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Strain-Counterstrain: Rationale, Methodology, and Utilization within the Practice of Physical Therapy

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Strain-Counterstrain: Rationale, Methodology, and Utilization within the Practice of Physical Therapy

by

Jacquelyn Ann Knodle
Bachelor of Science in Physical Therapy
University of North Dakota, 1999

An Independent Study
Submitted to the Graduate Faculty of the
Department of Physical Therapy
School of Medicine
University of North Dakota
in partial fulfillment of the requirements
for the degree of
Master of Physical Therapy

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2000
This Independent Study, submitted by Jacquelyn A. Knodle in partial fulfillment of the requirements for the Degree of Master of Physical Therapy from the University of North Dakota, has been read by the Faculty Preceptor, Advisor, and Chairperson of Physical Therapy under whom the work has been done and is hereby approved.

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Department Physical Therapy

Degree Master of Physical Therapy

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ABSTRACT

The purpose of this literature review is to take a closer look at the technique of strain-counterstrain in order to provide the reader with information regarding the history, scientific rationale, methodology, and utilization of this technique within the realm of physical therapy. Strain-counterstrain was developed and refined by Lawrence Jones. Jones' technique is largely based on Irvin Korr's model, which sites the muscle spindle as the primary cause of somatic dysfunctions. The principles of strain-counterstrain as set forth by Jones have been well established throughout literature. However, several variations of the technique do exist. Within literature strain-counterstrain has been noted as having a rather wide scope of practice, being utilized within a wide variety of patient populations and diagnoses. Although limited, literature has also presented scientific research that has pointed to this technique as being an effective means of treatment. This research along with its strong rationale and wide scope of practice point to strain-counterstrain being a beneficial technique.
CHAPTER I

THE DISCOVERY OF A NEW TECHNIQUE: STRAIN-COUNTERSTRAIN

The musculoskeletal system is the most massive system of the body, yet in the performance of its infinite repertoire of motions and postures, it is the most delicately controlled and coordinated.

Irvin Korr

This “massive” musculoskeletal system described with such eloquent words by physiologist Irvin Korr can be considered as playing a dual role in its relationship with the central nervous system. It serves as its largest beneficiary of efferent output and as the origin of the most diverse yet continual stream of sensory information into the central nervous system. As this sensory input is processed by our nervous system, it is used to control the behavior of our movement patterns and muscular activity. This is not its only function, however, as this sensory information is also utilized by our autonomic nervous system to direct the internal activities of our organs and circulatory system along with the body’s metabolic responses in order to deal with the demands placed upon them by the musculoskeletal system.

From this relationship the assumption has been drawn that if a disruption in the normal input of sensory information from the musculoskeletal system occurs, it could result in the disruption of various bodily processes besides the
logical disruption of motor activity that would occur.¹ If these assumptions are true, then a manual therapy technique that addresses the physiological formation of these disturbances may be found beneficial. One such manual therapy technique that will be explored here is strain-counterstrain.

Lawrence Jones,² a doctor of osteopathy, developed strain-counterstrain thanks do in part to his frustration in treating patients with somatic dysfunctions. Korr³ described a somatic dysfunction, also known as an osteopathic lesion, in 1947 as “a facilitated segment of the spinal cord maintained in that state by impulses of endogenous origin entering the corresponding dorsal root. All structures receiving efferent nerve fibers from that segment are therefore potentially exposed to excessive excitation or inhibition.”

The “endogenous” origins alluded to are suspected to be muscle spindles,⁴ which are defined as “sensory organs that are stimulated by lengthening or stretching the muscle.”⁵ They are suspected for three primary reasons.⁴ First, muscle spindles are found to exhibit sensitivity to stress placed on the musculoskeletal system. Second, they do not exhibit the ability to adapt; thus they supply a continuous flow of input into the central nervous system. Lastly, they have distinct influences on the muscles around the joint or segmental spinal level involved in the somatic dysfunction.

In the 1930’s, however, when Jones² was schooled at the College of Osteopathic Physicians and Surgeons different beliefs existed about somatic dysfunctions. There was a belief that joint stiffness and discomfort was the result
of a joint subluxation not an abnormal proprioceptive reflex involving the muscle spindle. The predominate treatment of such pain was manipulative thrusts. Some success was achieved with many patients using such techniques, but there were also those patients in which these techniques could not bring about relief of their pain. It was in treating one such patient, a healthy 39-year-old male with back pain that Jones\textsuperscript{2,6} stumbled upon a discovery that would lead him to develop the technique of strain-counterstrain and continue to refine it over the next few decades.

Jones\textsuperscript{2,6} patient had been suffering from low back pain for 4 months and had not been responding well to any treatment that had been offered to him. One of the most exhausting problems that the patient complained of was an inability to sleep because of his discomfort. Believing he would respond to Jones' treatment if he could sleep better, Jones devoted a treatment session to trying to find a comfortable position for the patient. After contorting the patient's body for some time, Jones finally found a position in which the patient was almost completely pain free. Jones propped the patient into position and left to attend to another patient. Upon returning to the man after 20 minutes, the patient arose from his position, and his pain did not return. By simply finding a position of comfort, this man's intense pain had been relieved and Jones' lifelong journey to discover and share his new findings had begun.

Jones\textsuperscript{2} strongly believed in and largely based his technique of strain-counterstrain on Irvin Korr's\textsuperscript{1} neurological model in which he sited the muscle spindle as the primary source of joint dysfunction. Korr\textsuperscript{1} stressed the importance
of realizing that while muscles are usually thought of as producing motion they can also oppose it. Abnormal proprioceptive reflexes created in the strain of a joint and the resultant protective reaction of the body can create such opposition to movement along with abnormal pain, and perpetuate a somatic dysfunction. It is the goal of strain-counterstrain to address these abnormal reflexes.\textsuperscript{2,7} This goal is well described in Jones\textsuperscript{2} definition of strain-counterstrain:

Relief of false messages of continuing strain arising in dysfunctioning proprioceptor reflexes, by applying a strain in the direction opposite that of the false messages of strain. This is accomplished by shortening the muscle containing the false strain message so much that it stops reporting strain. The body in normal positions can suffer this pain for years yet have it stopped in ninety seconds of the opposite strain.

