A CASE STUDY:

The Treatment of C8 with Manual Therapy

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ABSTRACT:

Manual therapy has evidence to support its use in treating cervical spine issues such as headache, pain, and radiculopathy. The techniques that appear most studied are mobilization, manipulation, traction, and stretching. This report looks at another form of manual therapy called Myokinesthetic. This treatment was used to help a patient with multiple compalaints of headache, neck pain, and radiculopathy, by addressing the C8 nerve root. The treatment appeared to help with the patient complaints and there were changes in range of motion, strength, pain, headache, and two point discrimination. The issue that arose in the author's mind was this treatment appears to cross over various types of manual therapy techniques and raised the question of what technique can a manual therapy practitioner use to best suit their patient need and be quick and efficient. In other words, what specific manual therapy technique should be used for the specific cause of the issue plaguing the patient?

The headache is a fairly common patient complaint. This headache can have neck pain, radiating pain, muscle spasm, muscle weakness, numbness and tingling associated with it. Some headaches are spontaneous, and some have an injury history, and some from other causes. The headaches may be "acute" or "chronic"(example: more than 15 days a month for 6 months in year(1)(2)). The question arises, in the Physical Therapy realm, what is the Physical Therapist supposed to treat the condition with? A possible treatment is the use of some form of manual therapy. Some options are: traction, mobilization, manipulation, craniosacral, myofascial release, trigger point work, massage (patient preferred), manual stretching, Myokinesthetic treatment (MYK), neural mobilization, strain counter strain, and Epply maneuver. One tool to decide which treatment to employ is to investigate the literature for evidence.

Manual therapy, initially for literature review, was in reference to any technique where the hands of a therapist have physical contact with patient's tissues, but in examining manual therapy literature, most research deals with mobilization, manipulation, traction, nerve mobilization, and stretching. In a majority of cases these treatments had additional associated treatments used with them such as exercise and modalities. With so much literature available and trying to narrow down the search to components, of this case report treatment, little success was met. The search turned to looking at systematic reviews of manual therapy and filtering out the associated information. This was based on the "evidence pyramid" in which systematic reviews of high quality randomized control studies are considered the pinnacle of evidence, but should be debated(3). It is assumed well- thought-out conclusions were made.

There is extensive information on manual therapy, found in the September 2008 Journal of Orthopedic & Sports Physical Therapy, Number 9, Volume 38, pages A1-A30. The Clinical Guidelines for Neck Pain(4) were published. Table 4 of the article presented 3 of 4 recommendations that fit the patient of this report. The literature review then concentrated on information after this date. After this publication it appears that minimal information was published to contradict what was seen in the JOSPT article.

In a systematic review done in 2010 by Jordan Miller, Anita Gross et al., the conclusion was evidence to support manual therapy for treatment of chronic neck pain and manual therapy with exercise was better than just manual therapy.(5) Another review supported the previous conclusion with additional improvement in benefit with exercise and adding behavior change.(6) In a systematic review on manual therapy for cervicogenic headache, it was noted that physiotherapy and spinal manipulation therapy can be an effective treatment.(7) Another review in 2011 on cervicogenic headache care noted uncertainty and varied results for the effectiveness of manipulation on cervicogenic headache(8) Another review done in 2012 on Chinese manipulation for mechanical neck pain showed some support for the care in producing short-term results on neck pain.(9) It was hoped that more study and interpretation of the information would glean more promising results for manual therapy. As a side note, a nice case report on orthopedic manual therapy showed that multimodal Physical Therapy may be effective in the management of cervicogenic headache.(10) These previous references have backed up the use of manual therapy, although with not with a lot of vigor. In summary, the literature showed that just about any kind of manual therapy MAY be helpful.

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This case report is using the Myokinesthetic treatment which does not appear to be mentioned in the literature investigated. This treatment appears to have no formal study, is not in the traditional line of manual therapy, has anecdotal success per patient experience, and for the most part, employs a somewhat expanded thought process to understand what is occurring during treatment.(refer to reference list 2 in appendix.)

The MYK treatment of note needs some description. The treatment addresses the nerve root deemed most involved as determined by standard assessment with the added components, of posture, pain distribution, and specific weak muscle testing.(refer to appendix for postures) Of note, the assessments mentioned in previous articles are also helpful in determining which root may be most involved, but there are other postural notations that are considered when picking the root to treat. Once the nerve root to treat is found, then stimuli, to that root, are provided by moving the muscles innervated by the root into a lengthening position. This movement is opposite the muscles action and can use active range and or passive range of motion, and even a static hold can influence the lengthening. Then external stimuli are provided to the muscle at points from origin to insertion. The stimuli can be a massage, broad pressures, long stroking, point pressure etc. all based on muscle access and patient tolerance. The instructed most beneficial treatment is when a nice range can lengthen the muscle and have the muscle move through its functional pattern of joint movement while stimuli are applied. All ranges and stimuli are to patient comfort. In this report, the C8 root is addressed and of note the muscles innervated by C8 cover a lot of distance from the cervical spine to hand. Both sides of the body are treated thus the therapist works both sides of the cervical spine and both upper extremities. Once the treatment is completed, the patient is to stand and oppose gravity.

CASE REPORT:

The patient was a female in her late thirties, with main complaints of neck pain, shoulder pain, hip pain, and headache. A signed informed consent form was obtained prior to evaluation and treatment. The discomfort history was associated with two motor vehicle accidents- one a rollover and the other a rear end collision. Other trauma came from a previous all-terrain vehicle accident involving flipping over, and numerous horseback riding falls. The falls from horseback, during her teen years, were when the neck issues began. Other injury history included torn knee ligaments, finger injuries, foot and toes injuries, fracture of the coccyx, rib fractures and right shoulder dislocation.The patient had previous surgeries which were non-contributory to the overall case. Contributory issues related to the overall complaints were bruxism at night, sinusitis, dizziness when turning the head too fast, upper extremity radiculopathy with numbness and tingles into both hands, and seasonal swelling of both lower extremities. The patient reported various imaging studies were performed and stated that there were changes that could be possibly addressed by surgery as noted by her primary care physician. There have been numerous treatments and techniques performed over the previous years to help relieve the noted headaches, neck pain, upper extremity odd feelings etc, but with little success.

