

A Critical Analysis of the Reality Distortion of Chiropractic Among Scientists with Constructive Criticism of the Current Debate

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Abstract

Objective: To contribute to matters raised in debate proposing a division of conventional chiropractic. We examine these matters in the context of the history of the profession and contemporary debate.

Methods: Document analysis within the methods of historical narrative was applied to arguments identified in a contemporary debate to derive and then present evidence to inform the debate.

Results: Our analysis reveals reality distortion of chiropractic among scientists from the associated disciplines of biomechanics and rehabilitation therapies. We locate this distortion as sitting within the 'European School' of chiropractic. No evidence is found to support the proposition that chiropractic is 'an unhappy

family' and headed for divorce and evidence refutes the proposition to divide Traditional chiropractic.

Conclusions: We conclude that the debate initiated by the European School of chiropractic is confused, presenting an allegorical allusion with no argument and no evidential support. It demonstrates a low level of scholarship and as such may have the intent of virtue-signaling where evidence-free opinion may be expressed without the responsibility of justification.

Keywords: *chiropractic; manipulation; subluxation; adjustment; scientific debate; tone; conservative; traditional health care.*

Introduction

Chiropractic science comprises several intellectual strands. A long tradition is evident of an association between subluxed vertebra and the nervous system. Within chiropractic's first decade a second strand emerged and persists, a strand that accepts therapies beyond a 'hand only, spine only' model. There are also strands woven through the matters of cause and effect, with one insisting that the only relationship between subluxed vertebra and the patient is range of motion (ROM) and pain, and another insisting that the relationship is far more complex and extends to matters of health and well-

being. And of course there are deviant, minor strains which at one extreme argue there is no such thing as subluxed vertebrae and no effects other than the modulation of pain through the primitive gating theory evidenced by improvement documented on various outcomes instruments, and at the other that subluxation is the sole cause of disease. Neither extreme is acceptable to us.

The centrality of subluxation to current debate is evident in argument by Leboeuf-Yde et al (LY).¹ They are largely

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scientists of the European school focused on biomechanics and rehabilitation. We make this observation on information derived from the academic field of each as given in their University profiles.²⁻⁶ Two have been acknowledged for their research contributions^{7,8} and another is the Chair of the Research Council⁹ of the World Federation of Chiropractic (WFC).

We consider each an authority in their field and to critically analyse their expressed views¹ we apply Document Analysis to artifacts found in print and electronic media using the methods of Historical Narrative. We will show their position misrepresents the inherent nature of the discipline they condemn to division.

Methods

The methods of the Historical Narrative were applied in the manner of Tosh¹⁰ with the understanding of Ankersmit¹¹ “*historical debate is a semantic quarrel not about the exact meaning of words, but about the past. Everything hinges on how to grasp this idea of ‘aboutness’*”. While ‘aboutness’ is important, both syntax and semantics have significance in forensic decision-making especially in a clinical field where proxemics, semiotics and semiology are important to practice wisdom. The authors understand omission may occur unintentionally or through not identifying artifacts and we welcome communication that may add to the record reported in this paper.

All historical artifacts underwent on-going validation. Bucheli and Wadhvani¹² describe this three part process:

1. Source criticism to identify possible biases and judge the extent to which a source can be trusted to address the research question;
2. A process of triangulation which compares the found data with other data relevant to the particular topic; and
3. Hermeneutics, the process of interpreting the information.

Hockett’s¹³ technique of internal and external criticism was utilised to weave a narrative among the found artifacts and each was tested with Garraghan’s¹⁴ six questions:

1. When was the source, written or unwritten, produced (date)?
2. Where was it produced (localisation)?
3. By whom was it produced (authorship)?
4. From what pre-existing material was it produced (analysis)?
5. In what original form was it produced (integrity)?
6. What is the evidential value of its contents (credibility)?

The value of this method of understanding chiropractic is its ability to find understanding beyond interpretation of quantitative data.

Results

Our analysis reveals reality distortion of chiropractic among scientists from the associated disciplines of biomechanics and rehabilitation therapies. We locate this distortion as sitting within the ‘European School’ of chiropractic derived from Henri Gillet^{15,16} and Fred Illi¹⁷ who in the 1950s researched the biomechanics of subluxation. For the purpose of our paper it is important to note this early work was focused on understanding subluxation.¹⁸

We reject LY’s characterisation of chiropractic as two groups of practitioners, as being argument akin to that of scientists whose fields of endeavour include astronomy and astrophysics and who argue points of view about black holes.¹⁹ Many things are thought to be seen but establishing them as a phenomenon is another matter.²⁰ Some see subluxation as chiropractic’s metaphorical ‘black hole’, we do not.

We reject LY’s arguments as flawed in both logic and argument on this occasion. First our discussion will establish the characteristics of (i) Conservative chiropractic and test their notion of ‘traditional chiropractic’, a key element of LY’s argument when we show it cannot be. We then address (ii) false argument, and (iii) replication in science. We will also discuss the matter of subluxation.

We shall be concise with our language as we reject LY’s lexicon cleansing. They attempt to re-cast Evidence-Based Chiropractic as “*evidence-friendly*”, a novel term and in their argument distinct from “*Traditional Chiropractic*”. Villanueva-Russell spoke of ‘lexicon cleansing’ in her 2011 discussion of identity and cultural authority within the profession of chiropractic,²¹ having first raised evidence-based medicine as an emerging issue in chiropractic in 2005.²²

We hold the view there is an imperative for lexicon cleansing of research in the discipline of chiropractic for the purpose of erasing nebulous terms such as ‘manipulation’ and ‘spinal lesion’ and replacing them with the discipline-specific term ‘subluxation’, the description of which can be precise to strengthen research by allowing replication. We show those meanings and conclude the evidence does not support LY’s proposition that Conventional chiropractic and subluxation differs from ‘evidence-friendly’ chiropractors, their putative ‘traditional’ chiropractors.

Discussion

Conservative Chiropractic

LY recast Conservative chiropractic as ‘traditional’ and fail to describe what they mean apart from being an amorphous ‘middle ground’. The literature does not provide a definition nor does it seem to consider there is a ‘traditional’ strand of chiropractic, situating the entire discipline as a Traditional form of health care. Chiropractic is classified conservative care²³⁻²⁵ within Traditional Health.²⁶

Lawyer Chapman-Smith²⁷ considers chiropractic as one of “*traditional or complementary health care services [that] have a growing and significant role in both developed and developing countries*”. The Philippine Institute of Traditional

and Alternative Health Care (PITAHC)²⁶ formally recognise and regulate chiropractic as among clinical disciplines distinct from medical fields.

Chiropractic expresses “many traditional characteristics” of the biopsychosocial model of health care²⁸ and adopts selected traditional healing approaches²⁹ yet remains a singular, conservative method for the clinical management of health and well-being.

We consider Conservative Chiropractic to be that strand of thought, practice and evidence established by DD and understood within the context of his numerous publications up to 1914. McDowall et al³⁰ distinguish that DD founded chiropractic on tone and their work is placing greater value on tone in societal health.