Jones\textsuperscript{2} provided many case studies similar to his initial encounter with strain-counterstrain that support its benefits and use as a manual therapy technique. Scientific research into the area of somatic dysfunction and the use of strain-counterstrain as a treatment, however, is sparse.\textsuperscript{7} It is also considered by some sources as still being within the realm of alternative therapy.\textsuperscript{8}

Thus continued research into this technique is important in order to prove the efficacy of strain-counterstrain as a treatment. This is especially true in light of the changing environment of health-care that calls for us to provide justification for the treatments we provide to our patients. As therapists we must explore the rationale that lies behind strain-counterstrain and identify the appropriateness of its use within different patient populations. The purpose of this review is to
explore the history, rationale, methodology, and utilization of strain-counterstrain as it has been laid forth in literature in order to help clinicians make a more informed decision about the appropriateness of this technique within the scope of their practice.
CHAPTER II

NEURAL COMPONENTS OF THE SOMATIC DYSFUNCTION

In order to form a foundation for developing ones knowledge of strain-counterstrain as a treatment technique, it is important to understand the abnormal proprioceptive reflexes believed to be responsible for somatic dysfunctions. Basic to this knowledge is a background in the structure of muscles and the function of muscle spindles.

Within muscles are two types of fibers, extrafusal muscle fibers and intrafusal muscle fibers. The extrafusal muscle fibers can be considered the main contractile tissues of the muscle. Alpha motor neurons serve as the source of innervation for these extrafusal fibers. They are the lower motor neurons that serve as the highway from the central nervous system to the extrafusal fibers.

Intrafusal fibers are of two different types, nuclear bag and nuclear chain fibers. Nuclear bag fibers have centrally located nuclei, while nuclear chain fibers have their nuclei arranged in a single row. The intrafusal fibers also have contractile portions at each end. The muscle spindles are associated with the intrafusal fibers (Figure 1). They consist of a connective tissue cover that surrounds the intrafusal fibers. They function as specialized sensory receptors and they can be found throughout the muscle's extrafusal
Figure 1. Muscle spindle. Adapted from Jones LH, Kusunose R, Goering E. *Jones Strain-CounterStrain*. Boise, Idaho: Jones Strain-CounterStrain, Inc; 1995:13.
fibers. They run parallel to the muscle tissue and are attached to the extrafusal fibers at their ends.

Muscle spindles have two sensory (afferent) components, primary and secondary afferent nerve endings. Primary or annulospiral endings innervate both types of fibers by wrapping around their central region. Secondary or flower spray endings innervate nuclear chain fibers primarily and are located on each side of the annulospiral endings near the muscle spindle's polar ends.

When a muscle is stretched the muscle spindle is also stretched, and this increases its afferent discharge to the central nervous system accordingly. Both annulospiral and flower spray endings send out afferent discharge in a frequency that is directly proportional to the changes occurring in the muscle's length. These fibers look at the length of the extrafusal fibers in comparison to the intrafusal fiber, not the absolute length of the extrafusal fibers alone. Annulospiral endings have an additional sensitivity to the rate of change of muscle length and also fire proportionately to this. These ending synapse with the anterior horn cell of the alpha motor system and their afferent output results in the facilitation of the agonist muscle and reflex inhibition of its antagonist.

The intrafusal fibers are also innervated by the gamma motor system at their polar ends. Gamma impulses received by intrafusal fibers cause their polar ends to contract, stretching the central region and stimulating the firing of the intrafusal afferent nerve endings. The body uses this gamma stimulation from the gamma motor system to reset the muscle spindle's length, the spindle discharge, and its sensitivity to stretch. The higher the gamma stimulation, the
greater the muscle spindles sensitivity. This means when a muscle with an increased muscle spindle sensitivity is stretched the strength of the reflexive contraction produced by the muscle will be greater.

Under typical relaxed conditions gamma output to the muscle spindle is at levels that maintain normal muscle tone and sustain it in a state where it is prepared to act if called upon. When a muscle spindle is shortened to an extreme degree either through passive approximation or active contraction, its discharge greatly decreases and it may even stop reporting altogether. Thus, the central nervous system is deprived of the information it needs to keep the muscle in a state of readiness. To counteract this, the central nervous system increases its gamma output to the spindle causing contraction of the intrafusal fibers. This causes the intrafusal fibers to take up their slack, resetting the muscle spindle length as described earlier and causing the muscle spindle output to increase again.

Korr felt that this resetting of the muscle spindle length through gamma output control was part of a phenomenon he referred to as "autonomic gain control". He also proposed that this resetting of the spindle is involved in the formation process of a somatic dysfunction. He hypothesized that when a muscle is suddenly shortened the sudden decrease in length silences the spindles and the central nervous system is deprived of information about its current length and condition. When the muscle that was slackened is then called upon to contract the central nervous system greatly increases its gamma discharge to the intrafusal portion until it begins to receive information from the
muscle spindle again. Due to the increased gamma output, the muscle spindle keeps firing and reflexively resisting the return of the muscle to normal resting length and thus a somatic dysfunction is created.

Korr along with Denslow and Krems\textsuperscript{10} supported the belief that the origin of the somatic dysfunction lies primarily in the muscle spindle through experimentation with motor reflex thresholds in dysfunctions of the spine. Although visceral involvement and higher centers of the nervous system were considered as possible origins of facilitation, they were ruled out due in part to the fact that the participants in their study demonstrated no symptoms that would be related to involvement of these structures. This along with other characteristics such as the tendency of the involvement to be confined to 1 or 2 levels and the discrepancy found between sides at the same level of the spine when determining thresholds, led them to believe that what they were dealing with was of a more segmental nature. This would point to involvement of their last suspected source, the proprioceptors. A proprioceptor is defined as "a receptor that responds to stimuli originating within the body itself, especially one that responds to pressure, position, or stretch."\textsuperscript{11} Muscle spindles are classified as proprioceptors.

