

# Complementing Chiropractic Philosophy with Science

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## ABSTRACT

In order to optimally help patients, collaboration among healthcare providers is superior to competition. To further this end, the intent for this paper is to enhance inter-professional communications and knowledge. The basics of chiropractic philosophy and science are illuminated herein. References and discussion supporting each of following four premises is described: (1) The body is a self-regulating organism, which possesses inherent recuperative abilities. (2) The nervous system directs all bodily functions, and therefore is requisite in the restoration and maintenance of health. (3) Improper motion or

position of vertebrae interferes with proper nerve function. This phenomenon is known as vertebral subluxation. (4) Removal/reduction of vertebral subluxations via chiropractic adjustments relieves/minimizes nerve irritations, and thus enhances the ability of the nervous system to promote health and healing. This paper addresses some questions and concerns regarding chiropractic research, as well.

**Key Words:** *vertebral subluxation, somatovisceral reflex, somatosomatic reflex, kinesiopathology, autonomic nervous system, mechanoreceptors, proprioception, nociceptors, chiropractic/spinal adjustment, spinal manipulation.*

## Introduction

Presently, there is an evolution in healthcare, where patients are seeking aid from diverse professionals (often referred to as complimentary or alternative medical providers).<sup>1,2</sup> Chiropractors in particular are the most commonly utilized alternative healthcare practitioners.<sup>3</sup> Patient satisfaction with chiropractors is exceedingly high,<sup>4,5,6,7,8,9</sup> and a majority of Americans surveyed believe chiropractic care should be a basic benefit included in their health care plan.<sup>10</sup>

The general public is not alone in its growing acceptance of chiropractic care (and/or spinal manipulation); many evidence-based organizations are acknowledging its merits. Washington D.C.'s Center for Studies in Health Policy, Inc.<sup>11</sup> concluded that the offices of chiropractors serve as portals of entry to the healthcare system, where patients receive assessment, diagnosis, treatment, management, reassessment, and referrals. The United States, Finland, New Zealand, Switzerland, the United Kingdom, Germany, Denmark, and Sweden all include spinal manipulation within their national guidelines for the management of low back pain.<sup>12</sup> The Ontario Ministry of Health<sup>13</sup> published research advocating chiropractic care, which states, "On the evidence, particularly the most scientifically valid clinical studies, spinal manipulation applied by chiropractors is shown to be more effective than alternative treatments for LBP [low back pain]." In a study conducted by the RAND Corporation<sup>14</sup> a multidisciplinary expert panel indicated that, "Spinal manipulation is the most commonly used conservative treatment for

back pain supported by the most research evidence of effectiveness in terms of early results and long-term effectiveness." Even cost effectiveness of chiropractic care has been demonstrated.<sup>13,15-20</sup>

Considering this expanding recognition of the chiropractic profession, increased communications and referrals among other medical professionals and chiropractors is a reasonable goal.<sup>21,22,23</sup> Nonetheless, misinformation is sometimes publicized<sup>24,25</sup> which detracts from interdisciplinary rapport. Furthermore, although much chiropractic research has been dedicated to low back pain, this discipline is not solely limited to low back conditions.<sup>26</sup> This paper was designed, therefore, to eliminate misconceptions, and enhance inter-professional communications by clarifying four essential tenants of chiropractic philosophy, and describing scientific support for each tenant.

Chiropractic philosophy is based upon the following concepts<sup>26</sup>:

1. The body is a self-regulating organism, which possesses inherent recuperative abilities.
2. The nervous system directs all bodily functions, and therefore is requisite in the restoration and maintenance of health.
3. Improper motion or position of vertebrae interferes with proper nerve function. This phenomenon is known as vertebral subluxation.
4. Removal/reduction of vertebral subluxations via chiropractic adjustments relieves/minimizes nerve irritations, and thus enhances the ability of the nervous system to promote health and healing.

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## Tenant One

The body is a self-regulating organism, which possesses inherent recuperative abilities.

This concept is supported scientifically by the phenomenon of homeostasis, which involves “dynamic processes of feedback and regulation,”<sup>27</sup> within the body. Hoag et al.<sup>28</sup> explain, “Organisms, including man, are constructed so as to preserve themselves, not so as to destroy themselves. ...disturbances activate machinery which dampens or nullifies the effects of the disturbance, returning the organism to or toward its healthy state.” Edward Taub, MD<sup>29</sup> states, “The dynamic of homeostasis is already naturally and unceasingly happening in your body. Your Healing Force is always at work, whether you command it or not.”

In concordance with Dr. Taub, many medical doctors speak of the inherent recuperative powers our bodies possess. Bernie Sigel, MD<sup>30</sup> states, “...I am asking that we become open to the healing gift within us.” Deepak Chopra, MD<sup>31</sup> explains, “The frustrating reality, as far as medical researchers are concerned, is that we already know that the living body is the best pharmacy ever devised. It produces diuretics, painkillers, tranquilizers, sleeping pills, antibiotics, and indeed everything manufactured by the drug companies, but it makes them much, much better. The dosage is always right and given on time; side effects are minimal or nonexistent; and the directions for using the drug are included in the drug itself, as part of its built-in intelligence...intelligence is present everywhere in our bodies.” According to Albert Schweitzer, MD<sup>26</sup>, “Each patient carries his own doctor inside him. They come to us not knowing that truth. We are at our best when we give the doctor who resides within each patient a chance to work.”

