

Differentiating chiropractic articular adjustments from manipulation:

Part 2 of a series.

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Abstract: Without greater differentiation, the authors contend that it is misleading to consider that all forms of manual therapy should be categorised under the one single term of manipulation. This paper seeks to clarify differences in the forms of manipulation, in particular, the intricacy, erudition and complex considerations of the vertebral adjustment. The extent of concentrated undergraduate training and depth of physiological recognition of the adjustment is portrayed in order to acknowledge that adjustments are more complex by involving integrated elements of somatosensory and somato-autonomic implications rather than just physical- mechanical procedures

Indexing terms: Articular adjustment, Vertebral adjustment, Manipulation, Spinal manipulation, Technique

Introduction

It is acknowledged that the term *articular adjustment* is appreciably different in a number of aspects to that implied by the more general expression manipulation. The term *manipulation* can have different connotations both in a general generic sense for some forms of manual therapy, as a type of manipulative technique in its own right, in a variety of health and medical procedures, as well as in non-medical processes. For these reasons it is considered necessary to differentiate the chiropractic adjustment from such potential ambiguity.

Joint manipulation is a generic term for various forms of manual care which seeks to normalise functional and structural relationships of joints and other biological structures. It is generally directed at releasing restrictive mechanical movement. (1)

The chiropractic vertebral adjustment has been identified by different nomenclature to distinguish it from such manual terms as general manipulation, mobilisation, manual therapy, so-called spinal manipulative therapy (SMT), and even massage. (2) The vertebral adjustment serves to normalise an individual segment's movement or articulation's function which may exhibit disturbed neurophysiological sensory reflexes, disturbed articular physiology, and disturbed structural relationships. It is more than just correction of osseous displacement.

... the chiropractic vertebral adjustment is a refined high-order clinical skill and must not be confused with manipulation'



In general terms, articular manipulation is directed at addressing dysfunctional mechanical movement. It may also involve forms of mobilisation, which along with other manual therapies, would be labelled by some as spinal manipulative therapy (SMT). The term manipulation can allude to non-specific, general mobilisation and biomechanical joint releases which may occur on individual joints or on a whole region with gross general movements. As Vaughan points out, manipulation has rather gross connotations as a purely physical manoeuvre. (3)

To report that a patient's spine has been manipulated is all-encompassing and nebulous unless such a statement is qualified. The term could be interpreted as any one of a myriad of manipulative techniques or procedures on their spine or other joints.

In early editions of their book, Bourdillon and Day refer to medical manipulative techniques as being of '*high velocity*' only, without mention of amplitude which would seem a significant oversight. Such a generalisation also tends to overlook other factors considered in more developed techniques. (4)

In conducting a correction of a subluxation, chiropractors identify the word adjustment rather than an all-encompassing label of manipulation. Even then, the particular adjusting technique should be specified. This is significant as it identifies the intent and nuances of the technique which includes interpretation of activated neurological sequelae and soft tissue elements of a complex dysfunction. In addition, it necessitates considerations concerning diagnosis, assessment, analysis, control, specificity, contact point, line of drive, and overall clinical presentation based on the extensive depth of training in the techniques for correcting the subluxation. Some practitioners of manual medicine and osteopathy have also adopted the all-embracing subluxation model, while others have confined their model of care only to the mechanical element of the functional lesion. (5, 6)

In pragmatic terms, the spinal adjustment is a biomechanical means of alleviating a neurophysiological response(s) – namely signs and symptoms which have been brought about or contributed to by an anatomically disturbed vertebral segment. The segment may be fixated or showing aberrant function, with or without slight displacement. It is a safe, conservative intervention, and is indicated particularly following distinctive spinal examination, analysis, and diagnosis of a patient. The care may be supported by recommendations such as exercise, lifestyle advice, and patient education. Vertebral adjustments are the principal management modality in chiropractic as one part of patient care, albeit a major one. (7)

Some may question the clinical evidence as to whether the vertebral subluxation exists while accepting terms such as somatic dysfunction which limits to a mechanical element alone without wider ramifications. Reluctance to use the term may be political-based stubbornness or a lack of understanding of its wider interpretation. (8)