Jones\textsuperscript{2} along with his colleagues\textsuperscript{7} supported Korr's\textsuperscript{1} hypothesis. They used a simple universal joint model to demonstrate these principles and describe the formation of a somatic dysfunction.\textsuperscript{2,7} This model is demonstrated in Figure 2 using springs to represent the muscles involved and arrows to represent the amount of proprioceptive activity each muscle spindle is reporting.
In the first model, muscle A and muscle B are balanced and show equal muscle spindle output with the joint in a neutral position.\textsuperscript{2,7} However, if the joint is strained, muscle A becomes excessively stretched and muscle B is approximated maximally. This causes the muscle spindle output of muscle A to greatly increase while that of muscle B is practically silenced. Whether a somatic dysfunction is created depends upon the body's next response. If the body slowly returns the joint to its normal position, normal function resumes. However, if it reflexively responds to the strain with an abrupt and forceful contraction of muscle A, muscle B and its spindles are suddenly stretched. This rapid rate of change in length increases the annulospiral output and results in a reflex muscle spasm in muscle B.\textsuperscript{7} With muscle B in a spasm and its ends approximated again, the muscle spindle output should theoretically be reduced to excessively low levels. Under Korr's\textsuperscript{1} theory, however, this would cause a significant increase in gamma output as the central nervous system responds to the lack of feedback, which in turn would increase the afferent output of the muscle spindle. The higher the gamma output the more sensitive the muscle spindle becomes to stretch and the greater the excitatory influence of the spindle on the muscle contraction. As a result it detects a strain in the muscle long before one would actually occur.\textsuperscript{2} The muscle would then continue to reflexively contract against movement towards the original neutral position of the joint.\textsuperscript{1} The end result is that the body's response to the initial injury, not the injury itself, has created a somatic dysfunction.\textsuperscript{7}
Figure 2. Proprioceptive activity in the formation of a somatic dysfunction. Adapted from Jones LH, Kusunose R, Goering E. *Jones Strain-CounterStrain*. Boise, Idaho: Jones Strain-CounterStrain, Inc; 1995:18.
Strain-counterstrain addresses these abnormal proprioceptive reflexes by passively taking the muscle into a position of comfort in which the muscle is maximally approximated. According to Korr such manipulative treatments work because they allow the spindle and thus the intrafusal fibers to slacken. As the muscle is shortened and its relative length becomes more proportionate to that of the intrafusal fibers, the central nervous system slowly lowers its gamma output to the muscle spindle. When gamma output is lowered, the afferent output from the intrafusal fibers is also lowered and the end result is that the reflexive contraction opposing the muscle is decreased. This allows the muscle to slowly return to its original resting position. Jones has sighted 90 seconds, as being the approximate time that is needed for this to occur.

This model is not, however, the only theory that exists in this arena. Other theories such as Bailey and Dick's nociceptive model provide additional possible rationales for the existence of somatic dysfunctions and how strain-counterstrain produces beneficial effects. Bailey and Dick recognize the role that proprioceptive reflexes play in somatic dysfunctions, however, they feel that they do not have an exclusive role. They feel that nociceptive stimuli also play a part in the creation of a somatic dysfunction. Reflexes that are induced by nociceptive stimuli have an enormous ability to overcome the volitional control of our muscles. This is seen with the phenomenon of flexor withdrawal.

They hypothesize that when a muscle is strained abruptly, it is injured to a degree that will elicit pain. In response to this pain we reflexively withdraw away from the direction of the initial strain as part of a protective response.
Under this model, relief will be felt when moving away from the position of the initial strain and palpation will produce pain in the muscle that was initially strained. This is contrary to the phenomenon described by the proprioceptive model. Jones described his tender points as being in the muscle opposite to the one that had undergone the initial strain and relief was found by returning the muscle to the initial position in which the supposed strain occurred.

Bailey and Dick feel that it is possible that both models exist, but that they take predominance during different stages of the injury, the nociceptive reflex being more common to the acute period immediately following the injury and the proprioceptive reflex prevailing in more longstanding cases. They use the model of a whiplash injury to describe the co-existence where both posterior and anterior tissues are involved and both the proprioceptors and nociceptors are activated by the trauma thus resulting in a multitude of restricted and painful motions.

While this model may indeed play some role in a somatic dysfunction, the question that exists and that Bailey and Dick address is how does strain-counterstrain bring about the resolution of these dysfunctions in light of the nociceptive model? The answer they provided returns to the proprioceptive model. They feel that strain-counterstrain may be beneficial in that it provides a more optimal healing environment for the injured structures by relieving the restrictive elements produced by the abnormal proprioceptive reflexes. Although this represents just one additional theory, it is interesting to note that it still contains a link to the proprioceptive model.
CHAPTER III
THE ROLE OF TENDER POINTS IN STRAIN-COUNTERSTRAIN

Now that the formation of somatic dysfunctions has been discussed, we will address the diagnosis of their presence and the particular role tender points play in this diagnosis. A commonly used mnemonic in the diagnosis of a somatic dysfunction is “A-R-T”. The “A” stands for asymmetry within the musculoskeletal system. An example of this may be a patient who presents with uneven iliac crests upon palpation of the pelvic region. “R” the next letter in the mnemonic, stands for range of motion. An abnormality in the range of motion of any one joint or several may indicate a somatic dysfunction when found in accordance with the other criteria. The most common abnormality in range of motion is a decreased range. Lastly, “T” is changes in tissue texture that are palpable upon examination. This last finding is of great significance in this discussion.

Jones noted that the most important skill for the practitioner to develop was the ability to feel the changes in tissue texture and tension that are located at the sight of what he identified as tender points. These tender points have been sighted as being a means of recognizing and diagnosing the presence of somatic dysfunctions. Jones’ belief was that each of these tender points are
specific for one joint dysfunction or irritation source along with the position of comfort used to bring about relief of the irritation. Thus tender points have become not only valuable diagnostic tools but also may be used to monitor the effect of the treatment administered.

Tender points are often described as being "tender, tense, and edematous" areas of tissue.\textsuperscript{7,16-18} Their size has been described as ranging from smaller or near the size of a fingertip\textsuperscript{2,18} to around the size of a pea.\textsuperscript{19} They have been described more specifically as being 1 centimeter or less in diameter with the area of greatest sensitivity measuring about 3 millimeters.\textsuperscript{17} They are typically found near the bony attachments of tendons, ligaments, or in the muscle belly.\textsuperscript{18,20} If the examining practitioner is unable to find the tender point in one of the above-described areas, however, it may be found in the dermatome of the spinal nerve associated with that level.\textsuperscript{18} Muscles that are subject to daily stress such as those whose primary function is postural support are most often sighted as the location of tender points.\textsuperscript{21}

Tender points are distinguished as being at least 4 times as tender as unaffected tissues.\textsuperscript{2} This is far less pressure than would be needed to cause a painful response in normal healthy tissues.\textsuperscript{2,7,18,22} D'Ambrogio and Roth\textsuperscript{17} go further into the explanation of tender point sensitivity by classifying them based on their level of tenderness.

