The role of the breath in osteopathic treatment of musculoskeletal dysfunctions

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Submitted on December 19th, 2022

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Foreword

My personal journey of fascination for the human body began through the breath. Or rather, by observing how we had "forgotten how to breathe."

I remember my first therapeutic yoga client, who was seeking my support due to elevated stress and muscular tensions. In our first session, I noticed his difficulty breathing diaphragmatically, as if the breath was not accessible in the abdominal area and was confined to the upper chest.

I immediately wondered: if stress had likely initially caused the breath to engage and tense the accessory respiratory muscles and inhibit the diaphragm function, could this adaptative breathing pattern now be the source of my client's psychological and emotional discomforts? Is upper chest breathing creating the sympathetic response? And, rather than addressing the symptoms, could retraining the breath reverse the condition?

More yoga clients came, and with many of them, I witnessed how yogic breathing practices affected their mental states, improved their posture, and relieved pain.

The seed was planted and fueled my desire to uncover the human body and the root cause of pain, which led me here.

As I undertook this degree in manual osteopathy, I continued to explore and dive deeper into various breathing modalities, observing more and more correlations between breath patterns, emotional states, and physical dysfunctions.

In writing this thesis, I read through dozens of books, manuals, and papers on osteopathy and manual therapies. To my surprise, while earlier osteopathy texts emphasize the role that breath and respiration play in the patient's overall health and manual therapy techniques themselves, many of the more recent technique-focused manuals fail to mention breath assistance and the physiological influences of breathing.

This observation fueled my passion for writing this thesis and compiling ways osteopaths and manual therapists can create more effective and lasting changes for their patients by leveraging their breath.

1. Introduction: Breath as the source of life

In Yoga and Ayurveda, the term *Prana* refers to life force as well as the breath. In traditional Chinese medicine, Qi is also the common term representing both the breath and the energy that flows through the body to provide vitality to a living system. Even in Christianity, it is believed that man was created inanimate from dust, and God “breathed life into it,” giving it a living soul.

Respiration is a vital process; without it, life cannot exist. Eastern medicine systems recognize that the importance of the breath is central to a holistically healthy body and mind. The breath is not just the lungs and movements of the thoracic cavity but also what provides and circulates energy through the whole body and regulates the nervous system. Breathing is, after all, the only autonomic process that can be controlled consciously. As such, it is unsurprising that exercises such as yogic breathing (pranayama), Tai qi, Qigong, etc., take a prominent stage in Eastern cultures and health practices.

Eastern medicine modalities share with osteopathy the concept that health is a state of balance or homeostasis and that one must look at the cause of imbalance to address disease. The founder of osteopathy, Dr. Andrew Taylor Still, saw the body as a perfect machine and the osteopath’s role as the mechanics harmonizing all pieces and clogs and hunting for the cause of misfunction.

Interestingly, he relates in his autobiography how his understanding of health and disease came together when treating a woman suffering from what he identified as pneumonia while not having medicines to treat her. Wondering how he could approach the situation, his attention was drawn to the ribs, and his fingers identified a dislocation, which he proceeded to address. The results were instant, and the woman’s fever immediately began to drop, followed by normal respiration restored within the hour. This incident made Dr. Still realize that structural lesions can impede vitalizing processes and the circulation of vital forces, and osteopathy was founded with the objective of resolving abnormal structural alignment that produces disharmony in the body.

While Dr. Still’s focus was on the importance of arterial blood supply (i.e., oxygenation of tissue and waste removal), further development of osteopathy continued to highlight the importance of breath and respiratory function circulation overall and in restoring health.

But, if the abnormal structure can impede the normal circulatory and respiratory functions that sustain health, can the breath support structural alignment or misalignment?

As both a mechanical movement and an autonomic process, the breath offers the potential to impact multiple systems of the body. This thesis explores and compiles the importance of the breath in osteopathic techniques and how it can provide effective treatment.

2. Mechanics of the breath

Breathing involves a change in the shape and size of the thoracic cavity, which, by creating a larger volume and lower atmospheric pressure, draws air into the lung. As the volume increases, the pressure falls in an inversed relationship, creating a void filled by external air.

While breathing refers to the mechanical movement of the thorax to circulate air in and out of the lungs, respiration involves the gas exchanges in the lung to bring oxygen to the cells and remove waste products.

