

**THE EFFICACY OF MUSCLE ENERGY TECHNIQUE IN THE
TREATMENT OF CHRONIC MECHANICAL NECK PAIN**

By

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Dissertation submitted in partial compliance with the requirements for the Master's Degree in Technology in the department of Chiropractic at Technikon Natal.

I, Vilash Boodhoo, do declare that the dissertation is representative of my own work.

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DEDICATION

To my family: mum, dad and Varsha.

You created a vision and then helped me realise my dreams. Thank you for your tireless dedication, endless love and for teaching me perseverance and discipline.

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ABSTRACT

The purpose of this study was to determine the efficacy of muscle energy technique in the treatment of chronic mechanical neck pain.

This was a randomized placebo controlled study. Two groups of thirty subjects from Durban and the surrounding areas were selected to participate in the study, which was carried out at the Technikon Natal Chiropractic Day Clinic. Subjects were diagnosed with the condition by the researcher.

Each subject received six treatments within a period of three weeks. Group A received muscle energy technique and de-tuned laser therapy applied to joint fixations. Group B received de-tuned laser therapy applied to the fixated areas.

Subjective assessment was by means of the Short-Form McGill Pain Questionnaire and the Numerical Pain Rating Scale-101. Objective assessment was by means of the digital algometer (The Commander™ Algometer by Jtech Medical Industries) and the Cervical Range of Motion Device. Both the subjective and objective readings were taken prior to the first treatment and a day following the final (sixth) treatment.

A statistically significant improvement was seen from treatment one to treatment six within both groups, for the Short-Form McGill Pain Questionnaire (SFMPQ), the NRS-101 data and the algometer readings. For the cervical ranges of motion, only Group A showed a statistically significant improvement from visit one to visit six in all cervical ranges of motion.

The only statistically significant difference noted between the two groups following the sixth treatment was for the NRS-101 data in favour of Group A.

It was concluded that muscle energy technique may play a role in the management of chronic mechanical neck pain. However, this therapy needs to be researched further.

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CHAPTER ONE

The Introduction

Gore (1998) reported that neck pain is a common problem and that the prevalence of neck pain was 13,8% in a random sample of ten thousand Norwegian people aged 18 to 67 years. In a South African epidemiological study, neck pain formed 57.4% of the presenting complaints to 17 private chiropractic practices in Durban, in the period of February 1994 to the end of April 1994 (Drews, 1994).

Muscle energy technique (MET) is a manual therapy that has been reported as having many clinical uses including increasing joint movement and reducing pain (Greenman, 1996: 93-98, Roberts, 1997). However, these reports by Greenman (1996) and Roberts (1997) were anecdotal, and the authors did not quote studies to support their claims. Furthermore, Aker et al. (1996), who reviewed conservative treatment measures to treat mechanical neck pain, including mobilization, reported that only a few of these treatment measures had been adequately studied through randomised clinical trials to assess their effectiveness.

Brodin (1987) investigated the efficacy of MET in the treatment of lumbar spine pain and found pain reduction statistically greater in the group treated with MET than in the non-treated control group. Furthermore, Brodin (1987) found that lumbar spine mobility increased in those patients whose pain levels reduced. In a study by Schenk et al. (1994), who investigated the effects of MET on cervical range of motion, the MET treated group had a statistically significant increase in left and right cervical rotation compared to a control group. Scott=Dawkins (1996) compared the effectiveness of MET to cervical spine manipulation and found that both therapies were equally effective in the treatment of chronic mechanical neck pain. One of the major flaws of these studies (Brodin, 1987, Schenk et al., 1994, and Scott=Dawkins, 1996) was a non-parametric sample size (samples consisted of thirty subjects and less).

1.1 The Aim of the Study

The purpose of this study was to evaluate the efficacy of Muscle Energy Technique (MET) in the treatment of chronic mechanical neck pain in terms of subjective and objective clinical findings.

1.2 The Objectives of the study

The first objective was to evaluate the efficacy of muscle energy technique combined with de-tuned laser, as opposed to de-tuned laser alone, in the management of chronic mechanical neck pain in terms of the Short-form McGill Pain Questionnaire and the Numerical Pain Rating Scale = 101 Questionnaire.

The second objective was to evaluate the efficacy of muscle energy technique combined with de-tuned laser, as opposed to de-tuned laser alone, in the management of chronic mechanical neck pain in terms of the cervical ranges of motion and the algometer readings.

It should be noted that de-tuned laser was used as a placebo-type therapy. Therefore, this study was considered to be a placebo controlled study.

1.3 The Hypotheses

1.3.1 Hypothesis One

It was hypothesized that muscle energy technique with de-tuned laser would be effective in treating patients with chronic mechanical neck pain.

1.3.2 Hypothesis Two

It was hypothesized that muscle energy technique with de-tuned laser would be more effective than de-tuned laser only in the treatment of chronic mechanical neck pain.

CHAPTER TWO

The Review of the Literature

2.1 Introduction

In this chapter the current literature regarding mechanical neck pain and its treatment is presented. Studies and other literature regarding muscle energy technique are also discussed.

2.2 Incidence, Prevalence and Gender Distribution of Neck Pain

Neck pain is a relatively common complaint affecting both sexes, not only in South Africa but also in numerous other countries around the world. Approximately 57.4% of patients from a sample of one hundred and sixty two patients presenting to 17 private chiropractic practices in Durban, South Africa, from February to April 1994, complained of neck pain (Drews, 1994). During the same period, 54.6% of patients from a similar sample presenting to the Technikon Natal Chiropractic Day Clinic, complained of neck pain (Drews, 1994). In a random sample of ten thousand Norwegian people aged 18 to 67 years, the prevalence of neck pain was found to be 13,8% (Gore, 1998).