Andrew Weil, MD<sup>32</sup> states, “If a strand of DNA is damaged—say, by an energetic ultraviolet ray from the sun—the molecule identifies the point of injury and repairs it, by manufacturing specific repair enzymes to do the job. The healing system operates from that fundamental level up to the level of cut fingers and into the mental realm, where it helps us adjust to emotional shocks. It operates continually, keeping most of us in good health most of the time in spite of all the agents of illness and forces of disorder that surround us constantly, and it is always at the ready to help us deal with serious threats to health when they arise... The most limiting omission in conventional medicine today is the absence of the concept that the body can repair itself.” Candice Pert, PhD<sup>33</sup> concurs stating, “...each of us is a dynamic system with a constant potential for change in which self-healing is the norm rather than the miraculous.”

Innate intelligence is the term chiropractors use to refer to the body’s in-born functional and healing abilities.<sup>26</sup> Surgeons certainly would not cut a patient’s internal organs if they believed the body would be unable to repair the incisions thereafter. All people have experienced natural recoveries from viruses and scrapes, as first hand evidence of innate recuperative powers at work. If our bodies were devoid of healing abilities, the human species would have become extinct in its earliest years.

## Tenant Two

The nervous system directs all bodily functions, and therefore is requisite in the restoration and maintenance of health.

This concept is paraphrased by Lantz<sup>34</sup> as follows, “...the nervous system is the mediator of vitality and health to the individual organs and tissues. Today, more than ever before, basic scientific and medical research supports this fundamental concept of chiropractic.” Guyton’s Textbook of Medical Physiology<sup>35</sup> explains, “The most important ultimate role of the nervous system is control of bodily activities. This is achieved by controlling (a) contraction of skeletal muscles throughout the body, (b) contraction of smooth muscle in the internal organs, and (c) secretion by both exocrine and endocrine glands...” One example of health maintenance coordinated by the nervous system is temperature regulation, which Guyton<sup>35</sup> describes as follows, “When the body temperature rises too high, special neurons in the anterior hypothalamus become excited; these in turn send signals through the sympathetic nervous system to dilate the skin blood vessels, thereby allowing transfer of major amounts of internal body heat to the skin. This heat then passes from the skin to the surroundings. As a result, the body temperature falls back toward normal.”

Taber’s Cyclopedic Medical Dictionary<sup>27</sup> states, “The nervous system regulates and coordinates body activities...”, and defines health as, “A condition in which all functions of the body and mind are normally active.” Since the definition of health encompasses proper bodily function, and the nervous system regulates bodily function, the nervous system is intimately involved in a person’s health.

The immune system safeguards an individual’s health as well.<sup>27,35</sup> Research has established that there are elaborate bidirectional communications between the nervous system and the immune system.<sup>33,36,37</sup> Chemical messengers such as hormones, neurotransmitters, neuropeptides, and cytokines facilitate dialogue between nerve fibers and immune cells.<sup>33,36,37</sup> Furthermore, the central nervous system modulates the immune system via autonomic nervous outflow. As stated by Felten et al.<sup>38</sup>, “Histochemical studies from our and other laboratories have shown the presence of autonomic nerve fibers in specific compartments of both primary and secondary lymphoid organs. These nerve fibers are associated not only with blood vessels but also with lymphocytes and macrophages.” In a related article, Felton et al.<sup>39</sup> state, “Nerve fibers distribute within the parenchyma of these organs, as well as along smooth muscle compartments.” Describing the significance of these findings they assert, “The presence of autonomic nerve fibers in the parenchyma of lymphoid organs establishes an anatomical link between the brain and the immune system for translating central neural processing into signals that can influence cells of the immune system.”<sup>38</sup>

One’s capacity for health and healing has been shown to diminish from altered regulation of, or stress upon, the nervous system/immune system dynamic. Hori et al.<sup>36</sup> provide examples of this. They explain, “A neuropeptide CRF in the brain has been postulated to be a key mediator of stress-induced responses...electric shock stress which produced an increase in brain CRF mRNA expression was shown to suppress NK [natural killer cell] activity,” and, “...centrally and peripherally induced enhancement in the splenic sympathetic activity inhibits the cellular immunity including the NK activity in the spleen and the peripheral blood.” Additionally, the immunological ab-

normalities apparent in chronic stress, clinical depression, and ageing have been associated with changes in sympathetic regulation.<sup>40</sup>

Sternberg et al.<sup>41</sup> claim, "...the central nervous system may coordinate both behavioral and immunologic adaptation during stressful situations. The pathophysiologic perturbation of this feedback loop, through various mechanisms, results in the development of inflammatory syndromes, such as rheumatoid arthritis, and behavioral syndromes, such as depression."

Felten et al.<sup>38</sup> explain, "Stressful conditions lead to altered measures of immune function and altered susceptibility to a variety of diseases... many stimuli which primarily act on the central nervous system (CNS) can profoundly alter immune responses."

Elenkov et al.<sup>42</sup> link homeostasis with the immune system - nervous system connection by stating, "During an immune response the brain and the immune system 'talk to each other' and this process is essential for maintaining homeostasis." This interdependency of systems, in combination with the nervous system's primary function, "control of bodily activities,"<sup>35</sup> illustrate the fundamental role of the nervous system in the restoration and maintenance of health.

### Tenant Three

Improper motion or position of vertebrae interferes with proper nerve function. This phenomenon is known as vertebral subluxation.

Causes of vertebral subluxation are numerous. According to Gatterman<sup>43</sup>, "...both trauma and immobilization are frequently implicated causes in patients with [vertebral] subluxation," and stress, repetitive and prolonged postural activity (either static or dynamic), nutritional neglect, inadequate or improper exercise, and toxic exposure also contribute toward spinal joint dysfunction.