We see *Conservative Chiropractic* as the vast majority of the profession, that indistinct ‘middle-group’ of LY. We show below that conservative chiropractors are not adhering to dogma, a recurrent theme of argument for division of the discipline.^{31,32}

Perspectives of Conservative Chiropractic

Most chiropractors in the UK see their role as being a primary contact health care provider³³ and wellness strategies seem common in Canadian practice.³⁴ Stainsby et al³⁴ applied the terms ‘mixer’ and ‘straight’ in their analysis of a survey of 41 Canadian chiropractors. They used cluster analysis associating ‘mixer’ with ‘broad-scope’ and a “scientific or research-based focus”, and ‘straight’ with a narrow-scope of “subluxation” and “innate intelligence”. The term ‘mixer’ was applied by DD to describe those who did not teach according to his views and it is fallacious to assign ‘subluxation’ and ‘innate intelligence’ to this.

Stainsby et al³⁴ state “both mixer and straight chiropractors used wellness management strategies focused on exercises in both acute and chronic cases” and “both groups focused on diet and the role of calcium in a patient with borderline osteoporosis”. These are the behaviours of conservative chiropractors and we consider use of the categories ‘mixer’ and ‘straight’ as political confection with no place in science.

All Danish chiropractors are reported³⁵ to regard Maintenance Care (MC) primarily as a means of providing secondary or tertiary care to patients with a history of recurrence. Myburgh et al do not distinguish by scope of practice. Maintenance has long been considered characteristic of conservative chiropractic management.³⁶

Swiss chiropractors are described³⁷ as being “strong referral-based” with the most common category of patient being “acute followed by the subacute patient”. Humphries et al made the point that even being legally and socially situated within medicine, they retain their professional identity and focus of practice. Interdisciplinary referral and management is characteristic of conservative chiropractic.³⁸

In 2009 Saltys³⁹ reported chiropractic in Portugal is “pro-subluxation” and an advancement of that country’s traditional manual approach of *endereita*, meaning ‘straighten.’ There is

no evidence that chiropractic in Portugal is not conservative.

In Australia Brown et al⁴⁰ surveyed 757 members of the public and found “the vast majority of these consumers are satisfied with the service provided”, echoing the findings of Jamison.⁴¹ We note of the 146 patients studied by Jamison one in three believed the chiropractic adjustment was entirely responsible for the beneficial outcome of their care and 85% felt the adjustment accounted for more than half of their clinical benefit. This evidence establishes a patient’s own well-being as paramount to them. Further evidence⁴² shows chiropractic in Australia is largely conservative in this regard and while this once may have reflected WFC values⁴³ it is not known whether the WFC remains conservative in its representation of chiropractic.

We each hold the student as the focus of our education behaviours and will let them have the final word on this matter. Banzai et al⁴⁴ report a pilot survey of students and found a relatively positive attitude toward EBP. Glied et al⁴⁵ surveyed 1,247 students globally and found “Most respondents agreed (34.8%) or strongly agreed (52.2%) that it is important for chiropractors to be educated in evidence-based practice. A majority agreed (35.6%) or strongly agreed (25.8%) the emphasis of chiropractic intervention is to eliminate vertebral subluxations/vertebral subluxation complexes. A large number of respondents (55.2%) were not in favor of expanding the scope of the chiropractic profession to include prescribing medications with appropriate advanced training. Most respondents estimated that chiropractors should be considered mainstream health care practitioners (69.1%). Several respondents (46.8%) think that chiropractic research should focus on the physiological mechanisms of chiropractic adjustments”.

Australian and New Zealand students (n=347) were surveyed by de Luca et al⁴⁶ who reported that, “for identity, most students (51.3%) hold strongly to the traditional chiropractic theory but also agree (94.5%) it is important that chiropractors are educated in evidence-based practice. The main predictor of student viewpoints was a student’s chiropractic institution. Chiropractic institution explained over 50% of the variance around student opinions about role/scope of practice and approximately 25% for identity and future practice”.

The evidence characterises LY’s ‘traditional Chiropractic’ as an evidence-based biopsychosocial model of health care with the intent of maintaining whole-body well-being by the adjustment of subluxation to restore the neurophysiological mechanisms which maintain optimal function for an individual.

We reject the term ‘traditional’ as the evidence we report characterises the greater majority as conforming with DD’s original intellectual strand. In this sense chiropractic is conventional and to say ‘traditional chiropractic’ is tautology. When needed, the appropriate descriptor is ‘conventional’.

We also consider LY’s debate flawed on the basis that its categories of ‘mixer’ and ‘broad-scope’ are created without evidence to support either. Further, the dichotomy is simplistic and false in that it implies a ‘mixer’ is not ‘scientific or research-based’, neither of which are supported by evidence. It also implies the scope of practice of what they call a ‘straight’

chiropractor is 'narrow' and the evidence shows this not to be true.

We now address the matters of false argument and replication,

False Argument

Scholarship has no place for false argument yet LY argue that the profession of chiropractic represents a marriage. They then use marital breakdown as an analogy to posit that "*many reasons for disharmony within the chiropractic profession are, in fact, irreconcilable*".¹ We consider this argument to be false.

For marriage to be an analogy it requires the discipline to be a union of two, an idea not sustained by evidence.

There is no doubt it was DD who advanced in the mid 1890s a long-held medical idea of using a targeted force to provide a mechanical input with therapeutic intent on a patient at some specific place in or about their spine. Palmer commenced practice as a healer⁴⁷ in 1886⁴⁸ and his clinical idea in 1895 was to treat "*displaced vertebrae by using the spinous and transverse processes as levers wherewith to rack subluxated vertebrae into normal position*".⁴⁹ This can be accepted as factual on the basis the primary and secondary sources have tertiary validation by Palmer-historian Foley.⁵⁰ Palmer's healing practice was named in the Spring or Summer of 1896⁵¹ as 'chiropractic' by Rev. Samuel Weed,⁵² a patient along with his wife and daughter of DD.

The evidence establishes chiropractic as a singular discipline, the history of which shows a number of intellectual strands but never a union of chiropractic as a discipline with another. Over time various professional chiropractic associations have been established, risen then fallen to amalgamation, an example of which occurred in Australia in the late 1980s. Australian professional associations were united by the political imperative to address the then political climate. Both associations existed within a singular, established discipline for which legislation was being presented to parliament. This union cannot be argued as a marriage of disciplines.