A population-based, cross-sectional mailed survey in Canada of two thousand one hundred and eighty four randomly selected Saskatchewan adults aged twenty to sixty nine years, revealed that the lifetime prevalence of neck pain was 66.7%, while the point prevalence was 22.2%. This study also showed that neck pain significantly disabled 4.6% of the adult Saskatchewan population during that time (Cote P; Cassidy JD and Carroll L, 1998). Cote et al. (2000) further reported that 54% of the respondents experienced neck pain at some point in the six months prior to the survey.

The one-year prevalence of neck pain was found to be 15% in men and 17% in women in a sample of eight hundred Chinese people aged thirty years and older living in two housing blocks in Hong Kong (Lau, EM; Sham, A and Wong, KC, 1996).

2.3 Basic Normal Anatomy and Biomechanics of the Cervical Spine

The seven cervical vertebrae and the occiput of the skull make up the osseous structures of the cervical spine (Wiesel SW; Boden SD; Borenstein DG and Feffer HL, 1992). There are five typical cervical vertebra (from C3 to C7) and two

atypical vertebra (the atlas, C1, and the axis, C2) (Greenman PE, 1996: 93-94; Cervical Spine Research Society, 1989:13; Wiesel et al., 1992).

The typical cervical vertebrae are similar in shape. The vertebral bodies are small and projecting from the posterior superior aspect of these bodies are two pedicles. From the pedicles arises a midline lamina, and superior and inferior articular processes. The articular processes form true synovial facet joints which are subject to the same pathologic processes as other synovial joints such as rheumatoid arthritis and osteoarthritis. The superior articular process forms the part of the facet joint that faces anteriorly, while the inferior articular process forms the part of the facet joint that faces posteriorly. The spinous process projects posteriorly from the midline of the lamina (Wiesel et al., 1992: 27).

There are additional paired upward facing projections from the cervical vertebral bodies known as the uncinata processes that form the uncovertebral joints. These are not true synovial joints (Wiesel et al., 1992: 28-29). The intervertebral discs (IVD's) separate the bodies of the vertebrae from C2 to T1 (Wiesel et al., 1992: 29).

Two sets of ligament complexes are found in the cervical spine. The anterior complex of supporting ligaments is made up of the anterior and posterior

ligaments while the posterior ligament complex is made up of the supraspinous ligaments, the interspinous ligaments, the ligamentum flavum and the synovial facet joints. Together with these ligaments, the IVD's provide the cervical spine with a stable yet flexible framework (Cervical Spine Research Society, 1989: 14-15; Wiesel et al., 1992: 29-30).

Neck movements are produced by an elaborate and complex interaction of muscle groups. The extensor muscles include the splenius, semispinalis, longissimus, interspinalis, rectus capitis posterior, trapezius, obliquus capitis superior and the sternocleidomastoid (posterior fibres) muscles. The flexor muscles are the sternocleidomastoid (anterior fibres), longus colli, longus capitis and rectus capitis anterior muscles (Cervical Spine Research Society, 1989: 16; Wiesel et al., 1992: 32-33).

These muscles may undergo four different types of contraction: isometric, concentric isotonic, eccentric isotonic and isolytic. Isometric and concentric isotonic muscle contractions are frequently used to treat joint restrictions (one example is muscle energy technique). The effect of the muscle contraction on the joint is either indirect, by causing hypertonic muscle relaxation, or direct, by concentric muscle contraction that mobilizes a joint directly against its motion barrier (Greenman, 1996: 93-94).

Apart from supporting the skull, the cervical spine provides mobility for numerous daily activities (Greenman, 1996: 175). The cervical spine is particularly vulnerable to injury because stability is sacrificed for mobility (Magee, 1992: 34).

The upper cervical spine from C0-C2 functions as an integrated unit but each segment needs to be assessed individually (Greenman, 1996: 175). The main movement occurring at the occipitoatlantal (C0-C1) junction is flexion and extension. Rolling and sliding form other minimal movements that occur at this joint (Greenman, 1996: 175; Schafer, 1990: 88).

The atlanto-axial (C1-C2) joints are the most mobile joints of the spine (Magee, 1992: 34). The primary motion that occurs at this articulation is rotation (Greenman, 1996: 176; Magee, 1992: 34) which is approximately 50° bilaterally. Flexion-extension is approximately 10° while lateral flexion is approximately 5° (Magee, 1992: 34).

The facet joints of the typical cervical vertebra (C3-C7) face backward and upward at approximately 45° and together with the intervening intervertebral discs allow for flexion, extension and coupled lateral flexion and rotation to the

same side (Greenman, 1996: 176). Flexion-extension movements of the facet joints occur mainly between C5 and C6. The resting position of the cervical spine is slightly extended and the close-packed position is achieved when the facet joints are in complete extension (Magee, 1992: 34).

All the structures of the cervical spine mentioned before become less flexible and more prone to injury as people age. Degenerative changes that occur include the loss of normal surface cartilage in the joints of the cervical spine, tearing or buckling of the ligaments that support the cervical spine, and bone spurs that may press on nerve roots or the spinal cord (Grieve, 1988: 379; Medtronic Sofamor Danek, 2001).

2.4 Causes of Neck Pain

The following are causes of neck pain that should be considered as differential diagnoses for mechanical neck pain according to Edwards et al. (1995:871):

- **Inflammatory causes** – infections, ankylosing spondylitis and other seronegative arthritides, juvenile arthritis, rheumatoid arthritis and polymyalgia rheumatica.

- **Metabolic causes** – osteoporosis (which can lead to fractures), osteomalacia (which can lead to fractures), Paget's disease, gout.
- **Neoplastic causes** – metastases, myeloma, reticulosis, intrathecal tumours.
- **Referred pain from** – angina pectoris, thoracic aortic aneurysm, pancoast tumour, diaphragmatic pathology, pharyngeal pathology, cervical lymphadenopathy, toothache, acromio-clavicular joints dysfunction and shoulder pathology.
- **Miscellaneous** – torticollis.