Chiropractic care with various techniques had been tried, injections to neck, physical therapy ("traditional"-noted on history form), massage, TENS unit, various doctors/specialists. The reported impact on her condition lasted little time and had not really changed her long term outlook. The patient has tried to change her sleep environment/positions-to little avail. Work was disrupted often with frequent position changes and thus not able to stay task-oriented for long periods. If headache was involved, then lying down was the option used to help relieve headache. The upper extremity was placed in various positions, usually locked elbow, wrist extended and then pushing into an object/surface when pain complaints were most noted in an upper extremity. Pain medication was used as a last resort as well as muscle relaxers. Over the counter medications were used as needed. The patient reported activity modification was the biggest challenge due to caring for active children. Weekend recreation activity was usually limited due to pain production or the noted "after activity pain". In short, normal life was disrupted. The patient also noted random dropping of objects such as a travel mug and pencil.

ASSESSMENT:

Assessment used the standard clinic patient history questionnaire and then evaluation with the added Myokinesthetic assessment components. Initial assessment complaints were of global/posterior headache, general neck pain, and bilateral upper extremity complaints. Range of motion testing for cervical rotation and extension was assessed. Since these pure motions are not performed as part of MYK treatment, it is presumed they would not significantly influence patient outcomes. Goniometric cervical rotation right was 10 degrees less than left and had a flexion component at the end of rotation. Cervical extension was 22 degrees and had a reported "bump" in range. All motion testing was done actively and pain-free by the patient and with the patient's eyes closed. Reliability of measuring cervical active range of motion with a goniometer is supported when performed by the same clinician(11) and even quick assessment of extension is supported.(12) Grip testing of each hand was performed using a Jamar hydraulic grip dynamometer over 3 reps per side with the average right hand grip at 78 pounds and the left was 79 pounds. Pinch test for all digits was measured using a Jamar pinch grip tester, over 2 reps each digit, with results as follows. Right hand little finger at 2 pound, ring finger at 7.5 pounds, middle finger at 10 pounds and index at 11.5 pounds. The left hand little finger at 5 pounds, the ring finger at 5 pounds and the middle and index both at 9 pounds. Acceptable or better reliability of dynamometry, regardless of device, is supported for hand testing.

(13) Reliability and validity is supported for grip and pinch testing even if using one repetition.(14) It is recommended using the same devices when measuring strength as inter-instrument reliability may not be consistent.(15) Two point discrimination was measured with a screw adjust engineering pin compass at midway of medial forearm. Two-point discrimination is a practical way to assess and monitor symptoms of radiculopathy(16) and clinicians are reliably able to assess two-pint discrimination at the neck, back, hand, and foot using mechanical calipers.(17) The area of greatest tenderness was the right cervical spine C3-4 laterally. Verbal complaints of "weird feelings" were noted from right medial forearm to little finger. At the time of assessment, no odd sensations or feelings were noted in the left upper extremity, but the patient reported a history of varied complaints. Pain report on the visual analog 0-10 scale was 9/10 for overall pain, and 8/10 for headache. The visual analog scale shows reliability and validity to measure overall pain in clinical practice.(18) Biceps reflex on right was noted to be less brisk as to left and noted to be more brisk in triceps on the left. Myokinesthitic cervical posture assessment was performed with the patients eyes closed and patient standing. Assessing postures with the eyes closed may remove the visual input that the body uses to level itself with the horizon. The most prominent postures noted during MYK assessment were left scapula upward rotated, left shoulder adducted, bilateral shoulders lateral rotated, bilateral supination of forearms, fingers flexed and adducted, and thumb abducted. The cervical posture was visually noted to be flexed, rotated right and side bent left from a visual expected neutral . Treatment choice of C8 came from postures, areas of complaint, weakness, dermatome distribution, etc. thus, the root associated with most symptoms. (Refer to Appendix for posture chart)

TREATMENT:

All measures noted were chosen before evaluation and treatment to try to limit any outcome effects to the "pure" influence of treatment. For example, pure linear cervical extension and pure rotation is not performed during treatment of C8. The treatment of C8 was to occur over 4 weeks with the first week consisting of 2 consecutive treatments, one day off, then 2 more sequential treatments. Treatment for the following three weeks was scheduled 3 times a week. With weather issues and a few life issues, treatment was actually done 3 times a week for 2 weeks and then 2 times week for 2 weeks. The McGill pain questionnaire(MPQ) was filled out prior to the first treatment and was scheduled to be re-done after the last treatment. The MPQ showed reliability and validity in the measuring of complex pain of cancer patients.(19) Unfortunately the final MPQ was not returned, so final assessment relied on the patient's subjective report on the last visit and a brief conversation six days after last treatment.

Myokinesthetic treatment of C8 consisted of putting the muscles of C8 nerve root on a form of lengthening and then actively or passively- moving the muscle into/through the range that the muscle action performs. As this was done, an outside stimulus was applied over the muscle as could best be applied from muscle origin to insertion. The treatment in this case was performed with the patient seated. The C8 root muscles are treated bilaterally. In this case the muscles of C8 are from cervical spine to anterior/posterior trunk and to both upper extremities to the hands.(refer to the appendix for C8 muscles) The treatment was performed in this patient with 6-8 AROM and PROM motions with the outside stimuli of rubs, or pressures, or squeezes applied during the motions and at tolerable levels for the patient. As treatment progresses stimulus intensity varies as to various areas of tenderness at times vary. The treatment was done per MYK treatment manual. The C8 treatment has 24 movements/muscles to be done bilaterally. As treatment moved on, time of treatment went from roughly 14 minutes to 12 minutes as patient and therapist familiarity improved.(refer to Appendix for the C8 muslces/movements)

The most noted areas of tenderness in this patient tended to be the right C3-4 lateral area, the left pectoralis major, the thumb extensors and adductors, then the various scalene musculature bilateral. The most lasting tender spot was the lateral right C3-4 spot. As noted with all the hands-on care, cervical spine freedom of movement improved over treatments, and the gross feel of the musculature tended to balance over both sides of the C-spine and upper extremities. From training and experience, it was natural to try and assess the feel of specific segmental movement as treatment progressed. The noted C3-4 segment was felt to possibly be stiff- to side bend left, to rotation and extension right throughout the treatment sessions.