Breath regulation happens in the medulla oblongata, where the respiratory center is also situated. Receptors monitor levels of carbon dioxide and pH in such a way that a slight increase in these parameters will immediately result in increased respiration. Oxygen levels are measured in the arch of the aorta and carotid sinus and processed in the medulla oblongata. A drop of approximately one-third of the normal oxygen level is required to trigger increased respiration, while sensitivity to carbon dioxide and pH changes are very high, and respiratory rate and tidal volume changes are rapid under the influence of these parameters. Respiratory stimuli also include warm or cold temperature, activity, pain, blood pressure, epinephrine, and progesterone[1].

Inhalation always involves the respiratory muscles contracting to expand the thoracic cavity. Exhalation can be a passive process of muscles relaxing under the restorative force of the thorax or forced and involving additional accessory expiratory muscles to push air out.

The diaphragm, separating the thoracic and abdominal cavities, is the primary muscle of respiration. This dome-shaped muscle attaches to the costal cartilage and the anterior body of the upper lumbar vertebrae. Innervated by the phrenic nerve, it contracts caudally and flattens, pushing the abdominal organs caudally and anteriorly. The flattening of the diaphragm also causes an increase in the diameter of the lower thorax as the lower ribs are raised. The resulting breathing pattern, termed “abdominal breathing” or “quiet breathing,” therefore involves movement in the abdominal cavity and lower thoracic cage, while the upper thoracic cage remains relatively fixed.

In quiet breathing, the scalene muscles are involved during inhalation to fixate the first rib. In deep inhalation, the scalenes and several additional muscles get involved in assisting the expansion of the thorax, including the external intercostals, sternocleidomastoid, pectoralis minor and major, serratus anterior, serratus posterior superior, and the erector muscles of the spine. Forced exhalation also recruits additional muscles such as the abdominals, internal and innermost intercostals, parasternal muscles, and latissimus dorsi[2].

The movement of the breath happens in all three planes of motion and involves 146 articulations of the thoracic cage[3]. Adequate breath depends on the ability of the muscles to move these joints

[1] Hebgen, E. (2010). *Visceral Manipulation in Osteopathy*. Thieme. p. 185
[2] Hebgen, E. (2010). *Visceral Manipulation in Osteopathy*. Thieme. p. 183
[3] Kuchera, M., & Kuchera, W. (1994). *Osteopathic Considerations in Systemic Dysfunction.* PEC Publishing. p. 43

appropriately and in a coordinated way to increase the volume of the thoracic cavity to supply the demand, as well as the compliance of the lungs.

3. Osteopathic principles and the breath

Osteopathy is based on the following principles:

1. The human being is a dynamic unit of function
2. The body possesses self-regulatory mechanisms that are self-healing in nature
3. Structure and function are interrelated at all levels
4. Rational treatment is based on these principles[4]

Osteopathic care follows these principles and applies them in five models and their focus:

1. Biomechanical model: Focused on alleviating somatic dysfunction to restore efficient and effective posture and motion through the musculoskeletal system
2. Respiratory-circulatory model: Focused on removing an impediment to respiration and circulation to promote efficient and effective arterial supply, venous and lymphatic drainage to and from all cells
3. Neurological: Focused on restoring normal neurological processes and alleviating pain
4. Metabolic-energy: Focused on restoring efficient metabolic processes, alleviating inflammation, restoring healing, and repairing function
5. Behavioral: Focused on individualized patient care taking into account the person's physical, psychological, behavioral, and spiritual aspects.

3.1. A dynamic unit of function

The first principle of osteopathy establishes that to look at disease or dysfunction, one must look at the human being as a whole, body, mind, and spirit. The functional unit is one where parts are interrelated and interdependent; therefore, all factors must be considered in the treatment approach.

In the human body, no part functions independently, and the disease or dysfunction in one organ or organ system impacts the entire organism.

Environmental and psychosocial contexts also influence the physical body, including the breath. Mental, emotional, or physical stressors trigger a sympathetic response that increases the breath's respiratory rate and tidal volume. This can lead to hyperventilation, which leads to physical and physiological effects such as muscle tension, hypersensitivity, exhaustion, dizziness, etc. These symptoms create additional stressors, leading to a vicious cycle of dysfunction[5].

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[4] Chila, A. (2011). *Foundations of Osteopathic Medicine by American Osteopathic Association*. Lippincott Williams & Wilrins. p. 3

[5] Chaitow. L., Gilbert, C., & Bradley, D. (2014). *Recognizing and Treating Breathing Disorders. A Multidisciplinary Approach – 2nd Edition*. Churchill Livingstone. p. 3

The opposite may also happen, where a somatic lesion or disease restricts the breath, leading to physiological symptoms, which create more stress on the body and can mimic emotional or mental distress.