Under D'Ambrogio and Roth's\textsuperscript{17} classification, if upon palpation a visual jump sign is elicited, the tender point is described as extremely sensitive. They
describe this jump sign as being characterized by the presence of a quick lurching motion, an attempt to grasp the therapist's hand to remove the pressure, obvious facial expressions of discomfort, or the patient crying out. Kraft, Johnson, and LaBan\textsuperscript{23} also described the jump sign in a similar manner in their work with Fibrositis. They characterized the jump sign as the patient's exaggerated response to palpation, which was exhibited by the patient pulling away from or wincing at pressure that was applied to the involved tender tissues. Jones\textsuperscript{24} also commented that if a patient is in a state that necessitates the need to seek out the help of a medical professional, the tender tissue or point is sensitive enough to cause the patient to wince from the pressure applied to it.

D'Ambrogio and Roth\textsuperscript{17} further their description of tender point sensitivity by describing the next level as being a situation where the patient verbally responds that the point is very tender but there is no presence of the above described jump sign. Under these circumstances, the tender point is considered a very sensitive tender point. If the patient relates to the therapist that there is some tenderness upon palpation but to a lesser degree and there is again no jump sign, it is a tender point of moderate sensitivity. This distinction between severity of tender points will become important in the planning of ones treatment program.

Kusunose\textsuperscript{7} a former colleague of Jones reports that there are approximately 200 tender points that Jones had identified and matched with varying somatic dysfunctions. Originally, tender points were known to exist only on the posterior surface of the body until Jones\textsuperscript{2} discovered the presence of
anterior tender points thanks to a rather fortunate accident. Kusunose,\textsuperscript{7} relates that the discovery of these anterior tender points was very important as Jones felt that they represented 50 percent of the dysfunctions that produce posterior pain in patients. New tender points continue to be found as several have been identified within recent years in the sacral area that differed from those previously described by Jones.\textsuperscript{25,26}

There is a significant overlap between the location of Jones' points and those identified in Travell's trigger points, acupuncture points, Chapman reflex points, and Shiatsu points.\textsuperscript{7} However, clinicians of strain-counterstrain identify two major distinctions between strain-counterstrain points and these related points. In comparison, other theories are more encompassing, relating their tender points to the body as a whole.\textsuperscript{27} Strain-counterstrain tender points are more segmental in nature usually relating to the specific level at which the dysfunction is present.\textsuperscript{7} Secondly, Jones believed these points are only outward signs of an underlying dysfunction that is of a neuromuscular or musculoskeletal origin. Because they are only outward signs of the underlying dysfunction, treatment is not directed at them but at the dysfunction. They are used only in respect to diagnosis and monitoring of the effectiveness of treatment. This differs from other theories, which aim their treatment directly at the tender point through such things as trigger point injections.\textsuperscript{7,18,19,27}

The use of tender points as a diagnostic tool is highly subjective and thus its efficacy and reliability, as with all diagnostic tools, is questionable. A study
done by Denslow, Korr, and Krems\textsuperscript{10} showed a correlation between tissue texture, lower motor reflex thresholds, residual soreness in the tissues tested, and pain at the level being palpated. When the areas being tested were measured with a pressure meter, it took less pressure to elicit a muscular response on electromyography in areas where changes in tissue texture were palpable. These areas were described by the authors as exhibiting tissue changes they classified as "doughy" or "boggy". Participants in the study also reported that they experienced pain in the area that was repeatedly tested for up to 24 hours, but this occurred only in areas that exhibited a lower motor reflex threshold. Lastly, pain with palpation of the spinous process that lasted even after the pressure had been removed occurred more commonly in areas in which lower motor reflex thresholds had been found in comparison to areas of higher motor reflex thresholds.

Denslow\textsuperscript{10} was able to utilize these characteristic tissue texture changes to make a fairly accurate diagnosis of the levels that would exhibit lower motor reflex thresholds on electromyography. He was able to accurately predict the threshold levels of 35 out of 40 vertebral segments based on his palpatory skills and reported his diagnosis of the remaining threshold levels fell within very close levels of what he had predicted.

A more recent study looked at the intertester reliability of therapists' judgment of the trigger point presence in patients presenting with low back pain.\textsuperscript{28} This study looked at the Travell and Simons' method of trigger point detection. Fifty patients with low back pain were examined separately by two
therapists within minutes of each other. They were examined for the presence of trigger points in the area of the iliocostalis lumborum and longissimus thoracis muscles. Kappa statistics, which correct for chance agreement showed a low reliability between testers, which created some question to the usefulness of this procedure.

Although this study looked at Travell and Simons' method in particular, it may indicate that such palpatory skills in general should be questioned for their reliability. A study of the reliability of judgment of the presence of tender points in strain-counterstrain may be beneficial.
CHAPTER IV
TREATMENT PRINCIPLES

In literature five basic treatment steps have been outlined in strain-counterstrain.\textsuperscript{16,18} These basic steps consist of the following:

1. Identification of significant tender points.
2. Positioning of the patient into a position of comfort utilizing gross movements and "fine tuning".
3. Maintenance of the established position of comfort for 90 seconds.
4. Slowly and passively returning the patient to a neutral position.
5. Re-examining the patient for the presence of the tender point.

Perfecting one's skill in these techniques is very important as lack of proficiency in performing the treatment is sited as the one of the major causes of inadequate results.\textsuperscript{2}

Identification of Tender points

The first step is of utmost importance. Identification of tender points is one of the major means by which areas of dysfunction are verified, along with a major means by which treatment is sequenced and monitored.\textsuperscript{2} The location of tender points can be determined in several ways.\textsuperscript{18} A standard structural examination may be used along with palpation to determine the presence of tender points. Another method entails first examining the patient for postural variations and
asymmetries and then palpating these areas for tender points. Still yet another method is using the patient’s history, such as position of injury, to determine sites that are likely to demonstrate the presence of tender points. Which method is utilized will largely be dependent upon the therapists preference and the way each patient presents.

When palpating for the tender point it is recommended that one use the pad of their finger or thumb rather than the fingertip. This is due to the fact that the finger pads have been found to be significantly more sensitive to tactile stimulation than are the fingertips. Also iatrogenic tenderness may be produced when using the fingertips, especially if the therapist has fingernails that are slightly longer that may dig into the patients skin. This may not give a fair representation of the true tenderness of the tissue in the area being palpated.

