Proprioceptive Coherence: An Expanded View of the Mechanics Behind the Indirect Method and the Introduction of an Innovative Variation

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ORIGINAL CONTRIBUTION

Abstract

Proprioceptive coherence is proposed as a novel osteopathic treatment technique whereby the desired technique response is rapid, resulting from the sensory integration of multiple diverse proprioceptive, somatosensory, nociceptive, neuroendocrine elements contributing to focal somatic dysfunction. Volitional components involving the cerebral cortex, emotional contributions from the limbic system as well as prioritization of the motor responses to dysfunction contribute to mechanisms putatively involved with the technique. The technique has a unique obligatory focus on a temporal element.

To better comprehend this treatment approach, diverse determinants of somatic dysfunction such as altered proprioceptive input, muscular influences, nociception, spinal cord processing and higher level central processing are discussed including muscular, aspects of mechanical transduction and tensegrity, nociception, spinal cord, and central processing. The diagnostic component of this technique involves identification of primarily interoceptive, proprioceptive and somatosensory related tissue alterations and considers a secondary exteroceptive contribution. The treatment phase is dictated by perception of precise balancing of localized forces on the area of dysfunction. A mandatory physician participation is dictated by the feed forward unique chronoception component. At the completion of the technique, rapid therapeutic effects are perceived by both the physician and the patient.

This paper is intended to appeal to the scientist in all of us; the lover of osteopathic manipulative techniques, and the healer we embrace as practicing osteopathic physicians. To help establish proprioceptive coherence as a novel technique, a comparison to common forms of osteopathic treatment based upon the indirect method is presented. It is proposed that proprioceptive coherence is a novel technique with unique mechanisms however others may consider the technique as a refinement of existing indirect methods.

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Disclosures: none reported.

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Dr. Lockwood prepared this thesis as a requirement to earn fellowship in the American Academy of Osteopathy. The Committee on Fellowship in the AAO provided peer reviewing for this article, and it was edited to conform to the *AAOJ*'s style guidelines.

Introduction

Osteopathic care is driven by a patient-centered model of care where personalization, precision and individualization is core. Health is the driver, as it is said that "anyone can find disease." To provide this care, the patient's burden of allostatic load is addressed and mandates removal of our nemesis, somatic dysfunction. In order to best remove or treat various impairments to achieve optimal function, the etiology of these dysfunctions must be addressed. Unless we understand the cause, our ability to reduce the influence of the patient's allostatic load is weaker. In order to promote function, our challenge is to use our science to discover the mechanisms and salient pathophysiology in the genesis and the concurrent influences on the area of dysfunction. To this end, proprioceptive coherence technique is proposed as a novel osteopathic indirect method treatment technique where the desired response is rapid, resulting from the balance of proprioceptive and sensory integration of multiple diverse elements of palpatory communication. Using principles of the indirect method, the treatment effect results from a rapid coherence of multiple influences on a local somatic dysfunction. It is acknowledged that different clinicians may take longer or shorter time to achieve tissue balance and that clinicians employing typical indirect principles can arrive at various degrees of success. If, for various reasons, only the approximate point of ligamentous or membrane balance rather than the precise point of balance is attained, the partial balance may be termed as only

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partially coherent. For the proprioceptive coherence technique, success is a function of the operator responding temporally and to the pathway toward balance dictated by the favorable response of the patient's tissues.

To distinguish the proposed technique, this paper is arranged in three parts. Part 1 is a discussion which focuses on recognition of influences on tissue function and somatic dysfunction, especially the proprioceptive sense. Part 2 is a comparative review of several osteopathic treatment techniques with the indirect method at their core. Part 3 presents the methodology of the proprioceptive coherence technique.

Objective Part 1: As an indirect method, we note historically that multiple attempts to determine the neurophysiology of the indirect method have been made with perhaps an erroneous hypothesis that a simple answer or a singular mechanism would emerge. This is simply not the case. We know tissue somatic dysfunction is influenced by numerous direct and indirect factors. There are biomechanical, biorhythmic and bio metabolic factors that alter function to the degree of impairment. Embedded in each of the major discussion topics are factors that distinctly influence dysfunction and are relevant to the proposed proprioceptive coherence technique.

Objective Part 2: Several notable technique types employing indirect method are categorized to provide perspective on the scope and distinctions of named techniques and the proposed novel method.

Objective Part 3: Method description with anticipated findings, treatment results with clinical conclusions, indications and contraindications to the technique are presented. The four phases of this indirect method are presented, as well as a simplified version of the technique application with example technique approaches for four areas of somatic dysfunction are found in an abbreviated *Manual of Proprioceptive Coherence Technique*.

Objective Part 1: A Review of Influences on Tissue Function and Somatic Dysfunction

Proprioception: For this paper, we will approach a working definition of proprioception to include static position sense and balance, dynamic or motion sense, ballistic sense, orientation to gravity, and force detection. Position sense is the conscious and subconscious sense of position joint location, orientation, and tensegrity relationships of body parts.[1,2,3] Proprioception relates to the aptitude or ability of proprioceptive input to provide information essential for motion activities. Proprioception is distinct from exteroception, in that exteroception relates to the external world, and interoception relates to information stemming from metabolic, visceral and energy ecology. For this paper, both exteroception and interoception are considered as they contribute to proprioceptive input and interrelate the mechanical and physiologic effects of somatic dysfunction. Proprioception is considered an über phenomena and has been described as: "Proprioception relates to mechanoreception (and related processes) as seeing relates to the retina."[1] Proprioception includes tactile information from ectodermal and mechanosensory information from mesodermal structures. Proprioceptive information is derived from two general sources which may be termed "macro-mechanoreceptors" and "micro-mechanoreceptors."

The "Macro mechanoreceptors" involved are free nerve endings, Ruffini corpuscles, unencapsulated free nerve endings, laminated or paciniform endings, Golgi tendon organs, and the muscle spindle apparatus. "Macro mechanoreceptors" are located primarily in tendons and joints and associated with joint position and movement, and those identified with muscles are involved with reflex and subconscious processing. Both group III myelinated fibers (fast-acting A-delta [Aδ]), and group IV unmyelinated, (slower acting C-type) are associated with the majority of free nerve endings. When myelinated Aβ neurons are activated during touch, the somatosensory cortex gives rise to sensations of relaxation, calm, security, and wellbeing, which are mediated through defined portions of the brain. C tactile (Ct) neuron activation conveys pleasant sensation and projects to the insula.[4]

It has been shown that overlap between proprioceptive function, nociception, and sympathetic vascular regulation is interrelated, especially in areas of dense connective tissue. When conflicting proprioceptive and sensory afferent information is processed, muscle, fascia and other tissues respond in an adverse manner.[5] By employing a technique that reduces or shortens local tissue, adverse afferent information and consequent central excitation is reduced, thus downregulation allows reset of multiple mechanisms associated with maintenance of dysfunction. Also to be considered are cellular level "micro mechanoreceptors" that include several gated mechanical channels which sense membrane tensions directly at levels of 30-200 piconewtons and alter DNA expression when stimulated.[6] Somatic dysfunction associated with adverse influence of gravity or due to enhanced muscle firing, regardless of a somatic, viscerosomatic, or tensegrity source, has negative effects on neural dynamics and is suggested to be mediated through proprioceptive, nociceptive and interoceptive pathways with focal tissues adversely affected by mechanical and local cell physiology.[7]

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Proprioception involves neural processing directly and indirectly by muscular responses such that there is a response to the amount, degree, and rate of muscle stretch and participate in the proprioceptive coherence technique. Importantly, the sarcomeres in the muscle involved with movement (or tension) of bone or myofascial elements operate similarly to the Dead Man's Switch, that is, unless constant active control maintained, active muscles will shorten. Those forces from epimuscular sources can be transmitted directly within synergistic muscles or to vascular bundles, or lymphatics and nervous pathways, embedded in continuous collagen networks. Fascial-altering effects of adjacent and distant structures, as well as changes due to inherent body forces such as respiration, cardiac activity, the primary respiratory mechanism, and other rhythmic third-order waves are coupled with corresponding reactions to those intrinsic forces altering functionality. With a multitude of sources of normal and abnormal afferent input necessitating processing at a spinal cord or central nervous system level, a technique addressing processing dissonant afferent neural signal to a place of equalization would result in reprioritizing and normalization of tissue responses to those adverse signals that perturb the system.