Spinal joint dysfunction (improper motion or position of vertebrae) is referred to as "kinesiopathology."<sup>44-47</sup> But, how exactly does vertebral kinesiopathology render local nerve fibers susceptible to harm? Chapman-Smith<sup>48</sup> explains, "Joint dysfunction can directly compress or irritate nerves, especially in the canals through which spinal nerves exit from the spinal cord...there is minimal spare space for the nerves and associated blood vessels in the interpedicular zone." Korr<sup>49</sup> concurs stating, "These [intervertebral] foramina contain not only the nerves and roots and their sheaths, but also quantities of fat, connective tissue, periosteum, blood vessels and so forth. We now know that it takes very slight, localized pressure or mechanical deformation to disturb the excitability and conductivity of the neurons that happen to be passing through a foramen at the focus of the pressure or deformation."

In fact, nerve roots are far more sensitive than peripheral nerves to compressive forces.<sup>34</sup> Konno et al.<sup>50</sup> found that nerve root compression with as little as 10mm Hg results in decreased action potentials, as did Sharpless<sup>51</sup> who determined that a pressure of 10mm Hg decreases nerve root conduction potential to 50% of its initial value within 30 minutes. Furthermore, this same minimal pressure is sufficient to block both nutrient blood flow and venous blood flow to and from nerves.<sup>52</sup>

Kinesiopathology also appears to accelerate spinal degeneration, which may further irritate neural tissues. Reactive osteophytes are likely to form in response to hypermobility (excessive motion) in the spine.<sup>53</sup> Evidence also supports the prevalence of segmental vertebral hypomobility (limited motion) and consequent degenerative changes.<sup>46,47</sup> According to Lantz<sup>47</sup>, "It is well known that the lack of movement in a joint leads initially to joint stiffness (loss of flexibility), with associated pain. This is followed by degeneration of the joint, and ultimate fusion by bony ankylosis."

Documented mechanisms of nerve root or cord compression resulting from degenerative changes include osseous constriction of the vertebral canal, hypertrophy of the zygapophyseal articulations, protrusion of the intervertebral disc,<sup>34,54</sup> protrusions and hypertrophy of the posterior longitudinal ligament<sup>34</sup> or of ligamentum flavum,<sup>44,54</sup> and fibrosis and sclerosis of the root sleeve.<sup>34</sup> (Degeneration-based nerve root compression is frequently a factor in producing radicular symptoms, as well.)<sup>54</sup>

According to the data mentioned thus far, the potential exists for neural encroachment within the intervertebral foramen, with or without the presence of degenerative changes. Yet, whether or not nerve roots are physically compressed, vertebral kinesiopathology may result in abnormal neurological activity. A phenomenon where vertebral kinesiopathology produces noxious, afferent (incoming) neurological messages, and noxious, efferent (outgoing) visceral responses result, has been referred to as a somatovisceral reflex,<sup>28,55</sup> or a somato-autonomic reflex.<sup>56</sup> In order to fully appreciate the somatovisceral reflex, a brief review of neurology is required.

The nervous system encodes incoming information in the following manner, according to Guyton<sup>35</sup>, "Sensory signals enter the cord through the sensory roots. After entering the cord, every sensory signal travels to two separate destinations. First, either in the same segment of the cord or in nearby segments, the sensory nerve or its collaterals terminate in the gray matter of the cord and elicit local segmental responses-local excitatory effects, facilitatory effects, reflexes, and so forth. Second, the signals travel to the higher levels of the nervous system- to higher levels in the cord itself, to the brain stem, or even to the cerebral cortex."

Specifically, with regard to spinal structures, sensory information from spinal joints and tissues is transmitted to the spinal cord via the sinuvertebral nerve, the gray rami communicantes, small direct branches from the anterior primary rami of spinal nerves, and all three branches (medial, intermediate, and lateral) of the posterior primary rami of spinal nerves.<sup>55</sup> Two main types of sensory receptors within the spinal and paraspinal tissues, mechanoreceptors and nociceptors, require elucidation, as well.

Sensory nerve endings called mechanoreceptors, include receptors such as Merkel's discs, tactile hairs, pacinian corpuscles, Meissner's corpuscles, Krause's corpuscles, and Ruffini's end organs. These receptors are located in the skin, spinal ligaments, and joint capsules.<sup>35,56</sup> Their function is described by Guyton<sup>35</sup> as follows, "In the deep tissues, they detect stretch, deep pressure, or any other type of tissue deformation-even the stretch of joint capsules and ligaments to determine the angulation of a joint." Mechanoreceptors located in muscu-

lar or tendinous tissues include muscle spindles and golgi tendon organs, respectively.<sup>35</sup> With regard to spinal mechanics, muscle spindles within the paraspinal muscle bellies detect changes in muscle length, whereas Golgi tendon organs detect tension changes within the tendons.<sup>35,57</sup>

Nociceptors are sensory receptors which detect physical or chemical tissue damage,<sup>35</sup> and are associated with the experience of pain.<sup>27</sup> They are located throughout the following spinal tissues: joint capsules of the zygapophyseal and sacroiliac joints, annulus fibrosis of the intervertebral discs, paraspinal ligaments, periosteum of the vertebral bodies and arches, paraspinal tendons, fascia, dura mater, epidural adipose tissue, and the skin and subcutaneous tissues of the back. Innervation to the walls of spinal blood vessels further extends the nociceptor system to the paraspinal muscles, epidural and extra-vertebral connective tissue, and the cancellous bone of the vertebral bodies, sacrum and iliums.<sup>55</sup> Nociceptors become excited from local inflammation, or any other noxious mechanical, thermal or chemical stimulation.<sup>55,57</sup>