Peters⁵³ reported a reason for amalgamation with his analysis of the development of chiropractic in Australia by identifying two competency strands. The strand he termed 'mainstream' consisted of chiropractors who arrived in Australia following training in the United States, mainly with Palmer College, and graduating as a DC. Bolton, also an historian, twice explored the concept of 'mainstream'^{54,55} These chiropractors were the main intellectual strand of the profession and established their Australian association in 1938.⁵⁶ Those trained locally, largely in part-time short programs as naturopaths and osteopaths and later, when chiropractic legislation was on the horizon, as chiropractors, were a second strand or stream organised from "*1959 when Frederick George Roberts founded the Chiropractic and Osteopathic College of Australasia*".⁵⁷

The unification of 1988 was among immediate family members, the older 'mainstream' group as the Australian Chiropractic Association, with the younger United

Chiropractors Association of Australia. Were we to lower our standard to apply an analogy of marriage then in contemporary parlance this was a same-sex marriage. If indeed we allow such a cheap analogy it would be described in the Australian context as '*one from the city and one from the bush*'. It is a matter of record that a few 'bushies' broke away soon after the merger to form the Chiropractic and Osteopathic College of Australasia which continues today as *Chiropractic Australia*.⁵⁷

Osteopathy is a distinct discipline with its own science and it is not within our expertise to do other than note elements of osteopathic teachings were introduced into early chiropractic education and that osteopathic-specific strands remain evident today.⁵⁰ This 'mixer' strand was introduced by Palmer's third graduate, Oakley Smith, who followed his own interest in science, particularly anatomy, and introduced those along with thoughts from other disciplines including osteopathy, into the education program he founded in 1903⁵⁸ nearby Palmer's college. Osteopathy was considered by DD as a "*cousin*" discipline,⁵⁹ not a suitor.

Scientists and educators from each discipline mingle freely. Indeed, the Head⁶⁰ of the osteopathic program with Southern Cross University is qualified as a DC and a DO and is an active scientist.⁶¹ The Head of the chiropractic program⁶² at Macquarie University is also qualified as a chiropractor and an osteopath and holds a doctorate in Anatomy.

In spite of chiropractic never being a marriage of disciplines Kawchuk, a co-author with LY, defends on social media⁶³ the purpose of 'the divorce concept' being to make "*the middle group of DCs realize unity is futile*".

We consider social media to be devoid of scholarship while acknowledging academic sites such as Researchgate⁶⁴ and Academia⁶⁵ may be appropriate for scholarly interaction. Our concern is its encouragement of trolls to make ignorant comment in matters of science. One such post fudges a distinction between a 'TOR' and a 'TIC',⁶⁶ the imputation of which escapes us. Another suggests to "*drown out the noise by clearly and professionally articulating what it is that we do*",⁶⁷ a comment that neither articulates a point of view nor demonstrates professionalism.

A few other posts demonstrate bias which would be a matter of concern were they given in the peer-reviewed literature,⁶⁸ also distorted reasoning⁶⁹ and gross categorisations.⁷⁰ Offensive behaviours are characterised by 'Reasonable Hank', a small town lawyer who traduces all things chiropractic⁷¹ at every opportunity. Equally offensive and indeed embarrassing are reports⁷² of an academic expressing ignorance as political statements regarding those who understand subluxation.

Not only does the evidence show it is not true to use an analogy of marriage and divorce to describe chiropractic, the defence of it on social media is tawdry.

Replication in Science

The more proscribed a clinical method the more replicable it is to allow further inquiry.⁷³ Scientists appreciate the critical importance of being able to replicate results and a current 'crisis of replication' is acknowledged in the sciences of public

health.⁷⁴ Chiropractic scientists should not contribute to this crisis, in particular because replication is paramount with investigations of clinical methods, broadly called ‘technique’ in chiropractic.

The least defensible manual ‘technique’ is manipulation, often masked as ‘diversified technique’, a generic catch-all term that results in clinical acts difficult to document and thus replicate, therefore having little value to inform further research. We see this in a report by Haas et al.⁷⁵ Examples of techniques that are replicable on the basis of their documentation and specificity are Gonstead Methods,^{76,77} Atlas Orthogonal Technique,⁷⁸ and Activator Methods,⁷⁹ to name three.

Whichever technique is used in clinical research must be supported by an evidence base, be fully described to allow replication, and be reported with both the intent of its selection and its clinical outcomes. The term within chiropractic that allows these is ‘adjustment’ with descriptors such as Gonstead, Atlas Orthogonal, or Activator, and so on. The term ‘adjustment’ is a hallmark of Conservative chiropractic.

The matter of Subluxation

LY characterise a ‘traditional’ group of chiropractors as being those who subscribe to “*concepts such as ‘subluxation’ and the spine as the centre of good health*”, thus acknowledging an association between subluxation and health. They refer to a group who focus on “*musculoskeletal problems based on a contemporary and evidence-based paradigm*” as a distinct ‘evidence-friendly’ group. Both positions are refuted by evidence.

The Medical view of Subluxation

Subluxation is well established to have been first described in medicine, and consistently over a considerable period of time. We will not repeat the thorough overview of Pettman⁸⁰ nor Rome’s comprehensive analyses of the medical evidence for subluxation⁸¹ and its near 600 variants.^{82,83}

Some ascribe medicine’s first use of the term subluxation to Harrison, a British physician who earned his PhD at Edinburgh University’s medical school however the definitive overview of subluxation in the chiropractic context is reported by Kent as *Models of Subluxation*.⁸⁴ Harrison was a thwarted advocate for medical reform⁸⁵ with his clinical focus on disorders of the spine.

Respected writers⁸⁶ cite the surname ‘Hironymus’ and ‘his’ thesis. However Terrett is correct⁸⁷ to cite the scholar as ‘Hieronymi’ but does not state whether this is taken from an English translation. Bovine⁸⁸ writes broadly and knowledgeably on the matter of the early use of subluxation. It is correct that one early use of subluxation in medicine is found in the thesis of Hieronymi,⁸⁹ a copy of which is held by the authors and in process of translation from its original 18th Century Latin.

The 31-page thesis of Iohannes Henricus Hieronymi was awarded ‘Most Learned Medical doctor’ on 21 December

1746 following examination by four independent academics and a chairperson. The authority is John Henry Jerome, President Jena University. The thesis title in English is “*Dissertation On Dislocations & Partial Dislocations*”.

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A discussion on the characteristics of subluxation commences as Section 15 on page 12:

Subluxation is recognized:

- 1) from diminished or difficult movement, or otherwise destroyed movement.*
- 2) from the slight change in placement and form [of the joints]*
- 3) from occasionally increased length [of the joints]*
- 4) from, for the most part, milder pain than in the case of dislocation, which nevertheless is not very clear evidence, if you have not taken out the following [evidence].⁹⁰ Therefore they ought to be considered.*
- 5) a vexed gait of motion, and*
- 6) by the nature of the joint. For instance, less force is more likely to produce a partial dislocation than a dislocation, and the jointed structures of the bones of the elbow are arranged so with the shoulder as with the wrist, and moreover the bones of the wrist and metacarpus, the knee, the bones of the tarsus and metatarsus—these are disposed towards partial dislocations more than true dislocations on account of their wide surfaces, or in reality more flat, and on account of having many tough ligaments. That is to say, the bones, whose surfaces are broad and less circular, indeed easily yield to the first inflammation, but are not able to be moved to a large space, unless the inflammation would become too large and rend the ligaments, because the adjoining bones, which at the same time ought to be moved, they weaken the inflammation little by yielding, indeed those adjoining bones increase their resistance.*

Hieronymi, a medical physician with an earned PhD is clearly describing what chiropractors also term subluxation. The Latin title of his thesis includes the word ‘*subluxationibus*’.

Examples where subluxation today is in active use by scientists are found in the discipline of rheumatology^{91,92} where its neurological manifestations are well documented. Others⁹³ report effects of treating ‘segmental dysfunction’, which they note is called “*subluxation by some chiropractors*”, as “*increased muscle strength and corticospinal excitability to ankle plantar flexor muscles*”.