Once the tender points have been identified it is important to follow the general rules of treatment sequencing, which are based upon how the tender points present. The first of these rules is to treat the most severe tender point first. Often treatment of the most painful tender points will result surprisingly in dissipation of pain at less sensitive tender points. Next, the therapist should treat proximal tender points before distal. It is important to also treat areas in which a large number of tender points have been identified before smaller areas. Lastly, if there are numerous tender points found in a row, start your treatment with the middle tender point. By closely following these principles the therapist will greatly strengthen the effectiveness of their treatment and the benefits to their patients.
Obtaining the Position of Comfort

Now that the therapist has identified the tender point with which treatment will begin, they must move to the next identified step in our treatment sequence, which is obtaining the position of comfort. Jones through years of practice identified numerous positions that are specific for certain tender points and their associated dysfunctions. These are outlined in his text Jones' Strain-CounterStrain. It is beyond the scope of this review to discuss the specifics of each position. However, several key points will be addressed in relation to obtaining the position of comfort properly.

Jones developed four basic principles for positioning that are important to consider when developing a treatment. The first principle states that anterior tender points will typically be treated in flexion. Likewise with the second principle, posterior tender points are thus treated in extension. The third principle addresses tender points located at the midline. These anterior and posterior points will be treated with more pure flexion and extension respectively. Lastly, the farther a tender point is located laterally the more sidebending and rotation that will be added to the treatment position.

One of the most important points to remember is that the technique of strain-counterstrain is a passive technique, and the therapist must instruct the patient to relax and allow themselves to be taken passively into the position of comfort. The patient is always taken in the direction of greatest ease of motion away from the direction of resistance. Frequently this position can be determined by a careful history to determine the position the patient was in at the
time of injury, as this will be the same as the position of treatment. Each position of comfort is unique and specific to one primary position of treatment. The therapist will first use slow gentle gross movements toward the position of comfort. During the movement of the patient into the position of comfort and throughout the treatment, the therapist keeps light contact with the tender point. This allows him to monitor for changes in tissue texture and palpate the point periodically to check its tenderness. As the patient nears the position of comfort fine-tuning is needed to reach what Jones refers to as the "mobile point". This mobile point is the point at which the greatest amount of relaxation occurs.

The change felt in tissue texture during treatment is not linear. At first changes in tension occur very slowly. However as the position is fine-tuned a rapid relaxation occurs with a change in position of 2 to 3 degrees that results in almost complete resolution of the tension previously felt. At least 30 percent of the relaxation that occurs is obtained within these 2 to 3 degrees.

Optimally, a reduction in tenderness and tension of 100 percent is desired, however a reduction of 70 percent is acceptable and still renders the treatment effective. In order to deduce this reduction in tenderness effectively it is important for the therapist to develop a means of communication with the patient. This can be done using several different methods. Some commonly noted ways are using a subjective 1 to 10 pain scale or a monetary comparison. When using the monetary comparison variation the patient is asked to relate to the therapist how much pain they have left if they started out with a dollars worth
of pain. The type of scale used is not important as long as it provides an accurate and effective means for the therapist and patient to communicate.\textsuperscript{18}

Maintaining the Position of Comfort

When Jones\textsuperscript{2,6} first began to develop the technique of strain-counterstrain he initially supported the patient in the position of comfort for 20 minutes, but over time he was able to successfully reduce the treatment time to 90 seconds. Jones found that this was the optimal treatment time.\textsuperscript{2,6,7} If the treatment time was less than 90 seconds, his results and success greatly varied.\textsuperscript{6,7} Treatment times of greater that 90 seconds did not seem to benefit the patient to any greater degree.\textsuperscript{7} The mechanism for why 90 seconds appears to be the optimal time is unclear, however, research has indicated that 90 seconds is required for learning to occur at the level of the spinal cord.\textsuperscript{18}

There is some dispute over the treatment time among variations of strain-counterstrain techniques. D'Ambrogio\textsuperscript{17} and Weiselfish have adapted their own technique and advocated longer holds of the treatment position. They have proposed that there are two phases of release, a release of the muscle tissue itself which takes 90 seconds and a second fascial release which may take up to 20 minutes. Weiselfish\textsuperscript{30} has also advocated a longer hold of 3 minutes be used with neurological patients.

While in the position of comfort the tissues may be palpated for what is referred to as the release phenomenon.\textsuperscript{31,32} This is reported to represent the return of the tissues to their normal nature. Various changes represent this
phenomenon including relaxation of the tissues being palpated, presence of a pulsating or vibrating sensation, heat emanating from the area, breathing and perspiration changes, changes in heart rate, and fluctuations in motor activity of the eyes. The therapist may stop the treatment when these changes are observed to be no longer occurring.

Other sources describe the phenomenon of the “therapeutic pulse” which is reportedly similar to what is felt when one palpates a radial pulse. When the therapeutic pulse and the radial pulse have been palpated together they have been reportedly found to beat in a fashion that is identical to one another. The therapeutic pulse has been found to be useful in aiding the therapist in obtaining the position of comfort and determining the time of treatment due to the fact that it is often felt when the optimal position has been achieved or the treatment position has been held for 90 seconds.

Slowly Returning the Patient to Neutral

It is always important to avoid a rapid return to neutral position. Not only is it important that the return be slow, but it should also be stressed that this movement must be passive with no active motion occurring from the patient. This slow return is important due to the fact that any rapid movement may reinitiate the abnormal proprioceptive activity the treatment was directed at resolving.

Recheck the Tender Point

Upon returning the patient to their neutral position, the tender point should be checked and the patient should report that their pain is reduced to a level that
is at least 30 percent of the original pain level. Several reasons have been given for why failure to achieve optimal results occurs. The main reasons cited are improper utilization of the technique due to inadequately holding the patient in the position of comfort for 90 seconds, not attaining the position as indicated by the tender point or making a rapid return from the position of comfort. The therapist may also produce less than satisfactory results if they fail to treat several tender points within the muscle because they were not identified during evaluation or if the primary irritation source was overlooked and not treated. The primary reason cited, however, is not following the principles for sequencing treatment of the tender points.