In order to rationalise intervention by articular manipulation, it is necessary to identify the target lesion by diagnosis. This requires an identifying appellation. Without identification and rationale for an objective, a manipulative procedure cannot be justified as it must be the focus for addressing *something*. The term subluxation covering multiple factors has served this purpose well for over 100 years. The positive clinical outcomes would tend to justify a reasonable cause and effect explanation based on current evidence and numerous case reports in various chiropractic journals listed in *The Index to Chiropractic Literature* and the *PubMed Medical Index*. (9)

A vertebral adjustment is intended to restore a target articulation's physiological motion, associated neurophysiological function, and normal anatomical setting within its own neutral path of motion – the centrode. (10)

Review

An adjustment may be described as a primary technique employed by chiropractors to address an articular pathophysiological disruption, commonly a vertebra, known as a subluxation. The correction of which comprises a predetermined and controlled therapeutic impulse selected by the practitioner to be appropriate for the age, spinal findings correlation, the presenting clinical status of the patient, and applied with rational intent of comfort, safety, and efficacy. (11, 12, 13)

As noted by the World Health Organisation (WHO), there are differences between the terms adjustment, manipulation, and mobilisation, the latter two primarily adopted by manual therapists other than chiropractors. (13, p3-4)

The WHO has acknowledged the adjustment as a part of the chiropractic model in addressing relevant and prevalent forms of mechanically disturbed articulations, primarily of spinal segments. It defines the chiropractic adjustment as:

Any chiropractic therapeutic procedure that ultimately uses controlled force, leverage, direction, amplitude and velocity, which is applied to specific joints and adjacent tissues. Chiropractors commonly use such procedures to influence joint and neurophysiological function. (13, p3)

The WHO guidelines also define the impulse or thrust element of some adjustment as:

The sudden manual application of a controlled directional force upon a suitable part of the patient, the delivery of which effects an adjustment. (13, p4)

This United Nation's organisation defines joint manipulation as a '*manual procedure involving directed thrust to move a joint past the physiological range of motion, without exceeding the anatomical limit.*' However, the implied concept of exceeding a joint's range of motion in this sense has to be questioned as it implies over-stretching articular holding elements and potential trauma to the joint. It is noted that *joint manipulation* is listed with the WHO as a separate definition to *chiropractic adjustment*. In addition, the phrase referring to *moving a joint past the physiological range of motion* is not included in the WHO definition of a *chiropractic adjustment*. (14, 15, 16, 17)

Manipulation may also be regarded as a non-specific dynamic thrust or assisted movement which may or may not cause cavitation as it attempts to release soft tissue and/or restore a joint's biomechanical range of motion. The forces of generic manipulation may be physically more exaggerated and intense than mobilisation. This WHO definition infers that a joint may be restricted in its normal range of motion and that the joint may be taken to its natural limit. This again differentiates it from a chiropractic adjustment.

Joint mobilisation is defined by the WHO as '*a manual procedure without thrust, during which a joint normally remains within its physiological range of motion.*' (14)

A more detailed explanation of mobilisation which highlights the difference from joint manipulation is provided by the South Dakota legislature. It describes mobilisation as '*a non-thrust passive movement of a joint within its normal range of motion when taken through a range of motion by a second party. In some cases mobilisation may be self-imposed to a limited degree.*' (18)

Joint restriction, dysfunction, or fixation are a part of the rationale which justifies manual (or instrument assisted) intervention. The fixation is identified by the WHO as '*the state whereby an articulation has become fully or partially immobilised in a certain position, restricting physiological movement.*' As such, a fixation considers only the motion component of a subluxation composite.

One must assume that if the fixation is *fully or partially immobilised in a certain position* that a degree of displacement must also occur if the fixation is not in its neutral central site. (10, 14)

Both manipulation and mobilisation imply that the identified vertebral segments or articulations do not possess normal motion and are potentially exhibiting symptoms. Consequently, they warrant restoration to normalcy. The primary consideration under these two terms is that a joint must be restricted in the first place. This potentially implies somatosensory and/or clinician awareness of more complex elements as alluded to in the WHO definition of a subluxation.

