⁶ It was thought that analysis had to do with sequence and force application in relationship to facilitation, dystrophic processes, and reflex patterns.^{3,35,147}

Epstein believed that the meningeal subluxation caused a tension on both ends of the spine, which he thought could fluctuate from one end to the other.¹²⁴ He based this thought in part on Toftness' incorporation of D. D. Palmer's theory that the neuroskeleton is a tonal regulator of the tension frame.¹⁴⁸ Toftness believed that CVS moved through the frame as a type of stress response.¹⁴⁹ Epstein hypothesized that an area of critical tension could be determined.¹³²

Thomas Faulkner wrote a letter to Epstein suggesting that he should include the works of Breig and Lowell



Fig 7. Donald Epstein.

at Sherman College of Chiropractic. He earned his chiropractic degree from Sherman College of Chiropractic in 1990. Boone was president of Southern California College of Chiropractic from 1990 to 1994, president of the Straight Chiropractic Accrediting Agency in the 1990s, acting head of the New Zealand School of Chiropractic from 1998 to 2000, director of research for the Association for Network Care from 2002 to 2004, and director of research at Sherman from 2004 to 2009. Boone died on November 21, 2010 (Fig 9).¹⁷⁹

There is some confusion in the literature about JVSJ being a journal and that articles are refereed. For example, McGregor-Triano writes, “the JVSJ is not classified as a ‘journal’ (Ulrich’s Periodicals Directory),” and “is considered by Ulrich’s Periodical Directory (2006) to be ‘academic’ and ‘scholarly.’”¹⁸⁰ In contrast to McGregor-Triano’s claims, Ulrichsweb’s Global Serials Directory in 2015 lists JVSJ serial type as a refereed and peer-reviewed “journal.”²⁵ Only the content type is described as “Academic/Scholarly.”²⁵ Furthermore, queries to several of the early authors and reviewers from the first issues suggest that Boone was heavy-handed as an editor and perhaps even unusual in his approach to peer review but that he certainly sent papers out for review and requested revisions and resubmissions.^{160,169,179,181} According to Graham Dobson (personal correspondence, September 13, 2016), it was not Boone’s intention to develop a top-tiered journal like *Spine*. Boone relied on his 2 decades as an academic and a scientist to shape his editorial style.¹⁸²⁻¹⁸⁷

In the first issue of *JVSJ*, Boone summed up the mission of the journal and his hopes for CVS research.²⁴ He acknowledged there was plenty of research to do. He proposed that the etiology, biomechanics, physiology, and consequences of CVS justified the journal’s narrow focus. Boone believed that without a journal dedicated to publishing peer-reviewed literature on all aspects of the CVS, studies on spinal manipulative therapy for low back pain and musculoskeletal conditions may dominate the

literature. He acknowledged that those research foci may be interesting, but if they were to dominate the literature we would not “expand our evidence base of vertebral subluxation further than it being a spinal lesion associated with various pathologies.”²⁴ He recommended a comprehensive research strategy including multiple theoretical and clinical perspectives.

Boone focused the journal on publishing articles describing investigative methodologies and appropriate paradigms through which to test various hypotheses. The first issue included 2 papers on CVS models with the hopes of expanding perspectives and reassessing CVS.^{5,9,24}

The objective of the first volume was to include a wide range of methods to clarify and describe models of CVS and increasing public awareness of the benefits of CVS correction and to publish innovative research. Besides the papers on models,^{5-7,9} the first volume included technique papers,^{3,188} research on surface electromyography paraspinal normative data,^{189,190} case reports,¹⁹¹⁻¹⁹³ small research designs,¹⁹⁴⁻¹⁹⁸ a survey report on guidelines,¹¹ and retrospective studies including the Blanks study, which was the largest chiropractic study on quality of life to date.¹⁶²

In the second volume published in 1998, Boone reflected on the papers from 1996 and 1997.¹⁷⁸ He claimed that scientific evidence had accrued indicating positive health benefits after or concomitant with CVS correction. The 3 areas he noted were that health benefits accumulated, improved function was promoted, and physiological and neurological changes occurred.^{11,161,169,189-208} Boone acknowledged that some areas of CVS research were more difficult to study and concluded that the neurological components would take the most effort to elucidate.¹⁷⁷ He established relationships with social scientists, biological scientists, and engineers at the University of California, enlisting several PhDs to explore some of the more elusive phenomena. In 2000, Matthew McCoy, a Life Chiropractic College and Emory graduate, became editor, and in 2011 the journal changed its name to *Annals of Vertebral Subluxation Research*.²⁰⁹⁻²¹¹



Fig 9. Ralph Boone.