Within chiropractic subluxation has long been understood and explained in the education context outside the immediate realm of DD.^{94,95} Carver reported its symptoms are “*many and varied*” and we note he was twice removed from DD, being a student of Charles Ray Parker who was a direct student of DD.⁹⁶ Most of the major texts referred to below are by leading college-based academics.

These facts should be known by those scientists offering comment on subluxation, especially given subluxation is central to the identity of chiropractic.⁹⁷ A recent narrative literature review by Russell⁹⁸ of subluxation raises the entry

level for all who wish to contribute in an informed manner as the focus of research swings towards ‘closing the gap’ in clinical evidence.

We place high value on scientific inquiry into manifestations of subluxation within any clinical discipline and on exploration of its multiple reported phenomena.

The chiropractic view of subluxation

LY et al distinguish ‘traditional’ chiropractic from what they call ‘the middle ground’ on the basis of beliefs about subluxation. To imply that ‘belief in subluxation’ is divisive in the profession is to resort to *argumentum ad terrorem*, opinion designed to induce fear of alternate consequences when such consequences lack an evidential basis.

Subluxation was first used in a chiropractic context by Oakley Smith in 1902,⁹⁹ creating a new intellectual strand perpetuated today by LY in that Smith’s technique lacked the finesse of DD’s, for example the use of a rack to stretch the spine, and of other devices [*ibid* pp 281-94]. Poor scholarship assigns the introduction to chiropractic of subluxation to DD, usually leading to subluxation being inately termed ‘Palmer dogma’,¹⁰⁰ an error that demeans those make it.

There is evidence DD first used the term ‘subluxation’ a year after Smith, in July 1903, when presenting lectures at his Santa Barbara Chiropractic School.¹⁰¹ Prior to this he spoke of ‘luxations.’ In late 1903 Burch, a lecturer at Smith’s *American School of Chiropractic and Nature Cure* used the term ‘sub-luxation’ in the first issue of Langworthy’s magazine called *Backbone*.¹⁰² DD’s son, Bartlett Palmer (BJ) first applied the term ‘subluxation’ in the magazine he managed, *The Chiropractor* in 1905.¹⁰³ This seems to be the first time Palmers dropped the hyphen. Smith et al in 1906⁶¹ advanced a significant role for ligaments in subluxation.¹⁰⁴

Smith was subluxation centred and undertook extensive anatomical investigation of the IVF and developed *The Situmounter* to study vertebral subluxation. Faulkner suggests Smith’s 1919 monograph is chiropractic’s first formal research publication and provides details of Smith’s textbooks (1906, 1932, 1966).⁹¹ As the third graduate of DD’s school he was equipped to establish his own college and broadened his curriculum beyond DD’s concepts.

Different education issues in chiropractic from time to time. Institutional and programmatic accreditation was recently unsettled^{105,106} and may still be so. Conflict among curricula dates from around 1945 with the introduction of Nugent’s medicalised curriculum. Around 1993 there was a stand-off regarding guidelines for clinical practice. Today, it is those with interests in biomechanics and rehabilitation perturbing the equilibrium of the science of chiropractic with a distorted interpretation of Conventional Chiropractic.

Keating¹⁰⁷ summarised the correct understanding of ‘subluxation’ as “*contrary to the notion that chiropractic theories and methods were fixed in 1895 by the founder, DD Palmer, a good deal of theoretical evolution was not completed until 1914*”. There is strong evidence that DD continued to evolve and refine his theories until his death in

1913, His 1914 volume¹⁰⁸ was published posthumously. Keating¹⁰⁷ tabulates the sequencing of Palmer’s concepts to 1914 when DD stated “*vertebrae do not subluxate; only the articular surfaces of joints can subluxate; when spinal joints subluxate, the intervertebral foramina become enlarged and the tension on nerves is altered, which in turn alters end-organ tone*”. We note DD’s specificity of subluxation to joints and his use of the term ‘altered’, and that the cascade is to affect end-organ tone. It is not possible to argue that organ tonicity is not a factor under neurological control and it is not possible to argue joints do not subluxate.

Palmer’s intellectual strand

Palmer gained an Iowa corporate charter for the Palmer School of Magnetic Cure in 1896¹⁰⁹ and commenced teaching. He produced a number of graduates who went forth to establish their own schools. The diplomas granted by DD stated graduates were competent to teach,¹¹⁰ and while initiative was common¹¹¹ and recognised by DD (1904)⁹⁹ he was critical of those who taught therapeutic modalities in addition to the techniques he initiated, developed, applied and taught. He referred to this mode of practice and teaching as ‘mixer’.¹¹²

In 1904 a legal case was won by graduate Brunning on the basis of chiropractic being a distinct system and not part of medicine.⁹⁹ Palmer’s desire to argue only his discoveries represented chiropractic and were thus ‘straight’ led to the use of the term ‘mixer’ for those who added teachings, notably from osteopathy, also ascendant at the time.

In addition to evolving explanations in his three textbooks,^{108,113,114} DD’s intellectual strand has been repeatedly tested. Every decade of chiropractic has a key textbook examining subluxation in the context of the knowledge of that time: Smith et al (1906),¹¹⁵ Firth (1919)¹¹⁶ revised in 1967,¹¹⁷ Stephenson (1927 and revised by Quigley 1947),¹¹⁸ Bartlett Palmer (1929 republished 2011),¹¹⁹ Biron et al (1939),¹²⁰ Wilson (1955),¹²¹ Bartlett Palmer (1961),¹²² Homewood (1962),¹²³ Illi (1971),¹²⁴ Kirkaldy-Willis and Burton (1983, 1988, 1992),¹²⁵ Strang (1984),¹²⁶ Keating (1992),¹²⁷ Wardwell (1992),¹²⁸ Leach (1994),¹²⁹ Lantz (1995),¹³⁰ Waddell (2004),¹³¹ Cooperstein and Gleberzon (2004),¹³² and Gatterman by text (2005),¹³³ peer-reviewed papers (1992,¹³⁴ 2009¹³⁵) and letter (2009).¹³⁶ The now closed journal *Topics in Clinical Chiropractic* dedicated an entire issue (2010) to subluxation with eight evidence-based papers.¹³⁷ Vernon (2010)¹³⁸ published an historical overview and update. Not all authors of monographs were chiropractors.

Lecture notes are circulating purporting to be of class presentations by DD in Santa Barbara, 1903. However historian Senzon states they “*are incorrectly labeled and have made their way around the internet that way. These are DD’s teaching notes from 1911-1912, which were reorganised and expanded into the 1914 book*”.¹³⁹ Further, Senzon and Foley consider this bound volume in the market place as an untrusted artefact of no relevance or value. Senzon also states DD wrote only about 200 pages of the 1906 volume, the rest by his son BJ, a reason for historian Keating¹⁰⁷ to consider this a volume unauthorised by Palmer.

The emergence of intellectual strands represents normal

discipline development and in the case of chiropractic brings additional variants of clinical technique and terminology. In the foundation strand Palmer refined his technique to be a targeted therapeutic input by hand. This was mainly to a region of the spine that he argued ‘subluxed’ on the basis of a variety of clinical signs and symptoms. That technique is distinguished today by the term ‘adjustment’ and the target as ‘subluxation’. Palmer considered subluxation as the entry point to the nervous system, manifested as subluxed vertebrae.

