Lavinia Rusu
June 3, 2022
DN/ PhD (OST)

THE EFFECT OF OSTEOPATHIC MANUAL THERAPY AND NAPRAPATHY ON MILD TO MODERATE FUNCTIONAL SCOLIOSIS IN ADULTS AND PEDIATRIC PATIENTS. A NEURO-STRUCTURAL APPROACH

Thesis for Doctoral Degree (D.N, PhD)

National University of Medical Sciences

June 3, 2022

Section 1. Table of Contents

Table of Contents

Section 2. Acknowledgements

To my dear wonderful husband who has encouraged me to become the very best version of myself. To my both sons, and especially my little Ryan who has been patiently waiting for his mommy to finish her school. To my mother-in-law who has been cooking and helping with our daily needs. To my own mother who has been supportive in all my endeavors. And to my patients who have been models and experimental subjects in this research.

To all of the above, I am thanking you from the bottom of my heart. You have assisted me to grow in different fields, become the very best practitioner I can be and achieve the best knowledge in the field of manual medicine.

To all my professors at National University of Medical Science, thank you for your contribution in elevating my knowledge and skills in assisting my patients.

And last but not least, I am forever grateful and give glory to God for the open doors, direction, constant assistance, health, a beautiful family, life and practice and for allowing me to finish this doctorate degree.

Section 3. Abbreviations and Definitions:

OMT: Osteopathic manipulative treatment includes a variety of hand-on techniques to treat somatic dysfunction

NMT: Naprapathic Manipulative Treatment includes a variety of hand-on techniques to treat connective tissue disorders

Somatic Dysfunction: the presence of one or more of the following physical findings – tenderness, tissue texture abnormalities, asymmetry, restricted range of motion

Structural examination – assessing for the physical findings of somatic dysfunction

IS: Idiopathic Scoliosis

JIS: Juvenile Idiopathic Scoliosis

RSPA: Resting calcaneal stance position angle

ROM: Range of Motion

Section 4. Abstract / Introduction

The complex anatomy and kinematics of the spine and its natural compensating behaviors has led to many studies across the time and much debate regarding different manipulations that can lead to temporary, stable or durable positive effects when it comes to abnormal curvatures of the spine. So far, there has not been documented a standard criterion quantifying a full correction of idiopathic scoliosis or other forms of scoliosis. There are few scoliosis corrective measures which have showed some validity and intra-session reliability, although the inter-session reliability has been distinguished as poor due to a different pathologies and origins and a variety of compensatory modes of the organism balancing itself.

The aim of this study was to examine the effect of determined single or multiple applications of Osteopathic Manipulative Treatments performed along with Naprapathic Manipulative Treatments in both pediatric and adult patients with functional or structural scoliosis. The model of treatment is a neuro-structural approach, involving a whole-body analysis and a whole-body treatment in order to obtain some forms of correction of the scoliosis curvature.

The method used includes applied Osteopathic and Naprapathic treatments to the out of balance tissues, regardless of their direct implications to the spinal deformity. After the entire body is balanced in the nervous system, in the muscular system and the skeletal system, lymphatic system, then a gentle indirect osteopathic technique is administered to the patient in order to encourage the body to readjust to a better alignment of the spine. The method may be adjusted from patient to patient depending of the actual requirements and deficits of the musculoskeletal system.

Section 5. History of Scoliosis

Scoliosis has been known and dated since prehistoric times and mentioned by Hippocrates (in Greece) approximately 400 B. C. Hippocrates has also designed an apparatus for the correction of the deformity. The literal translation of scoliosis is “crookedness” and it was invented by Galen in approx. 200 A.D. Galen also conceived the terms Kyphosis, Lordosis, and Scoliosis and described their treatment by chest binding and the application of spinal jackets. [1]

The Dark Ages (ca.500 to 1000 A.D.) saw little further advancement in the knowledge and treatment of spinal deformities; these were then thought to result from divine retribution and consequently such patients were regarded as heretics. The treatment for these patients and the punishment due to criminals was the same – to put them on the rack. [2]

[1] Huebert, H.T., Scoliosis. A brief History. Manit Med Rev 1967; 47:452-456
[2] Kumar K. Spinal deformity and axial traction. Spine 1996; 21:653-655

Then, in the mid-sixteenth century in France, Ambroise Pare first described congenital scoliosis and understood spinal cord compression as a cause of paralysis. [3]

It is alleged that in 1741, Nicholas Andre first invented the word *orthopaedia*. At this time, Andre was a grumpy 80-year-old Parisian pediatrician, and his book Orthopaedia was a self-help book written for parents of children with orthopedic disorders. [4] The full title of the book was Orthopaedia: Or the Art of Correcting and Preventing Deformities in Children: By Such Means as May Easily be Put in Practice by Parent Themselves and All Such as Are Employed in Educating Children. Thus, orthopedics literally means "correcting and preventing deformities in children."

Andre felt that scoliosis was the result of muscle imbalance and poor sitting posture. Accordingly, he believed that proper tables and chairs were important in preventing scoliosis. [5] He also recommended periods of recumbency as well as braces and corsets for treating the disorder, and advised that persons with scoliosis carry books on their high shoulder side. [6]

Other contributors to the treatment of spinal deformities are the brothers Le Vacher, Francois-Guillaume. Jean Andre Venel who developed a brace for scoliosis, the removal of which was followed by the patient's entering an orthopedic bed to relax with traction at night. The idea of an orthopedic bed then became very popular and because of Venel's achievements in treating skeletal deformities, he received the title of "Father of Orthopaedics".

The first surgery attempts were around mid to late nineteenth century. Delpech "recorded" surface shape by making plaster casts of his patients, [7] and introduced tenotomy in 1818. [8] Then the surgical implants made their appearance in 1891 and early 1900s by Fritz Lange who implanted metal rods attached to the spinous processes with double slings of silk. [9]

Besides the pioneers of the scoliosis redemptive attempts, there were numerous revolutions in the historical treatments of scoliosis, some of them being Paul Harrington in Houston TX (1955) with his distraction and compression instrumentation as being one of the most effective scoliosis surgeries [10], in the late nineteenth and early twentieth centuries, we have Harda, Lange, Wreden, Albee with bone grafting in the spine and Hibbs in New York with his subperiostal fusion procedure.