When looking at the patient's complaints, the breath offers clues to the mental, emotional, and physical context. These can be confirmed through detailed patient history, and whether the breath is the cause, consequence, or symptom of the dysfunction, it should be addressed in the treatment.

In Foundation of Osteopathic Medicine, the author notes:

> […] mentally or emotionally stressed patients with chronic pain often breathe more shallowly and rapidly. As pain and stress are relieved, often the patient will be seen and heard to sigh deeply and switch their respiration over to a slower, deeper, and more effective respiration. This, in turn, helps to maintain that pain reduction. [6]

The psychological and emotional influences on the breath, and the breath influence the autonomic system, support this first principle of osteopathy, highlighting the unity of mind, body, and spirit.

3.2. A self-healing body

The second principle of osteopathy highlights the body's natural intelligence and its self-regulating mechanisms to maintain homeostasis and health. The constant regulation and adaptation of the breath to supply adequate oxygen and rid the waste products of the body is one example of this self-regulation. Still, the role of the breath in maintaining health goes beyond blood chemistry.

Circulation is one of the focuses of osteopathy, for the cells must receive an adequate supply of oxygen and nutrients, and the fluid drainage must appropriately remove local metabolic waste products.

The lymphatic system plays a significant role in the body's immunity, and the circulation of lymph is directly influenced and supported by the breath.

In the respiratory-circulatory model, one of the goals is to reduce pain by removing edema and accumulated waste products in the affected area. While slow and deep breathing supports a parasympathetic response and a reduction of pain perception[7], abdominal breathing also promotes lymphatic circulation.

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[6] Chila, A. (2011). *Foundations of Osteopathic Medicine by American Osteopathic Association*. Lippincott Williams & Wilrins. p. 906

[7] Saoji, A.A., Raghavendra, B.R., & N.K.Manjunath. (2018). Effects of yogic breath regulation: A narrative review of scientific evidence. *Journal of Ayurveda and Integrative Medicine, volume 10, issue 1*, pp. 50-58. https://www.sciencedirect.com/science/article/pii/S0975947617303224

Diaphragmatic contraction and the decreased pressure in the thoracic cage increase the relative pressure in the abdomen, creating a "suction pump" and pulling lymphatic and venous fluid into the thorax[8]. 35% to 60% of the drainage through the thoracic duct is said to be accounted for by the pumping activity of the diaphragm.[9] The breath, therefore, supports immunity and reduction of edema.

Finally, adequate regulation of breath and respiration also impacts the ability of the body to deliver oxygen to the cells and tissues. A slight increase in oxygen in the tissues translates into a significant increase in the protection of these tissues against infection[10].

3.3. The interrelation of structure and function

Following the third principle of osteopathy, a structural issue implies consequences in the function because a tissue that is not structurally intact cannot perform its tasks optimally. Reversely, a physiological or metabolic dysfunction will induce structural changes in the tissues involved and likely generate compensation patterns.

Optimal breathing requires integrity in the chest and abdominal cavities, adequate posture, mobility of the 146 joints of the thorax, and healthy lung tissue (structure) to provide adequate respiratory function, which in turn impacts the entirety of the body. Reversely, adequate respiration with good circulation of blood, intact innervation, and lymphatic flow to prevent congestion is required for the movement of the breath to happen.

Following these osteopathic principles, the breath has an essential influence on the patient's overall health. It should therefore be considered in a rational treatment approach as described in the fourth principle.

4. Implications of the breath in somatic dysfunctions

Following the principles of osteopathy, the human body is a functional unit constantly adapting to maintain homeostasis. The respiratory and musculoskeletal systems cannot be viewed as independent parts acting separately, as their existence and function directly depend on one another. The relationship between breath and somatic dysfunction is bidirectional and multi-dimensional.

Normal breathing depends on the appropriate functioning of the respiratory muscles, a straight and mobile spine, and a flexible rib cage sitting over a leveled pelvis. A lesion on any of these structures could impact the breath.