The vertebral adjustment

Misunderstanding of the physical aspects of chiropractic spinal adjustments were reflected upon and nullified by the *New Zealand Commission of Inquiry* in 1979. It can be generally appreciated that the classic controlled, chiropractic adjustment technique, although fleeting, is not traumatic. To quote the NZ Commissioner's report:

'...it is alleged that the (chiropractic) technique consists mainly of a dynamic thrust. This is claimed to be dangerous because it is a sudden high-velocity movement, the patient cannot see what is being done, cannot resist the thrust, and is therefore at the chiropractor's mercy.'

Until the Commission saw chiropractors at work it imagined from such descriptions that this was the only way the chiropractor operated while the physiotherapist/manipulative therapist with his gentle articulations, extensions, or mobilisations was a very different practitioner. The truth is that while the chiropractor's movements are indeed often very quick, perhaps more so than those of the manipulative therapist, they are also usually small and precise. The most forceful manipulations we saw were performed by manipulative therapists.' (19)

We suggest that unfortunately, this false impression similar to that previously held by the Commission continues to this day. Consequently, perceptive considerations and honed techniques are paramount in modifying such disturbances. It is therefore appropriate to differentiate the chiropractic procedure called an adjustment in addressing the subluxation from non-specific manipulation.

The chiropractic vertebral adjustment focusses on a specific vertebral segment with a specific contact on that segment with a prudent consideration of the line of drive necessary via an effective long or short leverage technique correction. Other preparatory measures may include, locking of non-target segments, neuromuscular tone, preparatory setting, and the degree of amplitude and technique deemed necessary for those findings in each particular patient. (12, 20, 21, 22)

This vertebral adjustment is distinctly different as it serves to normalise the specific characteristics of a specific articulation in a specific direction to a specific degree. It is designed to consider disturbed neurophysiological somatosensory and somato-autonomic reflexes, disturbed articular physiology, and disturbed structural relationships; and is a complexity involving more than just physical osseous displacement. (23, 24, 25, 26, 27, 28)

A controlled chiropractic vertebral adjustment may be differentiated from generic manipulation in that it may be analogous to adjusting a radio dial, microscope or binoculars – one does not manipulate these when fine tuning.

In order to identify the emphasis placed by chiropractors in their own specialty of vertebral adjusting it is necessary to appreciate the subtleties of the profession's art behind the science that has been refined for over 120 years. Some of the basic principles of the science of adjusting techniques have not changed in that time suggesting positive acceptance. This stability demonstrates consistency and reliability with the added strength of efficacy. Other elements of

the science and art of adjusting techniques have evolved in keeping with research developments and empiricism, while some are quite different. (29, 30, 31, 32, 33, 34, 35)

The benefit of a selection of available techniques is that it takes advantage of the principles of short and long leverage, contact site, (force by distance) moments, and fulcrums as well as positioning of patient and practitioner thereby minimising the amount of dynamism needed to release the targeted fixation.

Table 1: Criteria of the adjustment

Each vertebral adjustment considers a number of factors in its implementation. These include:-

- Possible red or orange flags
- Analysis of target site
- Consideration of patient age, as well as health and physical status
- Consideration of patient comfort factors
- Consideration of patient preferences
- Considerations on purpose
- Controlled refinement of technique
- Correlation of associated signs and symptoms with target site
- Different criteria for implementation
- Efficiency of each available technique
- Neuromuscular tone
- Optimal line of drive for correction
- Somato autonomic reflexes
- Somatosensory reflexes.
- Somatosomatic reflexes
- Somatovisceral reflexes
- A selection of appropriate technique for the particular patient

Consideration of any risk and safety factors

Facet angles per spinal region

Predetermined amplitude

Predetermined velocity

Predetermined intensity

Predetermined mode of delivery

Predetermined direction (Line of drive)

Predetermined suitability of the patient for the technique chosen

Predetermined diagnostic assessment

Pre-load spinal flexibility

Skin laxity

Underlying pathology (e.g. osteoporosis, neoplasms, degenerative changes, disc condition, vascular status, fractures)

- Potential for modifying due to other patient considerations
- Potential for modifying due to patient conditions.
- Requirement for segmental specificity as a determinate.
- Requirement for a specific analysis of each involved spinal segment and other articulations
- Pre-thrust set-up and practitioner positioning
- Possible anomalies (e.g. hemivertebrae, block vertebrae, bent spinouses)
- Facet orientation (Especially L5/S1 anomalies –trophism)
- Pre-thrust recouplement of regional laxity
- Underlying pathology (e.g. degenerative changes, disc condition, fractures).