Neck pain of mechanical origin is usually caused by postural strain, facet joint fixation, facet joint sprain, cervical disc herniation and cervical strain e.g. overstretching or overuse of any of the muscles related to the cervical spine (Gatterman, 1990: 232-242).

According to Medtronic Sofamor Danek (2001), certain parts of the cervical spine start to degenerate as people age. As a result certain structures of the cervical spine like the bones, intervertebral discs, ligaments and muscles become less flexible and more prone to injury. Some of the degenerative changes that cause mechanical-type neck pain include loss of normal surface cartilage in the joints of

the cervical spine, tears or buckling of the ligaments that support the cervical spine and bone spurs that may be pressing on nerve roots or the spinal cord (Grieve, 1988: 379; Medtronic Sofamor Danek, 2001).

With chronic cases of mechanical-type neck pain, the head is carried forward off the line of gravity thus increasing the work for the posterior neck and suboccipital muscles to maintain the normal orientation of the head. This in turn leads to contracture of the suboccipital muscles and approximation and compression of the facet joints. The combination of contracted muscles and compressed joints produces head and neck pain, which may require prolonged treatment (Grieve, 1988: 379).

Data collected from 12907 patients, either from general practices or from the armed services in England, Scotland and Wales, provided evidence of a strong association between neck pain and certain physical activities in the work place. Symptoms of neck pain were most prevalent among male construction workers followed by nurses, armed service members and people who were unemployed. People who worked with their arms above their shoulders for more than one hour per day had a significant increase in symptoms of neck pain, headaches, tiredness or stress (Palmer *et al.*, 2001). This indicated that psychosocial factors and certain occupational physical activities might play a role in the prevalence of neck pain.

2.5 Signs and Symptoms of Mechanical Neck Pain

Patients with mechanical neck pain may present with a variety of symptoms including sharp neck pain, shoulder and arm pain, arm numbness and tingling, a lack of dexterity or even difficulty in walking caused by degenerative spinal changes (Medtronic Sofamor Danek, 2001).

Grieve (1988: 378) outlined the following signs and symptoms of mechanical neck pain:

- Localised and chronic mid-cervical pain with or without arm pain resulting from overstressed mid-cervical segments. This could be due to stiff cervicothoracic segments.
- Chronic advanced spondylotic changes of the lower cervical spine with stiffness, which results in stress on the upper segments. Here the area of hypermobility and hypomobility is distinct.
- Neck pain that gets worse during the day. Neck pain can be characterised by an unpleasant burning quality. The paravertebral musculature is tender to palpation and movement is restricted.
- Unilateral neck or occipital pain, with arm pain.

- Flexion may cause aggravation of posterior cervical pain, while extension may bring about mainly mid-cervical or upper cervical pain.
- Rotation and lateral flexion may be painfully restricted.
- There may be prominence of the upper and middle trapezius muscles.
- Stiffening of segments on any particular side will limit neck movements towards the painful side and the opposite side.

According to Edwards et al. (1995: 871), patients with mechanical neck pain may present with restriction of neck movements and referral of pain to the occiput or shoulders as well as to the neck muscles. According to Gatterman (1990: 80), the patient may also have a painful Kemp's test (Magee, 1992: 274), painful cervical compression test (Gatterman, 1990: 80), or painful lateral compression test (Magee, 1992: 50).

Due to these variety of signs and symptoms of mechanical neck pain, the various treatment approaches of the condition need to be studied through randomised clinical trials (Aker et al., 1996).

2.6 Treatment of Mechanical Neck Pain

2.6.1 Conservative Interventions

Treatment available for mechanical neck pain apart from surgery, includes physical medicine methods (e.g. spray and stretch, laser, electromagnetic treatment, infra-red, acupuncture, traction, exercise and transcutaneous electrical nerve stimulation), manual treatments (including manipulation, mobilization and massage) and education of patients (Aker *et al.*, 1996).

Very few of these conservative measures used in the treatment of mechanical neck pain have been adequately studied through randomised clinical trials to assess their effectiveness (Aker *et al.*, 1996, Gross *et al.*, 1999). However, Gross *et al.* (2000) reported on two randomised controlled trials where electromagnetic therapy produced a significant reduction in mechanical neck pain.

Furthermore, Gross *et al.* (2000) reported on three randomised controlled trials which showed that laser therapy did not differ significantly from placebo treatment, while there was still not enough scientific evidence that existed to determine the effectiveness of other physical medicine modalities.

Therefore, more research needed to be conducted into the efficacy of the above interventions to establish their roles in the management of mechanical neck pain (Aker et al., 1996).

Other nonsurgical treatment options for cervical spine disorders include the use of non-steroidal anti-inflammatory drugs (NSAIDs) and epidural nerve blocks. A common side effect of NSAIDs is irritation of the stomach (Medtronic Sofamor Danek, 2001).

2.6.2 Muscle Energy Technique

Muscle energy technique (MET), a manual therapy that was developed by Fred Mitchell, Sr. an osteopath in the 1940's, involves the voluntary contraction of the patient's muscle in a controlled direction with varying levels of intensity against a counterforce applied by the therapist (Greenman, 1996: 93).

MET is used in clinical practice to restore joint mobility. Here the therapist takes the joint to the motion barrier and the patient is instructed to push against the therapist's resistance thus mobilizing the joint gently (Greenman, 1996: 93).

In MET the main forms of muscle contraction that occur are isometric and concentric isotonic. After an isometric contraction, the muscle can be stretched to a new resting length, thereby equalizing muscle tone and balance between hypertonic/relaxed and agonistic/antagonistic muscles (Greenman, 1996: 94-95).

For this reason MET overlaps with Postisometric Relaxation techniques, where isometric contraction and subsequent stretching of muscle returns muscle to its normal length (Schneider, Dvorak et al., 1988: 10).