Kent’s Models (1996). Christopher Kent graduated from PCC in 1973. He joined the faculty upon graduation, worked in the research department, and was elected president of the faculty senate. He was invited as one of 11 chiropractic researchers to participate in the National Institutes of Health workshop on The Research Status of Spinal Manipulative Therapy in 1975.⁴² After entering private practice in the 1980s, he focused on developing objective measures to monitor nerve interference related to CVS. In 2001, he was elected chair of the United Nations Non-Governmental Organization Health Committee. In 2010, he founded the Foundation for Vertebral Subluxation, of which he is president, with McCoy. In 2016, he was named director of evidence-informed curriculum and practice at Sherman College of Chiropractic (Fig 10).^{212,213}



Fig 10. Christopher Kent.

In 1996, Kent's article "Models of Vertebral Subluxation: A Review" was published in the first issue of the *JVSR*.⁹ The article referenced the histories of Haldeman,²¹⁴ R. J. Watkins,²¹⁵ Terrett,²¹⁶ and Rome and concluded that such an entity must exist.² He defined Stephenson's 4-component model based on B. J. Palmer's work, otherwise known as MOPI or malposition, occlusion of an opening, pressure or impingement, and interference to the transmission of mental impulses.²¹⁷ Kent then described the models of Faye, Dishman, and Lantz.^{34,35,218,219}

Kent explored the major components of CVS by reviewing the basic science and clinical literature on the topic. He started with the joint degeneration model and the neurological consequences. These included cord compression, nerve root compression, local irritation, vertebral artery compromise, and autonomic dysfunction. The other models he reviewed included the nerve root compression model, the dysafferentation model, and the neurodystrophic model. After describing 15 references on the compression model, Kent concluded, "While some may criticize the 'garden hose' model as being overly simplistic, the nerve root compression hypothesis is far from obsolete."⁹ The dysafferentation model proposed by Kent involved the nociceptive and mechanoreceptive structures. The neurodystrophic model, according to Kent, relates directly to tone. It links neural dysfunction to pathogenesis via the intertwined nature of the nervous system, endocrine system, and immune system.⁹

Kent called for an operationalized model that accounted for the many neurobiological models and was broad enough for the many clinical operational models.⁹ Outcomes assessments should be developed for conceptual models, analytic procedures, type of adjustment, and criteria for

success or failure. Based on previous classifications, Kent adopted Dan Murphy's 3 classes of CVS models: segmental models, postural models, and tonal models.⁹

Kent proposed that the methodologies for correcting CVS have a common neurological objective.⁹ Models to demonstrate objective clinical outcomes could be developed for any method as long as they measure evidence for improved "functional integrity of the nervous system, and improvement in general health and quality of life indicators."⁹ He suggested that researchers focus their efforts on practice procedures that are efficient and predictable.

Boone and Dobson's Vertebral Subluxation Model (1996-1997). Ralph Boone and Graham Dobson wrote a 3-part article in the first 3 issues of *JVSR*.⁵⁻⁷ They proposed the vertebral subluxation model (VSM) as a way to integrate all previous models and to research CVS on many levels of complexity. Dobson graduated from PCC in 1971. He was dean of clinical sciences at Sherman College from 1979 to 1982, vice president of the chiropractic program of Southern California College of Chiropractic from 1990 to 1994, and interim president of Southern California College of Chiropractic from 1994 to 1995, and has held various positions at the NZ New Zealand School of Chiropractic SC (now the New Zealand College of Chiropractic) since 1998 (Fig 11).²²⁰ In the late 1990s, Dobson developed his own CVS analysis by integrating methods from Goodheart and Blair, as well as White and Panjabi.²²¹

Boone and Dobson proposed the VSM to integrate the traditional concept of B. J. Palmer's early vertebral subluxation model (EVSM), Faye's VSC, Dishman's chiropractic subluxation complex (CSC), and Lantz's VSC model (VSCM).⁵ The VSM integrated the models from the 1980s with the early model from B. J. Palmer,



Fig 11. Graham Dobson.

along with the literature on outcomes, health-related quality of life, and proposed neurological models of mental impulse (Fig 12).⁵

The papers by Boone and Dobson included quality of life. The articles explored the VSM in 3 parts: physiological and biomechanical,⁵ health and etiology,⁶ and interdisciplinary research methodologies appropriate for testing the VSM.⁷ The articles were in part an answer to Keating's call to put politics and propaganda aside and conduct serious research on CVS.⁷⁰ In the first article, they quote from Keating's 1992 book:

What of subluxation? Will we ever set aside the political uses of these supposed spinal boo-boos long enough to operationally define and investigate their potential role in health and illness? If we were to cease propagandizing subluxation as "the silent killer" and study it as a serious scientific phenomenon, who knows what we might find? Yet, so long as we insist on emphasizing the chiropractic lesion as our political "raison d'être," the real "tragedy of the subluxation" will continue to be our ignorance of it.⁷⁰

Boone and Dobson partially agreed with Keating. An operational definition was essential. They suggested that consensus definitions should arise from specific operational definitions tailored to test each component of CVS, followed by progressive studies, which might then be developed into a functional definition. From there, further

operational definitions could emerge (Fig 13). In response to this quote, they wrote:

The present model is designed to accept this challenge. In doing so, it becomes necessary to develop a functional definition which also encompasses parameters dealing with etiology and health and to include, for scientific investigation, those aspects of the vertebral subluxation which are likely to impact on these phenomena.⁵

Boone and Dobson started by exploring aspects of the early CVS that had evidence and aspects of detection that were repeatable.⁵ They did not accept the early theory outright. Rather, they focused on evidence for the theories associated with the early model, namely B. J. Palmer's 4 components of CVS: misalignment of a vertebra, occlusion of a foramen, pressure on nerves, and interference with mental impulse flow. Included in their functional definition was the fourth component or the organizing information analogous to the mental impulse. Boone and Dobson pointed out that one of the failings of modern definitions is the exclusion of the mental impulse hypothesis.⁵

By expanding research questions, they suggested we might be able to test hypotheses that were previously thought untestable. They noted that it was a mistake to assume that mental impulse was adequately described as the action potential. For example, they suggested that the mental impulse theory, when viewed as a complex hypothesis, might be tested by examining factors that were involved with neurally mediated organizing coordination information.⁵ These might

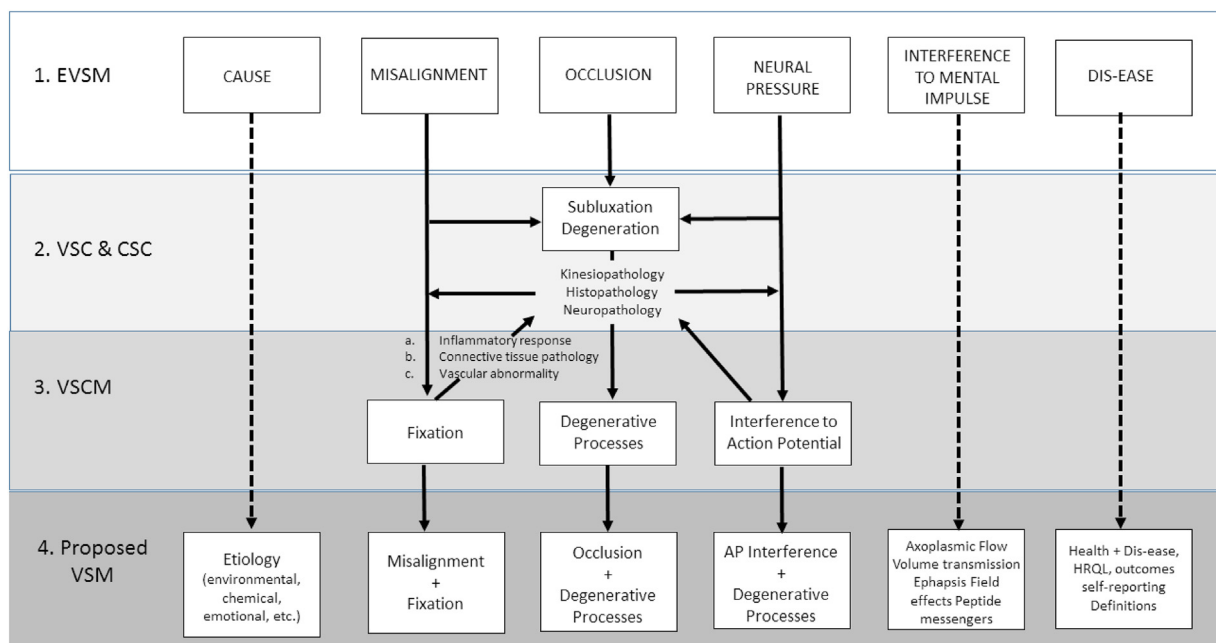


Fig 12. Redrawn from the original, this depicts the VSM as an integration of all of the recent models with the early models.