These criteria would indicate that the chiropractic spinal adjustment is based on a pre-determined analysis and focused on an identified biomechanical vertebral lesion. The adjustment is implemented as a refined and focussed form to that of the more generalised and non-specific manipulation. In practice, subluxations usually involve spinal articulations more frequently than peripheral articulations. Refined psychomotor skills within the broad range of specific adjusting techniques are those required for the safe and effective delivery of the precise spinal adjustment. (7)

Depending on factors listed in Table 1 and the spinal level, the adjustment may deliver forces of around 104 N (cervical spine), 506 to 554 N (mid and low thoracic spine) and 225 N (sacroiliac joint) within some 90 ms (cervical spine), up to 150 ms (thoracic spine) and between 166 and 182 ms (sacroiliac joint). These variables do not differ significantly between male and female chiropractors and are modified depending on individual patient clinical presentation. (36)

Another factor in some chiropractic techniques is often referred to as a controlled High Velocity Low Amplitude (HVLA) thrust. This is perceived as not only being specific, but having more positive and effective influence in activating the objective's segmental pathoneurophysiology. However, a range of other techniques are utilised by chiropractors and cannot be regarded as HVLA. The use of the term HVLA term itself is also questionable as it is open to the variables of subjective interpretation and therefore defies specific definition. (37)

The implementation of the adjustment may be preceded by the preparatory pre-thrust pressure in order to recoup regional laxity in order to optimise its efficiency, efficacy, and specificity. (38) If there is also displacement, the adjustment may then release the fixation element towards its neutral position within the joint surface. As such, the line of drive of the thrust is not towards an anatomical limit of motion of the articulation. The order, number and type of adjustments at any one visit are then determined by clinical signs and symptoms as well as the clinicians experience and judgement in assessing these. (39, 40, 41, 42, 43)

It is a limited view to consider a vertebral adjustment in purely mechanical terms. To do so is to ignore the consideration of somato-sensory-autonomic reflexes about which Sato and others have demonstrated effects of an extraordinary range of potential neurophysiological ramifications as discussed in a range of published material. (44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56)

The range of these techniques can include technically sophisticated and precise mechanical impulse adjusting instruments and the associated protocol for those techniques. These can be finely tuned depending on the patient analysis with the amplitude and the velocity adjustable on these instruments. While these may qualify under the HVLA category, they are quite different to manual adjustments with the velocity being much faster, more controlled, and considerably lower in amplitude. (After Ebrall) (16, 36)

Mobilisation

One difficulty in differentiating the manual techniques applied in published studies is that at times there is no clear explanation as to the type of 'manipulation' that has been employed. This often leaves the impression that manipulation is regarded as any form of manual procedure. We would maintain that the type of manipulation or adjustment is crucial in all such studies. Without differentiation of techniques, the efficacy of that technique is not appreciated and unable to be comparatively assessed. (57)

It is acknowledged that mobilisation can be effective for a range of conditions. However it employs rather different procedures with different protocols and different objectives to other forms of the manipulative range. Biomechanical mobilisation involves a milder, assisted motion to essentially address a different set of milder conditions of joints with limited ranges of joint

motion. It may also be included in a preparatory work-up before manipulation, or as an exercise. (58, 59, 60, 61, 62, 63, 64, 65)

In two studies, Dunning and colleagues found that versions of manipulation tend to be more efficacious than mobilisation for both cervicogenic headaches and neck pain. They state that *'Six to eight sessions over 4 weeks of upper cervical and upper thoracic manipulation were shown to be more effective than mobilisation and exercise in patients with cervicogenic headache (CH), and the effects were maintained at 3 months.'* (66) The detailed explication of the type of manipulation in such studies is called for to fully evaluate the comparative efficacy of the particular technique. (66, 67)

Lee and colleagues concluded that postero-anterior (P-A) mobilisation upon the spinous of C5 with the patient prone, concluded that *'mobilisation should be interpreted as three-point bending of the entire cervical spine, rather than simple gliding of one vertebra upon another.'* This prone P-A technique on lower cervical may not be a standard or recommended chiropractic technique on that segmental level, although it may be a form of mobilisation technique used by others. (68)