Chronoception: The novel fourth dimension requirement of the technique, time, requires precise management. The central nervous system (CNS) must process time intervals and does so rapidly. Time calculations by the CNS are usually determined either by what is termed exact time (explicit time) or perceived (implicit) time. The anticipation or planning of an anticipated event, such as is inherent in the utilization of the proprioceptive coherence technique, requires our ability to perceive both explicit (syntactic, duration or rhythmic, actual) and implicit (semantic, perceived, or conceptual) properties of time. An example of explicit time is the sense of the actual time the driver of a dragster processes between the yellow and the green signal to race. The implicit time would be the eternity it takes for the driver to realize the race lasted only 3.2 seconds, is over, and was won. Explicit temporal processing requires an estimation of the duration of or to an event that has not yet occurred. This is a "when will it occur" question for the brain.[8] Implicit or perceived time, on the other hand, examines the time interval separating two events, one of which is in the future.[9] This is a "how long" question for the brain.

For this technique, as one attempts to produce precise tissue balance, gross and fine monitoring and patient positioning is used to attain coherence for the focal area of dysfunction. Time, and the rate of the change and tissue response must be perceived. At the precise moment that equalization and balance (coherence) occurs the physician must passively respond to the same time frame and motion vectors that were required to attain the coherence response. The ability to track the duration, velocity, and trajectory of the response of tissue is critical to obtain results with the proprioceptive coherence technique. In summary, the person performing the proprioceptive coherence technique identifies the area of focal dysfunction, while attaining balance in a pre-release phase estimates the duration and rate of time and tissue change then, perceives a point of coherence (instantaneous release) reproduces the pattern in reverse in the post-release (post-proprioceptive coherence) phase. My suggestion is that the exquisite balance results in a "coherence" phenomenon that occurs at a central basis resulting in a near instantaneous (150-200 milliseconds) signaling resulting in the rapid response seen in the PC technique, hence the nickname of "Lightning Indirect."

Nociception and Pain: Nociceptive signaling is not considered a part of the proprioception pathway; it is rather, a contributor to the burden of somatic dysfunction and often involves a bodily "protective" or splinting response, thus secondarily changing local or regional or total body response by position and posture thus, alters profoundly proprioception afferent signaling. Somatic dysfunction involves the pain network with responses to nociceptor from C fibers, and the A-delta (Aδ) fibers with their network of interneurons. The periaqueductal gray (PAG) responds to signals from these neurons in a variety of ways resulting in enhanced muscle tone, increased autonomic functions, motivated behavior, and behavioral responses to threatening stimuli. In addition, the PAG is also a primary control center for descending pain modulation (and further responds to endorphins, vasopressin, oxytocin in manners not particularly related to this topic). Nociceptive pain messages follow the ascending spinothalamic tract, are decoded by the thalamus, sensorimotor cortex, insular cortex, and the anterior cingulate to be perceived as an unpleasant sensation that can be localized to a specific region of the body.[10] The time frame involved with response to noxious or threatening touch stimuli, where a muscular withdrawal response is elicited has a total "reaction time" of approximately 150 milliseconds. This is proposed as the time interval required for the proprioceptive coherence release to occur. Pain and nociception processing commonly involve the primary and secondary somatosensory cortex (S1 and S2), insula, anterior cingulate cortex and prefrontal cortex, and the thalamus. Secondary responses are mediated through the motor cortex, the cerebellum, and at a spinal cord level.[10]

Interoception: The concept of interoception is an evolving construct in neurophysiology, which generally relates to the perception of the state and physiologic condition of the body. The central nervous system forms a "sense" of body condition by synergizing information from various sources including, but not limited to, multiple sources of afferent flow. Interoception

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involves a somatoemotional sense of work load, temperature, itch, sensual touch, muscular and visceral sensations, vasomotor activity, hunger, thirst, and "air hunger." Some consider all forms of pain in some manner as forms of interoception, as the insular cortex is prominently activated during pain processing.[11] Interoception, in distinction to proprioception, has a sensory and a behavioral motivational component with an unconscious focus on elements either integral to aiding in maintenance or restoration of physiologic integrity. As relevant to this paper, interoception relates to cortical processing and to the patient's sense of body condition prior to treatment, during the treatment phases, as well as the post-treatment awareness of favorable and enhanced wellbeing.

Mechanical transduction and bio tensegrity: Biomechanical forces such as local stiffness, compressive strain, and fluid shear stress have been named as mechanical transduction factors with involvement of the proprioceptive sense and contribute to dysfunction when altered. Fibroblasts, when subjected to tensions and mechanical loads, even for brief time intervals, give rise to altered DNA expression. The timescales involved with tissue responses contributing to the initiation of somatic dysfunction are small, seconds to minutes. Longer stretch or strain time intervals result in changes in the collagen matrix of the fascial network. Chronic changes are to be considered in our current discussions of somatic dysfunction. As a metasystem, the human fascial continuum can be viewed as a pre-stressed tensegrity unit. According to Wolf's Law, when subjected to mechanical stress, the tensioned network remodels and modifies bone, connective tissue, and muscle. Inhibitory effects of tensioning are normally exerted by ligamento-muscular reflexes on various muscles associated with joint stabilization and increasing antagonist muscle coactivation, and thus affect joints and associated structures[4] and feasibly reversed with osteopathic technique. The conclusion could be made that tissue function and chronic dysfunction are influenced with alterations in DNA expression via mechanical transduction and by the tensegrity phenomena mediated primarily through fascial osseous networks.

Sympathetic, parasympathetic and oxytocin effect: Preliminary to the treatment effect of the proprioceptive coherence technique is the situation of enhanced autonomic neural incongruity. Alterations of sympathetic and parasympathetic activity of the autonomic nervous system, as well as effects of visceral efferents and the adrenal axis, have direct effects on target tissues. Primary pain of visceral origin induces changes in tissues related to their common embryologic origin through viscerosomatic feedback reflexes. The inverse also occurs where somatic pain induces changes in visceral function in embryological-related visceral organs mediated by the autonomic nervous system and known as somatovisceral reflexes. Injury and the fight, flight or freeze body protective measures are directly related to pain or perceived threat and are linked to the adrenal axis and hypothalamic centers and under control of the limbic system. In distinction, non-noxious stimulation (light touch and stroking) related to the sympathetic adrenal axis actually lowers adrenaline and cortisone levels in the hypothalamo-pituitary adrenal axis drive, and efferent vagal activity is induced.[12] Non-noxious stimuli result in decreased blood pressure, decreased peripheral resistance, downregulation of muscle spindle activity, and, in general, healing and restorative processes are enhanced. Soft touch is thus demonstrated to be a modifier of autonomic function.

Physiologic effects of oxytocin result in global behavioral responses that manifest as the opposite of the sympathetic autonomic nervous system's flight, fight, or freeze response. The oxytocin response is uniquely distinct from the parasympathetic autonomic nervous system's digest and restore mechanisms; and has been named the relaxation and growth response and the calm and connection response. Gentle touch, warmth, and behavioral components of trust, safety and love induce and are induced by oxytocin release. Repeated oxytocin release has multiple therapeutic and physiologic effects implying a role in the favorable effects seen after multiple osteopathic treatments and the proprioceptive coherence technique.

Viscerosensory: Viscerosensory pathways related to organ function and dysfunction have profound effects on embryonically related tissues such as the dermatome, myotome and sclerotome pathways, and central effects in cognitive information processing, emotional state, and responses to other stimuli arriving at related spinal and supraspinal locations. Evidence of organ related disease by discerning abnormal dermatome related tissue texture change found in the paraspinal region has been validated at a probability of 70% and related primarily to enhanced alterations of sympathetic activity.[13] Adverse viscerosensory afferent signaling as interoceptive information contributes to the individual's allostatic load.

Fascia: Proprioception mediated via fascial networks must be managed for effective use of the proprioceptive coherence technique. The human body's connective tissue matrix forms an omnidirectional tensional network enveloping each organ, each muscle fiber, and "forms the form" of our being.[14] Historically, as repeatedly discussed by A.T. Still, fascia is a metasystem.