However, the element of concentric isotonic contraction of muscle separates MET from Postisometric Relaxation techniques. Concentric isotonic contractions are made against a progressively increasing resistance (counter-force), resulting in increased tone and strength of the muscle. This will also inhibit antagonistic muscle activity if performed throughout the range of motion of the muscle. Concentric isotonic contractions of muscle are also used to mobilize a fixated joint (Greenman, 1996: 94-95).

MET is also reported as being able to reduce localised oedema (Greenman, 1996: 93). Roberts (1997) reported that MET could also be used to reduce pain.

However, the reports by Greenman (1996) and Roberts (1997) were anecdotal and the authors did not quote any trials or studies to support these claims.

A study on the treatment of lumbar pain using MET in a sample of forty-one patients split into either a treatment group or control group (no treatment), revealed that treated patients had a statistically greater reduction in pain than the non-treated group (Brodin, 1987). However, according to Schenk *et al.* (1994), there has been no evidence in the form of published research to support the effectiveness of MET against placebo in the treatment of neck pain.

A controlled clinical trial carried out by Schenk *et al.* (1994) tested the effects of MET against placebo in two groups of volunteers who were all pain free. A cervical range of motion device was used for measurement on patients with reduced cervical range of motion (ROM). The MET treated group showed a significant increase in cervical ROM for both left and right rotation compared to the control group (Schenk *et al.*, 1994). This study, however, was non-parametric as the sample size consisted of eighteen subjects and, therefore,

inferences about the general population group could not be made. Furthermore, this study did not investigate the aspect of pain. Therefore, a study with a larger sample size is needed that investigates the efficacy of MET in the treatment of neck pain.

Scott-Dawkins (1996) compared the effectiveness of cervical spine manipulation to muscle energy technique in the treatment of chronic mechanical neck pain in two groups of fifteen subjects each, with each patient receiving two treatments weekly for three weeks. The manipulation group showed a greater reduction in pain initially while the MET-treated group showed a more gradual improvement over the three-week treatment period. However, after conclusion of treatment, a further three-week follow-up period revealed no statistically significant difference between the two groups (Scott-Dawkins, 1996). This was a non-parametric study as the sample size was fifteen per group and, therefore, inferences about the general population group could not be made. The criteria for patient selection was poorly defined in terms of acute, sub-acute and chronic presentations which supports the need for a trial that does incorporate stronger criteria, together with a placebo control and a larger sample size.

Studies undertaken by Schenk et al. (1994) and Wolfson (1991) investigated the effectiveness of MET as compared to a control group in the treatment of loss of cervical motion and lumbar spine pain respectively. The subjects of the control group underwent the same positioning as the treatment group but these positions were held statically and no MET was performed (Schenk et al., 1994, Wolfson, 1991). There was no evidence that the static positioning of the control group, as described above, was not therapeutic to the patient, which questions the role of this technique used as a placebo-control.

Therefore, a placebo-controlled trial without the positioning of the control group in the same position as the treatment group was needed to determine the efficacy of MET in the treatment of mechanical neck pain.

2.7 Conclusion

There is a lack of knowledge regarding the use of muscle energy technique for the treatment of mechanical neck pain. The shortcomings of previous studies included the absence of a placebo control and small sample sizes. Therefore, considering this and the prevalence of neck pain, a trial with a larger sample size investigating the efficacy of muscle energy technique in the treatment of chronic mechanical neck pain was feasible.

CHAPTER THREE

Materials and Methods

3.1 Introduction

In chapter three the methodology of the study is discussed. A description of the location of the subjective and objective data is given, sampling methods discussed and the interventions described. The methods of analysis of the data are also briefly discussed.

3.2 Measurement and Observation

3.2.1 The data

The data contained in this study were both of the primary and secondary types.

3.2.1.1 The Primary Data

a) Objective data:

The objective data was obtained with the use of a digital algometer, called the Algometer Commander™ and Digitrack Commander™, by Jtech Medical Industries, and the Cervical Range of Motion Instrument (CROM), by Performance Attainment Associates. The digital algometer was used to measure

the patient's pressure-pain threshold and sensitivity over the fixated facet joints, while the CROM was used to evaluate the active cervical spine range of motion. The researcher measured all objective readings.

b) Subjective data:

The subjective data was obtained from the Numerical Pain Rating Scale-101 (NRS 101) and the Short Form McGill Pain Questionnaire. The NRS 101 was used to determine the patient's perception of their level of pain. The Short Form McGill Pain Questionnaire was used to determine the patient's perception of the sensory dimension of their pain. The patient completed both questionnaires.

3.2.1.2 The Secondary Data

The secondary data was obtained from journal articles, books and related Internet sites.

3.2.2 Methods of Measurement

3.2.2.1 Subjective measurement

◦ **Numerical Pain Rating Scale 101 (NRS 101)**

With the NRS 101, the subject had to rate their pain from 0 (equivalent to no pain) to 100 (equivalent to pain as the worst it could be). The subject had to

write down two percentages. The first had to be their pain from 0 to 100 when the pain was at its worst and the second reading had to be their pain from 0 to 100 when the pain was at its least. The average of the two percentages gave an average of that particular subject's pain intensity.

The validity and practicality of the NRS-101 was shown by Jensen et al. (1986) when they did a comparison of six methods of assessing clinical pain intensity. Bolton and Wilkinson (1998) also showed the validity of the NRS Scale. The NRS-101 was reported, by Jensen et al. (1986), to be simple to administer and score in either written or verbal form. The NRS-101 had 101 response options and was therefore more sensitive compared to the Visual Analogue Scale, the 11-point Box Scale, a 6-point Behavioral Rating Scale, a 4-point Verbal Rating Scale and a 5-point Verbal Rating Scale. In addition, Jensen et al. (1986) reported that the NRS-101 was a "wise choice" as it was not age-associated and therefore could measure patients' chronic pain intensity levels for different ages. Bolton and Wilkinson (1998) demonstrated the NRS Scale to be better designed in detecting clinically significant changes than the Visual Analogue Scale, no matter how small those changes were.