Recall that mechanoreceptive and nociceptive (sensory) input from spinal structures is transmitted via afferent neurons to the central nervous system.<sup>55,57,58</sup> When vertebral subluxation is present, vertebral kinesio-pathology promotes abnormal joint loading (noxious mechanical stimulation) and inflammation (noxious chemical stimulation), which both alters normal mechanoreceptive input and excites nociceptors.<sup>55,57</sup> These afferent messages pass through the dorsal roots to the dorsal horn of the spinal cord, and then form connections to interneurons.<sup>57,59,60</sup>

Now we may return to discussing somatovisceral reflexes. According to Patterson<sup>59</sup> up to 80% of spinal interneurons that receive information from somatic afferents also receive input from visceral afferents. He explains that inflammation increases joint receptor activity by as much as 10 fold, and due to the above-mentioned convergence of signals at interneurons, such dramatic increases in sensory input cannot help but disrupt normal autonomic outflow patterns.

Sato et al.<sup>56</sup> describe somatovisceral reflexes as follows, "...preganglionic sympathetic neurons form the intermediolateral and intermediomedial columns between, approximately, the first thoracic and the second or third lumbar segments...Somatic afferents entering the spinal cord at these segmental levels have the opportunity, therefore, to synapse with local autonomic motor neurons, as well as to synapse with projections to higher supraspinal centers." Although either the sympathetic or parasympathetic system may be activated by a somatovisceral reflex, activation of the parasympathetic system is less frequently cited experimentally. Visceral effects from somato-autonomic reflexes will be expressed unless the reflex is masked by descending influences from the brain.<sup>56</sup>

Budgell et al.<sup>61</sup> and Koch et al.<sup>62</sup> witnessed the somatovisceral reflex phenomenon in their laboratories. Budgell et al. stimulated somatic structures of the lumbar spine in rats and observed visceral responses. They state, "...in central nervous system (CNS)-intact animals, noxious chemical stimulation of the interspinous ligaments caused a pronounced elevation of mean arterial pressure (MAP) and a prolonged depression of sciatic nerve blood flow (NBF)." Koch et al.<sup>62</sup> measured the

visceral effect of heart rate changes in infants, in response to mild mechanical stimulation of the upper cervical spine.

Sato et al.<sup>56</sup> summarize the somatovisceral reflex phenomenon sufficiently, "It is now clear that there are a multitude of reflex responses of visceral function following somatic afferent stimulation...Thus stimulation of the appropriate segmental spinal nerves does indeed elicit spinally mediated autonomic responses, and these responses, rather than being broad and generalized, are most likely to be specific for organs served by the local autonomic efferents."

On the other hand, the phenomenon of a somatic disturbance (postural or mechanical articular derangements/kinesio-pathology) creating a neurologically based somatic response (anterior horn cell stimulation and muscle contraction) is termed a "somatosomatic reflex."<sup>28,43,55</sup>

Furthermore, a neurological complication known as "facilitation"<sup>28,45,49</sup> or "sensitization"<sup>59,60</sup> may arise from vertebral subluxation. During facilitation, reflex thresholds are lowered, causing a hyper-excitable state to be maintained at the lesioned joint level. Thus, persistent somatosomatic and/or somatovisceral reflexes may result from mild afferent stimuli.<sup>28,45,49</sup>

Korr<sup>49</sup> describes facilitation where somatosomatic reflexes persist. He states, "First, postural, mechanical, and articular derangements unquestionably cause increased fiber-length or tension in the muscles and tendons on at least one side of the articulation in question. The proprioceptors [e.g. mechanoreceptors] are highly sensitive to changes in fiber-length or tension. Second, they are the nonadapting type of receptor. They keep firing impulses into the cord via the dorsal root fibers as long as they are under tension...As a result of the continuous barrage of impulses which they fire into the cord at their level, the anterior horn cells of the corresponding segment are maintained in a state of chronic facilitation...The muscle fibers to which they are connected will then be excessively high in tone."

Korr<sup>49</sup> also discusses facilitation where both somatosomatic and somatovisceral reflexes abide. He states, "A large portion of the efferent neurons are kept near the firing point (facilitated)...by chronic afferent bombardment from segmentally related structures. Proprioceptors are undoubtedly an important source of this bombardment... The state of facilitation may extend to all neurons having their cell bodies in the segment of the cord related to the lesion, including the anterior horn cells, preganglionic fibers of the sympathetic nervous system, and apparently the spinothalamic fibers...Because of the lowered barriers in the lesioned segment, excitation is channelized into the nervous outflow from that segment."

Dishman<sup>45</sup> describes facilitation as follows, "Facilitation is referred to as that state in which nervous impulses can be elicited with minimal amounts of stimulation...Proprioceptors in muscles are the most important source of afferent impulses which result in changes in the cord associated with the lesion/subluxation. Clinical evidence of the lesion/subluxation includes hyperalgesia, autonomic asymmetry, restricted joint movement and abnormal texture or tone in soft tissues."

Hoag et al.<sup>28</sup> concur, and describe facilitation as such, "... there is evidence that when motor reflex thresholds are chronically reduced, at least some of the preganglionic sympathetic neurons of the same [subluxated] spinal cord segments are

maintained in a continued state of facilitation, so that reflex activity can result from a relatively light stimulus. Then as the cycle of abnormal activity continues, the segmentally related structures in turn set up a chronic bombardment of impulses that maintain the spinal cord segments in a hyperirritable state.”