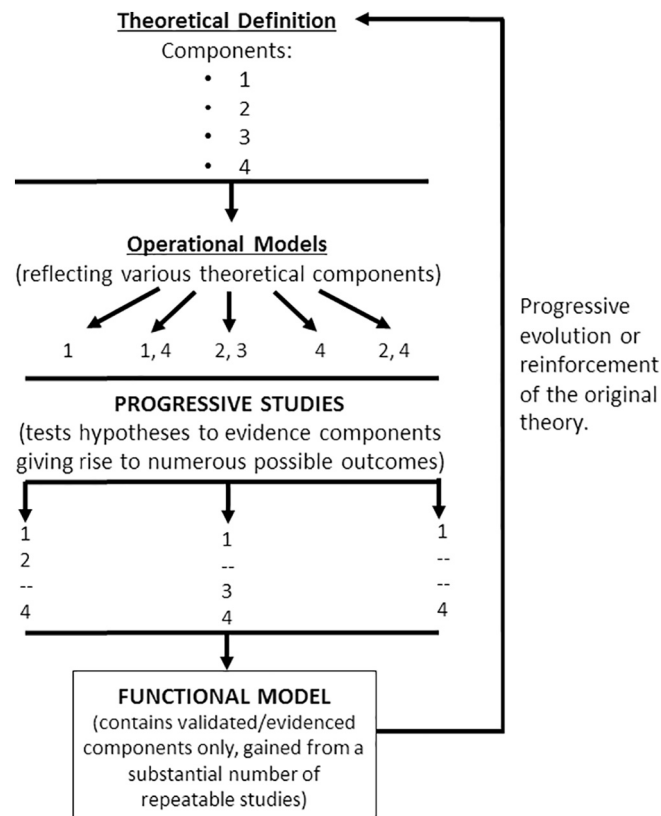


Fig 13. Redrawn from Boone and Dobson's functional model.

include neural transmission outside of the action potential, such as growth factors, ephaptic transmission, axoplasmic transport, the propulsion of energy and information from nerve to nerve such as neurotransmitters, and alternative export of molecules for sliding filaments, bidirectional movements, and antero-grad and retrograde flow.⁵

Boone and Dobson critiqued the recent trend in the profession of redefining the traditional theory without adequate testing and evidence to do so. For example, the mental impulse was equated to action potential by Haldeman and Drum in 1971.²²² Other theorists sought ways to integrate the mental impulse hypothesis. R. J. Watkins addressed this issue and emphasized the importance of the quality of the impulse in 1965; he related it to the neurology of the joint getting detuned, whereas the adjustment retunes the joint neurology.^{30,223} It was also proposed that research into subtle energy systems and energy medicine might be appropriate avenues to pursue research into the mental impulse concept.^{224,225}

Because of the variation in practice, philosophy, and definitions within the profession, Boone and Dobson suggested an encompassing functional definition of CVS, as follows:

A vertebral subluxation is a potentially reversible and/or preventable alteration of the intervertebral relationships

of one or more articulations of the spinal column or its immediate weight bearing components of the axial skeleton; accompanied by a change in the morphology of the tissue occupying the neural canal and/or intervertebral foramina; as well as an alteration of neural function sufficient to interfere with the transmission of organizing information, believed to be homologous to the mental impulse, thus contributing to negative health outcomes.⁵

This functional definition was designed to include many testable tenets and form a basis for several operational definitions.

Critical Analysis

Several important areas of discussion arise from an analysis of a sample of the literature from this period. The main areas to discuss include omissions of literature and lack of critical discourse, historical accuracy, questions about the reliance on reliability studies, and critiques of consensus.

Omissions of Literature and Lack of Critical Discourse From 1996 to 1997. Some papers during this time omitted literature that could have informed the authors and potentially led to different conclusions. Such oversights could have been due to limited distribution of literature, poor searching strategies, a lack of indexing of the source material, dismissivism,²²⁶

intraprofessional politics,²⁷ gatekeeping,²²⁷ or scholastic error. Any of these issues may have occurred in a single paper. Sometimes references may have been omitted for the authors to support perspectives that were personally or politically motivated. McAulay pointed out problems in the chiropractic literature that stem from this dismissivist approach.²²⁶ Villanueva-Russell claimed that some academics were staging a coup by using journals, lexicon cleansing, and evidence-based standards to control the profession's identity.²²⁷ This is related to the medicalization of "regular" chiropractic, mentioned by McAulay in 1995.²²⁸ Dismissivism may include a lack of historical references to support positions.