Other manual therapies in the mobilisation category could include, Sustained Natural Apophyseal Glides (SNAGs), Natural Apophyseal Glides (NAGS), facet glide and lateral glide techniques. (69, 70)

Mierau et al state clearly that *'manipulation and mobilisation are distinct therapies with different effects (and) should not be considered equivalent...(and further that) as distinct passive movement treatments...varying in both mode of application and effect on target joints.'* (57)

Manipulation

The term manipulation is somewhat ambiguous in manual therapy. It alludes to both the whole range of manual therapies as well as to non-specific, general mechanical mobilisation of joint releases. This may occur on individual joints or over multiple spinal segments. The term articular adjustment as discussed here is shown to be appreciably different in a number of aspects to that of manipulation. (57)

For these reasons it is considered necessary to differentiate the various techniques, especially the chiropractic adjustment from such a potentially confusing assortment. To report that a patient has been manipulated is nebulous without more defining details.

As indicated by Ebrall, the manipulation spectrum often begins at a basic level with manual treatment such as massage with specific muscle release and soft tissue techniques. It may then progress through a range of techniques collectively considered as passive mobilisation. Another technique is general joint releases conducted by the clinician of a patient's joint or number of joints - usually by means of long levers. These may or may not include varying degrees of an impulse or thrust. These are the types of non-specific techniques commonly referred to collectively as manipulation. (7)

Various forms of chiropractic adjustments are conducted with a vector in either rotatory, translatory or a combination of both along the plane of the facet surface involved. Each spinal region has different facet planes and adjusting techniques also address that consideration.

Differentiating the adjustment from generic manipulation

Differences between manipulation and chiropractic adjustments can be distinct in rationale, technique, biomechanics and purpose. The vertebral adjustment is a specific form of manual care refined over a century of application, clinical observation, and research which seeks to correct a specific complex subluxation in a specific manner. While spinal manipulation may be interpreted as either a broad generic form encompassing all manual therapies, or a general non-specific release of a restricted joint. (3)

The chiropractic adjustment as differentiated from generic manipulation differs in identification, application, intent, set-up, control and specificity. However, it is the consideration of its influence on mechanoreceptors, somatosensory and somato-autonomic reflexes that focus the correction of disturbed articulations. This relates particularly to vertebral subluxations exhibiting dysfunction with symptoms and clinical signs attributed to associated pathoneurophysiology such as radicular or localised pain and cervicogenic headaches as examples. (Tables 1 and 2) (57)

The chiropractic adjustment is governed by an assessment of a patient's health history, symptoms, examination findings, and is intended to restore a particular articular dysfunction of an osseous segment in a specific corrective direction to a specific degree. As an analytical process it is based on considerations and implemented in a singly focussed form compared to the more generalised and non-specific manipulation or mobilisation. It is especially directed at altered motion of specific osseous structures - particularly vertebrae, but may also address aberrations of joint motion (particularly hypomobility) of peripheral articulations. In addressing a subluxation for an adjustment, the orientation or plane of the articulations involved influences the line of corrective impulse. It also includes consideration of potential somatosensory and somatoautonomic reflexes that may be activated at the specific level. Manipulation of multiple spinal segments would not necessarily address or deliberate on these particular factors. (Tables 1 and 2)

Table 2: Differentiating factors the the adjustment

There are noted characteristics which differentiate the specific chiropractic segmental vertebral, adjacent (e.g. costovertebral articulations) and peripheral articular adjustment from general manipulation. These factors include:

- The identification by chiropractors of an individual segmental subluxation which may contribute to presenting signs and symptoms.
- Abnormal motion (dysfunction) with or without abnormal positioning within the articulation's normal range of motion.
- The selection of the appropriate technique to be employed.
- The characteristic of the particular localised segment.
- The age and health condition of the patient.
- The expected outcome of that particular adjustment.
- Consideration of its physiological, neurophysiological and vascular ramifications at that level.
- The potential for some cases to require a combination of spinal and joint manipulation or mobilisation, as well as a specific adjustment(s).
- The option of incorporating an instrument assisted technique.
- Preparatory muscle release if indicated.