---

[3] Huebert HT. Scoliosis. A brief history. Manit Med Rev 1967 ; 47:452-456
[4] Rang M. The Story of Orthopaedics. Philadelphia: WB Saunders; 2000:8-9
[5] Moen KY, Nachemson AL. Treatment of scoliosis. AN historical perspective. Spine 1999; 24:2570-2575

[6] Rang M. The Story of Orthopaedics. Philadelphia: WB Saunders; 2000:8-9
[7] Rang M. The Story of Orthopaedics. Philadelphia: WB Saunders; 2000: 154
[8] Rang M. The Story of Orthopaedics. Philadelphia: WB Saunders; 2000: 334
[9] Howorth MB. Evolution of spinal fusion. Ann Surg 1943; 117:278-289
[10]Harrington PR. Treatment of scoliosis. Correction and internal fixation by spine instrumentation. J Bone Joint Surg Am 1962; 44A: 591-610

Although scoliosis was discovered, monitored, investigated and treated for a long historical time, there have not been any manual technological treatments so effective that they would be noted and researched till today.

As Dr. Still is saying in the chapter called 'Osteopathy An Independent System', "None has a foundation in a well-regulated system to insure good health and long life. Osteopathy proclaims and proves that success in cures comes when all joints in the body move as Nature Ordered. " 11[11]

This research is an attempt to a new method in manual medicine to inquire of the changes of structural and physiological changes with a neuro structural manual manipulation approach.

Section 6. Osteopathic Manual Therapy.

1.1 Understanding the History of Osteopathy

Manual Medicine is an ancient science and is an art in itself. There has been documented manual medicine procedures in Ancient Thailand dated 4,000 years old. The ancient Egyptians also have been using applications of hands in treatment for injury and disease. Hippocrates himself, the father of modern medicine, revealed procedures, distinct traction and leverage techniques, in the treatment of spinal deformity. Historical figures in medicine like Galen, Oribasus and Celsus have been using manipulative procedures. There was a period in the history that prevented physicians to come in close contact with their patients, and that period was marked by the plagues.

In the 19th century, a revival of hands-on medicine came to the world, starting with Dr. Edward Harrison , a 1784 graduade of University of Edinburg in Scotland who brought manual medicine procedures back to the public.

[11] Andrew Taylor Still, (1902). The Philosophy and Mechanical Principles of Osteopathy, p 21.

The 19th century was known for the evolution of the "bonesetters" both in England and in the United States. There were articles in the Lancet and the British Medical Journal about the unconventional practices of bone setting which led to a great success in physical medicine at that time. In the United States there was the Sweet family in New England, Rhode Island and Connecticut who was skilled in practicing bone-setting with great success. Sir Herbert Barker, an English manipulative surgeon, was knighted by the crown back in early twentieth century for his remarkable success with his manipulative techniques.

Principles of Osteopathy

Osteopathic medicine was founded by Dr. Andrew Still (1828-1917), a physician, a surgeon, an author, and inventor and a balanced humble innovator who has synthesized the ancient practical medicine truths with the current medical success in the latest research in modern medical practices. He has harmoniously blended natural medicine with physical medicine to bring the human body to the optimal possible functionality. He invented the name OSTEOPATHY by blending two words together: *'osteon'*- the Greek root for 'bone' and *'pathos'* the Greek work for suffering. He has brought a new philosophy in the medical science with five basic principles which included:

1. Life is movement. In order to be alive, all the elements of the human body have to freely and uninterruptedly move in a harmonious order. This does not include just the musculoskeletal system like joints and muscles, but also all the fluids (like blood, lymph, etc.) and all the organs.
2. Structure and Function. Dr Still has realized that optimal demands all the tissues and cells of the body to function together in a harmonious motion. Dysfunction can become evident in impaired mobility of the bodily structures. In Osteopathy, the practitioner examines the movements of the bodily structures, identifies the lesions or the irregularities and treats with different techniques to re-establish the body's self-healing powers and return the system to an adequate function. Most importantly, the principle is that the human body is a dynamic unit of function which is harmonious with nature, and is a complex association of different substances (gas, fluids and solids) of the body like bones, muscles, nerves, brain, fluids, organs, etc., all forming a wonderful live machine with a mysterious blood which oils and feeds every component , and is sensitive to nutrition, adequate environment, proper alignment and that has a unthinkable capacity of self-regulation, self-healing and has a remarkable interrelationship between structure and function.

3. The law of the Artery. Dr Still's renowned quote that "the rule of the artery is supreme", or the "rule of the artery is absolute", universal and it must not be obstructed" [12]. The supply of nutrients and oxygen we well as the discarding the CO2 and byproducts of metabolism is a fundamental principle of life. If these functions have long-term interference of the supply, demand and excretion, this may impair the quality and

[12] Still Andres Taylor. Autobiography of Andrew T. Still With a History of the Discovery and Development of the Science of Osteopathy, Kirksville, MO: published by the author; 1897: 219

mobility of the tissue. This can apply to all the bodily fluids (arterial, venous, lymph, cerebral spinal fluid, etc.) The Osteopathic approach is committing to sustain optimal supply of all the fluid structures establish optimal function of the body.

4. Bodily globality. The human body is a unit, an integrated organism in which no part functions independently. The structures and tissues are functioning mechanically (joints, muscles, ligaments, etc.) all interconnected with nerves and blood. This interaction between all individual structurers that allow the body to work as a union makes osteopathy philosophy a unique science by treating the body entirely rather than treating a single illness or infirmity excluding the broad evaluation of the entire system.
5. Health restoration and disease prevention. The healing power of nature which aids the body to heal itself. Dr. Still has repeatedly mentioned the laws of cause and effect, and that this principle is fundamental in treating the human body. The self-healing power of the body can be demonstrated in the nature of would repair, in the bone growth after a fracture, in the immunity acquired after an infection, in the immune system equipped to protect the body every step of the way. This amazing science addresses a large variety of fields of medical studies, starting from external environmental stressors like trauma, infections, nutrition, social disruption and going deeper to circulation and body fluids, metabolic, immune and endocrine factors, to behavioral adaptation, to neurologic balance, to posture and motion and addressing the structure of the Musculo-skeletal system with an original form of treatment called osteopathic manipulative treatment.