A few articles important to the dialogue on CVS have not been well cited. It is not clear if this is because the sources were difficult to find, locate, or obtain in search engines. PubMed did not include many chiropractic publications until after 2002. Until that time, the *Journal of Manipulative and Physiological Therapeutics* was the only chiropractic journal included in MEDLINE starting from 1982. Few other indexing systems of the period indexed chiropractic periodicals or else they charged for the use of the service, placing barriers to access the information. Most of these search engines, other than PubMed, required a fee for use. The only search engine that focuses on chiropractic literature, the Index to Chiropractic Literature, was only in print format until 2001, and each issue was released for reference the year after research papers were published. This made it difficult to obtain papers for citation. The Index to Chiropractic Literature was not released in a web-based and open-access format until 2001. For example, Ruch's *Atlas*¹⁵ was cited in only 4 chiropractic journals and 4 nonchiropractic journals, according to Google Scholar.²²⁹⁻²³⁵ Epstein's works are rarely cited in the literature.^{3,168} Kent's 1996 review,⁹ which proposed the dysafferentation approach to CVS, was followed by a paper by Seaman and Winterstein, titled "Dysafferentation: A Novel Term to Describe the Neuropathophysiological Effects of Joint Complex Dysfunction."²³⁶ The article references many of the same sources, such as Bogduk and Korr; however, the 1998 article did not cite Kent's 1996 article.^{9,236}

Keating's and Nelson's articles from this time are well-cited in the literature, but the critiques of their articles are few.^{1,10,114} This paucity could have many reasons, such as apathy, journal bias, gatekeeping, and possibly that the articles are considered well written and well referenced without the need for further critique. However, if 88 percent of the profession seemed happy to keep the term *subluxation*,²³⁷ our profession might have lacked rigorous professional discourse. This was proved further when an article that was dismissive of the historical constructs of CVS⁴⁷ went without critical response publications or letters to the editor.

Not citing existing sources about CVS could weaken arguments for or against it. This is evident in Nelson's

article where he stated his opposition to the profession-wide, 3-year-long, consensus process. He wrote:

The authors have begun the consensus process apparently assuming that agreement exists that there is a particular type of lesion that is the focus of the chiropractic profession. Obviously, some chiropractors believe in the existence of subluxations, but it is equally obvious that many do not.

Nelson provided no references for this contention, including the references about the widespread consensus across 30 years in the profession (through 1997) about subluxation.^{12,92,98-100,215,238-240} His critique was written 5 years after the consensus process was complete, suggesting that this information was available. The consensus included dozens of stakeholders from most schools and organizations.¹²

Missing the Neuropathic Perspective. Speransky's neuropathic theories were integrated into CVS models starting in the 1930s.²⁴¹⁻²⁴⁴ This integration continued into the 1990s by chiropractors who found that the empirical evidence in Speransky's research and theory was congruent with chiropractic's central paradigm.^{142,241,245} Theorists such as B. J. Palmer,¹⁴¹ Watkins,³⁰ Janse,²⁴⁰ Weiant,^{246,247} Verner,¹¹¹ Homewood,⁴⁴ and Harper included Speransky and other Russian neurophysiology in their models.²⁴⁸ By the 1960s, the neuropathic perspective dominated the profession. This approach was explained by R. J. Watkins:

Hence the classic chiropractic definition of a subluxation can be better stated as an "intervertebral subluxation with consequent neuropathy." Since this is definitely not always the case there are the following combinations seen and described:

1. Subluxation—minor muscle imbalance with no consequent neuropathy, (These usually clear quickly and easily—no vasodilation failure.)
2. Subluxation with consequent neuropathy. (Classic chiropractic specialty.)
3. Subluxation as a symptom of a neuropathy. (Local or remote) This type of subluxation as a symptom can initiate further neuropathies to become a complex chain.

Any neuropathy can also exist as a self-perpetuating vicious circle, after the original subluxation has physically disappeared. This emphatically illustrates the critical importance of the time factor. Each patient is the sum total of all prior neurological experience.³⁰

Some of the literature of the late 1990s included a neuropathic approach. Epstein incorporated it into his models and also integrated several other Russian neuropathic perspectives from Kositsky, Ukhtomsky, Luria, and Bernstein.^{134-136,155,249} This neuropathic perspective on the CVS is lacking in much of the recent critical literature.^{47,250-253} This may be in part due to the 1970s

research emphasizing pain disorders related to CVS rather than the pathophysiology associated with neurodystrophic and neuropathic processes.^{42,254-255} Nevertheless, this element of theory should not be ignored and should be included in critical appraisals.