- **Short-Form McGill Pain Questionnaire (SFMPQ)**

The Short-Form McGill Pain Questionnaire consisted of 15 descriptors (11 sensory and 4 affective). Each descriptor was rated as follows: mild pain = 1, moderate pain = 2, severe pain = 3 and no pain = 0 (Katz and Melzack, 1999; Melzack, 1987).

This questionnaire was developed for certain research settings when there was little time to obtain information from the subjects and when more information was required than that provided by intensity measures such as the Visual Analogue Scale (Katz and Melzack, 1999). The SFMPQ which has been used in studies involving chronic pain, can be used to assess the sensory, affective and quality dimensions of pain, according to Melzack (1987). Melzack (1987) demonstrated the validity and practicality of the SFMPQ in patients with chronic pain.

3.2.2.2 Objective Measurement

- **The Cervical Range of Motion Instrument (CROM)**

The CROM is a device that is used to measure active cervical flexion, extension, right and left rotation and right and left lateral flexion in subjects with a history of cervical dysfunction. The patients have to be seated during measurement (Rheault et al. 1992).

Rheault et al. (1992) investigated the inter-tester reliability of the CROM and found it to be clinically reliable. Ordway et al. (1997) found that the CROM was a reliable device used clinically to measure cervical flexion and extension as long as the patient's thoracic positioning was standard to minimize the upper thoracic spine movement.

The method of measuring the cervical range of motion was the same as that followed by Rheault et al. (1992):

- The CROM device was placed on the nose bridge and ears and fastened behind the head with Velcro® straps.
- The subject's chair was positioned such that the magnetic field zeroed the dial meter for the rotation component.
- The subject had to sit erect in the chair with the low back against the chair, mid-back away from the chair, arms hanging at the side and feet flat on the floor.
- All the dials were calibrated to zero before measuring the components of active cervical flexion, extension, right and left lateral flexion, and right and left rotation.

- Subjects were asked to follow a horizontal line with their eyes while the researcher measured the rotation component. They were also asked to focus on the line straight ahead of them when measuring the lateral flexion component.
- Each motion component was measured twice and an average reading was recorded.
- Cervical motion directions were tested in the same order for all subjects.

- **The Algometer (Digital Algometer)**

The algometer is a device used for the assessment of pain pressure threshold and treatment results, and is useful in determining tender spots and trigger points (Antonaci et al., 1992; Fischer, 1987). Fischer (1987) demonstrated the reliability and validity of using an algometer to test pain threshold.

The Commander™ Algometer (by JTech Medical Industries) was used to measure the pressure-pain threshold over the articular pillar at the various levels of joint dysfunction as determined by motion palpation of the cervical spine.

The method of obtaining the pressure pain threshold readings was followed similar to the procedure outlined by Livingston et al. (1998):

- The procedure was explained to the subject and he/she was asked to indicate any onset of pain during the procedure.
- The area of joint dysfunction was palpated. The point was documented according to an anatomical landmark for further testing at the last appointment.
- The applicator tip was placed over the articular pillar that was being tested. The force was applied perpendicularly to the skin's surface at a gradually increasing rate. The algometer was removed when the subject acknowledged the onset of pain. A reading was taken from the screen of the algometer and recorded.

All patients were seated for this procedure.

3.3 The Location of the Data

All data was collected by the researcher. The primary data was collected in the form of the NRS-101, Short-Form McGill Pain Questionnaire, algometer readings and the CROM readings. The questionnaires constituted the subjective data while the algometer and the CROM were means of obtaining objective data. All

subjects completed the questionnaires under the supervision of the researcher. All the data was collected prior to the first treatment and a day following the last (sixth) treatment. All consultations were carried out at the Technikon Natal Chiropractic Day Clinic in Durban, South Africa.

3.4 Study Protocol and Design

3.4.1 Object of the study

The purpose of this study was to evaluate the efficacy of muscle energy technique (MET) in the treatment of chronic mechanical neck pain in terms of subjective and objective clinical findings.

The study aimed to contribute to the current body of knowledge regarding chronic mechanical neck pain and identify whether or not this conservative treatment method was effective for the condition.

3.4.2 Sampling procedures

Convenience sampling was used in this study. Posters and advertisements were placed in health shops, pharmacies, local newspapers and community notice boards in the Berea, Overport and Morningside areas to inform people of the study. People with neck related complaints were also be informed of the research study via telephone when they telephoned the Technikon Natal Chiropractic Day Clinic seeking treatment for neck pain.

3.4.3 Criteria for acceptance of subjects

Each potential subject was screened to assess whether they could be considered for the study. Screening consisted of questions concerning the patient's age, the location, duration, and onset of the pain, and the presence of referred pain. If the patient suited the screening algorithm (Appendix K), the patient underwent an initial consultation. The initial consultation included completion of the research information sheet (Appendix A), case history (Appendix D), physical examination (Appendix E) and regional cervical spine examination (Appendix F) as set out by the Technikon Natal Chiropractic Day Clinic. Patients were also motion palpated to assess cervical joint fixations. Motion palpation was reported to be a reliable diagnostic tool in determining the areas of joint fixation in patients with cervical spine pain (Lakhani, 1999).

The following inclusion and exclusion criteria were used during the first consultation by the researcher to further determine whether or not the patient qualified as having chronic mechanical neck pain:

- **Inclusion Criteria**

Patients who met the following inclusion criteria were considered for the study:

1. Patients older than eighteen years of age were considered for this study so that they understood and agreed to what was required of them in the completion of questionnaires.
2. Triano et al. (1992) suggested that spinal pain lasting for more than fifty days be regarded as chronic pain. David et al. (1998) and Fourie (1997) regarded patients with neck pain lasting more than six weeks long as having chronic neck pain. For the purposes of this study, patients who experienced continuous or intermittent episodes of mechanical neck pain for at least forty-two days were considered as having chronic neck pain.
3. Patients who exhibited one or more of the following signs and symptoms of mechanical neck pain, as outlined by Grieve (1988: 378), were accepted into this study:
 - 3.1. Localised chronic cervical pain without arm pain. Subjects with referred pain as a result of myofascial pain and dysfunction syndrome in the neck were included in this study.