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[8] Kuchera, M., & Kuchera, W. (1993). *Osteopathic Principles in Practice*. Greyden Press. p. 227

[9] Chila, A. (2011). *Foundations of Osteopathic Medicine by American Osteopathic Association*. Lippincott Williams & Wilrins. p. 792

[10] Kuchera, M., & Kuchera, W. (1994). *Osteopathic Considerations in Systemic Dysfunction.* PEC Publishing. pp. 33-34

Restriction in the lumbar spine can, for example, impact the crura of the diaphragm and its ability to contract.[11] Restrictions or lesions to the thoracic spine, ribs, and clavicle can affect the expansion of the thorax in deep breathing. A cervical flexion lesion increases the likelihood of mouth-breathing and hyperventilation.[12]

In the spine, the impact of musculoskeletal lesions goes beyond the mechanical movement of the breath. In his book Classical Osteopathy, John Wernham lists the immediate effects of bony lesions on animal and human test subjects. The reported symptoms of lesions applied to the cervical and upper thoracic areas all directly involved increased respiratory rate and irregular respiratory and cardiac rhythms through somatovisceral reflex[13].

The impact of somatic lesions on the breath is not limited to muscles and bones directly involved in breathing. Musculoskeletal lesions resulting in limited motion or asymmetry increase the individual's energy requirement and, therefore, the load on the respiratory system.[14]

The body structures respond and progressively adapt to the demands of lifestyle, activities, patterns, etc., which will determine the musculoskeletal system's functional or dysfunctional configuration. Dysfunctional breathing patterns have postural implications due to the involvement of accessory muscles and inhibition of key respiratory muscles.

In the example of upper chest breathing, the accessory muscles tend to be shortened, the diaphragm becomes less efficient, and the lower rib cage becomes restricted. Follows a visceral stasis and weakening of the pelvic floor and abdominal muscles, which gets compensated through tightness of the erector spinae. Reduced motility of the visceral organs could lead to adhesion and further discomfort and pain in the lumbar area.

The recruitment of the accessory muscles and resulting hypertonia elevates the first ribs and impact the mobility of the thoracic and cervical spine, often leading to a fixed lordosis in the lower cervical spine.[15]

The resulting upper-cross syndrome is also likely to impact the shoulder function and potentially involve other consequences such as thoracic outlet syndrome, headache, etc.

Adding to the postural consequences of upper chest breathing, the impact of respiratory alkalosis of this breathing pattern results in reduced oxygenation of the tissues, constriction of the smooth muscles, increased sympathetic activity, and, with it, hyperirritability of sensory nerves, and consequently increased pain perception, and development of fibroid tissues in the form of myofascial trigger points.[16]

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[11] Chila, A. (2011). *Foundations of Osteopathic Medicine by American Osteopathic Association*. Lippincott Williams & Wilrins. p. 934

[12] Nelson, K.E., & Glonek, T. (2006). *Somatic Dysfunction in Osteopathic Family Medicine*. Lippincott Williams & Wilkins. p. 223

[13] Wernham, J. (1996). *Classical osteopathy*. The John Wernham College of Classical Osteopathy. pp. 228-232

[14] Kuchera, M., & Kuchera, W. (1993). *Osteopathic Principles in Practice*. Greyden Press. p. 49

[15] Chaitow. L. (2006). *Muscle Energy Techniques – 3rd Edition*. Churchill Livingstone. pp. 61-62

[16] Chaitow. L. (2006). *Muscle Energy Techniques – 3rd Edition*. Churchill Livingstone. pp. 63-64

All these signs and symptoms can become a stressful burden for the patient, furthering the maladaptive breathing pattern due to constant perceived stress. Garland notes: "These changes run physically and physiologically against biologically sustainable patterns, and in a vicious circle, promote abnormal function, which alters the structure, which then disallows a return to normal function.[17]"

Musculoskeletal or breath dysfunctions are intertwined and can create a vicious cycle of adaptation that reinforces dysfunctional patterns. Reversely, osteopathic techniques that enable or promote a relaxed optimal breath to increase parasympathetic activity can be key to the patient's well-being.

5. The breath as an osteopathic diagnostic tool

The mechanical movement of respiration offers essential information to the therapist regarding somatic dysfunctions or restrictions.

During inhalation, the spinal curves flatten, starting at the sacrum and moving as a wave toward the cervical spine. This can best be observed in a prone position and can inform the therapist of areas of vertebral fixation. These will show as rigid areas moving as a block rather than a wave or as the initiation point of the movement rather than seeing the breath initiating at the sacrum[18].