6. Structure-function interrelationship. The known statement the “structure governs function” and also the vice versa is true that function influences the structure.

7. The somatic component of disease and the use of manipulative therapy. Dr Still believed that the musculoskeletal system as an integral part of the body can affect the total body health. This amazing science addresses a large variety of fields of medical studies, starting from external environmental stressors like trauma, infections, nutrition, social disruption and going deeper to circulation and body fluids, metabolic, immune and endocrine factors, to behavioral adaptation, to neurologic balance, to posture and motion and addressing the structure of the Musculo-skeletal system with an original form of treatment called osteopathic manipulative treatment. The use of medical manipulation became an integral part of Dr Still’s philosophy and practice and he believed that the restauration of the body’s maximal functional capacity would increase the level of wellness and aid in recovery from an injury and malaise.

“What is osteopathy? It is a scientific knowledge of anatomy and physiology in the hands of a person of intelligence and skill, who can apply that knowledge to the use of man when sick or

wounded by strains, shocks, falls, or mechanical derangement or injury of any kind to the body. "[13]

Osteopathic philosophy, which can be deliberately simple in its appearance outlines the basis for osteopathic medicine's distinctive approach to health care. It includes all characteristics of the human body, including physical, mental, emotional, and spiritual aspects and at the same time being a patient centered focused science directed to cure diseases, restore different conditions to well-being and full health.

One of the basic mechanisms of Osteopathy is the question of intelligence, not necessarily a question of book knowledge. It includes comprehension of the knowledge of anatomy and physiology, histology, chemistry and more that this, it includes the correct implementation of this knowledge to useful applications with anatomical exactness for the purpose of facilitating proper bodily fluid circulation locally or generally by manipulation of a variation of bone, muscle, ligament or fibers, or other parts of the body.

--

Osteopathic healthcare is based on manual therapeutic attempts to help the body maintain and restore homeostasis and healing. It is using numerous applications including a variation of modalities in order to correct and re-establish health and balance. Most of the times is a hands-on practice, palpating and mechanically correcting positions of body parts including joints, muscles, organs, fluids, bones, etc. In the osteopathic philosophy incorporates the broad understanding that unhindered flow of blood and lymphatic fluid is a prerequisite of human health, while the practitioners work on locating and correcting structural and functional changes in the tissues of the human body that impair the free flow of blood and lymph ([14].Degenhardt & Kuchera, 1996. Also, Osteopathy is dedicated to prove and proclaim that:" success in cures comes when all joints in the body move as Nature ordered". [15](Andrew Taylor Still, 1902)

[13] Andrew Taylor Still, (1902). The Philosophy and Mechanical Principles of Osteopathy p.18; Discoverer of the Science of Osteopathy, Hudson-Kimberly Pub. CC, Kansas City, MO. Page 18, paragraph 2.

[14] Degenhardt, B. F., & Kuchera, M. L. (1996). Update on osteopathic medical concepts and the lymphatic system. Journal of the American Osteopathic Association, 96(2), 97.

[15] Andrew Taylor Still, (1902). The Philosophy and Mechanical Principles of Osteopathy; Discoverer of the Science of Osteopathy, Hudson-Kimberly Pub. CC, Kansas City, MO. Page 21, paragraph 3.

“It is the object of a physician to find health, anyone can find disease.” A.T. Still.

Restore health, not just manage symptoms.

The Osteopathic practitioner is a serious, attentive, focused, governed by reason, wise, seeking the truth, bringing harmony to the systems and components of the body, works with the nature, simple movements, progressing in education and research, and bringing wellness to the patients. He is understanding that osteopathy works on the principle of debtor and creditor, that he has to have an anatomical critical eye and willingly perform small adjustments, analyze centers and variations, good and bad positions, have the knowledge of many theories and facts, systems, with much more than a superficial knowledge of the body mechanisms. Deep study of fascia, muscles, ligaments, bones, organs, glands, vessels, all their forms and conditions are a duty that offers the practitioner the opportunity to corelate and coordinate the data in order to bring a synchronized outcome to the patients and promote homeostasis.

Section 7. Naprapathy

Naprapathy is a health science with more holistic and integrative nuances that is distinct in the array of manual medicine practices. Naprapathy is based on the fundamentals and principles of osteopathy and chiropractic views, yet it has a completely different approach in observation, management and treatment, focusing on the connective tissue around the spine and other joints in order to restore the whole health.

A Brief History of Naprapathy

Naprapathy is a combination of the Czech work *'Napravit'* which means "to correct" or "to fix" and the Greek work '*Pathos'* meaning "suffering", "experience or emotion". In other words, Naprapathy means 'to correct disease' or to fix suffering. It is not to be confused with the word Naturopathy and they are two different professions.

Dr. Oakley Smith became a chiropractor at an early age being trained by the primary American promulgator D.D. Palmer studying at the Palmer's School of Cure in Davenport Iowa. While the chiropractic science was promoting the spinal misalignment (called "subluxation") as the root of malaise and disease, being a curious and detailed researcher, Dr. Smith discovered that the root of the problems is found in the soft tissue rather than the bones.

"As a good scientist, Dr. Smith sought proof for his theory, and found it in the pathology lab looking at connective tissue under the microscope. What he saw were adhesions affecting the nerves after they emerged from the spine, cumulative trauma that constricted nerve impulses and instead caused pain, muscle tension, numbness, partial paralysis and other infirmities that kept patients from their activities. These strictures also affected the blood and lymph vessels that form bundles with the nerves, bringing oxygen and nourishment, as well as carrying away metabolic waste products from our muscles and organs. Dr. Smith realized that by freeing up the connective tissue- in particular the fascia that surrounds every organ, separates all of our 650 plus muscles from other muscles and tissue, and supports our bodies's structure – he could relieve pain and dysfunction. " Naprapathy -Manual Medicine for the 21st Century[16]

"Naprapathy is based on a discovery by Dr. Oakley Smith in the early 1900's. Dr. Smith who was a chiropractor embarked on a program of research to demonstrate how the subluxation is ahte cause of illness or condition. Dr. Smith never did make this determination. He instead found that the nervous system is affected by disturbances in the connective tissue that encases the spinal nerves. With this basis in mind, he devised a precise and intricate system by which these points of connective tissue disturbance are found and charted. He also developed manual techniques that can treat these points of disturbance to take their influence off the nerve they are affecting, Naprapathy is so effective for two basic reasons 1) it treats disturbances of the tissue most closely in contact with the nervous system and 2) it finds and treats these disturbances with remarkable precision and accuracy and it does this with movements of gentleness that is characteristic of this profession." [17] (Naprapathy, The Effective Healthcare Alternative!)