Mechanical strength, load sharing transmission of muscle, and other forces demonstrate the inherent stability of the network. Additionally, collagen serves as a protein semiconductor and when subject to compression or deformation, electrical fields are generated. The resultant piezoelectric effects are directed by the body to initiate healing and remodeling again along lines of force

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in agreement with Wolf's law. Fascia, as a contractible tissue, is in contiguous connection with myofibrils forming myofascial links for muscle related functional and dysfunctional tone and relaxation of these tissues is critical to effective indirect method techniques.

When considering the macro architecture of fascial systems, the dural system must be considered. The intracranial dural system functions as a reciprocal tension tensegrity system. Forces generated and transmitted extend cranially and caudally, affecting physiology as well as mechanics and the generation of positive and negative pressure gradients for movement of fluids. Mechanical signals generated by a variety of biorhythms, in distinction from chemical signaling, via the adhering fibers have been shown. Notably, myofibroblasts exhibit intrinsic spontaneous oscillations, as well as a synchronous oscillatory motion at a rate of 0.66 Hz,[15] which is congruent with the Sutherland long tide of 100 seconds.[16] The respiratory efforts of breathing and the cranial rhythmic impulse from a clinical or palpatory perspective produce similar structural and physiologic rhythms whereby respiratory inhalation and flexion of the sphenobasilar synchondrosis produce an enhanced interstitial flow, while respiratory exhalation and the extension phase of the primary respiratory mechanism result in an enhancement of retention of interstitial fluids. It has been shown that "central" or intracranial CSF and lymphatics, namely the dural lymphatic flow, and the oscillatory perivascular system known as the glymphatic system, are affected by arterial pulsations and the mechanics of breathing.[17] The same likely occurs but has not been established with the mechanics related to the primary respiratory mechanism.

When employing the proprioceptive coherence technique, attention to forces altering the original connective tissue form and function is made, such that traction component, as well as compressive forces should be addressed with an application of axial loading when employing proprioceptive coherence as an indirect method.

Motor Activity and Proprioceptive Senses

Adverse influences and muscular responses occur from the two kinds of muscle related sensory nerve endings, namely those that respond to the stretch of a muscle and those responsive to the rate of muscular stretch are two of the first sources of proprioceptive input. As modified from the unpublished manuscript of C. D. Ianuzzo, PhD: "Muscle length…tension, and location of limbs and body parts are sensed primarily by two types of mechanoreceptors."[18] The muscle spindle and Golgi tendon organ (GTO) are the two most important proprioceptors in skeletal muscle.[19] These proprioceptors have the ability to sense stimuli regarding body position, motion, muscle tension, sense of effort, balance, and in motor control. The central nervous system can increase the force of muscle contraction by either increasing the rate of firing or the number of motor units, or a combination of the two.[20] Both are likely involved in the maintenance of somatic dysfunction as evidenced by the research of Denslow[21,22] and others.

Selective manipulative procedures are used in osteopathic treatments to activate muscle and inhibit these receptors and mechanisms with the intent of realigning skeletal and soft tissues to reinstate normal function.[18]

Coherence: The proposed proprioceptive coherence appears to be a functional state within a proposed proprioception network where disadvantageous somatic response dissipates rapidly when central integration of afferent information is processed to a new set point or "balanced." Brain networks by definition are collections of neuron populations that support a unified function, relay information, and are defined as structural, functional, and effective.[23] One of the properties of large-scale brain activity is that a coherent activity can result as a response to required processing and responses to distribute information.[24]

Inherent in the networks are positive and inhibitory feedback loops, and while synchronous (coherent) electrical and oscillatory patterns are important,[24] our focus is on a commonality of network decision making such that adverse signaling from local somatic dysfunction is dissipated or eliminated. Arterial Spin Labelling Magnetic Resonance Imaging (ASL MRI) has revealed baseline differences of traits, both genotypic and phenotypic, but more profoundly, responses to exogenous sources of the state of the brain induced by pharmacologic substances and task performance.[25] With the proprioceptive coherence technique, since a palpably defined event heralded by a specific timed tissue change vis-à-vis "coherence point" is identifiable by the physician operator in the area being treated and retrospectively by the patient, we posit there is an event marker that will be discovered and provide validation in neurophysiology.

Since there is a rapid treatment response, efferent tracts are involved and coupled local set point mechanisms respond in kind. The insular cortex becomes a likely candidate for this processing as the insula links emotions, perception, motor control, self-awareness response selection, selective attention to tasks, and task performance[26] although sectors of the limbic system may be primarily involved.

Another primary or secondary candidate to be considered is the cerebellum, traditionally thought of as a coordinator of motor activity. Evidence has emerged which now points to the

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cerebellum's connectivity, both anatomically and functionally, with motion perception, nociception, self-motion, timing, predictive processing, and perceptual sequencing and autonomic activity.[27] The cerebellum is in part a predictor of events, especially in the absence of "anticipated somatosensory input." As an example, the system predicts proprioceptive and sensory data arriving from a heel strike while walking. If the data does not appear, such as would be the case if an unexpected hole in the walkway was encountered, the cerebellum immediately attempts a corrective maneuver. We suggest a favorable corrective process occurs with the proprioceptive coherence technique, as an unanticipated diminishing of multiple influences maintaining a focal area of dysfunction occurs rapidly that then requires a processing event. Perhaps the prelude to the coherence point creates a novel pre-event and a unique reprocessing of afferent information results.

Summary

The case can easily be made that the proposed proprioceptive coherence technique is neither new nor novel. When we as clinicians consider the definitions of sensorimotor, interoception, and proprioception with its subtasks of chronosensitivity and subconscious position awareness, we strain the identified boundaries between neuroanatomy, neurophysiology, neuroendocrinology, and neuropsychology. Our awareness and understanding of pathologic processes and the multiplicity of potential influences resulting or converging on tissues resulting in impaired or altered function is staggering. The array and diversity of defined influence elements stretches textbooks, and one must consider the following: proprioception, biomechanics, velocity, and motion, chronoception, nociception and pain, interoception autonomic, endocrine and oxytocin effects, neurophysiologic viscerosensory viscerosomatic, somatovisceral reflexes, muscular physiology interaction of various tissues, and neural coherence. Our patients are, for the most part, consciously unaware of all areas of somatic dysfunction, and rather are aware of areas of disease and painful regions, such as joints and other structures. They have a generalized sense of well-being or ill-being, and understand in a vague way when something is wrong with their rib, neck, or stomach. Multiple mechanical strains from competing muscles, fascia, and articular elements result in conflicting afferent proprioceptive neural signaling and consequently promote conflicting efferent feedback loops. Afferent signals stemming from the interoceptive system arrive at the insula and other brain regions and form a connection where interpretation of muscle activity is initiated, evaluated, and then processed to prioritize relative to match and mismatch of signals related to somatic dysfunction. With dysfunction of the body's structure and related function, there are competing and conflicting influences converging at anatomic location with an epicenter of dysfunction. Part of the coherence phenomena related to this technique is central processing related to a proprioceptive input processing where afferent and referent signal-match-cancellation occurs. The signals are compared and involve the dorsal spinocerebellar and other centers. With this technique, when balance or coherence is obtained with the proprioceptive coherence technique, it is suggested that the system will reprioritize the conflicting proprioceptive and sensory data and the efferent pathways and simple motor commands feed forward to reverse dysfunctional efferent motor control. When a precise match occurs, coherence occurs, cancelling of signals occurs, and in part, motor action is modified.[24] The final pathway used in treatment is the proprioceptive response of local tissues, which relies on signaled position and movement from proprioceptors and sensory receptors in the affected peripheral tissues.