Selano et al.<sup>63</sup> note that facilitation which maintains sympathetic responses upsets the normal autonomic balance, and is deleterious to the excited tissues. They explain that vertebral subluxation that is located in the uppermost region of the cervical spine, which places pressure upon the spinal cord, may produce facilitation. They state, “C1 subluxation may also result in torsioning of the spinal cerebellar tract. This sets up a system of high gate facilitation which results in sustained sympatheticonia...sympathetic hyperactivity, sustained over long periods of time, will tend to produce pathologic changes in the target tissues...chronic subluxations and long term sympatheticonia will eventually lead to an attenuation in the neuronal physiology and “burnout,” which leads to a reduced state of cellular activity.”

In 1921 Henry Winsor, MD<sup>64</sup> explored this relationship between spinal integrity and the condition of the viscera. He dissected cadavers, with the following purpose in mind, “The object of these necropsies was to determine whether any connection existed between minor curvatures of the spine, on the one hand, and diseased organs on the other; or whether the two were entirely independent of each other.” Among a sample of 50 human cadavers, he found the following results, “...221 structures other than the spine were found diseased. Of these, 212 [95.9%] were observed to belong to the same sympathetic segment as the vertebrae in curvature.” Dr. Ussher<sup>65</sup> and Drs. Wills and Atsatt<sup>66</sup> also contended that in many cases spinal alterations appear to disturb physiology. These doctors found correlations between visceral symptomatology and spinal injury and/or postural deviations of the spine in living patients.

According to Hoag et al.<sup>28</sup> postural deviations, with accompanying stress upon the nervous system, are relatively common. They explain that the evolutionary development of upright posture in man allows greater susceptibility for postural distortion. In other words, stability was sacrificed for enhanced mobility. They assert that with upright posture, “...there is a greater risk of unbalancing the pelvic base and of incurring deformity through any deviation from the optimum pattern of erect posture...The ultimate effects of alterations in basic posture or weight bearing are...twofold: (1) the superincumbent parts are required to make further compensations (e.g., the posture of the head and the curves of the neck are directly related to the midgravity line and the presence or absence of changes in the sacral base level, lumbar curves, etc.); and (2) there are increased stimuli to the somesthetic nervous system, with increased demands not only on the somatic nerves but also on the autonomic nervous system.”

Postural deviations, joint misalignment, and stress upon the nervous system may also be traumatically induced, as noted earlier by Gatterman.<sup>43</sup> Slosberg<sup>60,67</sup> discusses somatosomatic reflexes and somatovisceral reflexes<sup>60</sup> resulting from traumatically induced joint dysfunction. He asserts, “Trauma may not only produce alterations in sensory neurologic patterning but

may also result in altered muscle tone, mobility and sympathetic responses.”<sup>60</sup>

These three characteristics: altered muscle tone, mobility, and sympathetic responses, resultant from vertebral kinesio-pathology, constitute a three-dimensional model of the vertebral subluxation.<sup>68</sup> More specifically, Kent and Warner<sup>68</sup> describe these neurological characteristics as dysponesis (abnormal involuntary muscle activity), dyskinesia (impairment of voluntary movement/range of motion), and dysautonomia (functional abnormalities of the autonomic system). Preliminary studies<sup>69-72</sup> lend support to their claim that, “Each component may be reliably measured using appropriate instrumentation.” The Insight Millennium Subluxation Station is Kent and Warner’s example of reliable, appropriate instrumentation; it combines surface electromyography (dysponesis assessment), computerized inclinometry (dyskinesia assessment), and skin temperature measurement (dysautonomia assessment). Although this technology requires further research, it appears to be a useful clinical tool for gauging patient progress.”<sup>68</sup>

#### Tenant Four

Removal/reduction of vertebral subluxations via chiropractic adjustments relieves/minimizes nerve irritations, and thus enhances the ability of the nervous system to promote health and healing.

As early as the 1930’s there were medical doctors who upheld that structure and function were linked. Dr. Ussher’s<sup>65</sup> research inspired him to state, “For some time the clinician has been so engrossed in the effects of visceral dysfunctions and their *outward* manifestations that he has neglected the skeletal structures with their disturbance reflected *inward* on the viscera.”

As alluded to in the “Tenant Three” section of this paper, Dr. Ussher<sup>65</sup> and Drs. Wills and Atsatt<sup>66</sup> investigated what they termed the ‘viscerospinal syndrome.’ They reported many cases of this syndrome, which involved diverse visceral manifestations such as asthma attacks, nausea and vomiting, symptoms of angina, esophageal spasm, pylorospasm, constipation, or painful and frequent urination. Positive findings of one or more of the following: scoliosis, acute or chronic injury to the spine, abnormal kyphosis or lordosis, and short leg phenomena, were reported in all subjects. Corrections utilizing varied combinations of heel lifts, physiotherapy, massage, heat, supports, muscle training, and osteopathic manipulation resulted in relief or cure of the symptomatology.