Keating's body of work used little neuropathic literature. Based on his use of references, Keating's descriptions of CVS in his early writings did not include a comprehensive review of chiropractic research literature that was published between 1928 and 1980,^{59,61,256} such as theories about vertebrogenic reflexive pathophysiological processes of CVS theory; Speransky's theory; or works of R. J. Watkins, B. J. Palmer, Verner, Harper, and Weiant. As Keating's publications evolved and he eventually mastered some of the historical literature of chiropractic, he did not alter his initial assumptions.^{47,52,54,257,258} His basic arguments remained the same over the course of 30 years of publishing even though he developed those arguments before having referenced a large portion of CVS theories.^{59,60} Keating stated that he did not know how CVS could be studied non-symptomatically or as an overall neural dysfunction.⁷²

Keating et al critiqued the use of the term *subluxation* in the ACC consensus statement as "dogmatic."⁴⁷ In the paper, the authors mentioned parallels to the Russian school of "nervism" in relation to the altered function attributed to CVS; however, they make this connection to dismiss models from "nineteenth century neurology and physiology."⁴⁷ They do not link that line of thought to chiropractic literature classified as Speranskian subluxation theory, which made reference to 20th century neurophysiology research conducted in Russia.²⁴⁵ Sechenov's school of nervism was carried forward through research by his students Pavlov and Ukhtomsky, and also by other Russian neurophysiologists, most notably Speransky.²⁵⁹

The paper critiqued the ACC paradigm as embracing "subluxation dogma," not delineating a more precise definition of how "neural integrity" is compromised, and not demonstrating the empirical evidence about the clinical meaningfulness of CVS.⁴⁷ Beyond the lack of reference to the neuropathic perspective, the authors offered a limited viewpoint about what validity claims should be considered as adequate for testing hypotheses and lacked references to historical and recent literature. Including a full spectrum of historical references in modern discussions about CVS is important to ensure arguments are balanced and well cited. This could lead to more complete viewpoints and ideally to testable hypotheses that could be further studied.

Historical Inaccuracies in the Literature. Several of the articles in the literature cited during this time period contain historical inaccuracies. Some historical errors may have been due to barriers to accessing information, which left authors to make conclusions with missing information. Modern technology, such as powerful computer search engines, has allowed for historical facts to emerge from newspaper and archived databases. It is not too late to add

updates to the literature by filling in gaps with historical facts.

Keating and Mootz proposed that chiropractors in the 1930s and 1940s were afraid to publicly criticize their own cherished ideas, which they argued led to a lack of reputable research on CVS.⁶⁶ The examples given were that chiropractors used the statement "chiropractic works" to prove efficacy and that chiropractors only researched the "how and why" but not effectiveness.⁶⁶ They referred to this as part of the insidious dogma. They proposed that chiropractors felt "That chiropractic is a science *because* it is rational (ie, consistent with basic science), that the validity of chiropractic theory is determined by its plausibility, and that the clinical value of the chiropractic healing art can be judged on the basis of private (unpublished) uncontrolled observations."⁶⁶ The same argument was used by Keating in other articles but these have yet to be critiqued in the literature.^{59,61,65,67,70,260-262}

Although it may be true that D. D. Palmer wrote that chiropractic "makes a rational claim upon the afflicted,"²⁶³ chiropractors did not only develop unpublished private models nor did they all suggest that chiropractic was valid only because it was congruent with science and rationale. Verner said it was both; he writes, "Chiropractic is truly scientific and truly rational."¹¹¹ Chiropractors held conferences from the 1920s to the 1960s; tested hypotheses; established labs; published their thoughts on every element of chiropractic in both self-published texts and professional journals and magazines; and developed dozens of theoretical, analytic, diagnostic, and corrective methodologies. Keating and Mootz's statement has some merit, but perhaps it should not be used to characterize all of the history of CVS research in chiropractic.

In a similar critique, Nelson attributed CVS theory from the early years of the profession, especially the bone-out-of-place model, to D. D. Palmer.¹ As Keating noted, this was not D. D. Palmer's definition; rather, Palmer emphasized the subluxated joint impinging on a nerve.⁷¹ Thus, Nelson's conclusion that modern CVS theory should be abandoned if it does not link to D. D. Palmer's theory may be based on a mistaken interpretation of Palmer's original theory.

How historical facts are interpreted or presented may influence later publications. An example from the 1996-1997 literature is Keating's quote of D. D. Palmer about relieving human suffering and how, according to Keating's interpretation, this could imply that D. D. Palmer included other methods within chiropractic.⁷² In writing about this topic in his 1992 paper,⁷² Keating quoted and cited from a secondary source, which was page 272 of Rehm's *Necrology*.²⁶⁴ As did Rehm, Keating used the first part of the passage written by D. D. Palmer. Keating wrote about D. D.:

His Port Perry, Ontario monument quotes him as saying: 'I never considered it beneath my dignity to

do anything to relieve human suffering' (16, p. 272). Additionally, the founder of chiropractic probably continued in some of the clinical procedures involved in his magnetic healing days (ie, pre-1895)...⁷²

The original writing by Palmer was on page 322 of his tome in a chapter about adjusting for corns and bunions. D. D. Palmer wrote, "I never felt it beneath my dignity to do anything to relieve human suffering. The relief given bunions and corns by adjusting is proof positive that subluxated joints do cause disease."¹¹³

When Keating first used the quote in 1992,⁷² perhaps he was unaware of the full statement by D. D. Palmer. Rehm was referring to what was etched into a monument in Ontario, Canada that was dedicated to D. D. Palmer in Ontario.²⁶⁴ Use of a partial quote placed it out of context.