Objective Part 2: Comparative Review and Summary of Several Indirect Method Osteopathic Techniques

The osteopathic profession has a notable history in describing, categorizing, and cataloging osteopathic treatment techniques for both posterity and utility in application by osteopathic physicians in the patient care arena. Multiple modalities, approaches, and sequences have been described. The Educational Council on Osteopathic Principles (ECOP) has an ongoing enterprise to clarify and expand those medical terms with unique distinctiveness and contextual meaning for use by students, practitioners, researchers, and scholars for a broad and narrow understanding of our osteopathic vocabulary. Paul Kimberly, DO, FAAO, was a modern pioneer in the description of the manipulative armamentarium where he trifurcated all treatment techniques into direct, indirect, and physiologic response methods. His application of treatment methods was based upon the approach to somatic dysfunction in which those techniques that approached the restrictive barrier were termed direct, and those that found a balance point at a shifted neutral position were grouped as indirect. The third group included techniques designed to advantage biomechanical and physiologic relationships resulting in a treatment response. He included a category of "combined methods" in which a sequence of direct and indirect activating forces is defined in the technique application. He did not describe technique "hybrids." Within the category of treatment methods, he discussed a wide variety of activation forces used to employ or assist in the successful implementation of a specific technique. Activating forces are maneuvers or processes used with the three categories of techniques that allow responses in the skeletal, arthrodial, myofascial, vascular, neural, and lymphatic arenas of somatic dysfunction. Important to note for all techniques, the necessary and sufficient criteria for application of osteopathic treatment is to identify somatic dysfunction. Somatic dysfunction is impaired or altered function in the body framework that

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embraces three objective findings: tissue texture abnormalities, restricted motion, and asymmetry of position. It includes one subjective component, tenderness. Respiratory forces are produced by thoracic cage motion and associated "air hunger" factors, which can be used to enhance the position and proprioceptive balance of an area under treatment. With patient cooperation or volitional assist, the patient is instructed to alter position or neuromuscular guarding to aid in proprioceptive and neuromyofascial balance. Physician guiding forces occur when the physician passively allows for decreased restriction of mechanical forces and may chronologically retrace the pathway involved with the generation of somatic dysfunction. To the extent that gravity contributes to dysfunction or aids in the release of tensions,[27] it is considered in proprioceptive coherence technique. Several of the common activation forces are necessary but not inclusively sufficient for utilization of proprioceptive coherence. Due to the "instantaneous" treatment response found with the proprioceptive coherence technique, likely candidates for a mechanism of action are shown in Table 1.

Table 1 - Likely Candidates for Rapid Proprioceptive Coherence Response

Mediator	Mechanism	Interval
Mylenated neurons involving myofascial elements	Mechanoreceptors	Milliseconds
Autonomic response	TGF-β1 induced by sympathetic drive as a potent stimulator of myofibroblast tone, and stimulates entire bundles of fascia	Milliseconds
Reciprocal communication of autonomic efferent and afferent pathways	Subdivisions form distinct fingerprints for each unique pathway	Milliseconds, seconds and much longer for specific physiologic responses
Oxytocin pathways	Decreases periferal resistance, heart rate, induces calm	Milliseconds, seconds and much longer for specific physiologic responses
Interoceptive pathways	Cortical processing through the insula bypassing the somatosensory cortex	Milliseconds
Proprioception	Group III myelinated (fast)	A-delta (Aδ) neurons
	Somatosensory cortex A-beta (A β) activation relays to the primary somatosensory cortex C(t)tactile Unmylenated fibers	20-50 milliseconds 80-120 milliseconds 250-500 milliseconds

In the *Glossary of Osteopathic Terminology*, the indirect method (I/IND) is defined as "a manipulative technique where the restrictive barrier is disengaged and the dysfunctional body part is moved away from the restrictive barrier until tissue tension is equal in one or all planes and directions."[28] This paper will attempt to discuss many planes and influences on a focal area of somatic dysfunction to envelop indirect methods.

Traditional indirect methodology thus considers primarily factors that influence body structures in three dimensions or 3D. With traditional indirect methods, the physician attempts to be as precise as possible with localizing and balancing with a three-dimensional mindset and greater results are typically achieved with greater precision. However, if the degree of balance and minimization of adverse forces is lessened to 95% to 98% of the original, a favorable tissue response is achieved and the somatic dysfunction load is reduced. With the proprioceptive coherence technique, a greater precision of balance is required in the range of 99.9%. With the time management factor as a necessary component, it may be viewed as a four-dimension (4D) version of indirect method. A comparison with the common forms of osteopathic treatment based upon the indirect method is presented to help establish proprioceptive coherence as a novel technique. Table 2 catalogs common osteopathic techniques employing various elements of the indirect method and indicates those elements that are not shared with the proprioceptive coherence technique.

Various indirect methods of treatment are described by Hruby, Chaitow, Jones, Hoover, Greenman, Van Buskirk, Schiowitz, Sutherland, Magoun,[20,30-38] and others. The focus is on "position" and "balance" based upon three planes of motion. The indirect method, in general, requires a favorable tissue response phase of varied time intervals to allow a therapeutic release. Currently described indirect techniques employ neither the precision of localization nor to be conjoined with exacting time management as found with the proprioceptive coherence technique. The proprioceptive coherence technique ventures beyond to include a unique time management factor. The proprioceptive coherence technique is a salient innovation as it uniquely requires a chronoception sense, coupled with an enhanced perception of progressive and favorable tissue texture changes that may allow the body's proprioceptive sense to form a resultant coherence of neural processing and allow a release phenomenon for multiple contributors to the focal dysfunction. The methodology for the proprioceptive coherence technique can be considered as triphasic, namely, pre-coherence, coherence, and post-coherence intervals, and includes the two classic obligatory elements of diagnosis (which must be precise) and recheck for effectiveness.

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Table 2 - Common Osteopathic Techniques Employing Indirect Method
(Shaded areas are elements not found in common with the Proprioceptive Coherence Technique)

Technique	Process	Activation Forces	Secondary Considerations	Treatment Response	Time Dimension
Balanced Ligamentous Tension	Normalize ligamentous tensions around a joint or dsyfunction	Gentle disengagement for motion freedom, then a triplaner exaggeration of balanced ligamentous structures for altered nociception and proprioceptive input from area of dysfunction, follwed by balance of tissues	The operator is guided to a patient position whereby palpation tissues are relaxed or balanced and must provide continuous repositioning as the response occurs	Gradual release of tensions often in an animated fashion as sequential normalization occurs around the involved structure	Takes seconds to minutes
Balanced Membranous Tension	Normalize intracranial and intraspinal tensions of the 11 cranial strain patterns or dural membranes and affected cranial sutures	Gentle disengagement for motion freedom, then a triplaner exaggeration of balance of dural tensions for altered nociception and proprioceptive input from area of membranous dysfunction, followed by balance of tissues	The operator is guided as to a patient position whereby palpation tissues are relaxed or balanced and must provide continuous repositioning as the response occurs	Gradual release of tensions often in an animated fashion as sequential normalization occurs around the involved structure while entrained with the cranial rhythmic impulse	Takes seconds to minutes.
Ligamentous Articular Strain	Correct abnormal ligamentous strain in some or all of a joint structure; often associates with inflammation or trauma. Three steps generally are disengage, exaggerate and balance.	Gentle disengagement for motion freedom, exaggerate the dysfunction then a balanced ligamentous tensions approach is applied to maintain equal tensions until release occurs	The patient remains in the treatment position until the tissues respond maximally	Palpable relaxation of involved tissues occurs; marked reduction in tissue tensions and pain are perceived by the patient	Takes seconds to minutes.
Facilitated Positional Resease	Resolution of primarily joint-related dysfunctions	For spinal regions the region is flattened then a neutral indirect position regarding tensions is obtained, then a compression or torsional activational force is applied	Sagitttal plane is addressed and held for 5 seconds; repositioning in three planes of relative freedom in order to maintain unloading of tissue strains	Sense of tissue response requires monitoring by palpation	A few seconds typically
Counterstrain	Corrects inappropriate strain reflex by positional relief of pain	Fold, hold, and return	Requires maintainence of other sterotypical body positions. Some positions are counterintuitive. Requires competent feedback from a patient able to cooperate and understand instructions.	Introductory approach is very successful; refined technique more challenging	Ninety seconds for most; 120 seconds for ribs and for some patients
Indirect Myofascial Release	First described by A.T. Still. Engages continual palpatory feedback guided along a path of least tissue resistance. Response is a combination of more coherent muscle firing patterns and slow elongation or creep of fascial elements.	Gentle positioning to maximal tissue freedom in flexion or extension; left or right sidebending left or right rotation in no particuar sequence in the three planes	Some discuss three additional translatory dimensions, superior or inferior, medial or lateral, and anterior or posterior to attain a position of ease	Monitored release can occur in an unwinding manner or by gradual changes in tension. Free movement is the desired endpoint	Gradual, usually from 30 to 120 seconds
Neurofascial Release	Identification of a fascial pattern related to the release point distant to the area of dysfunction guide treatment.	A focus on the "key lesion," which is an area of maximal dysfunction where treatment is based on a fascially related link to the central nervous system	Release points are commonly distal from the area of dysfunction, quasi-dermatome related, ipsilateral and allows individual point or zone contact to optimize release effect.	Baseline function and dysfunction is determined typically with the Fulford approach to passive fascial restriction, but other methods such as diminished intrinsic motion are used	A few seconds