Checking the tender point is not the only way to determine the success of the treatment. D'Ambrogio and Roth advocate what they call the "reality check". The reality check consists of finding a specific movement, joint position, or objective measure that has been found to reproduce the patient's pain and to recheck these measures following treatment to determine if these measures have improved.

During this time it is also very important that the patient is warned of the possibility that some post-treatment soreness may develop. Jones reports that there is about a 30 percent chance of developing this post-treatment soreness by the following morning. D'Ambrogio and Roth have found through their work with the technique, that closer to 40 percent of clients treated will experience this phenomenon and that the soreness may not be localized just to
the area treated. They suggest avoiding strenuous activity for 24 to 48 hours following such a treatment to help avoid any unwanted discomfort. Jones stressed that the patient's cooperation is vital in avoiding the positions and activities that have caused them pain for a few weeks to avoid reinitiating the abnormal proprioceptive reflex and to aid in healing.

Scheduling Treatment

Lastly a therapist must consider the frequency of the treatments provided to the patient. Variations exist throughout literature in regards to the scheduling of the patient for treatment. Jones recommended that the patient wait at least 3 days in between treatments and that no more than 6 tender points be treated at a time to help reduce the likelihood of post-treatment soreness (personal communication between Jones LH, Glover JC, and Yates HA, 1993). Jones also found that immediate success with no need for extended treatment might often occur in cases of acute injuries but that multiple treatments were commonly needed for cases where the patient presented with a long-standing disorder. This was needed in order to prevent reoccurrence of injury and promote healing.

D'Ambrogio and Roth whose positional release therapy, as described earlier, has adapted the technique to include longer treatment times believe that the more "global" treatments, which include both a muscular release and fascial release, should be done no less than a week apart from each other. In addition, they feel the patient may be seen 2 to 3 times during that week for treatments that are held for only 90 seconds and consist of the muscular release phase only.
Technique Variations

Jones was not alone in his discoveries when he developed strain-counterstrain, as years before him Harold Hoover another doctor of osteopathy had formulated a method of treatment known as “functional technique”. Hoover explored the irregularity of muscle tension that sometimes exists around joints when they are placed in their natural positions. He also utilized the principle of moving away from restrictions and worked to place the joint in a position in which muscular tension assumed a more symmetric balance around the joint and aimed to achieve a state in which the symmetric muscular tension was attained in the joint’s neutral position. Jones alluded to the fact that, although similar to Hoover’s technique, his technique focuses primarily on one side of the joint where the dysfunction is present. Hoover’s technique addresses balance of muscular tension in a more global sense looking at both sides of the joint.

Jones treatment methods also continue to be adapted as numerous practitioners explore the use of his techniques throughout different populations and realms of healthcare. Schiowitz has expanded his technique to include the addition of compressive or torsion forces that he believes to have an effect on abnormal reflexes that are occurring in the somatic dysfunction. Weiselfish, as mentioned earlier, has done extensive work with this technique in the area of neurology. She has advocated the use of a longer hold in the position of comfort that lasts for at least three minutes along with specific areas of treatment that may be of benefit to these patients, such as the treatment of the latissimus dorsi for patients presenting with subluxed shoulders. D’Ambrogio
and Weiselfish together have also adapted the initial technique of strain-counterstrain by implicating a second "myofascial phase" in the release of a dysfunctioning joint. As one can see, strain-counterstrain is still an evolving technique in many respects.
CHAPTER V
RESEARCH INTO STRAIN-COUNTERSTRAIN

Jones documented several case studies that demonstrated the success he had with the strain-counterstrain technique. As mentioned earlier however, scientific research in the area of strain-counterstrain is quite limited. In recent years, however, there have been studies that have looked into the efficacy of strain-counterstrain within several realms of healthcare.

A study by Walko and Janouschek is of particular interest to physical therapy as it is a study of the effects of osteopathic manipulative treatment (OMT) on cervicothoracic pain. Osteopathic manipulative treatment consists of techniques that are classified as being thrust or non-thrust techniques. Strain-counterstrain is considered to be classified as a non-thrust technique and was utilized as part of the treatment repertoire in this study.

The aim of the study was to describe the effect of OMT on patients who were experiencing cervicothoracic pain using thermography to quantify the circulatory changes exhibited over the course of the treatments. The study was conducted on 5 women who were between the ages of 26 and 50. Each woman underwent 4 sessions. The first 3 sessions consisted of the administration of a pain questionnaire, structural examination, and thermography.
along with OMT. The last session was carried out in the same manner except that no OMT was administered.

The results of the study showed a significant decrease in reported pain scores from an average of 4.8 to 3.4 (P<.01). To support this they reported that 80% of the women felt their improvement in pain was due in part to the OMT, while only 60% believed that the medication they were taking played a role. It was also found utilizing thermography that the mean temperature of the patients’ cervicothoracic area dropped 0.98°C (P<.001) and that skin temperature asymmetries that had initially been seen on all of the patients’ first thermograms had returned to a symmetric pattern or shown some improvement in symmetry in 4 out of the 5 women. These areas of asymmetry were found to correlate with the areas of pain when the thermograms of 2 subjects were analyzed. These changes in temperature may be representative of a relief of muscular tension in the posterior cervicothoracic musculature or changes in the hydration of epidermis.

Both of the examiners involved in the study also found a significant decrease in their findings of tissue texture changes, range of motion restrictions, and tenderness directly following treatment sessions (P<.001). Both examiners reported an increase in the number of findings in week 2 followed by a decrease in week 3. One examiner, however, continued to report a decrease in findings through the final session while the other examiner reported an increase. Lastly, the authors point out that they found similar success in pain relief in patients with chronic conditions as compared to those with more acute cases.
A study by Lo, Kuchera, Preston, and Jackson,\textsuperscript{36} looked at the effects of osteopathic manipulation on 19 patients who had been diagnosed with fibromyalgia. They specifically looked at OMT’s effect on fatigue, non-restorative sleep, generalized muscle pain, and tenderpoints, which are associated with fibromyalgia syndrome. Their results showed that 84.2% of patients experienced improvements in their sleep along with a 94.7% improvement in reported pain. The majority also showed significant reductions in tender points (P<0.0007) and reported pain on the visual analog scale (P<0.0258). The subjects in this study also reported that the effects of these treatments lasted on average of 3.7 weeks.