Misuse of this quote had apparently been a contentious issue for decades. Even as far back as 1957, B. J. Palmer pointed out this matter. He wrote:

Frequently, we find FIRST sentence ONLY, quoted, which, by itself, makes it appear that D.D. Palmer believed in and practiced "Anything to relieve human suffering," such as air, light, heat, water, diet, exercise, vitamins, food supplements, physiotherapy, naturopathy, colonic irrigations, massage, ad infinitum, ad nauseum. The motive of quoting ONE sentence, **apart from** its text, pretext and context, it to think others justify things THEY do by what D.D. Palmer did NOT believe in and DID NOT do.²⁶⁵

Keating quoted from page 322 of Palmer's original text the entire paragraph in a later publication.²⁶⁶ However, to the best of this author's knowledge, Keating never wrote about Palmer's "felt it below my dignity" comment in its full context.⁷² Even though Keating used the full quote in a later paper, he never corrected the literature or pointed out how the partial use of the quote led to inaccuracies in the literature.

In some literature, D. D. Palmer stated that he did not include other methods with chiropractic. For example, in a letter to B. J. in 1902, D. D. Palmer explained how his older methods actually would "undo" his chiropractic adjustment. He wrote:

I have no use for those books on "Nature Cure," as I have been over the whole field and have outgrown them. It is a positive fact that after we Chiropractics have done the right thing, that we should not undo what we have done. I.e. for e.g. Mama has me to treat her Chiro. Then I must treat her Magnetic and undo what I have done. By Chiro. I free the nerves

and set them in action, by magnetic I soothe them and quiet them, give them ease.²⁶⁷

Documents from D. D. Palmer's earliest days as a magnetic healer from 1886 until his death in 1913 are available.^{148,268-274} In the documents cited, Palmer did not indicate that chiropractic was anything more than adjusting the articulations to relieve nerve impingement to aid human suffering. Palmer stated that chiropractic was distinct from all methods he had previously studied.^{113,267}

Interpretations such as Keating's may have led to a misunderstanding of D. D. Palmer's paradigm, especially when Keating helped to shape historical interpretations of D. D. Palmer.⁷¹ This has the potential to fuel the intraprofessional debates with information that may not be accurate.

In any literature there will be myriad interpretations of material and a continued need to update historical research. Some final points to consider are presented here. Papers by Kent, Boone, and Dobson lack reference to Faye's earliest edition of his manual from 1980.^{5,9,275} Faye originated the VSC.¹¹⁴ Kent referred to Faye's 1983 edition and assumed that Flesia's 1982 description of the model predated Faye.⁹ Also, Boone and Dobson acknowledged that they were not able to trace the origins of VSC and thus relied on Flesia.⁵

Relying on Reliability Studies. Keating advocated for validity studies as a standard that the profession should focus on regarding examination procedures, particularly those for CVS.¹⁰ In his earlier writings, Keating emphasized the value of other types of research, from case studies to other designs.^{59,70,276} His call for validity studies seemed to resonate with the profession. However, his references from these early years point to interexaminer reliability studies about low back pain, not to CVS correction.

In at least 3 of his writings, Keating referenced some reliability studies and time series studies from the 1980s to support his argument that CVS detection was not well researched.^{56,58,103} He shared this perspective with the profession through the literature. For example, in 1988, Keating referred to 3 interexaminer reliability studies from the 1980s when he wrote, "We are not yet able to relate the palpable and manipulable lesion to subluxation theory, in part because we do not yet agree on how to find these spinal boo-boos. The black box of the clinical subluxation has yet to be located, let alone pried open."²⁵⁶ This conclusion was based on reliability studies that showed researchers could reproduce their own findings but not one another's findings. This shaped Keating's perspective on CVS research. He continued:

It may be that we find so little agreement among examiners in many reliability studies of subluxation-detection because subluxation is not a meaningful clinical entity. Perhaps the greatest value of subluxation theory may be to have encouraged chiropractors to probe for them, and therefore to adjust/manipulate. In this context the success of chiroprac-

tic palpators in reproducing their own examination findings and occasional agreement among doctors might be seen as sources of superstitious reinforcement for an erroneous theory of adjustment.²⁵⁶

Keating acknowledged in his 1992 book⁷⁰ that inter-examiner studies were an important place to start even though validity studies are more important. He repeated much of the arguments from that book in his 1996 paper.¹⁰ The limited references do not fully support the assertions Keating made in his paper.¹⁰ There were not enough historical references on chiropractic's history of CVS research and theory to support such broad assertions.