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Balanced ligamentous tension (BLT) was first described by William Garner Sutherland, the originator and architect of osteopathic cranial principles and methods. Early teachers of the technique, Paul Kimberly and Harold I. Magoun Sr., applied the technique methodology, not only to the head region, but throughout the body. When the technique was employed with the cranial mechanism, the term balanced membranous tension (BMT) was the preferred designation. The concept involved the equalization of all ligamentous (or membranous) tensions in three dimensions within the physiologic range, with a focused balance at the shifted neutral point associated with the dysfunction. The result was the articular elements would respond after proprioceptive information guided muscular structures involved to promote changes in ligamentous tensions where ligaments of joints were rebalanced by equalizing reciprocal forces.[35]

Ligamentous articular strain (LAS) is also a Sutherland defined technique where unbalanced ligamentous tensions cause the bone to assume a position anatomically closer to that in which the strain was produced. The technique involves normalizing reciprocal ligamentous tensions after tissue disengagement; then carrying the dysfunctional part by exaggeration to the point that tissue balance is optimized the treatment response occurs. The steps are often listed as disengage, exaggerate, and balance. The proposed mechanism of action is that a substantial decrease of afferent information in the form of proprioception and altered muscle firing patterns is reordered at a spinal cord and central processing level, which results in resetting to a normalized state of control at the joint and ligamentous level.[33]

Facilitated positional release (FPR) is a system of myofascial release where a component region of the body is placed into a neutral position, diminishing tissue and joint tensions in all planes. Then, a compression or torsional activating force is applied.[34] FPR mandates as the first step that balance in the sagittal plane be achieved, then the facilitating element, and then shortening of muscle for five or more seconds.

Counterstrain or strain-counterstrain (CS or SCS) was first named Spontaneous Release by Positioning by Laurence Jones, DO.[37,38] Contemporary diagnosis is established by identification of tender points from a wide catalog in all body regions. The mechanism for establishment of a tender point is considered to be maintenance of an inappropriate strain reflex, likely the result alteration in the afferent signals from the gamma mechanism. The described gamma gain theory is presently the best scientific explanation while other mechanisms have been presented.[39] The identified non-radiating focal areas of discomfort are treated by establishing a pain scale with the patient for the local tender point; passive positioning of the patient until the pain is reduced ideally to zero or at least to 70% less than the original pain; maintaining the patient in the relaxed position for 90 or 120 seconds for certain points or patients; then slowly returning the patient to the anatomic position.[28]

Indirect myofascial release (iMFR) is a technique first described by A. T. Still, which engages areas of somatic dysfunction primarily in large myofascial structures and employs continual palpatory feedback guided along a path of ease or least tissue resistance to attain normalized myofascial structures.[38]

Neurofascial release (NFR), championed by Stephen Myles Davidson, DO, employs light touch contact at the epicenter of a pattern of fascial-related dysfunction. The original name for the technique was fascial directed fascial activated (FDFA) treatment. It was later renamed patient directed patient activated (PDPA) and nicknamed YDN or "You Do Nothing," as there was a required passive element from both the patient and the physician for the treatment response. With this technique, the physician follows a tissue response rather than leads the technique. The operator of the technique allows identification of the appropriate treatment zone of dysfunction, being attentive to at least five dimensions, viz. the three cardinal planes, a pattern related to trauma, and an emotional component. The operator's attention, palpation, direction, and intention are integral to the technique. One hand passively monitors the area of maximal somatic dysfunction, and the other hand contacts a release structure to allow intrinsic forces to perform the correction. The release structure or zone, determined by following a palpatory sense of diminishing tension at the area being treated, guides the treatment methodology.[40]

For many specific indirect method treatment types, numerous adaptations and deviations from the original descriptions and application of techniques have been presented, typically adding compression, distraction, patient position, gravity unloading, or mixing techniques for a synergistic effect, thus compromising the original definition and description of the technique. This hybridization often occurs unconsciously by the physician, as application of techniques are guided by patient and tissue responses. Commonly, the hybridized techniques are subsequently described as enhancements.[31]

It is easy to overstate or understate the effectivness or scope of application of a given technique, as the technique is employed as the physician sees fit. The remote and lasting effects may not be appreciated, or the patient reevaluated specifically for the treatment response; instead, the mindset is to reevaluate for the moment at

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hand and proceed to consider findings currently present. Having said that, there is wide application for the proprioceptive coherence technique.

For certain vulnerable groups the application is among the best choices. For adolescents with immature skeletal structures, it is well accepted and interesting to the young patient and allows one to identify tenderness in locations the patient was unaware of and eliminate the pain with seemingly no effort. Pregnant women receive the technique for the same reasons and often remark that the pain in their back or sacrum is finally gone. A similar response is encountered with the elderly, as safety and ease of application are always factors in the selection of techniques. The acutely injured benefit, as relief can be attained at and near inflamed tissues.

This technique is useful as a supplement to other techniques to enhance the body's self-corrective measures. If, from an arena of somatic dysfunction, we are able to apply corrective measures to most closely promote tissue health, one can expect a more thorough resolution of dysfunction. When using muscle energy techniques, the muscle apparatus is reset. If a less than complete response occurs, it is sometimes helpful to apply an articular or thrust technique to allow repositioning of the altered fulcrum point of the articular elements invovled. Likewise, when using a thrust technique, it is often helpful to apply myofascial release or muscle energy as an adjunct to modify neural firing patterns, somato-somato reflexes, and myofascial elements. By minimizing the effect of nociception, proprioceptive, and other afferent information, the proprioceptive coherence technique can be used in this adjunct role to address a multiplicity of sustaining factors associated with the somatic dysfunction.

Our knowledge as to the scope and limitations for application of the proprioceptive coherence technique remains to be determined. Recently, it was discovered that the technique has effects on somatic manifestations of altered visceral functions. With the understanding that the application of this technique to organ related presentations requires scientific validation and a carefully controlled study of several hundred applications, three patients are presented anecdotaly. One patient had asthma, one had pneumonia, and another with a large predominately right-sided pulmonary embolism. Each was found to have lateralized pulmonary anterior Chapman's points and paraspinal tissue texture abnormalities related to pulmonary pathology. Each patient was treated with different modalities and the inclusion of the proprioceptive coherence technique with subjective improvement.

The first example was a person with subacute asthma. Physical examination revealed three out of the four lung-related Chapman's points were positive. She had pulmonry related right-sided paraspinal muscle changes that exhibited acute tissue texture abnormalities. After treating the first Chapman's point with the proprioceptive coherence techique, it was difficult to palpate the remaining two pulmonary Chapman's points. The evidence of viscerosomatic reflex with paraspinal muscle hypertonicity found at T2,3,4 diminished by 80% without specific treatment of the paraspinal region.

The second example was a patient 20 weeks pregnant with her second child that presented with resolving pneumonia after a macrolide was started seven days earlier. Her physical examination revealed four out of four pulmonary Chapman's points positive and also a right-sided Chapman's point for the bronchus. She also exhibited acute paraspinal tissue changes for the pulmonary region. With application of the proprioceptive coherence technique, her Chapman's points became less evident, her paraspinal muscle tensions improved, and she reported that it was easier to breathe.