While Osteopathy is generally looking to structural derangements in order to apply techniques of stretches to realign the hard tissue structures, Naprapathy is having a closer look at the disturbances inside the connective tissue which surround the bony structures. Naprapathy has a unique approach of manual therapy to "essentially disassemble the syndrome that is affecting the nervous system"

[16] Dr. Nuzzon, Patrick, D.N., Dr. LaVista, Kirsten,2022, D.N. Monee, IL , Naprapathy Manual Medicine for the 21st Century.

[17] Plumbo, Anthony, D.N., Naprapathy The Effective Healthcare Alternative, 1995, 2005, pg 37

Ligatites

The connective tissue wrapping the housing the spinal nerves is to a great extent ligament. The disturbances or knots that he has seen in the ligaments he named them Ligatites. A Ligatite is mainly a spot or a point inside the ligament that is constricted or tightened. By disabling and releasing the Ligatites he has corrected a multitude of diseases. He has tested the manipulative techniques that released the Ligatites on his own body, his own family and friends with great results. He was researching to prove the theory of subluxation, and by his findings he instead disproved it. He found that the manipulative thrusts of the vertebras were actually related to the Ligatites in the connective tissue.

The science of Naprapathy includes the principle of Homeostasis, where the human body is striving to balance forces of chemical, physical, mental and emotional factors, which in harmony they confer what we call health. It is the intrinsic notion of homeostasis that gives the body the ability to maintain health. It is the duty of a Naprapath to assist in alleviation of conditions rather than suppression of symptoms with drugs.

It is unique in the science of Naprapathy to see specific examination, identification of syndrome, or Naprapathic diagnosis, and applied treatment based on the diagnosis. Charting, documenting certain malfunctions of the tissue, coming with a treatment plan and documenting the progress of the improvements until the malady has been resolved is also in the scope of practice. This is called: Quadrication. "This term makes reference to the four principles that Naprapathy follows as it assesses and addresses the cause of condition. These principles are as follows:

1. The Causitor: this is the environment that gives rise to the cause of the condition;
2. The Causitite: this is the naprapathically defined reason for the patient's condition;
3. Chardosis: is the charted diagnosis of Naprapathic findings, which identifies the Causitite. And
4. The Correcto Plan: this is the plan of therapy the Naprapath will use to address the charted diagnosis. [….]
   […..] The premise, which the process of Quadrication follows, ultimately focuses upon the connective tissue disturbances addressed before. No other healthcare profession or approach functions in this way. And, by the same token, no other healthcare profession achieves the results as Naprapathy does." [18]

[18] Palumbo, Anthony, D.N., Naprapathy, The Effective Healthcare Alternative, 1995, 2005, pg. 29

Section 8. Pathogenesis of Idiopathic, Functional and Rotational Scoliosis

Idiopathic Scoliosis is a sideways or rotational curvature spinal distortion that is common in both pediatric and adults' patients with an unknown etiology. Presumably, some of the factors can be hereditary and genetic, some other elements can derive from spinal injuries (like falls, accidents, etc.) or infections, birth defects such a spinal bifida, muscular dystrophy groups of diseases or cerebral palsy. Adolescent idiopathic scoliosis has a prevalence of 0.47-5.2% in the current literature. The female to male ration ranges from1:5:1 to 3:1 and increases substantially with increasing age. Generally, the Cobb angles numbers are higher in girls than in boys: The female to male ration rises from 1:4:1 in curves from 10° to 20° up to 7:2:1 in curves higher than 40°. (https://ncbi.nlm.nih.gov/pmc/articles/PMC3566258)

In the elderly population, due to the fact of degenerative causes, the prevalence rate is changed.
"Previous reports note a prevalence of adult scoliosis up to 32%. In this study, results indicate a scoliosis rate of 68% in a healthy adult population, with an average age of 70.5 years. This study found no significant correlations between adult scoliosis and visual analog scale scores or nutritional status in healthy, elderly volunteers." https://pubmed.ncbi.nlm.nih.gov/15864163/#:~:text=Conclusions%3A%20Previous%20reports%20note%20a,average%20age%20of%2070.5%20years.

The pathogenesis of scoliosis is not entirely understood. We cannot have an opinion that an existing malformation might produce an asymmetrical loading of the growing spine, which in turn would cause asymmetrical growth of the vertebrae. It is unknown how it starts and why is it progressive in some patients and not in others. "Biomechanical, neural, metabolic and hormonal changes have been reported in IS but is difficult to say whether these are primary or secondary to the deformity. [.....] Some theories are suggesting that pineal gland disorders and a deficiency in melatonin levels, mentioning a melatonin-signaling pathway dysfunction affecting only certain cell types, notably osteoblasts, [19] . " Calmodulin, a calcium-binding receptor protein, regulates contractile properties in platelets and muscles, and interacts with melatonin. Increased levels of calmodulin in platelets and an

[19] Wang WW, Man GC, Wong JH, Ng TB, Lee KM, Ng BK, et al. Abnormal response of the proliferation and differentiation of growth plate chondrocytes to melatonin in adolscents idiopathic scoliosis. Int J Mol Sci 2014; 15(9): 17100-14

asymmetrical distribution of calmodulin in paraspinal muscles compared to healthy controls have been described in IS patients". [21, 22] [2021]

Another hypothesis can be a relative anterior spinal overgrowth or an uncoupled neuro-osseus as a cause of IS [23] [22]

Other postulation may suggest a link between the low bone mineral density and fast bone turnover rate in girls in relationship with sex hormones. Or a decreased level of cartilage oligomeric matrix protein in patients with juvenile Rheumatoid Arthritis as another factor.