- 3.2. Tender paravertebral muscles restricted cervical spine movements,
- 3.3. Unilateral neck pain (patients with bilateral neck pain were excluded),
- 3.4. According to Gatterman (1990: 80), the patient could also have either a painful Kemp's test, painful cervical compression test, or painful lateral compression test.

- **Exclusion Criteria**

Patients who were older than sixty years of age were not considered for this study. This was for comparison to previous studies involving manual therapies for mechanical neck pain.

The following causes of neck pain other than mechanical neck pain according to Edwards et al. (1995: 871) were ruled out:

- 1. Inflammatory – infections, ankylosing spondylitis, juvenile arthritis, rheumatoid arthritis and polymyalgia rheumatica.
- 2. Metabolic – osteoporosis, osteomalacia, Paget's disease, gout.
- 3. Neoplastic – metastases, myeloma, intrathecal tumours.
- 4. Referred pain as a result of – angina pectoris, aortic aneurysm, pancoast tumour, diaphragmatic pathology, pharyngeal pathology, cervical

lymphadenopathy, toothache, acromio-clavicular joint dysfunction and shoulder pathology.

5. Torticollis.

In addition, patients with recent trauma, fractures and referred pain arising from other areas apart from the neck were excluded from the study.

Patients suffering from lateral canal stenosis, central canal stenosis, nerve root entrapment and disc herniations were excluded from the study.

Patients were advised to refrain from taking anti-inflammatories, muscle relaxants and rubifacients or receive any manual therapy (including manipulation, mobilization, and massage) other than MET administered by the researcher for the duration of their participation in the study. Physical therapies (including spray and stretch, electrotherapy, laser, traction, electromagnetic treatment, infrared, acupuncture, exercise and transcutaneous electrical stimulation) and patient education (including ergonomic and postural advice) were also discouraged for the course of this study. Patients who did not comply with these factors were excluded from the study.

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Group A (the experimental group) received muscle energy technique as outlined by Greenman (1996: 97) together with de-tuned laser therapy, as described later applied to the same levels that were mobilized. Group B (the control group) received a placebo-type therapy in the form of de-tuned laser treatment.

3.4.5 Detailed patient procedure and interventions

Patients accepted into this study were required to complete and sign an informed consent form (Appendix D) that gave information regarding the study and explained the procedure of being involved in it. It also gave consent that they would voluntarily participate in the study.

Group A received muscle energy technique applied to all cervical joint fixations in the cervical spine, as determined by motion palpation, according to the method followed by Greenman (1996):

3.4.5.1 Muscle Energy Technique - Typical Cervical Vertebra (C5-C6)

Example (Motion restriction: Extension, right rotation, right lateral flexion):

- a) All patients were supine on the table with the researcher sitting at the head.
- b) The researcher's fingertip of the right index finger was placed on the right articular pillar of C6 to hold the segment so that C5 could be moved upon it.
- c) The researcher's left hand controlled the left side of the patient's head and neck.

- d) The researcher's right finger moved the segment anteriorly so that the neck moved into extension.
- e) The researcher's left hand introduced lateral flexion or rotation of the head and neck to the right, reaching the right rotation or right lateral flexion barrier of motion.
- f) The patient exerted a small isometric effort against the researcher's resisting left hand into forward flexion, left lateral flexion or left rotation.
- g) After 3- to 5- seconds of muscle effort, the patient was asked to relax and the researcher moved the joint to the new restrictive barrier. The process was repeated three to five times and the examiner re-tested the joint for the restrictive barrier each time.

Patients were then asked to lie prone for the administration of the de-tuned laser treatment.

Six treatments were given within a period of three weeks. There was no consistency of intervals between consultations.

3.4.5.2 De-tuned laser procedure

Group B (the control group) and Group A received a placebo-type therapy in the form of de-tuned laser treatment. The laser head was held for a minute on the skin of each of the cervical spine levels that would have been mobilised had they been received MET.

According to Laakso et al. (1994), laser doses above $4\text{w}/\text{cm}^2$ inhibit cell processes and the therapeutic window lies between $0,5$ and $4,0\text{w}/\text{cm}^2$. For the purposes of this research study, laser dosage was set at zero. The laser unit was switched off due to a possible effect of the red light. The patient was unaware of this, as he/she was prone during this session. Therefore, the de-tuned laser therapy was considered as a placebo-type therapy. In effect, Group A received muscle energy technique with placebo therapy, while Group B received placebo therapy only.

3.6 Statistical Analysis

3.6.1 Treatment of the Data

Subjective Data

The ratings for the SFMPQ were added to give a total out of 45 for each recording. The NRS-101 ratings were added together for each recording and

then an average was worked out. This data was then analysed for both groups.

Objective Data

The CROM readings were recorded in degrees for the different motion components.

The algometer readings were taken over the joints that were fixated as determined by motion palpation. All fixations on both sides of the neck in all directions were taken into account. An average pain-pressure threshold reading was calculated for each patient for the different recordings.

The data was then analysed.

3.6.2 Statistical Analysis of the data

The continuous variables were analysed using parametric methods, while categorical variables were analysed using non-parametric methods regardless of the sample size per group.

The Decision Rule

The decision rule for all procedures:

The null hypothesis was rejected at the $\alpha = 0.05$ level of significance if $p < \alpha$ where p was the observed level or probability value. Otherwise, the null hypothesis was accepted at the α level of significance.