Restrictions of the sacrum against the ilium can also be sensed in a prone position by cradling the bone and feeling the inspiratory and expiratory movements.[19]

In a supine position, quiet breathing should be observed to move the abdominal wall anteriorly down to the pubic bone, a sign of a well-domed diaphragm contracting functionally. The lower ribs will expand proportionally ventrally, laterally, and dorsally, and the sternum will minimally translate anteriorly. The intercostal space should increase during palpation, and the accessory breathing muscles should remain relaxed. The abdominal wall should remain soft through inhalation and exhalation.

In pathological or dysfunctional breathing, the therapist can observe the dominance of the upper thorax in the breath movement, with the accessory muscles active and pulling the thorax cranially. The sternum is displaced superiorly, and the spine moves into extension with exaggerated movement at the thoracolumbar junction. Minimal to no expansion is observed in the abdomen, and the abdominal wall might be sinking in during inhalation and contracted

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[17] Garland, W. (1994). *Somatic changes in hyperventilating subject*. Presentation at International Society for the Advancement of Respiratory Psychophysiology Congress, Paris.

[18] Chaitow. L., Gilbert, C., & Bradley, D. (2014). *Recognizing and Treating Breathing Disorders. A Multidisciplinary Approach – 2nd Edition*. Churchill Livingstone. p. 108

[19] DiGiovanna, E.L., Schiowitz, S., & Dowling, D. J. (2004). *An Osteopathic Approach to Diagnosis and Treatment - 3rd Edition*. Lippincott Williams & Wilrins. p. 338

during exhalation, indicating hyperactive abdominal muscles. Hyperactive abdominal muscles will also reflect in a reduced xyphocostal angle below the normal range of 90-75 degrees[20].

In postural assessment, dysfunctional breathing patterns may be reflected in the patient's thorax position over the pelvis. Synchronicity between the caudal movement of the diaphragm and pelvic floor and the expansion of the abdominal cavity require the axis of the lower thoracic aperture and pelvis to be parallel to the chest. An inspiratory position of the chest, when the thorax is positioned superiorly as if taking a deep breath, is often accompanied by anterior pelvic tilt, an abnormal posture termed "open scissors," and involves hyperlordosis of the lumbar spine. Another breath-related dysfunctional posture marked by an anterior shift of the thorax is linked to hyperkyphotic thoracic spine.

A raised clavicle angle can indicate spasticity of the accessory muscles of the breath and signal hyperventilation syndrome.

Observation of dysfunctional breathing patterns invites further osteopathic assessment, including[21]:

- Spinal curves and spinal segment mobility
- Rib fixation
- Myofascial trigger points or shortness of the accessory respiratory muscles
- Integrity of the position and contraction of the diaphragm
- Visceral adhesion
- Pelvic floor strength
- Assessment of the quadratus lumborum and iliopsoas
- Etc.

These will inform the manual osteopath on the appropriate treatment focus to reestablish structure and function.

6. Integrating the breath in manual osteopathy techniques

Osteopathic techniques address somatic dysfunctions and their resultant impairments in the vascular, lymphatic, and neural tissues. These techniques include, among others, joint mobilization and manipulation, muscle energy technique, soft tissue work, and positional release techniques.

Several studies have shown that osteopathic manipulation techniques improve the sympathetic nervous system function and therefore impact the respiratory rate, heart rate, and blood pressure[22].

[20] Chaitow. L., Gilbert, C., & Bradley, D. (2014). *Recognizing and Treating Breathing Disorders. A Multidisciplinary Approach – 2nd Edition*. Churchill Livingstone. p. 188

[21] Chaitow. L., Gilbert, C., & Bradley, D. (2014). *Recognizing and Treating Breathing Disorders. A Multidisciplinary Approach – 2nd Edition*. Churchill Livingstone. pp. 101-115

[22] Edmond, S. L. (2006). *Joint Mobilization/Manipulation. Extremity and Spinal Techniques.* Mosby. p. 12.

A relaxed breath, in turn, decreases somatic input and autonomic arousal and promotes muscle relaxation, which can support the efficacy of the treatment[23].

The breath can also offer indicators about the force applied in the techniques and the treatment approach. In the book *Somatic Dysfunction in Osteopathic Family Medicine*, the authors note:

> Increased heart or respiratory rate also indicates that the patient has reached the level of tolerance. If the patient feels that the intervention is too uncomfortable, the clinician should stop and choose another approach or return later and try again. It is often best to apply small doses of OMT daily or even several times daily[24].