Since the time of these early studies, growing numbers of osteopathic physicians and medical doctors have been discussing the clinical benefits of spinal manipulation. Cole, MD<sup>22</sup> notes that in injured individuals, manipulation reduces pain and promotes faster recovery. Lewit, MD<sup>73</sup> states, “The vast number of painful disorders designated as ‘functional’, in reality attributable to disturbed function of internal organs and the locomotor system, constitute the majority of minor ailments afflicting our fellow humans. It is here that manipulative and other techniques of physical medicine (‘dieting’) are the adequate method to deal with disturbed function and the ensuing reflex changes, treating them in the most specific and physiological way. It would indeed be a significant contribution to modern medicine if these

methods, judiciously used, were to be brought into play where the heavy and often only too effective armament of drug therapy, with all its side-effects, is called upon for 'minor everyday troubles'. The heavier weapons could then be saved for the right moment." As stated by Hoag et al.<sup>28</sup>, "...manipulative procedures enable the reduction of the abnormal influences of somatic lesions on other somatic or visceral structures."

Chapman-Smith<sup>48</sup> provides greater detail regarding healthful benefits resulting from chiropractic adjustments:

"There are now a number of well-described *mechanical* and *reflex* results of manipulation. These include:

1. Joint cavitation and increased range of motion (mechanical), causing inhibition or reduction of pain (reflex)... This is Melzack and Wall's "gate" mechanism... Increased proprioceptive input from increased joint motion reduces- closes the gate on- pain transmission.
2. Joint and muscle receptor stimulation (mechanical) causing relaxation of paraspinal muscles (reflex)... Herzog's interdisciplinary team at the University of Calgary in Canada has recently shown that 11 commonly used chiropractic manipulative techniques for different regions of the spine and pelvis not only have calming effects on muscles near the joint being manipulated but also in other areas of the spine, arms and legs...
3. Breaking of joint adhesions (mechanical). With chronic or long-term pain there is shortening of connective tissue, long-term reduced joint mobility and formation of adhesions- the joint is partially "stuck together." Manipulation can stretch or break these adhesions. This brings increased motion which has the reflex effects already discussed.
4. Release of connective tissue trapped in joints (mechanical). Anatomical studies by Giles in Australia in the 1980s showed tags of fibrous and other tissue that had become trapped in lumbar and cervical facet joints. Giles discusses how these may cause irritation and traction in both the affected joints and adjacent ones, leading to the reflex muscle spasm associated with acute locked back or neck (torticollis). Manipulation can release these tags of tissue.
5. Stimulation of the autonomic nervous system (ANS) (reflex) through cavitation and increased range of motion (mechanical). The work of Korr, for example, indicates that spinal manipulation, through ANS reflex effects, influences the vasomotor tone (the caliber or diameter of blood vessels and their function) of neuromusculoskeletal tissues.
6. Relief of chronic nerve compression and irritation by correction of abnormal joint mechanics (mechanical). Joint dysfunction can directly compress or irritate nerves, especially in the canals through which spinal nerves exit from the spinal cord (interpedicular zone)... This situation is aggravated by degeneration or stenosis- narrowing of these canals because of boney outgrowths over time. Kirkaldy-Willis and Cassidy have reported good results with many back patients with central (spinal) or lateral (nerve root canal) stenosis. It is thought that many of them will have had a combination of stenosis and restricted joint motion."

In addition, where immobilization degeneration is present, joint remobilization within a reasonable period of time is able

to reverse many adverse histological changes, reverting the joint back toward its normal functional capacities.<sup>46,47</sup>

Two points aforementioned by Chapman-Smith require further description. He speaks of increased joint ranges of motion resulting from spinal adjustments; this creates increased active ranges of motion for patients.<sup>74-78</sup> Also, he notes that paraspinal and extremity muscle tension reduces following manipulation; this has been verified by measurements of reduced muscle electrical activity.<sup>79-83</sup> Additional melioration in articular and/or muscular function following chiropractic care includes: increased muscle strength,<sup>84,85</sup> enhanced athletic performance,<sup>86</sup> and improved proprioception.<sup>78</sup>

In light of the above data, it is not surprising that somatic conditions have shown betterment with chiropractic care. The Magna Report upholds chiropractic effectiveness in relieving lower back ailments,<sup>13</sup> as do a plethora of other studies.<sup>12,14,19,20,77,87-90</sup> Chiropractic adjustments have produced improvement in thoracic pain,<sup>91</sup> ankle pain,<sup>92</sup> migraine<sup>93,94</sup> and tension/cervicogenic headaches,<sup>95,96</sup> carpal tunnel syndrome,<sup>97,98</sup> herniated disc induced sciatica,<sup>99,100</sup> elbow pain,<sup>101</sup> and neck pain.<sup>74,75,77,88</sup> Fibromyalgia sufferers have benefited significantly from spinal manipulation in combination with ischemic compression in hypertonic muscle tissues.<sup>102</sup> Chiropractic care is helpful for whiplash syndrome, as well.<sup>103</sup>

Additional healthful benefits that have been demonstrated following spinal adjustments include: increased plasma beta endorphin levels;<sup>104</sup> enhanced peak flow rate,<sup>105</sup> forced expiratory volume,<sup>106</sup> and vital capacity values<sup>105,106</sup> in patients with obstructive lung disease; increased immune activity via enhanced neutrophil respiratory burst and elevation of substance P;<sup>107</sup> reduction of blood pressure;<sup>85,108,109</sup> improved capillary counts;<sup>85</sup> and enhanced cognitive processing.<sup>110,111,112</sup> Subjects have also experienced relief from pelvic pain,<sup>113</sup> PMS,<sup>114</sup> ulcers,<sup>115</sup> and vision problems.<sup>116-119</sup> Peterson<sup>120</sup> found that spinal manipulation decreased the intensity of emotional arousal in subjects with phobic disorders. Selano et al.<sup>63</sup> measured a 48% increase in CD4 cell counts for HIV positive patients who had been receiving chiropractic adjustments for 6 months. The control group, on the other hand, demonstrated a 7.96% decrease in CD4 cell counts.