RESULTS:

The final results of data gathering were noted. Force was measured using the same dynamometers as in the initial assessment. Cervical range of motion into rotation was noted to be virtually equal without the previous end range flexion component. Cervical extension increased to 77 degrees without complaint of "bump". Grip on the right hand averaged 75 pounds and on the left 80 pounds. The pinch test on right hand little finger was 5.5 pounds, ring finger 7 pounds, middle 11 pounds, and index at 10.5 pounds. The Left hand little finger was 5.5pounds, the ring at 7 pounds, the middle at 10.5 pounds, and the index at 10 pounds. Pain complaint was 0/10 and headache was 0/10. The two point discrimination on the right forearm was 2.3 cm and for the left was 2.0 cm. For overall discussion of the McGill pain questionnaire, the most telling result was the quick response to treatment. As noted, the final questionnaire was not available for comparison. The pain levels and headache frequency greatly dropped after the first week of care.(See Table 2) The most noted changes by the patient were better tolerance to activity. Work disruption was greatly diminished and the patient was able to stay on task more easily. Weekend activity vastly improved. Activities usually thought to aggravate the patient's issues such as boating, riding horses, and practicing sports with kids, were much better-tolerated. It was reported that the usual weekend at the lake did not seem to carry

over to the following week with increased pain, headache etc. Reports of random dropping of objects decreased greatly. By the end of care, the patient stated hardly noticing this complaint. The usual self-treatment postures of elbow extension, wrist extension and pushing on objects for relief of neck pain and upper extremity issues had really diminished if not gone away over the last week of care. Neck, shoulder, and upper extremity pain complaints dropped from 9/10 to 0/10 and headache complaint dropped from 8/10 to 0/10. The pinch test most noted changes occurred in the right little finger pinch with an overall increase from an average of 2 pounds to 5.5 pounds. A noted change in two-point discrimination, on the left medial forearm, was from 3.2 cm to 2.0 cm. The cervical spine extension change from 22 deg to 77 deg was quite significant and also the decrease in complaint of "bump". (See table 1) Also significant was a visual improvement of the noted postural MYK patterns from initial assessment. From the noted changes, MYK may have contributed to improvements in range of motion, strength, two point discrimination and most notably subjective improvement in pain and function. There was still residual soreness at the C3-4 right area with noted mobility deficit. From this information, it may be concluded that MYK helped the patient. The question raised is how or what changed. Does this form of manual therapy now fit into and acceptable manual therapy treatment for headache, neck pain, and radicular complaints? This is a safe form of care and there should be encouragement to have standardized research on MYK as well as other techniques outside of the more traditional lines of manual therapy.

DISCUSSION:

MYK worked on this patient with neck pain, headache, and radicular complaints. Pain was virtually eliminated, headache became rare, and the carry-over post care appears to be at least 2-4 days, as noted by less complaints between treatments, and most patient complaint of pain and headache dissipated over the first week. The range into cervical extension improved, the gross grip strength had no appreciable change, but individual finger strength in the right little finger improved. The two point discrimination finding needs caution when interpreting(17) and is noted for consideration. The gross subjective report of function appears to have improved drastically. The patient was able to enjoy leisure life more, work was less painful, stereotypical posturing of the wrist into extension was reduced in frequency, and there were fewer radicular complaints. So now with this rough untested information, a conclusion can be made that MYK MAY help in the care of patients with headache, neck pain, and radicular complaints. The treatment has little research support on the effectiveness as does the noted manual therapies. Further justification is presented on why MYK may have been effective as to not be satisfied with the explanation "it works".

Manual therapy has been shown to reduce pain, improve function, improve quality of life, etc, but not in every patient with complaints of headache, neck pain, and radicular symptoms. If we look at a single manual therapy technique, which articles support the use on all the various complaints, which manual therapy is best and at what is the therapy best at taking care of? For example, if the patient with various complaints (PVC) is treated with massage and some get better, would manipulation have been better? What about mobilization? So now let's look at this a little differently, what if a group of 10 patients(10 PVCs) were treated with manipulation and 7 of those improved to an acceptable level, then another group of 10 PVCs were treated with mobilization and 7/10 improved, then the same was done with traction. It seems logical that maybe treating all 10 PVCs with all 3 treatments would, thus, have very high odds of getting 10/10 improved. Of course, some articles mention that even no treatment is successful.(6)

In performing MYK, treatment may cross the boundaries of the aforementioned types of care. This treatment may have forms of joint mobilization as in this case, the cervical spine is moved in various ranges, massage as the various tissues are massaged, pressured, squeezed, and pinpointed pressure which may be a form of trigger point technique. The ranges that the muscles can be moved through could be considered a form of stretch and possibly traction. Neural mobilization may occur as the cervical spine and upper extremities are moved through various ranges of motion and the nerves follow along. A partial form of myofascial care could occur as all tissues move. With some MYK treatments, a "pop" can be elicited and, thus, MYK may be considered a form of manipulation. It is noted that the patient in the case report manifested issues over a wide body area and the C8 root was associated with most issues, so treat the areas associated. MYK was the choice by this author as it can address C8 more than the other manual therapies at disposal.