The third example was the person with a history of pulmonary emboli one year prior to presenting for osteopathic treatment. After one year she was still having shortness of breath without pleuritic pain, but tightness in her right lateral chest wall and short, shallow breaths. At her third osteopathic treatment, the decision was made to treat persistant pulmonary Chapman's points with the proprioceptive coherence technique. The anterior Chapman's points responded, with the patient reporting decreased pain with palpation and local tissue changes dissipated. For her, the paraspinal tissue changes responded less favorably than the other cases with 20% to 30% improvement. It could not be determined whether there was a significant net change in chest cage compliance, but she reported it was easier to breathe.

Overall, the technique's versatility, scope of application across age groups, patient conditions, gender, and utilization in visceral disease states supersede the physician's associated learning curve for the technique. As with any novel approach, one must be cautious to neither become overzealous nor underutilize a new-found modality or methodology. Personalization, precision, and individualization of treatment is merging in medical care, and a parallel can be made relative to establishing the genesis of somatic dysfunction.

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Methods Part 3: Presentation of Proprioceptive Coherence Technique Method Including an Abbreviated Manual of Proprioceptive Coherence

Introduction to the Proprioceptive Coherence Technique

Proprioceptive coherence is a novel osteopathic treatment technique whereby the desired technique response is rapid, resulting from the sensory integration of multiple diverse elements primarily of palpatory communication. The treatment effect provides a rapid coherence of multiple influences on the local dysfunction using the principle of indirect method mediated by the proprioception system. A rapid therapeutic effect is perceived by both the physician and the patient. Employment of the technique requires intermediate to advanced levels of sensory literacy to discern feedback to local areas of tissue somatic dysfunction. Fine increments of change are induced at a tissue level, recognizing the body's inherent capacity for healing. It is understood that the pathology of the dysfunction being dealt with at the moment is more complex than the few factors able to be identified. Features of the proprioceptive coherence technique are presented in Table 3.

The diagnostic phase of the technique involves identification of primarily interoceptive, proprioceptive, and somatosensory-related tissue alterations, along with a secondary exteroceptive contribution. The treatment phase is dictated by perception of precise localization of mostly mechanical forces on the dysfunctional tissue, and a physician response dictated by the feed-forward chronoceptive on the zone of dysfunction.

The final pathway used in treatment is the proprioceptive response of local tissues, which relies on the physician's response to a signaled position and movement from sensory receptors in the affected peripheral tissues. Table 4 shows mechanisms for the proprioceptive coherence technique.

Indications and Contraindications

Indications

1. Acute, chronic and persistant somatic dysfunction
2. Focal pain related to somatic dysfunction
3. Somatic dysfunctions related to muscle related firing patterns
4. Alterations in local or regional tissue compliance, elasticity, continuity and fibrosis in the fascial tensegrity network
5. To enhance vascular, neural and lymphatic function impairment
6. Dysfunction associated with somatosomatic, viscerosomatic reflex phenemomena
7. To potentiate and augment the effects of other osteopathic techniques

Relative Contraindications

1. Patients that are not willing or able to cooperate
2. Patients for whom body positioning for the technique is not possible due to altered anatomic barriers, structural defects, casts or splints
3. Patients for which the treatment position exacerbates local or distant pain
4. Patients with acute dislocation or fracture or traumatized tissue
5. Moderate to severe articular instability
6. Local infections, lytic lesions, malignancies

Appropriate triage should be initiated for persons with active bleeding, or life-threatening injuries or medical conditions. Caution should be employed for those patients with severe illnesses.

Proprioceptive Coherence Technique Method

There are several phases of this indirect method called proprioceptive coherence, which are simplified as a summary and depicted in Diagram 1. The technique is outlined for four body areas and presented in Appendix A.

Preliminarily, focal and specific dysfunctions of the body part or region is determined, and an epicenter of dysfunction is identified. The predominance of findings are in the tissue texture abnormality, asymmetry, restriction of motion, and tenderness (TART) scheme: restricted motion, tissue texture alterations, and patient-perceived tenderness or pain, but not necessarily significant asymmetry. Tissue texture alterations include swelling, high tension on muscles and ligaments, and alterations of physical properties of collagen. Restricted motion is found with alterations of the fascial network and not limited to the three cardinal X-Y-Z coordinates and three translatory factors with potential restriction: superior or inferior, medial or lateral, anterior or posterior motions. The specific area of dysfunction requires identifying factors and compression or traction, axial loading, gravitational strain, compression-related and altered motion from respiratory mechanics and dysfunctions of the primary respiratory mechanism. Tenderness is elicited with light palpation, typically using less than 2 kg of pressure. The pain is often sharp, focal, and may be radiating. Often, clusters or satellite areas of tenderness are more likely identified after the primary area is treated.

For the treatment phase, aspects of the treatment must be employed concurrently. The cause of pain and variety of stimulations are initially minimized by positioning the patient in a manner similar to counterstrain and various positional release approaches. The localization must be nearly exact, or the treatment response will not occur. Simultaneous to the initiation and progress to

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Table 3 - Features of the Proprioceptive Coherence Technique					
Proprioceptive Coherence	*Identification of focal area of somatic dysfunction determined primarily by restricted motion, tissue texture abnormalities and tenderness. Precision is required.*	*Use the indirect method in multiple dimensions to result in maximal, precise localization. Simultaneously, as the precise point of maximal tissue relaxation is "approached," the physician will perceive a rate of change using chronoceptive palpation to the tissues involved.*	*With the release of dysfunction the* proprioceptive coherence *(instantaneous balance) is palpated.*	*Return the tissues to a neutral position, which must be done with a reverse capitulation using the chronoceptive haptic palpation sequence to complete the technique. A central interoceptive component is often evidenced by a change in facial expression, a smile or gesture.*	*"Instantaneous," thus the nickname* ***Lightning Indirect***

Table 4 - Mechanisms for Proprioceptive Coherence				
Input	Mechanism	Peripheral Processing	Central Processing	Convergence
Proprioception Position sense Velocity (Kinesthesia) Balastic	Free nerve endings Mechanoreceptors Cutaneous receptors	"Macro mechanoreceptors" located in tendons and joints Offloading of movement synergists	Somatosensory cortex	Feedback loop, feedforward loop
Chronoception		Complex interaction of the cerebral cortex, cerebellum and basal ganglia in the brain and likely the suprachiasmatic nucleus	Cerebral cortex, cerebellum and basal ganglia	Velocity phase
Nociception	Inflammatory mediators Substance P NDMA receptors	C fibers and A-delta (Aδ) fibers and pool of interneurons and the fast A-beta (Aß) fibers Linked to nitrous oxide and synaptic hyperexcitability. Spinal pathway is the ascending spinothalamic tract	Afferents are decoded by the thalamus, sensorimotor cortex, insular cortex, and the anterior cingulate	Feedback loop
Interoception	Interceptor receptors in skin, muscle, and distance direct and indirect receptors in the viscera	Project from Lamina I in the spinal cord, where Lamina I projects to the preganglionic cells of the sympathetic nervous system, which in turn travel to the brainstem via the sponothalamic cortical pathway.	Insula with connections to the limbic system	Feedback loop