Pediatric chiropractic care has also received attention in the literature. Infantile colic,<sup>121,122</sup> asthma,<sup>123</sup> ADD/ADHD related disorders,<sup>124,125,126</sup> various mental and learning disabilities<sup>126,127</sup> (results reported in both adults and youths),<sup>128</sup> and otitis media<sup>129,130</sup> have all been ameliorated in pediatric chiropractic patients.

Chiropractic research studies addressing wellness and prevention have been published as well. A retrospective analysis of almost 2000 surveyed chiropractic patients found that significant health benefits were reported in each the following domains: physical state, mental/emotional state, response to stress, life enjoyment, and overall quality of life. These clinical improvements reportedly continued throughout the duration of patient care, indicating no maximum or plateau for achieving clinical benefits.<sup>131</sup>

Rupert et al.<sup>132</sup> surveyed 311 elderly individuals (aged 65 and older) who were wellness/maintenance chiropractic patients. These subjects spent only 31% of the US national average for

health care services when compared with citizens in their age bracket; they even spent less than the US national average when compared with US citizens of all ages. Coulter et al.<sup>133</sup> found that individuals receiving chiropractic care were less likely to have been hospitalized, used fewer medications, and were more active and mobile than those who did not receive chiropractic care. Additionally, a randomized clinical trial comparing medication, acupuncture, and spinal manipulation for the treatment of chronic spinal pain, not only found chiropractic adjustments to be the most beneficial overall in terms of symptom relief, but noted a 47% improvement in general health status in the manipulation test group, as measured by the Short-Form-36 Health Survey. (On the other hand, the general health status of the medication test group improved by 18%, and the acupuncture test group by 15%.)<sup>77</sup> All of the above-mentioned studies support the chiropractic notion that inducing structural balance in the spine helps to normalize nervous system function, thereby fostering improved health.

The current state of chiropractic research is well summarized by Dishman<sup>45</sup> as follows, “The “chiropractic subluxation complex” may now be defined and described as a definitive clinical entity having broad and deep implications concerning pathogenesis. Its corollary, the absence of subluxation complex, also serves as a model for health and homeostasis by virtue of a normal neurobiomechanical system the sine qua non of which is the vertebral column; undoubtedly the most neglected vital organ in the human body.”

## Discussion

Chiropractic philosophy, backed by research, thus supports the following concepts:

1. *The body is a self-regulating organism, which possesses inherent recuperative abilities.* Many reputable medical doctors validate and discuss the body’s natural healing abilities, and “dynamic processes of feedback and regulation”<sup>27</sup> are evidenced by the marvel of homeostasis.
2. *The nervous system directs all bodily functions, and therefore is requisite in the restoration and maintenance of health.* Since the definition of health encompasses proper bodily function, and the nervous system regulates bodily function, the nervous system is intimately involved in a person’s health. Furthermore, elaborate bidirectional communications exist between the nervous system and the immune system.
3. *Improper motion or position of vertebrae (kinesio-pathology) interferes with proper nerve function. This phenomenon is known as vertebral subluxation.* Spinal nerve roots may become physically compressed, and/or aberrant afferent impulses may produce any combination of the following neurological consequences: facilitation, somatovisceral reflexes, or somatosomatic reflexes. These neurological abnormalities may be expressed in the body as dysponesis (abnormal involuntary muscle activity), dyskinesia (impairment of voluntary movement/range of motion), and/or dysautonomia (functional abnormalities of the autonomic system).
4. *Removal/reduction of vertebral subluxations via chiropractic adjustments relieves/minimizes nerve irritations, and*

*thus enhances the ability of the nervous system to promote health and healing.* Studies reveal a wide range of healthful benefits associated with receiving chiropractic care.

Although evidence supporting four main tenants of chiropractic philosophy has been provided, some concerns have been raised, as well. According to Haldeman<sup>55</sup> somatovisceral and somatosomatic reflexes have sparked interprofessional debate for the following reasons, “Questions about their relative potency as factors in health and disease and methods to assess them are largely unsettled.” Yet, the “Tenant Two” section of this paper affirms the vital role of a properly functioning nervous system for optimum health. The “Tenant Three” section uncovers how somatovisceral and somatosomatic reflexes result from vertebral subluxation, and the “Tenant Four” section illustrates that chiropractic adjustments, which aim to correct vertebral subluxations and normalize such reflexes, have produced various positive effects upon health. As mentioned in the “Tenant Three” section, surface electromyography, inclinometry, and thermography are new methods to quantitatively assess somatovisceral and /or somatosomatic reflex effects present with vertebral subluxation.

A few studies have found chiropractic care to be of no greater benefit for back pain relief than comparison treatments tested.<sup>134,135,136</sup> Cherkin et al.<sup>134</sup> state, “A meta-regression analysis of the results of 26 RCTs [randomized clinical trials] evaluating spinal manipulation for acute and chronic back pain reported that spinal manipulation was superior to sham therapies and therapies judged to have no evidence of a benefit but was not superior to effective conventional treatments.” Although being of equal value to conventional care is not negative, the fact that spinal manipulation is such a safe intervention warrants the expansion of its use.