For example, the references in the introduction to Keating's article related to low back pain research.¹⁰ Most references in the body of the paper pointed to reliability studies.¹⁰³⁻¹⁰⁸ Based on these references, Keating claimed there was no hard evidence for the validity of an operational definition for CVS.¹⁰ He claimed that chiropractic researchers had not established a relationship between CVS and health problems and that "the validity of the chiropractor's 'subluxation complex' has not been studied by chiropractors or anyone else."¹⁰ Keating stated that there was no standard to compare detection methodologies. In 2001, he continued this perspective when he stated that CVS as a reliably detectable and clinically meaningful phenomenon was untested.²⁶¹

Reliability studies of the future might model the recent studies that emphasize the training and self-review of the examiners.^{65,260} Such studies may point the way to a new era in reliability research and raise the standard through which to assess the adequacy of previous studies.^{277,278}

These new studies may offer an opportunity to redo the research upon which Keating based his original claims. Such studies could be undertaken with new methodology, which was developed by Holt et al²⁷⁷⁻²⁷⁹ and Cooperstein, et al.^{280,281} Cooperstein et al wrote:

It may be possible to repeat many other inter-examiner reliability studies, including studies of examination procedures other than motion palpation (thermography, x-ray line marking, etc.) with similar design modifications that may more meaningfully assess examiner agreement than the mostly discrete analysis that has been used up until now.²⁸⁰

Research and Critiques of Consensus Definitions. Calls during this period for more adequate and comprehensive operational definitions started with Keating and continued through Nelson, Kent, Boone, and Dobson.^{1,5-7,9,70} Various types of studies were proposed, including well-organized case reports, reliability studies, and other research designs. One common theme from this period was that consensus definitions were not valuable for research purposes and that operational and functional definitions were needed.^{1,5,10} Perspectives on this vary. Boone and Dobson agreed with

Keating that operational definitions should replace consensus definitions.^{5,10} However, they felt investigations should start with functional definitions and then lead to more specific operational definitions to be tested. Consensus definitions should then arise from the research.⁵ Kent suggested different operational definitions based on different models and methodologies.⁹ Nelson critiqued the process of consensus in general, especially the process that led to Gatterman's text and the ACC paradigm, while also calling for proposing and testing various hypotheses.^{1,4,36}

Many types of perspectives could be used to study the myriad ways CVS may influence individuals. Boone and Dobson's expanded VSM included research proposals that encompass many avenues of health-related quality of life in relation to CVS.⁵⁻⁷ In 1999, I proposed integration of the VSM and systems science with a somatobiological and psychospiritual view of health.¹⁶⁰ The intent was to capture the emergent psychospiritual aspects of health-related quality of life expression traditionally associated with chiropractic and the adjustment of CVS.¹⁶⁰

Limitations

This article reflects one person's interpretation of historical writings and theories. This paper covers concepts and events that are modern enough that they can be reviewed from the perspective of current events, which leaves the historical interpretation open to bias by current perspective. A lack of clear inclusion and exclusion criteria for the material covered in this paper is a limitation that must be noted, as it influences the content, interpretations, and conclusions of the paper. Others may include additional literature or have other opinions that may potentially lead to different conclusions.

CONCLUSION

This brief period demonstrated that there were perspectives on CVS from streams of discourse in chiropractic's history of ideas. Rather than focus on limited sets of ideas organized around a handful of practitioners, researchers, or scholars, future developers of the profession could draw upon the spectrum of chiropractic's complex history. The challenge is to integrate the best from all historical and modern ideas with the rigors of science and the tools of philosophy.

The peak of chiropractic scholarship during this era rested upon prior research and theory. An accurate history of ideas could be used as a critical tool to evaluate the veracity of arguments set in their historical context. No models or theories appeared in a vacuum. Being informed by the history of ideas is a powerful method that we can use to evolve as a profession. In researching the CVS, we should consider exploring plausible hypotheses put forward from chiropractic history.

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Practical Applications

- This series of articles provides an interpretation of the history and development of chiropractic vertebral subluxation theories.
- This series aims to assist modern chiropractors in interpreting the literature and developing new research plans.

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