The reliability of some clinical tests thought to identify one component of the vertebral subluxation complex have been reported¹⁴⁰ and we consider it nonsense for any scientist to argue the concept of subluxation on the basis of opinion and without evidence. Historical evidence is replete, empiric evidence is strongly supportive of a subluxation theory relevant to chiropractic, more so observational than measured, and evidence of effects continues to emerge.⁹³ Today, the debates in the science of chiropractic must be about matters of substance such as phenomena including outcomes of Conservative chiropractic care. There is no room for political posturing to trivialise Conventional chiropractic by proposing to divide it to ‘evidence-friendly’ and ‘traditional’.

LY imply their ‘evidence-friendly group’ do not subscribe to “*concepts such as ‘subluxation’ and the spine as the centre of good health*”, in which case we ask, what is it their group actually do in the name of chiropractic?

In particular, what diagnostic label do they give to the target of their manipulation if indeed it is targeted? What evidence do they apply to identify any putative lesion? What purpose do they have beyond pain relief? How does their model of practice differ to that of generic physical therapy? Are they physical therapists using the term ‘chiropractic’ for their own purposes? In Australia this would meet the criteria to be a breach of the *Health Practitioner Regulation National Law*, as in force in each state and territory.¹⁴¹

Non Overlapping Magisteria

We do not see an argument showing that the categories of subluxation and evidence are mutually exclusive. Chaberek¹⁴² shows it is possible to hold two world views, such as subluxation and evidence, in one’s mind at the same time by applying Gould’s¹⁴³ principle of *Non Overlapping Magisteria*. Both Hawk¹⁴⁴ and Senzon¹⁴⁵ have documented the world-views of chiropractic and such paradigmatic philosophies and methods of inquiry must be assessed for commensurability by delineating the advantages and disadvantages of combining methods as they relate to each paradigm.¹⁴⁶

Conclusions

The evidence overwhelmingly tells us that conventional chiropractors and students are quite able to hold two world views in their minds at the same time; those of the values of evidence, and those of the phenomenon of subluxation.

It is incumbent on LY and other scientists with a biomedical

mindset to do the necessary research and enhance their understanding of the intellectual strand of chiropractic without throwing away the knitting needles.

We object strongly to sensationalism of social and scientific matters. After all, if we lower our own dignity and allow marriage conflict as an analogy of chiropractic, we make the observation that any divorce would see *Conventional Chiropractic* retain the family name with its major assets of subluxation and adjustment.

We conclude the report of Leboeuf-Yde et al¹ is confused and presents an allegorical allusion with no argument and no evidential support. It demonstrates a low level of scholarship and as such may have the intent of virtue-signaling where evidence-free opinion may be expressed without the responsibility of justification.

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References

1. Leboeuf-Yde C, Innes S, Young KJ, Kawchuk GN, Hartvigsen J. Chiropractic, one big unhappy family: better together or apart? *Chiropr Man Therap* 2019;27:4 <https://doi.org/10.1186/s12998-018-0221-z>.
2. LD C. Professor, Institute of Regional Health <https://portal.findresearcher.sdu.dk/en/persons/clyde>.
3. Innes S. Lecturer in rehabilitation and physical therapies. Profiles. Murdoch University <http://profiles.murdoch.edu.au/myprofile/stanley-innes/>.
4. Young K. Senior Lecturer. Profiles. Murdoch University <http://profiles.murdoch.edu.au/myprofile/kenneth-young/>.
5. Kawchuk G. Professor. Find a person <https://www.ualberta.ca/rehabilitation/about-us/contact-us/faculty-directory/greg-kawchuk>.
6. Hartvigsen. Find researcher <https://portal.findresearcher.sdu.dk/en/organisations/institut-for-idræt-og-biomekanik>
7. SDU Research. George B MacClelland American Chiropractic Association Researcher of the Year 2017 [http://findresearcher.sdu.dk/portal/en/prizes/george-b-maccllelland-american-chiropractic-association-researcher-of-the-year-2017\(fde34225-f231-443e-8834-bf40e842d207\).html](http://findresearcher.sdu.dk/portal/en/prizes/george-b-maccllelland-american-chiropractic-association-researcher-of-the-year-2017(fde34225-f231-443e-8834-bf40e842d207).html).