Negative publicity about chiropractic care has erroneously implied that it is dangerous.<sup>25</sup> Meeker and Haldeman<sup>137</sup> describe the low level of risk associated with chiropractic adjustments, imparting statistical evidence to back their assertions. They state, “Non-serious side effects of manipulation may consist of localized discomfort, headache, or fatigue that resolves within 24 to 48 hours. The more serious reported complications are the cauda equina syndrome from lumbar manipulation and cerebrovascular artery dissection from cervical manipulation. The apparent rarity of these accidental events has made it difficult to assess the magnitude of the complication risk. No serious complication has been noted in more than 73 controlled clinical trials or in any prospectively evaluated case series to date. Serious complications from lumbar spinal manipulation are extremely rare, estimated to be 1 case per 100 million manipulations. For cervical manipulation, the risk for a cerebrovascular accident has been calculated by various authors to range from 1 in 400,000 to between 3 and 6 per 10 million manipulations.” When compared with chiropractic adjustments, over-the-counter, non-steroidal anti-inflammatory drugs (NSAIDs) pose a risk several hundred times greater for serious complications and death.<sup>138</sup>

Another concern about chiropractic care is that there have been studies where results were linked with the placebo effect.

For example, Balon et al.<sup>139</sup> and Kockjohn et al.<sup>140</sup> found that both the treatment and placebo groups in their studies exhibited positive changes. This illustrates the undeniable presence of the mind-body connection within the healing process, and is not at all unique to recipients of chiropractic care. As explained by Bernie Siegel, MD<sup>30</sup>, “If a person can turn from predicting illness to anticipating recovery, the foundation for cure is laid.” For this reason, sham surgeries<sup>31,141</sup> and sham medications<sup>142-144</sup> have resulted in patient improvements as well.

Despite being common, the placebo effect is elusive. Benedetti and Amanzio<sup>145</sup> state, “Placebo is a widespread phenomenon in medicine and biology and its mechanisms are understood only partially.” Deepak Chopra, MD<sup>31</sup> explains, “...the placebo effect, has been noted for centuries, but it is highly unpredictable. The doctor cannot tell in advance which patients will benefit or to what extent.”

In the *Journal of Medicine and Philosophy*, Sullivan<sup>146</sup> discusses that modern medicine generally ignores placebo effects because of their inexplicable nature, and consequently limits research efforts to the randomized clinical trial design. However, he cautions against this, stating, “...placebos produce actual but unexplained therapeutic successes. The blinding necessary for a proper placebo-controlled RCT therefore introduces an epistemic bias into orthodox medicine: therapeutic successes that rely upon a direct link between knowing and healing, such as placebo effects, are discarded in favor of therapeutic successes that rely upon an indirect link between knowing and healing, such as pharmacological interventions... The clinical consequences of this method of testing therapies include a diminished vision of the therapeutic potential of the doctor-patient relationship and of the potential human resources available for healing.” It may be helpful for all healthcare practitioners to acknowledge that the doctor-patient relationship, the mind-body interaction, and placebo effects are integral players in the healing process.<sup>31</sup> Ideally, these factors may be used to enhance every treatment rendered, thereby maximizing patients’ results.

## Conclusion

Although this paper describes chiropractic science within a philosophical framework, bear in mind that the topic of chiropractic philosophy is broad and was only minimally explained here. A central concept of chiropractic philosophy is that a universal intelligence organizes all matter and life, and that the innate intelligence within our bodies is derived from this great, intangible wisdom of the universe.<sup>26,147</sup> Modern influential speakers such as Dr. Wayne Dyer<sup>148</sup> and Dr. Deepak Chopra<sup>149</sup> also espouse the idea of a universal intelligence, however, this concept was not elaborated upon, as science is just beginning to creatively explore and explain the organization of our universe.<sup>150</sup>

Just as the complexity of our universe is acknowledged, so are the intricacies of human physiology. In most cases illness results from a combination of negative elements.<sup>32</sup> Lewit, MD<sup>73</sup> states, “There are many disorders that are caused by more than one factor, and the spinal column may [or may not] be only one of several factors causing a pathological condition.” Hence, chiropractic care is not a “cure-all treatment.” While the Tenant

Four section of this paper reveals associations of benefits received following chiropractic care, it cannot unequivocally prove causality. It is certainly a logical deduction that minimizing stress upon the nervous system is at the very least, a step in the direction of *better* health and *better* healing capability; nonetheless more research about chiropractic care is warranted. In particular, many published case studies and/or larger RCTs where patients are evaluated pre and post a regimen of chiropractic care, using paraspinal temperature assessment, surface electromyography, inclinometry, and detailed symptom and quality of life surveys, would be informative.

Of the currently available chiropractic-related literature, only a sampling is presented in this article. Yet, it is my hope that even with its limited scope, this paper will provide some edification of chiropractic science and philosophy, and will aid in bringing various healthcare professionals together for their common cause. According to the *Annals of Internal Medicine*<sup>151</sup> patients desire such collaboration. It was found that, “Adults who use both [complementary/alternative medical (CAM) therapy and conventional medical care] appear to value both and tend to be less concerned about their medical doctor’s disapproval than about their doctor’s inability to understand or incorporate CAM therapy use within the context of their medical management.” In light of this, and of the fact that every healthcare practitioner has witnessed patients responding uniquely from one another, even when given identical treatments for the same diagnosis, it stands to reason that having many options available for healing via professional teamwork benefits patients to the greatest degree possible.

## Acknowledgements

The following people are greatly appreciated, as their work significantly contributed toward this paper: Rondberg TA, Kent C, Guyton AC, Hoag JM, Haldeman S, Sato A, Sato Y, Schmidt RF, Korr IM, Chapman-Smith DA, Dishman R, Chopra D, Lewit K, Meeker WC, and Eisenberg DM

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