In a further example of the difference between a chiropractic adjustment and medical manipulation, Cyriax offered manipulative techniques which appear to take joints to extreme limits if not beyond. It is possible that impressions drawn from such extreme procedures may have created a misconception of, and be falsely interpreted as being chiropractic adjustments. (71) (Appendices A-G) These are not chiropractic techniques and would be consistent with the opinion expressed by the Commissioner in 1979 in his NZ report. (19)

Another example of general medical manipulation in relation to newborn infants is the presentation demonstrated by an unknown Russian paediatrician. His demonstrated routine is quite different to conservative chiropractic procedures. (72)

High velocity, low amplitude (HVLA)

It is acknowledged that only some chiropractic adjusting techniques may be regarded as HVLA. It is however the technique of choice when it is indicated. Some instrument-assisted techniques are particularly high velocity but with extremely low amplitude. These can be calibrated according to clinical indicators and clinicians' assessment.

There appears to be no specified parameters as to what constitute high or low in the term High Velocity Low Amplitude (HVLA) in the application of manipulation techniques. The descriptive variables make it a particularly broad term and equivocal. The phrase itself can be distinctly subjective which tends to lose relevance due to an individual interpretation of a manual technique. One observer or practitioner may determine a technique as high velocity, while another may not – similarly with the individual interpretations of low amplitude. High amplitude manual techniques are seldom embraced in chiropractic practices. The terms may however be employed to describe some manipulative procedures used with manipulation under anaesthetic (MUA). (73)

When indicated, particular HVLA thrusts may be perceived as not only being different, but having more positive and effective influence on improving a range of elements related to the objective's segmental pathophysiology and pathoneurophysiology. (74)

However, use of the term HVLA is distinctly subjective and therefore does not convey an accurate or consistent image as to how the procedure may have been carried out, the practitioner's experience, and the precise mode of delivery. (37)

Cavitation

Evidence also suggests that manipulation or mobilisation without cavitation has notably less physiological influence. Findings indicate that a single spinal manipulation treatment (SMT) does not necessarily alter the corticospinal or stretch reflex excitability of the *erector spinae* muscles (when assessed ~ 10-minutes following SM). However, it does indicate that the stretch reflex is attenuated when SM causes an audible response - cavitation. This finding provides insight into the mechanisms of manipulative procedures. It suggests that SM which produces an audible response in the release of a fixation may mechanistically act to decrease the sensitivity of the muscle spindles and/or the various segmental sites of the Ia neural reflex pathway more effectively. (60)

Brodeur noted that cavitation activates stretch reflexes of the periarticular muscles without which it would be difficult to generate the force necessary without damaging muscle tissue. This suggests not only should fixated articulations be released, but also that muscle reflexes may not be activated without cavitation. However, not all successful chiropractic adjustments necessarily produce the sound of cavitation. (75, 76)

As described by Ebrall sonic cavitation has been shown to facilitate the effect if vertebral adjustments, as '*joint cracking*', *(and) is traditionally associated with the adjustment of synovial joints but the evidence to extrapolate existing studies of the metacarpophalangeal joint to the zygapophyseal joints of the spine is inconclusive and the mechanisms remain theoretical.*' We note the difference in anatomy between vertebral facets and finger joints and the modes of creating cavitation, and question the comparison of inducing the cavitation. (36, 77)

Segment specific

Specificity in identifying an involved dysfunctional segmental lesion and the distinct rationale in addressing its rectification, are two of the primary factors that differentiate chiropractic adjusting techniques from general manipulation.

In noting that the stimulation of spinal nerves can affect visceral organs, Sato et al define this spinal segmental reflex being ‘... elicited when spinal nerves originating at specific segmental levels are stimulated. The segmental afferent nerves modulate visceral organs via autonomic efferent nerves or modulate them indirectly by affecting visceral afferent input.’ (78) As with much conventional research, Sato et al used animal subjects to demonstrate an appreciable correlation with medical human physiology. Their extensive works cite some 750 basic scientific papers.