In conclusion, idiopathic scoliosis is "a complex disease with a polygenic background". A clear finding cannot be revealed in the etiology and pathogenesis of idiopathic scoliosis.
https://scoliosisjournal.biomedcentral.com/articles/10.1186/s13013-016-0105-8

Section 9. Difference between functional scoliosis and idiopathic scoliosis

Idiopathic scoliosis mentions that the '*cause is unknown'*, while functional scoliosis calls attention to '*direct or root cause* 'of the deformity. Some schools of thought are referencing the idiopathic scoliosis as the structural scoliosis, and the functional scoliosis being not structural, due to the other extra-spinal pathologies such as leg-length difference, pelvic inequality and paraspinal muscle tone asymmetry. Leg length inequality and muscle spasm, are common causes of non-structural scoliosis. [24] [23]

It has been proven that Functional scoliosis was "caused by leg length discrepancy, which causes pelvic obliquity in the frontal plane and lumbar scoliosis with convexity towards the shorter extremity. Leg length discrepancy is observed in 3-5 % of the population. Un-equalized

[20] Chu WC, Lam WW, Chan Y, Ng BK, Lam TP, Lee KM, et. Al. Relative shortening and functional tethering of spinal cord in adolescent idiopathic scoliosis. Study with multiplanar reformat magnetic resonance imaging and somatosensory evoked potential. Spine. 2006, 31 (1) : E19-25
[21] Abul-Kasim K, Overgaard A, Karlsson MK, Ohlin A Tonsillar ectopia in idiopathic scoliosis: does it play a role in the pathogenesis and prognosis or is it only an incidental finding? Scoliosis, 2009; 4:25

[22] Chu WC, Lam WM, Ng BK, Tze-Ping, Lee KM, Guo X, et. al. Relative shortening and functional thethering of spinal cord in adolescent scoliosis- Result of asynchronous neuro-osseous growth, summary of an electronic focus group debate of the IBSE. Scoliosis. 2008; 3:8.
[23] Staheli LT. Fundamentals of pediatric orthopedics. 3rd ed. Philadelphia: Lippincott Williams & Wilkins; 2003. Pp 91-106.

lower limb length discrepancy leads to posture deformation, gain asymmetry, low back pain and discopathy. “ “Among 369 children the discrepancy of 0.5 cm was observed in 27, 1 cm in 329, 1.5 cm in 9 and 2 cm in 4 children. During the first follow-up examination, within 2 weeks, the adjustment of the spine to new static conditions was noted and correction of the curve in 316 examined children (83.7%). In 53 children (14.7%) the correction was observed later and was accompanied by slight low back pain. The time needed for real equalization of limbs was 3-24 months. The time needed for real equalization on the discrepancy was 11.3 months.” https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3282518/

It is significant to note that “in both structural and non structural scoliosis patients (i.e., if spinal pathologies and asymmetrical pronation of the feet are both accompanied), alignment of the spine will be affected by leg length, and pelvic height difference”. It has been studied and proven that JIS (Juvenile Idiopathic Scoliosis) can be corrected in some aspects like the pelvic inequality caused by different RSPA (resting calcaneal stance position angle) with foot orthosis. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6325314/#!po=9.37500

Section 10. Neurostructural Balance Concept.

In the practice of osteopathic medicine, it is necessary to assess an accurate diagnostic using either remedial or palliative therapy. If using pharmacology products, then a specific and accurate prescription needs to be written. If pharmacological medicine is not used, then in manual medicine a structural diagnostic need to be evaluated then a somatic dysfunction treatment needs to be prescribed. This can be in a form of a manipulative therapy.

Different manual medical practices are naming the lesions or dysfunctions in the body with different words like: joint blockage, joint lock, chiropractic subluxation, osteopathic lesion, loss of joint play, minor intervertebral derangement, Ligatite, etc.

The goal of manipulation is to use a hands-on approach using maneuvers to achieve “maximal, painless, movement of the musculoskeletal (motor system) in postural balance. There are different types of therapeutic effects that can be classified as follows:
1. affecting the circulatory system of the organism (by moving bodily fluids and providing restorative effect),
2. the nervous system by modifying reflexes like somatosomatic, somatovisceral, viscerosomatic, viscerovisceral, viscerosomatovisceral, somatoviscerosomatic,
3. maintaining the therapy for irreversible conditions. [24]

[24] DeStefano, Lisa A.D.O. , 2017, Greenman’s Principle of Manual Medicine, Fifth Edition, Wolters Kluwer, 4:pp 41

There are different models and mechanisms of manual medicine intervention per Dr. DeStefano, Lisa A., D.O.

a. Postural Structural or Biomechanical model. This model is the most popular and known model in the manual medicine practitioner's world. " In this model, the patient is approached from a biomechanical orientation toward the musculoskeletal system. The osseous skeleton is viewed as a series of building blocks piled one on top of another, starting with the bones of the foot and ending with the skull. The ligamentous and fascial structures are the tissues that connect the ossous framework, and the muscles are the prime moves of the bones of the skeleton, working aross single and multiple joint structure. Alteration of the patient's musculoskeletal system is viewed from the alignment of the bones and joints, the balance of muscles as movers and stabilizers of the skeleton, the symmetry of tone of the ligaments, and the integrity of the continuous bands of fascia throughout. Alteration in joint apposition, alteration in muscle function due to hypertonicity or weakness of fascia ae all considered when approaching a patient from this perspective. The manual medicine treatment would be directed toward restoring maximal motion to all joints, symmetry of tension within fascial elements throughout the body. The goal is to restore maximal function of this musculoskeletal system in postural balance. […] The most important element of the postural structural model in this author's experience has been the restoration of maximum pelvic mechanisms in the walking cycle. The pelvis becomes the cornerstone of the postural structural model. Influences from below or above must be considered to achieve symmetric movement of the osseous pelvis during walking." [25] The postural structural model is useful in resolving pain in cases of trauma or microtraumas, or due to postural imbalances. This model covers a large amount of the current" biomechanical engineering research in the areas of joint mechanics; properties of ligaments, tendons, and fascia; and kinetics and kinematics." ([26] ibidem) .

b. Neurologic Model is involving the action through autonomic nervous system. At this point, there is some evidence that the somatic (motor) nervous system can influence the autonomic nervous system, although more research is needed.

c. Autonomic Nervous System Model. The autonomic nervous system has the preganglionic fibers originating from the spinal cord from T1-T3. The lateral chain of ganglia are paired and overlie the posterior thoracic and abdominal walls where most of synapses are taking place with postganglionic fibers. Because of tight ligamentous tissue around the lateral chain of ganglia in the thoracic region, they are very tensed and dense around the heads of the ribs. " All the viscera and soma above the diaphragm receive preganglionic sympathetic nervous system fibers from above cord level T4. All viscera and some below the diaphragm receive preganglionic sympathetic nervous system fibers from T5 and

[25] DeStefano, Lisa A.D.O., 2017, Greenman's Principle of Manual Medicine, Fifth Edition, Wolters Kluwer, 4: pp 42

below. Understanding this anatomy helps in relating the identified somatic dysfunction to the patient's problem and can lead the physician to give appropriate manual medicine treatment. [26] Also, there is no parasympathetic innervation to the motor tissue, only sympathetic innervation is enervation the motor tissue. There is another aspect the autonomic nervous system which can be treated to address the cranial nerve through the cranial and sacral therapy in order to free possible entrapment of the nerves.