Procedure 1.1: Comparison between Group A and Group B with respect to categorical variables (Inter-group Comparison)

The Mann-Whitney U-test was used for inter-group comparison with respect to the SFMPQ. The null hypothesis stated that there was no difference between Group A and Group B with respect to the variable of comparison at the $\alpha = 0.05$ level of significance. The alternative hypothesis stated that there was a difference at the $\alpha = 0.05$ level of significance.

Procedure 1.2: Comparison between Group A and Group B with respect to continuous variables (Inter-group Comparison)

The continuous variables, NRS-101 Questionnaire, algometer data and the CROM data, were analysed using the unpaired t-test.

The null hypothesis states that there was no difference between Group A and Group B with respect to the variable of comparison at the $\alpha = 0.05$ level of significance. The alternative hypothesis states that there was a difference at the α level of significance.

Procedure 2.1: Comparison between related samples within Group A with respect to categorical variables (Intra-group Comparison)

The SFMPQ was analysed using the Wilcoxon Signed Ranks test for intra-group comparison with the specified level of significance (α) set at 0.05. The null hypothesis states that there was no improvement within the group at the α level of significance. The alternative hypothesis states that there was an improvement within the group at the α level of significance.

Procedure 2.2: Comparison between related samples within Group A with respect to continuous variables (Intra-group Comparison)

The paired t-test was used to evaluate the results from related samples. The null hypothesis states that there was no improvement between the two related samples being tested at the α level of significance. The alternative hypothesis states that there was an improvement between the two related samples being tested at the α level of significance.

Procedure 3.1: Comparison between related samples within Group B with respect to categorical variables (Intra-group Comparison)

The SFMPQ for the placebo group was analysed using the Wilcoxon Signed Ranks test for intra-group comparison with the specified level of significance (α) set at 0.05. The null hypothesis states that there was no improvement within the group when being compared at the α level of significance. The alternative hypothesis states that there was an improvement within the group when being compared at the α level of significance.

Procedure 3.2: Comparison between related samples within Group B with respect to continuous variables (Intra-group Comparison)

The paired t-test was used to evaluate the results from related samples within Group B. The null hypothesis states that there was no improvement between the two related samples being tested at the α level of significance. The alternative hypothesis states that there was an improvement between the two related samples being tested at the α level of significance.

Procedure 4: Comparison using barcharts and pie-charts

All results from the statistical analysis were plotted on bar charts and pie charts where necessary to give a visual overview of the comparison between Group A and Group B. Barcharts were also plotted from the average readings.

3.6.3.1 The Statistical Package

The statistical package used was the SPSS Version 9.0 for Windows®. All data was entered and analysed via this package.

CHAPTER FOUR

THE RESULTS

4.1 Introduction

All the results following the statistical analysis are presented in this chapter. The subjective and objective findings are presented. The subjective data includes data from the SFMPQ and the NRS-101. The objective data includes data from the algometer readings and the CROM measurements. Both the subjective and objective data were collected prior to the first treatment and following the sixth treatment.

Intra- and inter-group comparisons were carried out for Group A and Group B. A brief summary of the demographic data (age distribution, gender distribution and duration of neck pain) is also included.

4.2 Solving the subproblems

4.2.1 The First Subproblem

The first objective was to evaluate the efficacy of muscle energy technique with de-tuned laser, as opposed to de-tuned laser alone, in the management of

chronic mechanical neck pain in terms of the **subjective** clinical findings (SFMPQ and the NRS-101 Questionnaire).

The hypothesis for the experimental and control groups were:

Ho: there was no difference between the two groups with regards to the **subjective** clinical findings on analysis of the data.

Ha: there was a difference between the two groups with regards to the **subjective** clinical findings on analysis of the data.

4.2.2 The Second Subproblem

The second objective was to evaluate the efficacy of muscle energy technique with de-tuned laser, as opposed to de-tuned laser alone, in the management of chronic mechanical neck pain in terms of the **objective** clinical findings (cervical range of motion instrument and the algometer).

The hypothesis for the experimental and control groups were:

Ho: there was no difference between the two groups with regards to the **objective** clinical findings on statistical analysis of the data.

Ha: there was a difference between the two groups with regards to the **objective** clinical findings on statistical analysis of the data.

4.3 The analysed data

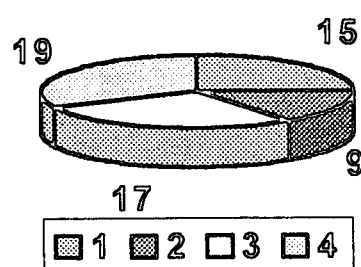
The null hypothesis was rejected and the alternative hypothesis accepted at the α level of significance ($\alpha = 0.05$) if $p < 0.05$.

4.3.1 Demographic Data

Table 4.1: Patient data

AGE DISTRIBUTION	Group A	Group B	Total
18 – 28	6	9	15
28 – 38	4	5	9
38 – 48	4	13	17
48 – 60	16	3	19
AVERAGE AGE	43.5	35	39.25
GENDER DISTRIBUTION			
Females	23	18	41
Males	7	12	19
DURATION OF NECK PAIN			
6 weeks to 3 months	6	6	12
3 months to 6 months	7	8	15
6 months to 1 year	1	4	5
> 1 year	16	12	28