The following sections detail specific applications of the breath in osteopathic techniques targeted at musculoskeletal dysfunctions.

6.1. Joint mobilization and manipulation

Joint mobilization is the application of a slow, small amplitude passive motion on a joint to produce gliding or traction of that joint. Joint manipulation is a sub-category of joint mobilization where a quick thrust is delivered on the joint.

Osteopathic joint mobilization and manipulation techniques aim at breaking the tissue resistance barrier to create greater motion, correct a positional fault in the joint, and reduce pain.

Generally, the application of the mobilization motion should be timed with the patient's exhalation to utilize the effect of the breath on the relaxation of the tissues[25].

However, applying the motion during inhalation may be more effective in some cases. In his book *Manual Osteopathic Technique*, Alan Stoddard mentions with regards to the treatment of the thoracic spine:

> In many patients, especially those who are heavily built or rigid, the thrust may be delivered as the patient exhales in order to enhance relaxation. In comparatively frail patients the thrust should be delivered as the patient breathes in, in order to increase stability.[26]

On top of the practitioner's assessment of whether stability or mobility is required in applying the technique, by palpating the segment treated, the practitioner can identify whether the tissue relaxation is more prominent on inhalation or exhalation. Discernment can then be used to establish which breathing phase will support the technique. The authors of *An Osteopathic Approach to Diagnosis and Treatment* note: "[…] if the therapist identifies that the segment is

[23] Schmidt, R., Willis, W. (2007). *Encyclopedia of Pain*. Springer. p. 598.
[24] Nelson, K.E., & Glonek, T. (2006). *Somatic Dysfunction in Osteopathic Family Medicine*. Lippincott Williams & Wilkins. p. 131.
[25] Edmond, S. L. (2006). *Joint Mobilization/Manipulation. Extremity and Spinal Techniques.* Mosby. p. 31.
[26] Stoddard, A. (1959). *Manual of Osteopathic Technique*. Unwin Hyman. p. 157

freer on inhalation, he or she can ask the patient to hold her breath for several seconds, allowing more freedom in the direction of ease.[27]"

Lewit goes further by connecting how the movement and resistance of the spinal curves and spinal segments during breathing can facilitate the mobilization of the spine:

> It is maximum inhalation that facilitates flexion in a kyphotic position and maximum exhalation that facilitates extension in a lordotic position, i.e., the thoracic extensor spinae contracts, and this to such an extent that deep inhalation is probably the most effective method of mobilizing the thoracic spine into flexion, and maximum exhalation most effective for extension. […] It can be regularly shown that during side-bending resistance increases in the cervical as well as in the thoracic spine in the even segments (occiput-atlas, C2, etc., and again in TI, T4, etc.) during inhalation; during exhalation we obtain a mobilizing effect in these segments. Conversely, resistance increases in the odd segments (C1, C3, T3, T5, etc.) during exhalation, while we obtain mobilization during inhalation.[28]

Understanding the impact of inhalation and exhalation of the segment treated can therefore make the technique more effective.

6.2. Muscle energy technique

Muscle energy technique (MET) is an osteopathic technique involving an isometric or eccentric isotonic muscle contraction, followed by a passive repositioning or stretch of the soft tissue being treated. This method aims at correcting musculoskeletal dysfunction by relaxing the muscles, increasing mobility and stretch tolerance, and reducing pain[29]. It uses the models of post-isometric relaxation (PIR) and reciprocal inhibition (IR) of the muscles to create a release and relaxation in shortened or spasmic muscles.

As opposed to joint mobilization, where the patient generally remains passive during the techniques, MET directly involves the patient's participation in creating the required contraction, then relaxing the area treated. This effort is however light, and the mechanical movement of the breath and its effect on muscles is sometimes sufficient to produce the desired results. Leon Chaitow notes, in his book *Muscle Energy Techniques*:

> Physicians and researchers such as Karel Lewit (1999) have demonstrated that extremely light isometric contractions, utilizing breathing and eye movements alone, are often sufficient to produce a degree of tissue relaxation that allows greater movement, as well as facilitating subsequent stretching.[30]

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[27] DiGiovanna, E.L., Schiowitz, S., & Dowling, D. J. (2004). *An Osteopathic Approach to Diagnosis and Treatment - 3rd Edition*. Lippincott Williams & Wilrins. p. 100.

[28] Lewit. K. (1999). Manipulative Therapy in Rehabilitation of the Locomotor System – Third Edition. Butterworth-Heinemann. p. 27.