8. Research. In, Member Update. Australian Chiropractors Association email 27 February 2019.
9. World Federation of Chiropractic, Research Council page, 'Greg Kawchuk Chair' https://www.wfc.org/website/index.php?option=com_content&view=article&id=127&Itemid=145&lang=en.
10. Tosh J. *The Pursuit of History. Aims, methods and new directions in the study of history* 6e.(London: Routledge, 2015).
11. Zammito J. Ankersmit and Historical Representation. *Hist Theory* 2005;44(2):155-81.
12. Bucheli M, Wadhvani RD. *Organizations in Time: History, Theory, Methods*, published to Oxford Scholarship Online (Jan 2014). Retrieved on 25 Feb 2018 from <http://www.oxfordscholarship.com/view/10.1093/acprof:oso/9780199646890.001.0001/acprof-9780199646890> and <http://www.oxfordscholarship.com/view/10.1093/acprof:oso/9780199646890.001.0001/acprof-9780199646890-chapter-13>.
13. Hockett HC. *The Critical Method in Historical Research and Writing*. New York: The Macmillan Company 1955.
14. Garraghan GJ. *A Guide to Historical Method*. New York: Fordham University Press 1946.
15. Weiss G. The Gillet family: Belgian chiropractic pioneers. *Chiropr Hist* 2004;24(2):554-8.
16. Gillet J. A brief history of the Gillet family. *Chiropr Hist* 1999;19(1):17-19.
17. Gaucher-Peslherbe PL. The progressive making of a foremost progressive chiropractic researcher: Fred Illi from Geneva. *J Manipulative Physiol Ther* 1996;19(3):178-84.
18. Sandoz R. Some critical reflections on subluxations and adjustments. *Ann Swiss Chiropr Assoc* 1989;9:7-29.
19. Curiel E. The many definitions of a black hole. *Nature Astronomy* 2019;3:27-34 <http://doi.org/10.1038/s41550-018-0602-1>.
20. Massimi M. Saving unobservable phenomena. *Brit J Phil Sci.* 2007; 58:235-62.
21. Yvonne Villanueva-Russell. Caught in the crosshairs: Identity and cultural authority within chiropractic. *Soc Sci Med* 2011;72(3):1826-1837 DOI 10.1016/j.socscimed.2011.03.038.
22. Yvonne Villanueva-Russell. Evidence-based medicine and its implications for the profession of chiropractic. *Soc Sci Med* 2005;60(3):545-61 <https://www.sciencedirect.com/science/article/abs/pii/S0277953604002515>.
23. Hawk C, Minkalis AL, Khorsan R, Daniels CJ, Homack D, et al. Systematic Review of Nondrug, Nonsurgical Treatment of Shoulder Conditions. *J Manipulative Physiol Ther* 2017;40(4):293-319 DOI 10.1016/j.jmpt.2017.04.001.
24. Goncalves G, Demortier M, Leboeuf-Yde C, Wedderkopp N. Chiropractic conservatism and the ability to determine contra-indications, non-indications, and indications to chiropractic care: a cross-sectional survey of chiropractic students. *Chiropr Man Therap* 2019;27:3 DOI 10.1186/s12998-018-0227-6.
25. Legorreta AP, Metz RD, Nelson CF, Ray S, Chernicoff HO, Dinubile NA. Comparative analysis of individuals with and without chiropractic coverage: patient characteristics, utilization, and costs. *Arch Intern Med* 2004;164(18):1985-92. DOI 10.1001/archinte.164.18.1985.
26. Government of the Philippines. Philippine Institute of Traditional and Alternative Health <https://aboutphilippines.org/documents-etc/PITAHC.pdf>.
27. Chapman-Smith D. Legislative approaches to the regulation of the chiropractic profession. *J Can Chiropr Assoc* 1996;40(2):108-120 NLM UID: 8009545
28. Gliedt JA, Schnieder MJ, Evans MW, King J, Eubanks Jr JE. The biopsychosocial model and chiropractic: a commentary with recommendations for the chiropractic profession. *Chiropr Man Therap* 2017;25:16 <https://doi.org/10.1186/s12998-017-0147-x>.
29. Brown BT, Bonello R, Pollard H. The use of traditional Chinese medicine principles in chiropractic technique. *Chiropr J Aust* 2009;39(1):18-26.
30. McDowall D, Emmanuel E, Grace S, Chaseling M. Tone as a health concept: An analysis. *Comp Thera Clin Pra* 2017;29: 27-34 <http://dx.doi.org/10.1016/j.ctcp.2017.08.001>.
31. Simpson JK. The Five Eras of Chiropractic & the future of chiropractic as seen through the eyes of a participant observer. *Chiropr Man Therap* 2012; 20:1 <http://chiromt.com/content/20/1/1>
32. Reggars JW. Chiropractic at the crossroads or are we just going around in circles? *Chiropr Man Therap* 2011;19: 11 <http://chiromt.com/content/19/1/11/abstract>.
33. Jones-Harris AR. Are chiropractors in the uk primary healthcare or primary contact practitioners?: a mixed methods study. *Chiropr Man Therap* 2010;18:28 <https://doi.org/10.1186/1746-1340-18-28>.
34. Stainsby BE, Porr JTC, Kim P, Collinge AM, Hunter JC. A survey of wellness management strategies used by Canadian chiropractors. *J Manipulative Physiol Ther* 2011;36(6):388-93 <https://doi.org/10.1016/j.jmpt.2011.06.001>.
35. Myburgh C, Brandborg-Olsen D, Albert H, Hestnaek L. The Nordic maintenance care program: What is maintenance care? Interview based survey of Danish chiropractors. *Chiropr Man Therap* 2013 ;21(27):Online access only 19 p <http://www.chiromt.com/content/21/1/27>.
36. Crawford JP, Hickson GS, Wiles MR. The management of hypertensive disease: a review of spinal manipulation and the efficacy of conservative therapeutics. *J Manipulative Physiol Ther* 1986;9(1):27-32.
37. Humphreys BK, Peterson CK, Muehlemann D, Haueter P. Are Swiss chiropractors different than other chiropractors? Results of the Job Analysis Survey 2009. *J Manipulative Physiol Ther* 2010;33(7):519-35 <https://doi.org/10.1016/j.jmpt.2010.08.003>.
38. Wirth B, Riner F, Peterson C, Humphreys BK, Farshad M, et al. An observational study on trajectories and outcomes of chronic low back pain patients referred from a spine surgery division for chiropractic treatment. *Chiropr Man Therap* 2-19;27:6 DOI 10.1186/s12998-018-0225-8.
39. Saltys EM. Chiropractic history in Portugal. *Chiropr Hist* 2009;27(1):9-12.

40. Brown BT, Bonello R, Fernandez-Caamano R, Graham PL, Eaton S. Chiropractic in Australia: A survey of the general public. *Chiropr J Aust* 2013;43(3):85-92 http://www.chiroindex.org/wp-content/uploads/2013/12/CJA_43_3.pdf.
41. Jamison JR. The chiropractic adjustment: The patients' perception [case report]. *Chiropr J Aust* 2005;35(1):4-8 <https://search.informit-com-au.ezproxy.scu.edu.au/fullText;dn=577077048261598;res=IELHEA>.
42. Australian Chiropractors Association. Vision and Values <https://chiropractors.asn.au/your-aca/caa-vision-and-values>.
43. Australian Chiropractors Association. WFC Assembly and Conference 2017 <https://chiropractors.asn.au/wfc-assembly-and-conference>.
44. Banzai R, Derby DC, Long CR, Hondras MA. International web survey of chiropractic students about evidence-based practice: a pilot study. *Chiropr Man Therap* 2011;19:6 <https://doi.org/10.1186/2045-709X-19-6>.
45. Gliedt JA, Hawk C, Anderson A, Ahmad K, Bunn D, et al. Chiropractic identity, role and future: a survey of North American chiropractic students. *Chiropr Man Therap* 2015;24:4 <https://doi.org/10.1186/s12998-014-0048-1>.
46. de Luca KE, Gliedt JA, Fernandez M, Kawchuk G, Swain MS. The identity, role, setting, and future of chiropractic practice: A survey of Australian and New Zealand chiropractic students. *J Chiropr Educ* 2018;32(2):115-25 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6192485/>
47. Foley J. DD Palmer and phrenology. *Chiropr Hist* 2011;31:49-58.
48. Palmer DD. Chiropractic defined. *The Chiropractor* 1904;1: Inside cover.
49. Palmer DD. Text book of the science, art and philosophy of chiropractic for students and practitioners. Portland: Portland Printing House Company 1910:11.
50. Foley J. Davenport's Ryan Building, birthplace of chiropractic: An architectural and historical examination. *Chiropr Hist* 2017;37:7-11.
51. Keating Jr. JC. D. D. Palmer's Lifeline. Phoenix: National Institute of Chiropractic (n.d.):7, personal archives.
52. Weed SH. *The Chiropractor* [Letters] 1905;1(5):16,17.
53. Peters R. An early history of chiropractic: The Palmers and Australia. Ashville NC: Integral Attitude 2014:78.
54. Bolton SP. Boots: A mainstream chronicle. *J Aust Chiropr Assoc* 1985;15(2):44-5.
55. Bolton SP. Branches: From mainstream roots. *J Aust Chiropr Assoc* 1986;16(3):99-102.
56. Sweaney JA. History of the Australian Chiropractors Association: The first twenty-five years. *Chiropr Hist* 1989;9(1):30-6.
57. About CA. Web page. Chiropractic Australia accessed 26 February 2019 <https://chiropracticaustralia.org.au/about-ca/history/>.
58. Zarbuck MV. A profession for 'Bohemian Chiropractic': Oakley Smith and the evolution of Naprapathy. *Chiropr Hist* 1986;6: 75-82.
59. Palmer DD. Important Announcement. *The Chiropractor* 1905;1(6):1.
60. Sandra Grace. Profile Southern Cross University. <https://www.scu.edu.au/about/contacts/staff-directory/staff/30500.php>.
61. Sandra Grace. Publications Research Gate. <https://www.researchgate.net/search.Search.html?type=publication&query=sandra%20grace>.
62. Rosemary Guiaratto. Profile. Macquarie University <https://researchers.mq.edu.au/en/persons/rosemary-guiaratto>.
63. Kawchuk G. Facebook post February 24/5 2019.
64. Researchgate <https://www.researchgate.net>.
65. Academia <https://www.academia.edu>
66. Perle S. Comment. Facebook post February 24/5 2019.
67. Angier A. Comment. Facebook post February 24/5 2019.
68. Resnick DK. Show me the evidence: Dealing with bias in the medical literature. NASS 2018 presidential address [Editorial]. *Spine J* 2019;19:2-7 <https://doi.org/10.1016/j.spinee.2018.11.005>.
69. Bronson M. Comment. Facebook posts February 26 2019.
70. Pappas D. Facebook post February 24/5 2019.
71. Reasonable Hank. Honk if you want a chiropractic college in South Australia [blog]. Accessed 5 March 2019 <https://reasonablehank.com/2014/10/23/honk-if-you-want-a-chiropractic-college-in-south-australia/>.
72. Wickes D. President of Canadian Memorial calls subluxation chiropractors the 'Gangrenous Arm' of the chiropractic profession [News] 13 November 2018 <http://chiropractic.prosepoint.net/160489>.
73. Grant RL, Hood R. Complex systems, explanation and policy: implications of the crisis of replication for public health research. *Crit Pub Health* 2017;27(5):525-32 <https://doi.org/10.1080/09581596.2017.1282603>.
74. Grant RL, Hood R. Complex systems, explanation and policy: implications of the crisis of replication for public health research. *Crit Pub Health* 2017;27(5):525-32 <https://doi.org/10.1080/09581596.2017.1282603>.
75. Haas M, Bronfort G, Evans R, Schulz C, Vavrek D, et al. Dose-response and efficacy of spinal manipulation for care of cervicogenic headache: a dual-center randomized controlled trial. *Spine J* 2018;18:1741-54 <https://doi.org/10.1016/j.spinee.2018.02.019>.
76. Gonstead Seminar of Chiropractic, General class notes and workbook. Melbourne: Gonstead Clinical Studies Society Australia 1999.
77. Gonstead Chiropractic Society Australia. Landing Page <https://www.gonstead.com.au>.
78. Sweat RW, Sweat MH. Atlas Orthogonal Chiropractic Program. 11th Edition 2016: ISBN 978-0-9846326-1-9.
79. Fuhr AW. *The Activator Method*. 2e. Mosby:St Louis 2009 ISBN 978-0-323-04852-1.
80. Pettman E. A history of manipulative therapy. *J Man Manip Ther* 2007;15(3):165-74.
81. Rome PL. Medical evidence recognising the vertebral subluxation complex. *Chiropr J Aust* 2016;44(4):Online access only p 303-307 <http://www.cjaonline.com.au/index.php/cja/article/view/119>.