In addition, research by Sato and Schmidt reported that neural somatosensory activation of sympathetic reflexes in cats found that ‘The size of the early reflex component was largest when the afferent volley entered the spinal cord at the same segment or at the segment adjacent to the white ramus.’ (78, p78)

Table 3: Nominated segmental associations

Segment level	Associated organ / function	Author	Source
C1/C2 (Rats)	Heart/hypertension	He, Lv, Li, et al (84)	Biomed Res Int. 2017
T2/T3	Raynaud’s Disease	Fraser DM (85)	Textbook, 1990
T4	Glove paresthesias	McGuckin N (86) DeFranca, Levine (87)	Textbook, 1986 JMPT, 1995
T5	Angina pectoris	Hamberg, Lindahl (88) Lindahl, Hamberg (89)	ACTA Med Scand, 1981
T5 (Rat subjects)	Impaired left ventricular function with enhanced sympathetic support	Lujan Janbaih DiCarlo (90,91)	J Applied Physiol, 2012 (x2)
T5/6 (T4-T7)	Gastro-duodenal	Lewit (92)	Textbook, 1985
T6 ‘Anterior’	Dyspepsia	Rome (93)	Chiropr J Aust, 2000
T6-T9	Duodenal or gastric ulcers	Kameith (94)	Arch Orthop Unfallchir, 1958
T13 (Rat)	Adrenal	Isa et al (95)	Neuro Sci, 1985

In other studies, it has also been noted that cervical adjustments may result in parasympathetic responses, whereas thoracic adjustments result in sympathetic responses. Furthermore, it appears that these responses may demonstrate the relationship of autonomic responses in association to the particular segment(s) adjusted. (79, 80, 81, 82)

Cramer and Darby describe rather specific vertebral correlations with organ nociception through preganglionic autonomic fibres. Their studies support the clinical observation of a possible influence through spinal manipulation – the somatovisceral reflex association. They note that *'Since pain is the most important clinical visceral sensation, knowledge of the spinal cord segments to which visceral afferent fibers project (which is the same location as the sympathetic preganglionic cell bodies) is extremely important. This knowledge allows the clinician to more effectively diagnose pathological conditions occurring in the viscera.'* (83)

Correlation of particular vertebrae with visceral function has long been recognised. Previously, other medical studies have identified visceral lesions with specific segments which exhibited vertebral anomalies. (96, 97, 98, 99)

Cogency and placement

The chiropractic adjustment is typically directed at releasing a fixated or hypomobile articulation, but in a corrective direction when that is indicated. It may also serve to restore aberrant kinematics or staggered, irregular articular motion, especially of a vertebra. It is hypothesised here that an articular motion may become fixated within its centre (path) of its axis zone with or without displacement – its neutral position. Beyond that zone that translation may approach a state of a strain or perhaps a sprain, as in a cervical whiplash. Both these would be outside the normal physiological range of motion, but also beyond the range of a controlled chiropractic adjustment. That is to say, the central zone of axes may be functionally disturbed with minimal movement.

Indeed in most circumstances, an adjustment releases a fixation within the central axis zone and within the joint's normal limit of its centre. For instance, Harrison et al found that complex, sacroiliac joint motion limited to "simultaneous rotations of 3 degrees or less and translations of 2 mm or less in three dimensions." This is also consistent with findings of Cattrysse et al in 2014. It is therefore suggested that there is no likelihood of a joint being conducted beyond its normal range of motion under a chiropractic adjustment. (10, 100, 101)

If movement within the central axis zone of vertebral motion is similarly limited, it could cover a zone occupying just an estimated 20% of the vertebral facet area.

Conclusion

While spinal vertebral articulations may be regarded as a primary focus of chiropractors, dysfunctional peripheral and adjacent articulations may also require adjustments or other manual procedures. It can be noted that both vertebral and peripheral articulations may also activate sensory and somato-autonomic reflexes in the firing of noxious impulses.

The chiropractic profession's unique techniques may come under the broad umbrella of manipulation. They are however discretely different to general manipulation *with distinctly different intent and purpose as to warrant the separate classification and nomenclature of adjustments.*

Chiropractic is not a manipulative technique it is a profession in which the adjustment is a specialised component. It can however also incorporate other more natural aspects of health care including exercise, lifestyle advice, dietary advice, health maintenance and appropriate referral procedures when required.



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Appendix A

The following plates show medical manipulative techniques and are taken with permission from Cyriax J. *Textbook of orthopaedic Medicine. Treatment by manipulation and massage*. Vol II. 7th edn. London: Cassell. 1965 (71). It must be noted that these do not depict chiropractic techniques.