The next study by Stotz and Kappler,\textsuperscript{37} also looked at the effect of OMT on fibromyalgia. This study specifically looked at the effect of OMT on tender point intensity. It also investigated the correlation between somatic dysfunction, activities of daily living, and the patients’ reported perception of pain on a visual analog scale. Eighteen subjects diagnosed with fibromyalgia for over a year received 6 treatments. It was determined that 12 patients responded positively with an average decrease in tender point intensity of 14% while 6 patients showed a 34% increase in tender point intensity. Correlations were also found between activity of daily living scores and pain perception on the visual analog scale (P<0.015) and tender point intensity scores before treatment and pain perception on the visual analog scale (P<0.016). The authors felt that OMT can be considered an effective means of reducing tender points, somatic dysfunction, pain, and improving the patient’s participation in everyday life.
A study by Brault and Kappler\textsuperscript{38} looked specifically at strain-counterstrain releases of the hamstring. This study looked at the correlation of electromyography findings, palpatory findings, and range of motion in the hip before and after treatment of hamstring tightness using a counterstrain technique. Twenty-one subjects between the ages of 16 and 57 were utilized for this study. Following backward and forward bending exercises, the patients were examined for palpatory findings, active hip flexion and extension, and a 20 second resting surface electromyography was taken on each hamstring. The side with the most significant tightness on each patient was then treated using the specified technique. The patients were then re-evaluated in the above-described manner. Their findings showed that all patients showed decreased palpatory tension in the hamstrings following treatment. Nineteen of the subjects showed increased hip range of motion with average increases of 5.7 degrees flexion and 2.9 degrees extension. Lastly, they found that 15 of the subjects exhibited normal electromyography levels and 6 showed elevated levels. Thus these authors felt that the treatment was an effective method of improving active hip range of motion and releasing muscular tension in the surrounding musculature regardless of electromyography findings.

Another study by Brochu and Cross\textsuperscript{39} looked at the effect of OMT on the obstetrical patient. Eighty-four women, each in their third trimester, were part of this study and were divided between control and treatment groups. All of the women had reported symptoms that had developed or worsened during their pregnancy such as shortness of breath, edema, headaches, and musculoskeletal
pain. They rated such symptoms on an evaluation form based on their presence and severity. The control group was asked to complete the form on their obstetrical visits, while the treatment group filled out the evaluation form, but was also given osteopathic examinations and treatment. The treatment methods varied but included strain-counterstrain, cranial concept, high velocity low amplitude, articulatory, and muscle energy techniques. The investigators found that out of 18 complaints assessed only 4 showed any significant difference between those in the control and treatment groups. They reported they felt, however, this was due in part to patient compliance issues.

A study by by Radjieski, Lumley, and Cantieri \(^40\) examined the effect of OMT on how long patients with pancreatitis are hospitalized. Patients in this study were admitted with the diagnosis of pancreatitis and were randomly divided between control and OMT groups. All patients received standard care while the OMT group was evaluated for somatic dysfunction and received daily OMT until discharge. Techniques used included myofascial release, pectoral traction, thoracic, lumbar, and iliosacral mobilization, and strain-counterstrain techniques. The investigators hypothesized that they would improve the arterial blood flow and lymphatic drainage of the patients through the use of OMT along with normalizing output from the sympathetic nervous system and viscerosomatic and somatovisceral reflexes. In this study it was found that the OMT group averaged a length of stay that was 4.5 days in comparison to the control group’s 8 days which is a significantly shorter time (P=.039). Other factors such as requests for pain medications, length of time spent on oral intake restriction, and age did not
differ significantly (P=.32). Thus they found the addition of OMT to standard care for pancreatitis was beneficial in reducing length of stay.

This last study addressed the effect of OMT on somatoviseral reflexes.\textsuperscript{40} To expand on the role that viscerosomatic and somatovisceral reflexes play in somatic dysfunctions and in defining the basis for this role Sato\textsuperscript{41} points to the segmental organization of the sensory nerves from the musculoskeletal system in relationship to the spinal cord. He also notes that the innervation of the autonomic nervous system, which regulates activities of the bodily organs, has somewhat of an inclination towards a segmental structure.

One study by Sato\textsuperscript{42} demonstrated the presence of these somatovisceral reflexes well as he was able to produce changes in the pulse, blood pressure and sympathetic nerve output in cats that had been anesthetized through movement of the knee joint beyond normal range. He found that these changes were demonstrated to an even greater level in joints in which the sensory receptors were inflamed. Small diameter sensory nerves were believed to be the activating source for these changes.

Of the studies looked at within this review, the majority showed significant findings that indicate the use of OMT, which includes strain-counterstrain, to be of benefit in several arenas.\textsuperscript{34,36,37,38-40} However continued research is always merited and would be beneficial to both the practitioner and patient.
CHAPTER VI

UTILIZATION OF STRAIN-COUNTERSTRAIN WITHIN PHYSICAL THERAPY

Strain-counterstrain has a number of attributes that make it a viable option as a treatment technique. Perhaps the most beneficial of these is its well-known gentle nature that makes it a useful technique when treating patients such as elderly, infants, osteoporotic individuals, or women who are pregnant.\(^2,7\) This is important due to the fact that many of these groups are considered as contraindications for certain modalities or therapeutic treatments.\(^43\) For instance, women who are pregnant are not candidates for use of several therapeutic techniques such as ultrasound, vigorous manipulation, deep heat modalities or electrical stimulation to name a few. However the use of strain-counterstrain is indicated for use during pregnancy in cases that warrant it.

Another benefit of strain-counterstrain is that it is easily adapted by the therapist.\(^2\) This is of importance as it may be utilized in various settings including the home. It has also been described as being a form of manual therapy that does not put undue stress on the therapist performing the techniques. Specialized treatment tables that can be adjusted for positioning\(^2,17\) and other devices such as wedges or therapy balls can be utilized easily to hold the position of comfort and reduce stress on the therapist, especially with patients of large stature.\(^17\)
Although a gentle technique, contraindications to strain-counterstrain still do exist and may include malignancies, aneurysms, and acute episodes of rheumatoid arthritis. Open wounds, sutures, unhealed fractures, hematomas, skin that is hypersensitive, and infections of both a localized or systemic nature are also considered to be local contraindications. The relationship of certain cervical techniques to the vertebral artery must also be considered. Care should be taken to watch for signs of occlusion, such as lightheadedness or nystagmus, when the head is brought slowly into extension and/or rotation over the table. Cessation of treatment is of utmost importance if any unwanted symptoms of a neurological nature occur. Care should be taken to monitor the occurrence of radicular pain with treatment, as this should be avoided. Caution should also be taken to avoid extreme flexion of the spine particularly in the lumbar and thoracic regions when treating a patient with osteoporosis.