82. Rome PL. Terminology relating to the vertebral subluxation complex and the manipulative sciences. Part I [Part 1 of 2] *Chiropr J Aust* 2017;42(2):Online access only p 73-89
<http://www.cjaonline.com.au/index.php/cja/article/view/154>.
83. Rome PL. Terminology relating to the vertebral subluxation complex and the manipulative sciences. Part 2 [Part 2 of 2] *Chiropr J Aust* 2017;42(2):Online access only p 33-30
<http://www.cjaonline.com.au/index.php/cja/article/view/155>.
84. Kent C. Models of vertebral subluxation: A review. *J Vert Subluxation Res* 1996;1(1):1-7
http://vertebralsubluxation.sharepoint.com/Pages/1197_0061_models.aspx
85. Weiner MF, Silver JR. Edward Harrison and the treatments of spinal deformities in the nineteenth century. *J R Coll Physicians Edinb* 2008;38:265-71.
86. Gatterman MI. *Foundations of Chiropractic: Subluxation*. St Louis: Mosby 2005:9.
87. Terrett AJG. The search for the subluxation: an investigation of medical literature to 1985. *Chiropr Hist* 1987;7:29.
88. Bovine G. The Nicetas Code Manuscript: Hippocratic 10th century writings in the *Biblioteca Medicea Laurenziana*. *Chiropr Hist* 2018;38(2):14-18).
89. Hieronymi JH. *De luxationibus et subluxationibus* [thesis] Jena University: 1746.
90. The verb (exceperis) has many meanings: to take out, remove, make an exception for, follow, succeed, etc. It even has a meaning in a medical context, to mix; but I [translatoer] do not think this applies here. It seems that Hieronymi means that milder pain is not a clear piece of evidence in diagnosis if the other points have not been observed.
91. Rajamurugan PSA. Neurological manifestations in rheumatoid arthritis. Diss. Madras Medical College Chennai, MGR Medical University 2007:
<http://repository-tnmgrmu.ac.in/1834/1/160900107arulrajamurugan.pdf>.
92. Rosa C, Alves M, Queirós MV, Morgado F, de Mendonça A. Neurologic involvement in patients with rheumatoid arthritis with atlantoaxial subluxation--a clinical and neurophysiological study. *J Rheumatol* 1993 Feb;20(2):248-52.
93. Christiansen TL, Niazi IK, Holt K, Nedergaard RW, Jens Duehr J, et al. The effects of a single session of spinal manipulation on strength and cortical drive in athletes. *European J App Physiol* 2018;118:737-49
<https://doi.org/10.1007/s00421-018-3799-x>.
94. Carver W. Carver's Chiropractic analysis of Chiropractic principles as applied to pathology, relatology, symptomology and diagnosis. Vol 1. Oklahoma City: Carver Chiropractic College 1921
<https://archive.org/details/cu31924080821386/page/n8>.
95. Carver W. Carver's Chiropractic analysis of Chiropractic principles as applied to pathology, relatology, symptomology and diagnosis. Vol 2. Oklahoma City: Carver Chiropractic College 1922
[https://www.chirobase.org/05RB/carver\(2\).pdf](https://www.chirobase.org/05RB/carver(2).pdf).
96. McDowall D. Personal communication. Email 27 February 2019 13:23.
97. Hart J. Analysis and adjustment of vertebral subluxation as a separate and distinct identity for the Chiropractic profession: A commentary. *J Chiropr Hum* 2016;23:1
<http://dx.doi.org/10.1016/j.echu.2016.09.002>.
98. Russell D. The assessment and correction of vertebral subluxation is central to chiropractic practice: Is there a gap in the clinical evidence? *J Contemp Chiropr* 219;2:17
<https://journal.parker.edu/index.php/jcc/article/view/42>.
99. Faulkner T. *The Chiropractors protégé*. Rock Island IL: Association for the History of Chiropractic 2017:72.
100. Reggars JW. Chiropractic at the crossroads or are we just going around in circles? *Chiropr Man Therap* 2011;19: 11
<http://chiromt.com/content/19/1/11/abstract>.
101. Palmer, D. Lectures given by the chiropractor at the Santa Barbara Chiropractic School and Infirmary. *Vertebral Adjusting*. Santa Barbara: Self published 1903.
102. Burtch C. The relation of vertebral displacement to disease. *American School of Chiropractic: Backbone* 1903 Oct 12.
103. Palmer B. (1905b). Suggestion. *Palmer School of Chiropractic: The Chiropractor* 1905;1(10):22.
104. Coleman R, Wolf K. Does the chiropractic of Modernised Chiropractic still live? *Chiropr Hist* 2015;35(2):20-35.
105. CCE Given Three Years by Federal Committee on Accreditation. News Item. *The Chronicle of Chiropractic* 12 December 2013
<http://chiropractic.prosepoint.net/78593>.
106. European CCE Denied Renewal by Accreditor. News Item. *The Chronicle of Chiropractic* 15 May 2016
<http://chiropractic.prosepoint.net/136238>.
107. Keating JC Jr. D.D. Palmer's Forgotten Theories of Chiropractic [presentation]. Association for the History of Chiropractic. Palmer University Archives 1995
https://chiro.org/Plus/History/Persons/PalmerDD/PalmerD's_Forgotten_Theories1995.pdf.
108. Palmer DD. *The Chiropractor*. Beacon Light Printing Company: Los Angeles 1915. NLM 05163140 2.
109. Zarbuck MV. Chiropractic parallax Part 3. *IPSCA Journal of Chiropractic* 1988;9(3):4-6, 17-9; reported in Joseph C. Keating, Jr., D. D. Palmer's Lifeline (Phoenix: National Institute of Chiropractic (n.d.): 7, personal archives.
110. Figure 9.1 E.E. Sutton's Diploma. In, Faulkner T. *The Chiropractors protégé*. Rock Island IL: Association for the History of Chiropractic 2017:129.
111. Montgomery DP, Nelson JM. Evolution of chiropractic theories of practice and spinal adjustment, 1900-1950. *Chiropr Hist* 1985;5:70-6
<http://www.ncbi.nlm.nih.gov/pubmed/?term=11620884>.
112. Palmer DD. *The Chiropractor* 1905;1(11) 4.
113. Palmer DD. *The Science of Chiropractic V1, V2*. Davenport: Palmer College of Chiropractic 1906.
114. Palmer DD. *Text-book of the science, art and philosophy of chiropractic for students and practitioners*. Portland: Portland Printing House Co. 1910.
115. Smith OG, Langworthy SM, Paxson MC. *Modernized chiropractic*. Lawrence Press" Cedar Rapids 1906.
116. Firth JN. *A text-book on chiropractic symptomatology, supplement to first edition*. Davenport: Palmer School of Chiropractic 1919.
117. Baltzell LG. *Firth's Technic Notes, Revised 1967*. self published 1967.
118. Stephenson RW. *The art of Chiropractic*. Davenport: The Palmer School of Chiropractic 1947.