If the PVC is assessed and an impairment category can be found, then a form of manual therapy is to be chosen, but how much of the impairment classification is used to influence the manual therapy chosen? A case report by Heintz and Hegedus proposed a treatment-based classification system for multimodal treatment of mechanical neck pain. Again, the patient was classified via a decision-making algorithm which led to the treatment of traction and exercise being chosen for their patient.(20) They classified a patient but did not explain why they made their treatment decision. If therapy fixes the cause of impairment, is not the impairment fixed? If this author goes through a similar thorough evaluation, as noted in JOSPT, and the case report of (10), a pretty good idea of what is going on with the patient should be felt and what is causing the complaint. Here is some justification of why MYK was used:

What cause of the patient condition did it address? This same question was echoed in a systematic review by Smith, Phty, and Bolton. The title asks: "What Are the Clinical Criteria Justifying Spinal Manipulative Therapy for Neck Pain?" The authors note a lack of reliable and valid diagnostic protocols to determine the use of spinal manipulation, on the patients referenced, with neck pain.(21) This treatment technique went through a thorough evaluative process plus the postural and pain assess of MYK for the patient. At this point it was roughly noted: radicular complaints (nerve dysfunction), mild weakness (muscle and/or neuromuscular origin), headache (stress, nerve irritation, muscle spasm, or other cause), neck pain virtually about the cervical spine to upper thoracic spine (joint dysfunction, pain misperception, aberrant neuromuscular movement, "pinched nerve", etc.) and chronic (at least a year of complaints). So according to the traditional line of thinking apparently manual therapy is recommended-mobilization, manipulation, traction, stretching, etc, but, MYK was used, in this case, and helped the patient. So, to try and find out what happened, the inventor of MYK treatment, Dr. Michael Uriarte, D.C., was interviewed.

The question of what made him or what thought crossed his mind to go in this direction of care was asked. The basic answer was that the manual therapy disciplines did not work together. He was looking at ways to maximize the various disciplines line of care, and come up with a more complete treatment that relates to the patient problem. Then the thought came about from a chiropractic view that if a segment is manipulated, then why not address that segment neurologically, treat the nerve root as well, and even the soft tissues associated with the segment. The Myokinesthetic approach arose out of thought and was initially planned to be in conjunction with manipulation. Through experience, MYK results were very successful without the manipulation component.(22) Then it should be asked if any research is/was used to support the treatment of note or was this all experiential and did any research help in the development of the technique. Dr. Uriarte reported that his education gave him the resources to think and that he then was able to gather information to support various components of the treatment.(22) Dr. Uriarte provided this author with numerous articles and in review, it was noted that he put a lot of effort, thought and research into MYK.

A review of his research articles was performed and Dr. Uriarte addressed a lot of the neuromuscular system. How and why the neuromuscular system works the way it does, not to forget there are two sides to the story in the neuromuscular system-thus the bilateral care and that the mechanism of pain is addressed. He also interpreted the results of the articles in a very practical way for support of the care. With Dr. Uriarte's permission to use his references, he provided his list for reader review.(see Appendix page for Dr. Uriate's references to help support his statements)

The traditional evaluative process plus the assessment used with MYK should shed more light on the best case scenario on how to treat patients. As noted by Dr. Uriarte, the MYK evaluative process came in reverse after the technique was developed. The postural assessments etc. came from much thought and on postural manifestations, then ended up at a muscle weakness component as well.(22) As MYK treatment progressed, as in this case, various issues resolve within the patient such as muscular soreness in various areas, stiff moving joints in certain areas, more resistance to certain movement, freer ranges of movement as treatment went on, noted responses to pain, noted responses to palpation, etc. With possible residual impairments/causes still lingering, they may be better addressed by another treatment technique. To try and provide optimal care for patient and not exclude other therapy techniques, the whole patient is assessed and maybe the whole patient should be treated?

There are 8 articles in the appendix references addressing the bilateral treatment and thus, moving toward more body system and Dr. Uriarte's ideas of what may be occurring during care. A lot of neuromuscular input is provided a nerve root (as well as associated nearby roots) during care if both sides of the body are addressed. Could the body respond in a balanced fashion to both sides of a bilateral body system design that is being influenced by treatment? Studies support the notion that the contralateral hemisphere is involved in the recovery of brain injury and may be better enhanced with appropriate stimuli.(23) This may address the neuromuscular aspect of care and the body has less to comprehend if learning normal movements and input, then can move the system more normal and have less overall stress; thus, less stress on joints, muscles, nerves, balance integration, etc. With so much of the body considered and the system apparently improving, tissues and the neuromuscular system may be healing or responding to extensive stimulus.(24)(23)

The healing of soft tissues appears to respond to appropriate stresses. Some healed tissues respond/remodel to stresses as well.(Note appendix reference 20) The issues and process of tissue healing, as covered in the book: "Wound Healing: Alternatives in Management"(25) may be influenced by MYK as well. For example, an increase in blood flow may occur with MYK as referenced in the 23rd reference in the appendix. This blood flow provides a stress that may help blood vessels adapt and heal in the correct fashion to mechanical stress as well.(26) Neural regeneration, was noted in the wound healing book, to possibly occur with healing of lymphatic vessels and the new vascular plexus. The two-point discrimination findings may need mention again as a possible way to monitor neural healing/activity and motor control [note appendix reference (25)](27). If interpreting the book information correctly, the body tissues need an optimal environment to heal. Fine motor control of neuromuscular control may be enhanced by MYK movement of muscles into their normal functioning patterns.(Appendix reference 1-8). Normal joint movement toward a possible stiff segment over repeated motions may increase the mobility of the segment(28). Also, if the body is sensing a normal pattern of movement, the body may control the joints in a normal fashion and thus, control joint movement to have less dysfunction that can be misinterpreted by the body. The body is quite complex, responding to a large amount of stimuli when going about movement function, and may make mistakes in movement that can be interpreted as injurious to the system and cause the body to respond with pain and/or aberrant movement. This may influence body tissue breakdown or cause the body to function poorly. Treating the body with normal neuromuscular patterns, normal joint pattern movements, and normal tissue stresses to encourage the body to heal, interpret pain, and process at a somatosensory level may result in normalized function(28)(29)