Consideration should also be given to the fact that there have been reported instances of spasming of muscles, irritation of herniated disks, lightheadedness, and fractures stemming from the use of strain-counterstrain. Jones also reported that in his practice he learned to adapt his technique to start out with treatments that achieved submaximal results for patients with myocardial infarctions, as in two instances patients experienced an additional myocardial infarction the following day after a treatment. Thus myocardial infarction is also a consideration when deciding on treatment of a patient using strain-counterstrain.

Patients suffering from acute injuries and those with long-standing dysfunctions alike may benefit from the utilization of this treatment due to its
atraumatic nature and its ability to resolve long-standing dysfunction by addressing the abnormal proprioceptive reflexes.\textsuperscript{2,7} It has also been shown to be a benefit for such orthopedic conditions as adhesive capsulitis by relieving guarding of the musculature around the joint. Although these patients may experience decreased range of motion, positions of comfort can still be found within these ranges that allow the treatment to be carried out.

Patients with neurological diagnoses can also find relief with strain-counterstrain for certain problems that have been brought on by their conditions.\textsuperscript{2,30} Weiselfish\textsuperscript{30} is credited with recognizing the lengthened period of time needed for the release to occur in the patient with neurological involvement along with several areas of particular importance in the treatment of these patients. These include treatment of the medial gastrocnemius for patients with plantarflexion posturing of their foot and dorsiflexion restrictions and iliacus techniques for counteracting tightness in the hip flexion musculature that is limiting hip extension.

Another group that may benefit from these techniques are patients who have undergone amputations.\textsuperscript{17} Dysfunctions throughout the body, particularly in such areas as the spine or pelvis, may contribute to the patient's discomfort following amputation. Removal of pain during the rehabilitation period may allow the patient to participate more effectively in other therapy activities such as gait re-education.

Sports injuries have been found to be particularly responsive to this technique.\textsuperscript{17} Typically the mechanism of injury is easily identified and the
treatments are straightforward, especially if the athlete is well conditioned and no other dysfunctions are present. Many of the injuries that are seen in athletes are successfully treated through a repertoire, which includes strain-counterstrain or variations of the technique, strength training, range of motion, and other modalities.

Although it may be used alone, strain-counterstrain is often used in correlation with other modalities and manual therapy techniques such as joint mobilizations and myofascial release. Strain-counterstrain is of benefit with these techniques because it is able to remove any abnormal reflexes that may exist before the additional techniques address the structural barriers. It also helps to prevent the reoccurrence of the injury from sustained states of increased muscle tension. A therapist has also reported utilizing the positions simultaneously with modalities. For example, a patient may be placed into the position of comfort while ultrasound treatment is administered to the area.

Another interesting use of this technique is its value as a tool of diagnosis. It can be used to distinguish between somatic dysfunctions and conditions that are of an inflammatory origin. If a patient has undergone the technique and the pain is now non-existent the condition was probably of a neuromuscular nature rather than an inflammatory nature, although benefits can still be seen when used with inflammatory conditions due to the improved clearing of edema with the release of the tension in the area. Schwartz also described the use of strain-counterstrain as a differential diagnosis tool in cases of myocardial infarctions and appendicitis in the acute hospital setting.
Lastly, one particular benefit of strain-counterstrain is that the patient can be taught to perform these techniques on themself. It is particularly effective as a self-treatment because the patient should know better than anyone when they have achieved their greatest position of comfort and their tender points are reducing in sensitivity. The key to remember for all patients, however, is to make sure the passive aspect of the technique is maintained.

These are only a sampling of the wide array of situations in which strain-counterstrain may be utilized. Each therapist will undoubtedly find unique ways to incorporate the techniques into their treatment repertoire and patient population as they gain experience and become more proficient in the technique.
CHAPTER VII
SUMMARY AND CONCLUSIONS

In our examination of strain-counterstrain we have looked at several different parts of the puzzle. Now, however, one must look at the whole picture and draw a conclusion about the role strain-counterstrain has in physical therapy.

A particular benefit of strain-counterstrain is the noted gentleness of the technique and the fact that it can be used to treat both acute and chronic patients.\(^2,7\) Another benefit is the wide variety of patient populations for which it may be used including osteoporotic elderly patients,\(^2,7\) athletes, and patients who have undergone amputation of a limb.\(^17\)

Some therapists may be concerned, however, with the fact that this is a very passive technique and that the patient treated with such a passive form of therapy will not take an active role in their therapy program. Two points may help ease the therapist's mind. The first is that the patient can be taught to utilize these strain-counterstrain techniques on themselves inducing a self-release of their tissues.\(^2\) Secondly, as cited with the patient having undergone an amputation, relieving pain and restriction with strain-counterstrain may actually allow the patient to take a more active role in other areas of their therapy such as gait training.\(^17\)
One would find it hard to deny that literature has presented a strong scientific rationale for how this technique provides beneficial results to its patients. Korr's model which sites the muscle spindle as the source of the somatic dysfunction has been well described. His model also provides a rationale for how such manual therapy techniques as strain-counterstrain work. Korr along with Denslow and Krems provided scientific support for this model through their study, which pointed to the source of somatic dysfunctions as being of a more segmental nature.

In supporting this technique one can also draw on the research that has shown strain-counterstrain as a beneficial technique. As pointed out, however, this research is limited.

A point to consider when looking at this research is the fact that little of what was presented in this review showed strain-counterstrain as an isolated technique. This makes it more difficult to assess the effectiveness of strain-counterstrain alone, as we are unable to determine exactly where the benefits from the treatment in these studies originate. Research that looks solely at the technique of strain-counterstrain may be of benefit. Also of benefit may be research that looks at a comparison of strain-counterstrain alone, strain-counterstrain combined with other modalities and therapy techniques, and the use of those same modalities and therapy techniques without the combined use of strain-counterstrain.

It is my opinion that the key points presented here provide a solid basis for supporting the use of strain-counterstrain within physical therapy. However, this
technique should not be used with blind faith. Individual therapists must make their own decisions within the scope of their practice, educating themselves in the technique and investigating its use.
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