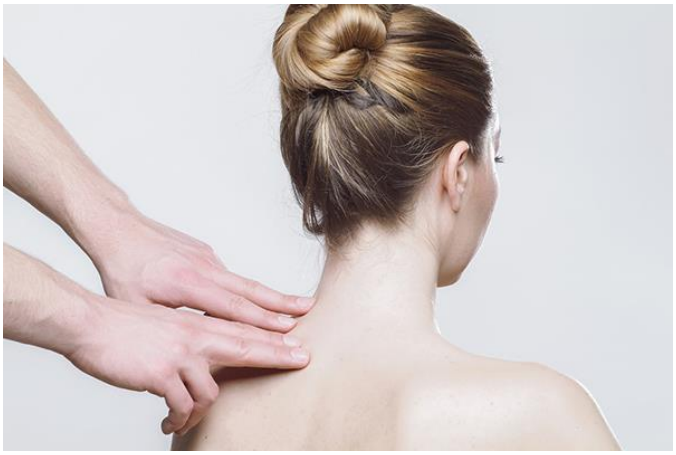
Due to the nature of this thesis, the neuro-structural model is used in this approach of assessing the effects of osteopathic and Naprapathic manipulation to idiopathic and functional scoliosis patients.

There are other types of models that are worth mentioning and can be discussed another time are: the Pain Model, the Stability Model, the Neuroendocrine Model, the Respiratory Circulatory Model, the Bioenergy Model and the Psycho-behavioral Model.

Section 11. Treatment modalities

A. Soft tissue procedures

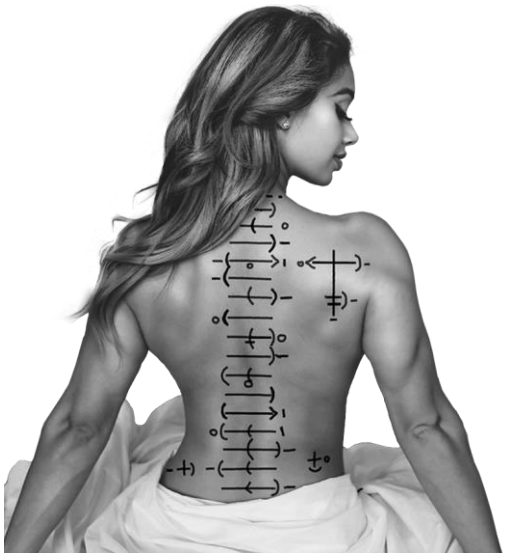
Following the popular belief of following the path of least resistance, when approaching functional scoliosis, the soft tissue presents itself of offering the least resistance in the treatment. The course of action will employ manual application of force toward influencing specific



The best approach I found is first calming the soft tissue by broad gentle and medium deep cross fiber techniques attempting to relax the muscles and tendons in an effort calm and alter the sympathetic nervous system. This method can be include kneading, stretching, in various directions depending of the presentation of the tissue.

B. Connective tissue mobilization.

[26] DeStefano, Lisa A.D.O., 2017, Greenman's Principle of Manual Medicine, Fifth Edition, Wolters Kluwer, 4: pp 42



This gentle approach is assessing each vertebra from C2 to S1bilaterraly by application of Naprapathic techniques. After the muscles and tendons are thoroughly release from tension, the practitioner is palpating first light and then progressively deeper between the transverse processes of each vertebra

Where Ligatites are found, they are carefully treated in a gentle, oscillatory way until the connective tissue has become loosened and not opposing any resistance to the maneuver.

C. Specific Joint Mobilization.

When it comes to rotational or misalignments of the spine, especially in scoliosis patients, my personal experience has shown that indirect mobilization techniques are better affecting the release of the joint movement that has been impaired. The sympathetic nervous system responds faster thus the mobilization technique has a better outcome. So if the rotation of L3 is towards the left, at first, I am applying the Catwalk technique and hold in towards the left rather than towards the right. After the indirect technique is applied, then in a shorter treatment I may apply the Catwalk technique on the right also.
The detectable feedback of the treated tissue shows a faster liberation of the tightness or inter-articular lesion where the indirect technique is applied properly, especially in rotational angulation.

D. Physiologic response method

The plan of action is to position the specific plane and perform the treatment that affects mobilization of the vertebrae in that particular plane. For instance, if the joint section (like the facet joints) is in the coronal plane, then the patient needs to be placed in the lateral recumbent position and the practitioner is mobilizing the joint in a posterior to anterior in relationship to the body, not in relationship to the table where the patient is laying.

Also, deep breathing plays an important role in the nervous system and the release of hypertonicity of the tissue. The respiration has been known to have an effect on mobility of vertebral segments withing the spine. “Inhalation effort enhances straightening of the curves and hence backward-bending movement in the thoracic spine and forward bending in the cervical and lumbar spines; exhalation effort causes just the reverse.”[27]

E. Afferent Reduction Procedures

This method is critical in performing any modification of the tonicity, laxity, spasticity, rigidity, contraction, and ultimately softening and releasing restrictions of the tissue. Stimulation of the mechanoreceptors found within various tissues of the musculoskeletal system is thought to influence (at least in theory) the central nervous system that in turn alters the programming of the musculoskeletal function. Recognizing the proper positions and steering of the tissue to reduce sensory overload of the spinal cord helps the organism to restore a more normal behavior. A rocking technique, a balance and hold technique, a release by positioning technique, all these are examples of aiding the afferent nerves to relax and tame the nociceptors.