This Myokinesthetic treatment is quick and efficient. This treatment takes little space, is quite portable, and is easy on the treating clinician. This treatment has specific home exercises to apply for a weak muscle or group found. The treatment has an excellent headache home management program. This treatment has the potential for fitting nicely in the ever-changing world of patients who want it quick and easy and on their time and even combined with their MD visit. Myokinesthetic can be used during the acute, as well as chronic, phases of healing with the treatment moderated to patient and tissue tolerance and still have an effect, it appears.(30) Study the appendix reference, and in the case of C8, and see the wide range of tissues treated and how much the body is and can be moved and/or stimulated. Consider that one root is heavily stimulated consistently and bilaterally may aid in nerve "regeneration" and point the body in the direction of easier motor learning.(31)(32)

At the time of this report, the concept of how the body perceives pain was raised. The concept or thoughts are brought up by Adrian Louw(33). MYK may have many components that help the body perceive pain in a different way. As noted during treatment, the two point discrimination improved on the left forearm. Does this mean the body is more aware of itself and has a better perception of pain and it was "ok" to move and this movement was

perceived as good?(27)(24) With so much hands-on during MYK, (not in an intrusive way), the body may note that this motion and this stimuli is "OK" to experience and perceive pain in a different fashion.(24) During MYK, the body is put through a lot of normal movements and from study, abnormal movement or non- movement can be painful. Tissues heal and as noted by Louw,(33) they should not have pain. Something is amiss in the body's handling of pain. This style of pain thought was presented in a video, by Lorimer Moseley, on pain perception.(34) MYK may hit on a portion of how the body perceives pain. Dr Uriarte notes that the movement and vibration receptors may influence the pain sensors information and may help the body's perception of pain.(appendix reference 24-27) Another component of MYK that may fit into this concept is how when the treatment session is finished, the patient is asked to stand and move to orient to gravity. Dr. Uriarte notes that posture is the outward expression of the neurological system. He points out that the body prior to treatment may have compensated to its dysfunction and after treatment, may adjust itself more normally as it opposes gravity. (22) Also, what are the (other) unintentional benefits of manual therapy that we do not see or perceive as patients or as therapists?

CONCLUSION:

Myokinestheic care helped this patient improve in their complaints of headache, neck pain, and radicular issues. The question arises: Is MYK a viable method of care for patients? Of note, MYK appears quick, safe, and effective. The treatment has promoted thought on the many potential "causes" of a patient issue and what the best treatment course is for the patient. MYK needs more research and discussion to support that MYK works and to help more validate MYK and other forms of manual therapy. MYK is not the only manual therapy of choice, as it may appear from the justification noted, but application of research, experience, and common sense has justified MYK, as well as other forms of manual therapy, when assessing and treating patients.

TABLE 1

TEST AND MEASURES	PRE-TREATMENT	AFTER 4 WEEKS OF TREATMENT
GRIP IN POUNDS	R HAND 78 POUNDS L HAND 79 POUNDS	R HAND 75 POUNDS L HAND 78 POUNDS
LITTLE FINGER PINCH	R HAND 2 POUNDS L HAND 5 POUNDS	R HAND 5.5 POUNDS L HAND 5.5 POUNDS
RING FINGER PINCH	R HAND 7.5 POUNDS L HAND 5 POUNDS	R HAND 7 POUNDS L HAND 7 POUNDS
MIDDLE FINGER PINCH	R HAND 10 POUNDS L HAND 9 POUNDS	R HAND 11 POUNDS L HAND 10.5 POUNDS
INDEX FINGER PINCH	R HAND 11.5 POUNDS L HAND 9 POUNDS	R HAND 10.5 POUNDS L HAND 10 POUNDS
CERVICAL ROTATION, GONIOMETER MEASURE	R ROTATION 10 DEG LESS THAN LEFT	R ROTATION VIRTUALLY EQUAL TO LEFT
CERVICAL EXTENSION, GONIOMETER MEASURE	22 DEGREES PAIN FREE AND "BUMP"	77 DEGREES
TWO POINT DISCRIMMINATION, MEDIAL FOREARM MID POINT	R ARM 2.4 CM L ARM 3.2 CM	R ARM 2.3 CM L ARM 2.0 CM
0-10 PAIN SCALE, PAIN AND HEADACHE	PAIN 9/10 HEADACHE 8/10	PAIN 0-1/10 HEADACHE 0/10

TABLE 2

PAIN/HEADACHE TREND DRUING TREATMENT
0-10 SCALE, PRE-TREATMENT COMPLAINT

EVALUATION TREATMENT 1	PAIN 9/10 HEADACHE 8/10
TREATMENT 2	PAIN 3/10 HEADACHE 1/10
TREATMENT 3	PAIN 1/10 HEADACHE 5/10
TREATMENT 4	PAIN 1/10 HEADACHE 4/10
TREATMENT 5	PAIN 1/10 HEADACHE 1/10
TREATMENT 6	PAIN 1/10 HEADACHE 0/10
TREATMENT 7	PAIN 0/10 HEADACHE 4/10
TREATMENT 8	PAIN 0/10 HEADACHE 1/10
TREATMENT 9	PAIN 0/10 HEADACHE 0/10

REFERENCES:

1. Saldanha G J F, Clough C G, and Ward E. Headache. Reviews in Clinical Gerontology 2002 12:127-144.
2. Schwartz J S, Song P, and Blitzer A. Therappeutic Uses of Botulinum Toxin, Headache, 2007, (7) 91-108, Humana Press Inc., Totowa NJ.
3. Rosner A L, and [Hon] LL D. Evidence-based medicine: Revisiting the pyramid of priorities. Journal of Bodywork & Movement Therapies, 2012 16:42-49.
4. Childs J, Cleland J, Elliott J, et al. Neck Pain: Clinical Practice Guidelines Linked to the International Classification of Functioning; Disability, and Health From the Orthopaedic Section of the American Physical Therapy Association. J Orthop Sports Phys Ther 2008;38(9):A1-A34. Doi:10.2519/jospt.2008.0303.
5. Miller J, Gross A, D'Sylva J, et al. Manual therapy and exercise for neck pain: A systematic review. Manual Therapy, 2010 (15): 334-354.
6. Salt E, Wright C, Kelly S, Dean A. A systematic literature review on the effectiveness of non-invasive therapy for cervicobrachial pain. Manual Therapy, 2011 (16): 53-65.
7. Chaibi A, Russell M B. Manual therapies for cervicogenic headache: a systematic review. Journal Headache Pain, 2012, 13:351-359.
8. Posadzki P, Ernst E. Spinal manipulations for cervicogenic headaches: A Systematic Review of Randomized Clinical Trials. Headache, 2011 51:1132-1139.
9. Lin J H, Chiu T T W, Hu J. Chinese manipulation for mechanical neck pain: a systematic review. Clinical Rehabilitation, 2012 26(11) 963-973
10. van Duijn J, van Duijn A J, Nitsch W. Orthopaedic Manual Physical Therapy Including Thrust Manipulation and Exercise in the Management of a Patient with Cervicogenic Headache: A Case Report. The Journal of Manual & Manipulative Therapy, 2007, Vol. 15(1):10-24
11. Youdas JW, Carey JR, Garrett TR. Reliability of measurements of cervical spine range of motion: Comparison of three methods. Physical Therapy 1991;71:98-104; discussion 105-106.
12. Whitcroft, K L, Massouh L, Amirfeyz R, and Bannister G. Comparison of Methods of Measuring Active Cervical Range of Motion. Spine 2010 Volume 35(19):E976-E980.
13. Mafi P, Mafi R, Hindocha S, Griffin M, and Khan W. A Systematic Review of Dynamometry and its Role in Hand Trauma Assessment. The Open Orthopaedics Journal 2012(6)(Suppl 1:M12):95-102
14. Abizanda P, Navarro J L, Garcia-Tomas M I, et al. Validity and usefulness of hand-held dynamometry for measuring muscle strength in community dwelling older persons. Arch Gerontol Geriatr 2012 Jan-Feb;54(1):21-27
15. King T I. Interinstrument reliability of the jamar electronic dynamometer and pinch gauge compared with the jamar hydraulic dynamometer and b&I engineering mechanical pinch gauge. Ameircan Journal Occupational Therapy 2013 Jul-Aug;67(4):480-483
16. Saeidian SR, Moghaddem HF, Ahangarpour A, and Latifi SM. Two-Point Discrimination Test in the Treatment of Right-handed Females with Lumbosacral Radiculopathy. Iran Journal Medicine Science 2011 December; 36(4):296-299
17. Catley MJ, Tabor A, Wand BM, Moseley GL. Assessing tactile acuity in rheumatology and musculoskeletal medicine—how reliable are two-point discrimination tests at the neck, hand, back and foot? Rheumatology (Oxford) 2013 Aug;52(8):1454-61
18. Englbrecht M, Tarner IH, van der Heijde DM, Manger B, Bombardier C, Muller-Ladner U. Measuring pain and efficacy of pain treatment in inflammatory arthritis: a systematic literature review. J Rheeumatol Suppl. 2012 Sept;90:3-10
19. Ngamkham S, Vincent C, Finnegan L, Holden JE, Wang ZJ, Wilkie DJ. The McGill Pain Questionnaire as a multidiemnetional measure in people with cancer: and integrative review. Pain Manag Nurs. 2012 Mar;13(1):27-51
20. Heintz M M, Hegedus E J. Multimodal Management of Mechanical Neck Pain Using a Treatment Based Classification System, The Journal of Manual & Manipulative Therapy, 2008, Volume 16(4): 217-224
21. Smith J, Phty M, Bolton PS. What Are the Clinical Criteria Justifying Spinal Manipulative Therapy for Neck Pain? A Systematic Review of Randomized Controlled Trials. Pain Medicine 2013;14:460-468
22. Uriarte, M. Developer of Myokinesthetic, Interview on June 25, 2013.
23. Weiloch T, and Nikolich K. Mechanisms of neural plasticity following brain injury. Current Opinion in Neurobiolgy 2006, 16:258-264.
24. Gitto E, Pellegrino S, Manfrida M, et al. Stress response and procedural pain in the preterm newborn: the role of pharmacological and non-pharmacological treatments. European Journal Pediatrics 2012, 171:927-933
25. Kloth L C, McCulloch J M, and Feeder JA. Wound Healing: Alternatives in Management. F. A. Davis Company, 1990.
26. Hosoyamada Y, Sakai T. Structural arrangement of collagen fibrils in the periarterial connective tissue of the kidney: their functional relevance as a structural stabilizer against arterial pressure. Anat Sci Int 2012, 87:80-87.
27. Luomajoki H, Moseley G L. Tactile acuity and lumbopelvic motor control in patients with back pain and healthy controls. Br J Sports Med 2009, 45:437-440.
28. Petri M, Ufer K, Toma I, et al. Effects of perfusion and cyclic compressions on in vitro tissue engineered meniscus implants. Knee Surg Sports Traumatol Arthrosc 2012, 20:223-231.
29. de Lussanet, M H.E., Behrendt F, Puta C, et al. A body-part specific impairment in the visual recognition of actions in chronic pain patients. Pain 2012, 153:1459-1466.
30. Voleti P B, Buckley M R, and Soslowsky L J. Tendon Healing: Repair and Regeneration. Annual Review of Biomedical Engineering 2012, 14:47-71.
31. de Albornoz P M, Delagato P J, Forriol F, and Maffulli N. Non-surgical therapies for peripheral nerve injury. British Medical Bulletin 2011, 100:73-100.
32. Ratan R R, Noble M. Novel Multi-Modal Strategies to Promote Brain and Spinal Cord Injury Recovery. Stroke 2013, 40:S130-S132.
33. Louw, A. Why do I Hurt, Minneapolis: Orthopedic Physical Therapy Products, 2013.
34. Moseley L. Why Things Hurt. 2011;Nov 21: TEDxAdelaide-Lorimer Moseley-Why Things Hurt-YouTube. Video.