[29] Chaitow. L. (2018) - Fascial Dysfunction - Manual Therapy Approaches. Handspring publishing. p. 240.

[30] Chaitow. L. (2006). *Muscle Energy Techniques – 3rd Edition*. Churchill Livingstone. p. 4

Breathing indeed plays a vital role in the MET procedure. Studies have shown that muscles, including non-respiratory muscles, receive inputs from the respiratory center and the mechanical movement of the breath. Myofascial tension changes following inhalation and exhalation, even in muscles not directly involved in the breath[31].

It is common practice to instruct the patient to inhale and hold the breath during the contraction and to release the breath as the stretch is applied[32]. Inhalation is by nature active and harnesses effort, while exhalation invites a general feeling of relaxation.

Karel Lewit however challenges this simplified view of the impact of the breath on myofascial in *Manipulative Therapy in Rehabilitation of the Locomotor System* (1999) and, just like for joint mobilization and manipulation, understanding the phase of the breath in which a particular movement is facilitated will make the MET technique more effective by enhancing the effects of PIR and IR.

This pairing of the breath phase with the contraction and relaxation of the segment treated is termed respiratory synkinesis. In some cases, such as a thoracic flexion or lumbar extension, the effort is best applied during inhalation and holding of the inhalation phases, and the stretch is applied on exhalation. In other cases, however, the opposite breathing instruction will offer the best results. These include, to name a few: thoracic extension, side-bending of the odd segments of the cervical and thoracic spine, and treatment of the temporomandibular joint or quadratus lumborum.

Leon Chaitow further recommends that full relaxed breath be taken after the contraction and before the repositioning or stretch is applied to help release all muscular effort[33].

6.3. Soft tissue therapy

Soft tissue therapy (STT) techniques encompass a large variety of techniques that target principally the muscles and fascia (including tendons and ligaments), as well as lymphatic and blood vessels. Soft tissue therapy aims to reduce pain, decrease or increase muscle tone, break fascia adhesion or remodel scar tissue, and facilitate circulation.

It’s been established in the previous sections that the breath has a neurologically and mechanically mediated influence on the tension found in muscles and fascia tissue, even those not directly involved in respiratory movements. It’s also been mentioned previously that inviting the patient to take slow abdominal breaths reduces autonomic arousal and promotes muscle relaxation. Since STT targets, in great part, the muscular system, encouraging a slow diaphragmatic breath renders the techniques more effective through easier tissue cooperation[34].

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[31] Chaitow. L. (2006). *Muscle Energy Techniques – 3rd Edition*. Churchill Livingstone. p. 86

[32] Chaitow. L. (2006). *Muscle Energy Techniques – 3rd Edition*. Churchill Livingstone. p. 139.

[33] Chaitow, L. (2003). *Maintaining body balance, flexibility and stability.* Churchill Livingstone. p. 9.

[34] Travell, J.G., Simons, D.G., & Simons, L.S. (1999). *Myofascial Pain and Dysfunction: The Trigger Point Manual Vol. 1.: Upper Half of Body – Second Edition*. Williams & Wilkinsp. 144.

Foundations of Osteopathic Medicine by American Osteopathic Association further lists four ways that breath assistance can be used to enhance myofascial release, soft tissue therapy technique, namely:

1. As fascial or articulatory activating force with complete breath cycles, i.e., as the therapist is holding a pressure of applying a direction of force;
2. As a way to enhance a position being treated with a particular phase of respiration;
3. By asking the patient to hold their breath for as long as air hunger can be tolerated to trigger a generalized relaxation of the tissues; and
4. By asking the patient to cough (forceful exhalation) or sniff (forceful inhalation) to produce an impulse to assist in releasing a restriction or resistance barrier[35].

A study published in Pain Medicine shows that holding the breath after a slow inhalation increases blood pressure, which produces antinociceptive effects[36]. This breathing method can be particularly beneficial for soft tissue techniques involving a higher level of discomfort for the patient, such as the treatment of trigger points.

6.4. Positional release techniques

In positional release techniques (PRT), the tissue treated is placed in a position of ease and held in this position with or without vibration, motion, or pressure applied by the therapist until a spontaneous change in the tissue (release) is observed.