Section 12. A Unique Scoliosis Resolution Approach

This distinctive method of having a positive scoliosis revolution is attributed to Dr. Cassius Camden Clay, D.C. owner of the innovative “QuickSelfFixes.com” and his wife, Dr. Shawne Murray, DO, assistant professor of Osteopathic Manipulative Medicine at PCOM Georgia. After attending an ‘Assisted Stretching’ continued education class, Dr. Clay has been sharing how he has successfully rehabilitated numerous of his patients from scoliosis using a particular method. Some of the idiopathic scoliosis patients saw improvements with lasting effects, some have seen improvements only temporary. His assisted stretching procedure is governed by 6 rules:

1. Be Prepared- Therapist needs to keep himself/herself in the best shape physically and mentally in order to be clear and focused.
2. Go Slowly - Means that all stretches should be done at a leisurely pace so that the client can express his discomfort or changes. This is a pin-and-stretch method, hold and wait style.

[27] DeStefano, Lisa A.D.O., 2017, Greenman’s Principle of Manual Medicine, Fifth Edition, Wolters Kluwer, 4: pp 45

3. You Are Number One- Don't convert a client's pain into your pain. Do not overestimate the patient's weight, avoid uncomfortable maneuvers for your body.
4. Look Pretty -Adopt proper ergonomics. Based on Alexander Technique, when our muscles are relaxed, they elongate therefore relaxing the entire body.
5. Never Trust Anyone – means that the therapist is 100% in charge if his/her own safety.
6. Just Be Nice – thinking more force may be a better treatment can be detrimental. Too much force can cause the client to be tense which prevents deep stretching and can produce pain and harm. Stay below the patient's pain threshold.

Dr Clay has been introducing two different stretches along within this method, one being called "Lumbar Connective Tissue Stretch" and the other "Costo Vertebral Ligament Stretch" for the thoracic spine.

The Costo Vertebral Ligament Stretch. The patient is placed supine with the hand closest to the therapist under his head. After the apex of the curvature has been identified, the practitioner applies pressure at the apex of the curvature, on the rib necks with middle, index and ring finger working together as a gripping unit, contact fingers being in the lamina groove, medial to the rib head, pushing or pulling the apex to make the curvature worse. This is a indirect osteopathic technique. The body's connective tissue is in essence, one piece. The practitioner is pinning the apex, stretching the tissue and holding for the connective tissue to slowly release tension. The entire connective tissue tree will resist against the therapist's pressure. If it is pushed too hard, this technique will not work. The practitioner must allow the body as it pushes or pulls against him/her to win. This method may produce some miraculous results in functional scoliosis patients and improvement in the structural scoliotic patients. Sometimes this technique needs to be repeated, other times once performed will be enough.

Lumbar Connective Tissue Stretch. Similar to the previous method by stimulating the apex of the curvature and cause it to become more pronounced. The practitioner is pinning the apex, stretching the tissue and holding for the connective tissue to slowly release tension. After the tautness is freed up, the clinician will slowly release the body.

Section 13. Case #1

Patient is a young female, 17, with mild scoliosis, presents with cervicalgia, shoulder pain in the levator scapula, rhomboids area, and lumbar pain.

The original measurement on the Economy Baseline Scoliosis Meter which measures only the rotational part of the scoliosis shows 5° to the left, which determines a lumbar levoscoliosis.

The patient examination reveals hypertonicity on the lumbar left paraspinals, right rhomboids, right levator scapula and right upper traps, and weakness in the right lumbar paraspinals. Using

all the methods described in this thesis, at the end of the treatment, the rotational scoliosis reading was showing only 2°.

Section 14. Case #2.

Patient is a geriatric male, 71 years old patient with severe idiopathic scoliosis, complaining of interrupted breathing, lack of energy, unable to walk or perform basic house tasks. Patient has been previously diagnosed with two different strains of SARS-Covid 2, one strain being Delta variant (December 2021) and another strain being the Omicron variant (January 2022). Patient was hospitalized for about 15 days due to hardship in breathing. At one point in time, patient was asked to be intubated due to a continuous severe drop of oxygen, to which the patient refused the intubation. Patient presents himself with shortness of breath, resting O2 of 99 and resting pulse of 128. Patient is not on any heart medication. Patient has scoliosis for a long time and a MVA which affected his thoracic spine where all the ribs were fractured, approx. 15 years ago. Patient has hardship to breathe while performing any movement except in recumbent positions. 5 months after exiting the hospital, patient cannot drive, cook, or perform any duties around the house. During the examination I have determined that his diaphragm on the left side is severely affected, and proceeded to release the tension along with all the ventral external and indirectly internal intercostal muscles. On prone position, I have found Ligatites on T1-T4 left area and proceeded to disable them. Also, worked on the paraspinals and upper trapezius for a more relaxed spine. The effects of the 1st treatment reflected in the drop of the heart pulse, from 128 to 98 in resting position and allowing the patient to walk a longer distance and even allowed him to cook dinner, which he was not able to perform for a long time.

The second treatment the patient was able to drive by himself for the first time since before the Sars-COV2 infection. His resting pulse was 112 after 6 days.

Patient is showing hard breathing being present on any movement on the table or outside the table. At the request to bend forward for a scoliosis inspection, the patient had a visible hardship of breathing, with different interrupted breathing patterns thus leading the practitioner to not be able to picture the post treatment effect and proper measurement. The original basic measurement was at 15.5 degrees levoscoliosis in the thoracic area.

This time, a scoliosis treatment was administered, and the rotational reading from before the treatment which was 15.5° levo-thoraco-scoliosis had changed to 12° rotational scoliosis. The picture post treatment could not be taken due to impaired breathing while bending forward. Patient has stated that he felt relief in his breathing

from both first and second treatment. Family members are testifying that the patient has a more positive approach to life since the first treatment.

Case #2. 71 yrs. old patient having trouble breathing while taking measurements.

Section 15. Case #3.

Patient is 69, only few days away from 70 years old. Female. Patient presents with severe chronic Right shoulder pain and reduced ROM, pain also appear into the left shoulder and neck, alternating. Patient has had a life long severe levothoracolumbar scoliosis which has progressed due to normal degeneration. The original rotational scoliosis measurement with the Economy base line Scoliosis meter was 14.5 ° which dropped to 9° at the end of the first treatment.