APPENDIX:

Reference page of defending references for Myokinesthetic, used with permission from Dr. Uriarte.

Dr. Uriarte's Reference List

1. Cross education and immobilization: Mechanisms and implications for injury rehabilitation. J Sci Med Sport. 2012 Mar; 15(2):94-101. Epub 2011 Sept 15. Hendy AM, Spittle M, Kidgell DJ
2. Cross-deucation of muscle strength: cross-training effects are not confined to untrained contralateral homologous muscle. Scand J Med Sci Sports. 2011 Dec;21(6):e359-64. Doi:10.1111/j.1600-0838.2011.01311.x. Epub 2011 Apr 18.
3. The ipsilateral motor cortex contributes to cross-limb transfer of performance gains after ballistic motor practice. Lee M, Hinder MR, Gandevia SC, Carroll TJ. J Physiol. 2010 Jan 1;588(Pt1):201-12. Epub 2009 Nov 16
4. Effects of cross-education on the muscle after a period of unilateral limb immobilization using a shoulder sling and swathe. Magnus CR, Barss TS, Lanovz JL, Farthing JP. J Appl Physiol. 2010 Dec 109(6):1887-94. Epub 2010 Oct 21.
5. Corticospinal adaptations and strength maintenance in the immobilized arm following 3 weeks unilateral strength trainging. Pearce AJ, Hendy A, Bowen WA, Kidgell DJ. Scand J Med Sci Sports. 2012 Mar 19.
6. Changes in functional magnetic resonance imaging cortical activation with cross education to and immobilized limb. Farthing JP, Krentz JR, Magnus CR, Barss TS, Lanovaz JL, Cummine J, Esopenko C, Sarty GE, Borowsky R. Med Sci Sports Exerc. 2011 Aug;43(8):1394-405.
7. The effect of contralateral training: Influence of unilateral isokinetic exercise on one-legged standing balance of the contralateral lower extremity in adults. Gait Posture. 2011 may;34(1):103-6. Epub 2011 May 4. Kim K, Cha YJ, Fell DW.
8. Unilateral strength training increases voluntary activation of the opposite untrained limb. Lee M, Gandevia SC, Carroll TJ. Clin Neurophysiol. 2009 Apr;120(4):802-8. 2009 Feb 18 Epub
9. Effect of passive stretching on the immobilized soleus muscle fiber morphology. E.L. Coutinho, A.R.S. Gomes, C.N. Franca, J. Oishi, and T.F. Salvini Braz J Med Biol Res, December 2004, Volume 37(12) 1853-1861
10. Flexibility and passive resistance of the hamstrings of young adults using two different static stretching protocols. S.P. Chan, Y. Hong, P.D. Robinson Scandinavian Journal of Medicine & Science in Sports. Vovune 11, Issue 2, pages 81-86, April 2001
11. The effects of passive stretching in children with cerebral palsy. Pin T, Dyke P, Chan M. Dev Med Child Neurol. 2006 Oct;48(10):855-62.
12. Dynamic vs. Static-Stretchig warm up: the effect on power and agility performance. Danny j. McMillian, Josef H. Moore, Brian S. Hatler, and Dean C. taylor. Journal of Strength and Conditioning Research 2006 20(3), 492-499
13. Effects of static stretching for 30 seconds and dynamic stretching on leg extension power. Yamaguchi, Taichi, Ishii, Kojiro Journal of Strength and Conditioning Research 2005 19(3) 677-683
14. Effects of differential stretching protocols during warm-ups on high speed motor capacities in professional soccer players. Thomas Little, Alun G. Williams Journal of Strength and Conditioning 2006 vol. 20 no. 1 pp. 203-207
15. The Acute Effects of Combined Static and Dynamic Stretch Protocols on Fifty-Meter Sprint Performance in Track-and-Field Athletes Fletcher, Iain M.; Anness, Ruth Journal of Strength and Conditioning Research, 2007 Aug;21(3);784-7
16. The effect of different warm-up stretch protocols on 20 meter sprint performance in trained Rugby Union Players Iain M. Fletcher and Bethan Jones, Journal of Strength and Conditioning Research 2004, 18(4) 885-888
17. Behavioral and physiological effects of deep pressure on children with autism: a pilot study evaluating the efficacy of Grandin's Hug Machine. Edelson SM, Edelson MG, Kerr DC, Grandin T, Am J Occup Ther. 1999 Mar-Apr;53(2):145-52.
18. Changes in Blood Pressure After Various Forms of Therapeutic Massage: A Preliminary Study. Jerrilyn A. Cambron, Jennifer Dexheimer, and Patricia Coe. The journal of Alternative and Complimentary Medicine. January/February 2006, 12(1):65-70
19. Effects of Patterns of Pressure Application on Resting Electromyography During Massage. Langdon Roberts, MA, CMT International Journal of Therapeutic Massage and Bodywork, Vol 4, No. 1 (2011)
20. Fibroblast responses to variation in soft tissue mobilization pressure. Gehlsen GM, Ganion LR, Helfst R. Med Sci Sports Exerc. 1999 Apr;31(4):531-5
21. Massage Therapy of Moderate and Light Pressure and Vibrator Effects on EEG and Heart Rate. Miguel A. Diego, Tiffany Field, Chris Sanders and Maria Hernandez-Reif. International Journal of Neuroscience 2004, Vol. 114, No. 1, Pages 31-44
22. Moderate versus light pressure massage therapy leads to greater weight gain in preterm infants. Tiffany Field, Miguel A Diego, Maria Hernandez-Reif, Osvelia Deeds, Barbara Figuereido. Infant Behavior and Development Volume 29, Issue 4, December 2006, Pages 574-578
23. The effect of deep-tissue massage therapy on blood pressure and heart rate. Kaye AD, Kaye AJ, Swinford J, Baluch A, Bawcom BA, Lambert TJ, Hoover JM. J Altern Complement Med. 2008 Mar; 14(2): 125-8.
24. Mechanisms of pain relief by vibration and movement. R Kakigi, H Shibasaki. J Neural Neurosurg Psychiatry 1992;55:282-286
25. Pain threshold changes by skin vibratory stimulation in healthy subjects. M Zoppi, M.R. Voegelin, M Signorini, A. Zamponi. Acta Physiologica Scandinavica Volume 143, Issue 4, pages 439-444, December 1991
26. Effects of vibratory stimulation on muscular pain threshold and blink response in human subjects. Tito Pantaleo, Roberto Durnati, Fabrizio Bellini. Pain, Volume 24, Issue 2, February 1986, pages 239-250
27. Vibration reduces thermal pain in adjacent dermatomes. David Yarnitskya, Margarita Kunin, Riva Brik, Elliot Sprecher. Pain, Volume 69, Issues 1-2, January 1997, pages 75-77