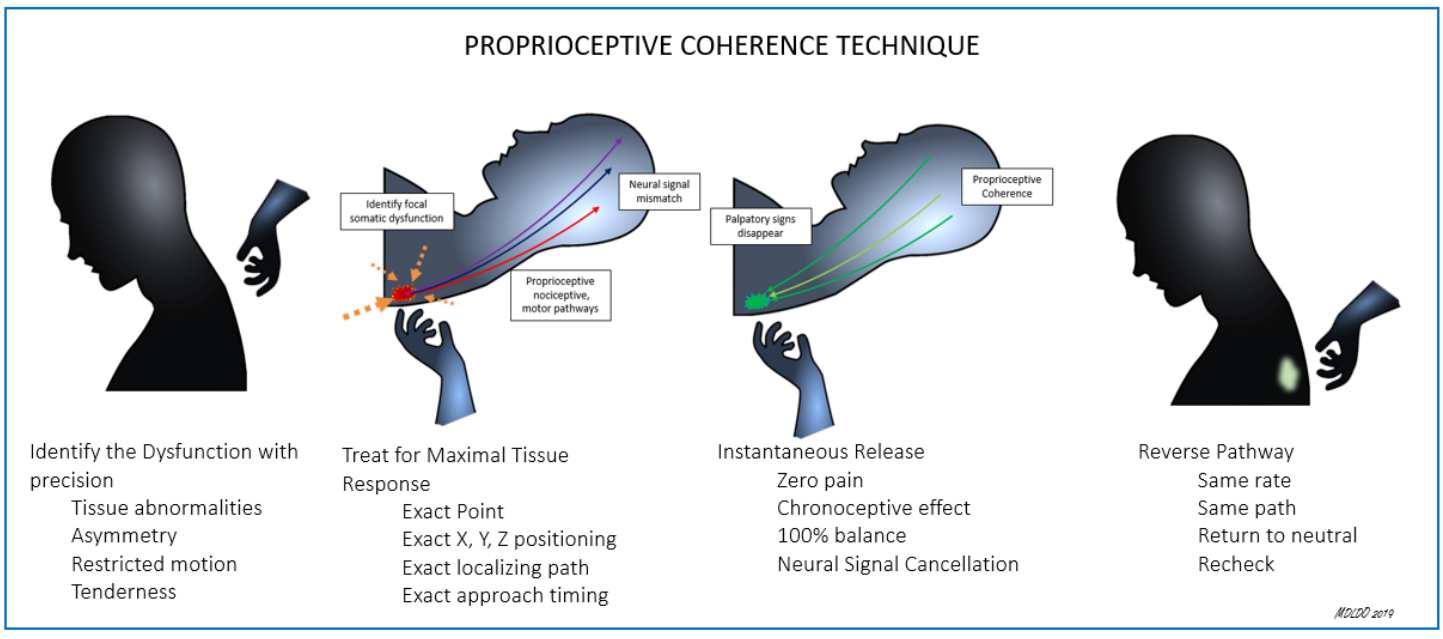

Diagram 1 - Proprioceptive Coherence Technique

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refinement of the precise treatment response position, as the precise point of maximal tissue relaxation is progressively "approached," the physician monitors to the rate of change of tissue using chronoceptive palpation. This is critical for the success of the treatment technique. A zone of freedom from tissue strain will emerge as the dysfunction gradually minimizes to imperceptible.

As the effect of sensory and proprioceptive coherence is palpated, a near-instantaneous release occurs with the emergence of proprioceptive coherence.

After the coherence point emerges, the tissues must be returned to the neutral position most commonly in a reverse pathway using similar timing and velocity, recapitulating the approach to the coherence point using the same chronoceptive palpation sequence found during the approach to the point of coherence. Uncommonly, the post release pathway can vary with the return pathway in different route. The velocity of the return is quite similar. With completion of the post release phase, pain is typically resolved. Gently but rapidly, the monitoring digit is removed completely from the region. Commonly, you will observe palpatory evidence of resolution accompanied by facial expression, a smile, or gesture, which possibly indicates the response includes an effect on the interoceptive system.

If pain and the other features of focused dysfunction are not diminished to less than 80% repeat the process and examine for satellite points and treat in a similar manner.

Proprioceptive Coherence Method Simplified:

A simplified version of the method is presented as follows:

- **Identify** the dysfunction with precision
- **Treat** with **4 E's**
  1. **E**xact X, Y, Z positioning
  2. **E**xact localizing path
  3. **E**xact approach
  4. **E**xact timing
- **Instantaneous release** and coherence
- **Reverse** the pathway
- **Reevaluate** for resolution of somatic dysfunction

Identify the Dysfunction with Precision

Identify a very specific area of dysfunction determined by the combined findings of tissue texture abnormalities, asymmetry and imbalance of structures, restricted motion, and tenderness (TART). Then treat with the four E's.

1. Exact Positioning: Use an indirect method of osteopathic treatment, and position to achieve tissue balance. While monitoring the dysfunction with the palpating finger, begin by deescalating the nociceptive impulses from sources of pain and afferent nerve impulses with positioning of the patient.
2. Exact Path: Monitor the dysfunction for precise balance in the X,Y,Z coordinates, of all structures related to the dysfunction.
3. Exact Approach: As the precise point of maximal tissue relaxation is "approached," tissues must progressively achieve complete freedom from adverse strain forces at the area of the dysfunction.
4. Exact Timing: Concurent with positioning, path, and approach, the physician will distinguish the rate and timing involved with tissue change using chronoceptive palpation.

Instaneous Release

With exact balance, positioning, path, approach, and timing, an instantaneous tissue freedom is palpated at the proprioceptive coherence point.

Reverse Pathway

At the same pace the coherence point was achieved, the tissues are returned to a neutral position, with a reversal of the timing, path, and position sequence.

The area of dysfunction is rechecked, and the technique is complete. A central interoceptive component is often evidenced by a change in facial expression—a smile.

Conclusion

The technique is highly successful and well accepted by patients. However, there are a few pitfalls and cautions that may detract from the most successful outcome. Despite precise diagnosis, which is critical for success, less than optimal results will occur if the chronoceptive timing component is not addressed. If the treatment position and timing are done too rapidly, the coherence point is not assured, and a partial response is the best that will occur. Similarly, if localization leading to the coherence point is not precise, poor results will be obtained. If one lingers on the proprioceptive coherence point, the treatment response seems to regress. If the reversal is done too rapidly, the response backslides. If the return to neutral is done too slowly, reestablishment of a degree of the original somatic dysfunction features reemerge.

In an approach to the individual patient, decisions are made as to multiple modalities and methods. Based upon experience, implementing the technique near the end of a complete treatment

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is preferred. By delaying the incorporation of the proprioceptive coherence component until the end of complete treatment, presumably, the sources of substantial afferent stimuli from somatic dysfunction have been modified favorably. Near the end of the complete treatment, there has been a deescalation of the sympathetic system, favorable parasympathetic response has been established, and the physiologic effects of the oxytocin's relaxation, growth, calm, and connection response have been initiated, thus enhancing the favorable effect of the proprioceptive coherence component.

In general, all properly applied methods, direct, indirect or physiologic response, have been found compatible with the proprioceptive coherence technique. If the proprioceptive coherence technique is performed and, for individual reasons, a high velocity, low amplitude technique is employed, a brief pause or monitoring phase needs to be done and the areas treated with the proprioceptive coherence technique require reevaluation. Patients of any age may benefit from this technique if they are able to cooperate. Patient cooperation may only require allowing the physician to position body parts from a comfortable resting position. Language barriers may limit the application of this technique. Techniques should be individualized, specific, and precise. As our understanding of health and disease continues to expand, so does the need for more refined therapeutic measures and methods.

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Appendix A

Technique Photo: Proprioceptive Coherence for the Upper Cervical Spine and Suboccipital Region. Image courtesy of A.T. Still University.

Proprioceptive Coherence for the Upper Cervical Spine and Suboccipital Region

Diagnosis: Occipito-atlanto dysfunction with suboccipital tension

Step One - With the patient comfortably supine, sit at the head of the patient, slightly to the right side. Identify Objective findings of somatic dysfunction include focal fascial restriction and fascial strain with condylar compression, suboccipital muscle hypertonicity. The occipito-atlantal joint has a motion preference as sidebent right, rotated left and extended. Slight increase in local edema turgor. Suboccipital tissues exhibit tenderness at a level of 4 out of 10 on a 0 to 10 scale. The epicenter of dysfunction is on the lateral mass (articular facet) of the atlas near the OA articulation on the right. Active and passive nodding motion of the OA is reduced.

Step Two - Gently contact the epicenter of focal dysfunction with one finger pad. Comfortably cradle the patient's occiput with the palmar surface of the other hand in order to position the head region to attain precise localization Then, with full attention being given to both reducing all tensions at the epicenter to zero and a mandatory focus on the tissue qualities, rate of favorable tissue change, and velocity, the point of coherence is attempted. Simultaneous with the initiation and progress of identification of the precise treatment response position, as the precise point of maximal tissue relaxation is "approached," the physician will perceive a rate of change of favorable tissue texture using chronoceptive palpation. The localization and timing must be nearly exact or the treatment response does not occur.