The second treatment was measured at 11° (a gain of 2° since the end of the previous treatment) and it dropped to 7° at the end of the treatment. After the following treatments, the improvement stabilized between 8°-9° rotational curvature.

Patient presents herself with a weakness in the rotator cuff group muscle, hypertonicity in the cervical flexors and weakness in the cervical extensors, tenderness in the Levator scapula, rhomboid and upper traps, gluteal muscle trigger points, weak paraspinals on the concave side of the spinal curvature, Ligatites at T7 -T11 bilaterally. Treatment was administered according to the needs using all the methods mentioned in this work.


BASELINE
Economy
Scoliosis Meter
12-1099
#1
RECOMMENDED
2A


BASELINE
Economy
Scoliosis Meter
12-1099
2B


BASELINE
Economy
Scoliosis Meter
3


Economy
Scoliosis Meter
#1
RECOMMENDED
CHIROPRACTIC
PILLOW
3B


BASELINE
4A


BASELINE
Economy
Scoliosis Meter
CE
12-1099
4 B

Section 16. Conclusion

Considering the results in this thesis, both idiopathic and structural scoliosis have suffered improvement to a certain degree after performing Manual Osteopathic Manipulation, Naprapathic maneuvers and soft tissue therapy. Depending of the age, grade, stage length of treatment, all categories have had improvement in pain level, and one case has had improvement in ROM. It has been mentioned that the neuro-structural approach is one of the best modalities to achieve desired results, and in this case it proved to be affirmative.

Section 17. References

[1] Huebert, H.T., Scoliosis. A brief History. Manit Med Rev 1967; 47:452-456
[1] Kumar K. Spinal deformity and axial traction. Spine 1996; 21:653-655

[1] Huebert HT. Scoliosis. A brief history. Manit Med Rev 1967 ; 47:452-456
[1] Rang M. The Story of Orthopaedics. Philadelphia: WB Saunders; 2000:8-9
[1] Moen KY, Nachemson AL. Treatment of scoliosis. AN historical perspective. Spine 1999; 24:2570-2575

[1] Rang M. The Story of Orthopaedics. Philadelphia: WB Saunders; 2000:8-9
[1] Rang M. The Story of Orthopaedics. Philadelphia: WB Saunders; 2000: 154
[1] Rang M. The Story of Orthopaedics. Philadelphia: WB Saunders; 2000: 334
[1] Howorth MB. Evolution of spinal fusion. Ann Surg 1943; 117:278-289
[1]Harrington PR. Treatment of scoliosis. Correction and internal fixation by spine instrumentation. J Bone Joint Surg Am 1962; 44A: 591-610
[1] Andrew Taylor Still, (1902). The Philosophy and Mechanical Principles of Osteopathy, p 21.
[1] Still Andres Taylor. Autobiography of Andrew T. Still With a History of the Discovery and Development of the Science of Osteopathy, Kirksville, MO: published by the author; 1897: 219
[1] Andrew Taylor Still, (1902). The Philosophy and Mechanical Principles of Osteopathy p.18; Discoverer of the Science of Osteopathy, Hudson-Kimberly Pub. CC, Kansas City, MO. Page 18, paragraph 2.

[1] Degenhardt, B. F., & Kuchera, M. L. (1996). Update on osteopathic medical concepts and the lymphatic system. Journal of the American Osteopathic Association, 96(2), 97.

[1] Andrew Taylor Still, (1902). The Philosophy and Mechanical Principles of Osteopathy; Discoverer of the Science of Osteopathy, Hudson-Kimberly Pub. CC, Kansas City, MO. Page 21, paragraph 3.
[1] Ed. Anthony G. Chila, [et.al.], Foundations of Osteopathic Medicine, American Osteopathic Association, third edition, 2011, page 4.
[1] Dr. Nuzzon, Patrick, D.N., Dr. LaVista, Kirsten,2022, D.N. Monee, IL , Naprapathy Manual Medicine for the 21st Century.
[1] Plumbo, Anthony, D.N., Naprapathy The Effective Healthcare Alternative, 1995, 2005, pg 37

[1] Palumbo, Anthony, D.N., Naprapathy, The Effective Healthcare Alternative, 1995, 2005, pg. 29
[1] Wang WW, Man GC, Wong JH, Ng TB, Lee KM, Ng BK, et al. Abnormal response of the proliferation and differentiation of growth plate chondrocytes to melatonin in adolscents idiopathic scoliosis. Int J Mol Sci 2014; 15(9): 17100-14
[1] Chu WC, Lam WW, Chan Y, Ng BK, Lam TP, Lee KM, et. Al. Relative shortening and functional tethering of spinal cord in adolescent idiopathic scoliosis. Study with multiplanar reformat magnetic resonance imaging and somatosensory evoked potential. Spine. 2006, 31 (1) : E19-25
[1] Abul-Kasim K, Overgaard A, Karlsson MK, Ohlin A Tonsillar ectopia in idiopathic scoliosis: does it play a role in the pathogenesis and prognosis or is it only an incidental finding? Scoliosis, 2009; 4:25

[1] Chu WC, Lam WM, Ng BK, Tze-Ping, Lee KM, Guo X, et. al. Relative shortening and functional thethering of spinal cord in adolescent scoliosis- Result of asynchronous neuro-osseous growth, summary of an electronic focus group debate of the IBSE. Scoliosis. 2008; 3:8.
[1] Staheli LT. Fundamentals of pediatric orthopedics. 3rd ed. Philadelphia: Lippincott Williams & Wilkins; 2003. Pp 91-106.
[1] DeStefano, Lisa A.D.O. , 2017, Greenman's Principle of Manual Medicine, Fifth Edition, Wolters Kluwer, 4:pp 41
[1] DeStefano, Lisa A.D.O., 2017, Greenman's Principle of Manual Medicine, Fifth Edition, Wolters Kluwer, 4: pp 42

[1] DeStefano, Lisa A.D.O., 2017, Greenman's Principle of Manual Medicine, Fifth Edition, Wolters Kluwer, 4: pp 42

[1] DeStefano, Lisa A.D.O., 2017, Greenman's Principle of Manual Medicine, Fifth Edition, Wolters Kluwer, 4: pp 45