119. Palmer BJ. *The Great Undertow*: 1929, republished Hughes HT: 2011 ISBN 9780578092348.
120. Biron WA, Wells BF, Houser RH. *Chiropractic principles and technique*. Chicago: National College of Chiropractic 1939.
121. Wilson GA. *Spinatology*. Salt Lake City: The Standard Research Laboratories 1955, 1956.
122. Palmer BJ. *Our masterpiece*. Hamilton: Hamilton Press 1961.
123. Earl Homewood AE. *The neurodynamics of the vertebral subluxation*, 3e. St. Petersburg: Valkyrie 1977.
124. Illi, FWH. *High lights of 45 years of experience and 35 years of research, Lectures and films*. Geneva: Institute for the study of the statics and dynamics of the human body 1971.
125. Kirkaldy-Willis WH, Burton CV. *Managing low back pain*. New York: Churchill Livingstone 1992.
126. Strang VV. *Essential principles of chiropractic*. Davenport: Palmer College of Chiropractic 1984.
127. Keating Jr. JC. *Toward a philosophy of the science of chiropractic*. Stockton: Stockton Foundation for Chiropractic Research 1992.
128. Wardwell WE. *Chiropractic, history and Evolution of a new profession*. St. Louis: Mosby 1992.
129. Leach RA. *The chiropractic theories. Principles and clinical applications* 3e. Baltimore: Williams & Wilkins 1994.
130. Lantz CA. *Back to basics ... A review of the evolution of chiropractic concepts of subluxation*. *Top Clin Chiropr* 1995;2(2):1-10.
131. Waddell W. *The back pain revolution*. Edinburgh: Churchill Livingstone 2004.
132. Cooperstein R, Gleberzon BJ. *Technique systems in Chiropractic*. Edinburgh: Churchill Livingstone 2004.
133. Gatterman MI. *Foundations of chiropractic – Subluxation*, 2e. St Louis: Elsevier Mosby 2005.
134. Gatterman MI. *The vertebral subluxation syndrome: is a rose by another name less thorny?* *J Can Chiropr Assoc* 1992;36(2): 102-4.
135. Gatterman MI. *Subluxation - Historical perspectives: Part 2*. *Chiropr J Aust* 2009;39:51-64.
136. Gatterman MI. *Chiropractic in the Twenty-First Century* [letter. *Chiropr J Aust* 2009 39:51-64.
137. Mootz RD, McCarthy KA. *In this issue [Editorial]*. *Top Clin Chiropr* 2010;8: 1.
138. Vernon V. *Historical overview and update on subluxation theories*. *J Chiropr Hum* 2010;17:22-32.
139. Senzon S. *Personal communication email* 07 March 2010 08:54.
140. K, Russell D, Cooperstein R, Young M, Sherson M, et al. *Inter-examiner reliability of a multidimensional battery of tests to assess for vertebral subluxations*. *Chiropr J Aust* 2018;46(1):101-17 <http://www.cjaonline.com.au/index.php/cja/article/view/196>.
141. Chiropractic Board of Australia. *About* <https://www.chiropracticboard.gov.au/codes-guidelines/code-of-conduct.aspx>.
142. Chaberek M. *Aquinas and Evolution*. Trinity, BC: Chartwell Press. 2017:13.
143. Gould SJ. *Nonoverlapping Magisteria*. *Natural History* 1997;106: 16-22, in *Leonardo's Mountain of Clams and the Diet of Worms*, New York: Harmony Books 1998 pp. 269-83 http://stephenjaygould.org/library/gould_noma.html.
144. Hawk C. *When worldviews collide: maintaining a vitalistic perspective in chiropractic in the postmodern era*. *J Chiropr Humanit* 2005;12:Online access only p 2-7 <http://archive.journalchirohumanities.com/Vol%2012/JChiroprHumanit2005-12-2-7.pdf>.
145. Senzon SA. *Chiropractic professionalization and accreditation: An exploration of the history of conflict between worldviews through the lens of developmental structuralism* *J Chiropr Humanit*. 2014 Dec;21(1):Online access only p 25-48.
146. Chang H. *Autoethnography in Health Research: Growing Pains? Qualitative Health Research* 2016;26(4):443–51 sagepub.com/journalsPermissions.nav.