Step Three – Palpate a zone of freedom from tissue strain and a proprioceptive coherence point will emerge rapidly as the dysfunction minimizes to non-perceptible. As the effect of proprioceptive coherence (instantaneous balance) is palpated, a near instantaneous release occurs. Immediately upon the perception of the point of coherence, the tissues must be returned to the neutral position in the reverse manner, with similar timing and velocity with a reverse capitulation, using the chronoceptive palpation sequence found during the second step. Then gently but rapidly remove the monitoring digit completely from the region.

Step Five - Wait for a few seconds before rechecking. The pain and the other features of somatic dysfunction should be reduced by

Technique Photo: Proprioceptive Coherence for the Upper Ribs. Image courtesy of A.T. Still University.

80% to 100%.

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Proprioceptive Coherence for the Upper Ribs

Dysfunction: Right Rib 2-4

Step One - With the patient comfortably supine, sit on the right side. Objective findings of somatic dysfunction include focal fascial restriction and fascial strain with preference to lateral motion and motion restricted in both superior and inferior translation of superficial tissues. Slight increase in turgor, tenderness at a level of 7 out of 10 on a 0 to 10 scale, and enhanced hypertonicity of the intercostal muscles immediately above and below rib 3 posteriorly. The epicenter of dysfunction is on the superior posterior aspect of rib 3 near the rib angle. Normal motion of rib 3 is reduced in inhalation and exhalation when induced by the patient's normal respiratory effort.

Step Two - Gently contact the epicenter of focal dysfunction with one finger pad. Grasp the patient's right upper extremity at the wrist to use the patient's right arm as a handle to attain precise localization. Then, with full attention being given to both reducing all tensions at the epicenter to zero and a mandatory focus on the tissue qualities, rate of favorable tissue change, and velocity, the point of coherence is attempted. Simultaneous with the initiation and progress of identification of the precise treatment response position, as the precise point of maximal tissue relaxation is approached, the physician will perceive a rate of change of favorable tissue texture using chronoceptive palpation. The localization and timing must be nearly exact or the treatment response does not occur.

Step Three – Palpate a zone of freedom from tissue strain and a proprioceptive coherence point will emerge rapidly as the dysfunction minimizes to non-perceptible. As the effect of proprioceptive coherence (instantaneous balance) is palpated, a near instantaneous release occurs. Immediately upon the perception of the point of coherence, the tissues must be returned to the neutral position in the reverse manner, with similar timing and velocity with a reverse capitulation, using the chronoceptive palpation sequence found during the second step. Then, gently but rapidly remove the monitoring digit completely from the region.

Step Four - Wait for a few seconds before rechecking. The pain and the other features of somatic dysfunction should be reduced by 80% to 100%.

Proprioceptive Coherence for the Quadratus Lumborum Muscle, With or Without Tender Points or Myofascial Trigger Points

Diagnosis: Spasm of the right Quadratus lumborum muscle

Technique Photo: Proprioceptive Coherence for the Quadratus lumborum Muscle, with or without tenderpoints or myofascial trigger points. Image courtesy of A.T. Still University.

Step One - With the patient comfortably supine, sit on the right side at the level of the lumbar spine. Identify Objective findings of somatic dysfunction include focal fascial restriction and fascial strain with hypertonic right quadratus lumborum muscle. It may be necessary to identify the focal area by wrapping your contact around the quadratus lumborum muscle. Slight increase in local edema or turgor. Pain is noted at level of 5 out of 10 on a 0 to 10 scale. The epicenter of dysfunction is on the lateral and slightly anterior portion of the muscle at a level of L3. Sidebending approximation of the origin and insertion of the muscle is possible and resistance to separation of the origin and insertion of the muscle is met with resistance and enhanced tenderness.

Step Two - Gently contact the epicenter of focal dysfunction with one finger pad. With your distal forearm, position the lower extremity in gross sidebending, slight flexion in order to position the region to attain precise localization. Then, with full attention being given to both reducing all tensions at the epicenter to zero and a mandatory focus on the tissue qualities, rate of favorable tissue changes, and velocity, the point of coherence is attempted. Simultaneous with the initiation and progress of identification of the precise treatment response position, as the precise point of maximal tissue relaxation is approached, the physician will perceive a rate of change of favorable tissue texture using chronoceptive palpation. The localization and timing must be nearly exact or the treatment response does not occur.

Step Three – Palpate a zone of freedom from tissue strain and a proprioceptive coherence point will emerge rapidly as the dysfunction minimizes to non-perceptible. As the effect of proprioceptive coherence (instantaneous balance) is palpated, a near instantaneous release occurs. Immediately upon the perception of the point of

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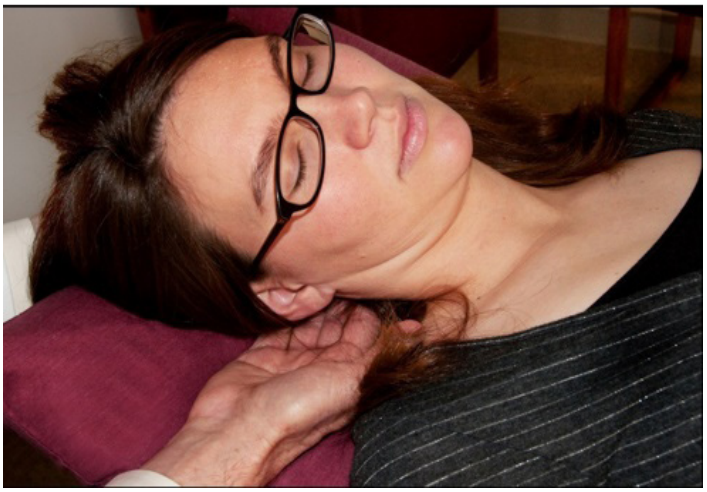
coherence, the tissues must be returned to the neutral position in the reverse manner, with similar timing and velocity with a reverse capitulation, using the chronoceptive palpation sequence found during the second step. Then gently but rapidly remove the monitoring digit completely from the region.

Image courtesy of A.T. Still University



Step Four - Wait for a few seconds before rechecking. The pain and the other features of somatic dysfunction should be reduced by 80% to 100%.

Proprioceptive Coherence for the Sacroiliac Joint

Diagnosis: Dysfunction of the right Sacroiliac Joint

Step One - With the patient comfortably supine, sit on the right side. Identify Objective findings of somatic dysfunction include focal fascial restriction, fascial strain and tight sacroiliac ligaments. Moderate local edema and increased turgor is found. Pain is noted at level of 4 out of 10 on a 0 to 10 scale. The epicenter of dysfunction is on the posterior aspect of the superior pole, medial to the posterior superior iliac spine. (Note: It may be necessary to identify a focal area on the superior or inferior pole, treat the dysfunctional pole, reassess then treat the other pole as needed. Adnexal structures such as the piriformis muscle, gluteal muscles sacrotuberous ligaments, may be involved.)

Step Two - Gently contact the epicenter of focal dysfunction with one finger pad. With your distal hand, grasp the ankle, position the lower extremity in abduction, slight extension, and internal rotation in order to position the region to attain precise localization. It may be necessary to slightly flex at the knee to reduce muscle tension at the ischial tuberosity from the hamstring group to attain precise localization and the point of freedom. Then, with full attention being given to both reducing all tensions at the epicenter to zero and a mandatory focus on the tissue qualities, rate of favorable tissue change, and velocity, the point of coherence is attempted. Simultaneous with the initiation and progress of identification of the precise treatment response position, as the precise point of maximal tissue relaxation is "approached," the physician will perceive a rate of change of favorable tissue texture using chronoceptive palpation. The localization and timing must be nearly exact or the treatment response does not occur.

Step Three – Palpate a zone of freedom from tissue strain and a proprioceptive coherence point will emerge rapidly as the dysfunction minimizes to non-perceptible. As the effect of proprioceptive coherence (instantaneous balance) is palpated, a near instantaneous release occurs. Immediately upon the perception of the point of coherence, the tissues must be returned to the neutral position in the reverse manner, with similar timing and velocity with a reverse capitulation, using the chronoceptive palpation sequence found during the second step. Then, gently but rapidly remove the monitoring digit completely from the region.

Step Four - Wait for a few seconds before rechecking. The pain and the other features of somatic dysfunction should be reduced by 80% to 100%.

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