Breath assistance can be used in PRT to both help guide the body to a position of ease and to facilitate an optimal release. The simple instruction of slow abdominal breathing can instigate a relaxation response in the tissue. Furthermore, once in the position of ease, the therapist can work with the patient to identify which phase of the breathing cycle further reduces pain and creates additional ease. The therapist can ask the patient to lengthen that phase of the breath for as long as comfortable[37].

George Goodheart, chiropractor, and originator of applied kinesiology, introduce a protocol in which the time required in the position of ease is vastly reduced before a release is attained. His method uses respiration assist, where inhalation is lengthened if the tender point is located on the anterior surface of the body, and the exhalation is lengthened for tender points on the posterior surface of the body. The breath is then held while the therapist stretches the tissue over the tender point for 30 seconds, as opposed to the 90 seconds typically required for PRT release to happen[38].

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[35] Chila, A. (2011). *Foundations of Osteopathic Medicine by American Osteopathic Association*. Lippincott Williams & Wilrins. p. 699

[36] Reyes del Paso, G.A., Muñoz Ladrón de Guevara, C., & Montoro, C.I. (2015) Breath-Holding During Exhalation as a Simple Manipulation to Reduce Pain Perception, *Pain Medicine*, *Volume 16, Issue 9,* Pages 1835–1841, https://doi.org/10.1111/pme.12764

[37] Chaitow. L. (2016). *Positional Release Techniques – 4th Edition*. Churchill Livingstone. p. 99

[38] Chaitow. L. (2016). *Positional Release Techniques – 4th Edition*. Churchill Livingstone. p. 13

Leveraging the breath in PRT can, therefore, improve the techniques' efficacy and achieve faster results.

7. Additional considerations

While the previous section highlighted the uses and benefits of breath assistance in osteopathic techniques targeting musculoskeletal dysfunctions, the treatment approach and techniques should always consider the patient's unique condition and physiology.

For example, while the relaxation effect of exhalation or slow diaphragmatic breathing is generally beneficial in softening the tissues, for an individual presenting hypermobility, it may be more helpful to create resistance and stability with inhalation[39].

Dysfunctional breathing patterns should also be observed, and the experience and tolerance of the patient should be carefully considered. Slow and deep breathing can quickly result in hyperventilation with symptoms such as dizziness, confusion, palpitations, cramping, visual disturbances, paraesthesia or numbness in the extremities, tremors, etc.[40] These undesirable symptoms are likely to induce stress on the patient, resulting in further tension in the body instead of the desired relaxation.

Constantly instructing the breathing can also become confusing or irritating to the patient, potentially causing stress. Therefore, the therapist should carefully select when breathing assistance supports the patient and use clear and simple instructions.

If the patient presents with dysfunctional breathing patterns such as paradoxical breathing, where the diaphragm does not contract during inhalation but rather during exhalation, instructing "deep breathing" is likely to reinforce this pattern and the recruitment of accessory muscles. In addition to addressing musculoskeletal dysfunction, therapeutic exercises and breath retraining are indicated to correct the patterns and promote normal breathing function.

Finally, it is worth recalling the numerous physical and physiological benefits of functional, slow, and deep breathing, such as posture stabilization, muscle relaxation, decreased pain, better blood and lymphatic circulation, decreased autonomic arousal, faster healing, and better immunity, to name only a few.

For these reasons, whether the breathing pattern is the cause or the consequence of a musculoskeletal disorder, or even if the patient does not present with a breathing pattern dysfunction, prescribing breathing exercises is conducive to an effective and complete treatment following the principles of osteopathy.

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[39] Hartman, L. (1996). *Handbook of Osteopathic Technique - 3rd Edition.* Nelson Thornes. p. 46.

[40] Chaitow. L., Gilbert, C., & Bradley, D. (2014). *Recognizing and Treating Breathing Disorders. A Multidisciplinary Approach – 2nd Edition*. Churchill Livingstone. p. 53.

8. Conclusion

This thesis aimed to demonstrate the importance of considering the breath in the osteopathic treatment of musculoskeletal dysfunction. It has been shown that somatic lesions impact the breath and that dysfunctional breathing patterns can create somatic dysfunction and postural changes. These can result in a vicious cycle of dysfunctional pattern reinforcement, and therefore both the breath and the musculoskeletal lesions should be addressed in a treatment plan.

Osteopaths will benefit from using breath assistance in their manual techniques targeted at musculoskeletal dysfunctions, making these techniques more effective and promoting better tissue compliance. In turn, these techniques have the potential to improve the mechanics of the breath and respiration, which supports the wellness of the patient.

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