Posture chart of Myokinesthetic, used with permission of Dr. Uriarte.

Posture Chart

Head	Head Extension	C1	C2	C3	C4	C5	C6	C7	C8	T1
	Head flexion	C1	C2	C3	C4	C5	C6	C7	C8	T1
	Head rotation	C1	C2	C3	C4	C5	C6	C7	C8	T1
	Head lateral flexed	C1	C2	C3	C4	C5	C6	C7	C8	T1
Scapula	Scapula elevated	C1	C2	C3,	C4	C5	C6	C7	C8	T1
	Scapula depressed	C1	C2	C3	C4	C5	C6	C7	C8	T1
	Scapula abducted	C1	C2	C3	C4	C5	C6	C7	C8	T1
	Scapula adducted	C1	C2	C3	C4	C5	C6	C7	C8	T1
	Scapula up rotate	C1	C2	C3	C4	C5	C6	C7	C8	T1
	Scapula down rotate	C1	C2	C3	C4	C5	C6	C7	C8	T1
Shoulder	Shoulder Flexed	C1	C2	C3	C4	C5	C6	C7	C8	T1
	Should extended	C1	C2	C3	C4	C5	C6	C7	C8	T1
	Should abducted	C1	C2	C3	C4	C5	C6	C7	C8	T1
	Should adducted	C1	C2	C3	C4	C5	C6	C7	C8	T1
	Should med rotate	C1	C2	C3	C4	C5	C6	C7	C8	T1
	Should lateral rotate	C1	C2	C3	C4	C5	C6	C7	C8	T1
Elbow	Elbow Flexed	C1	C2	C3	C4	C5	C6	C7	C8	T1
	Elbow Extended	C1	C2	C3	C4	C5	C6	C7	C8	T1
Forearm	Forearm Supinated	C1	C2	C3	C4	C5	C6	C7	C8	T1
	Forearm Pronated	C1	C2	C3	C4	C5	C6	C7	C8	T1
Wrist	Wrist flexed	C1	C2	C3	C4	C5	C6	C7	C8	T1
	Wrist extended	C1	C2	C3	C4	C5	C6	C7	C8	T1
	Wrist radial dev	C1	C2	C3	C4	C5	C6	C7	C8	T1
	Wrist ulnar dev	C1	C2	C3	C4	C5	C6	C7	C8	T1
Thumb	Thumb flexed	C1	C2	C3	C4	C5	C6	C7	C8	T1
	Thumb extended	C1	C2	C3	C4	C5	C6	C7	C8	T1
	Thumb abducted	C1	C2	C3	C4	C5	C6	C7	C8	T1
	Thumb adducted	C1	C2	C3	C4	C5	C6	C7	C8	T1
Finger	Finger flexed	C1	C2	C3	C4	C5	C6	C7	C8	T1
	Finger extended	C1	C2	C3	C4	C5	C6	C7	C8	T1
	Finger abducted	C1	C2	C3	C4	C5	C6	C7	C8	T1
	Finger adducted	C1	C2	C3	C4	C5	C6	C7	C8	T1

Muscles of C8 treated-24 muscles/movements for Myokinesthetic, used with permission of Dr. Uriarte.
Muscles of C8 treated: 24 movements/muscle groups.

1. Scalene Medius, Scalene Posterior
2. Multifidus, Rotatores Longus, Rotatores Brevis, Semispinalis Capitus, Semispinalis Cervicus, Splenius Cervicus, Longissimus Capitus
3. Longissimus Cervicus, Intertransversarii, Iliocostalis Cervicus
4. Interspinalis, Spinalis Cervicus
5. Latissimus Dorsi
6. Pectoralis Major
7. Pectoralis Minor
8. Anconeus, Triceps
9. Extensor Digitorum, Extensor Digiti Minimi, Extensor Indicis
10. Extensor Carpi Ulnaris
11. Abductor Pollicis Longus
12. Abductor Pollicis Brevis
13. Extensor Pollicis Brevis
14. Extensor Pollicis Longus
15. Palmaris Longus, Flexor Dig. Superficialis, Flexor Dig. Profundus
16. Pronator Quadratus
17. Abductor Digiti Minimi
18. Flexor Digiti Minimi Opponens Digiti Minimi, Palmaris Brevis
19. Palmar Interossei
20. Lumbricales
21. Dorsal Interossei
22. Flexor Carpi Ulnaris
23. Flexor Pollicis Brevis, Adductor Pollicis
24. Flexor Pollicis Longus

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