Fig 4.1 Pie chart illustrating the Age Distribution of the sixty subjects



1 = Ages 18 – 28

2 = Ages 28 – 38

3 = Ages 38 – 48

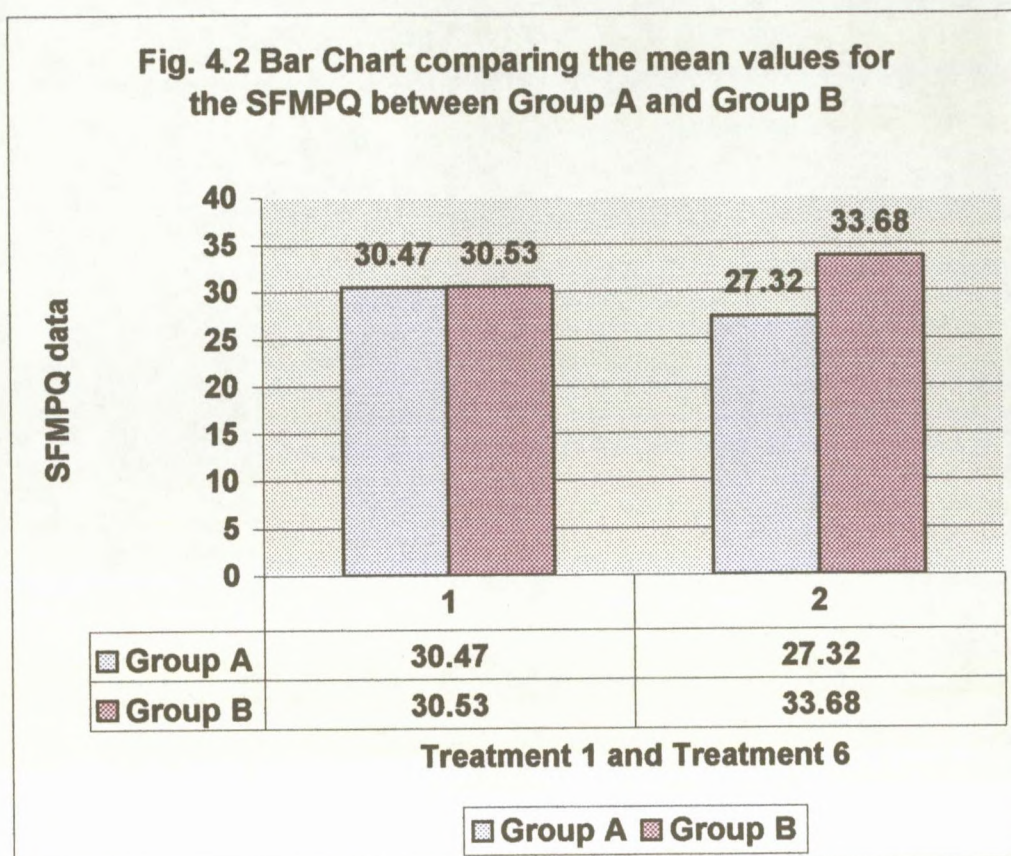
4 = Ages 48 - 60

4.3.2 Results of Statistical Analysis

Results of Mann-Whitney U-test comparing categorical variables between Group A and Group B

Table 4.2: Two Sample analysis of SFMPQ

	GROUP A (MET)		GROUP B (Placebo)
VARIABLE	MEAN	P VALUE	MEAN
SFMPQ-visit 1	30.47	0.988	30.53
SFMPQ-visit 6	27.32	0.157	33.68



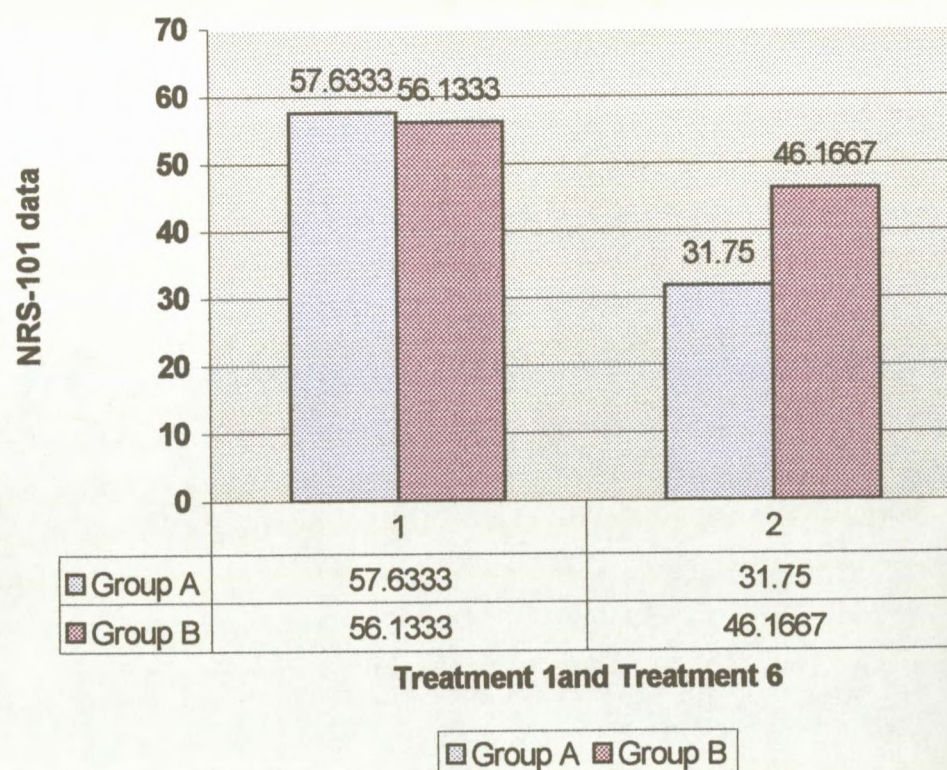
There was no statistically significant difference between the two groups for the Short-Form McGill Pain Questionnaire (SFMPQ) taken prior to the first visit as $p \geq 0.05$. There was no statistically significant difference between the two groups for the SFMPQ taken following the last visit as $p \geq 0.05$. Therefore the null hypothesis was accepted for both visit comparisons.

Results of the Unpaired t-test comparing the continuous variables between Group A and Group B

Table 4.3: Two sample analysis of NRS-101 data

VARIABLE	GROUP A		p-VALUE	GROUP B	
	S.D.	MEAN		S.D.	MEAN
NRS-101 visit 1	19.1257	57.6333	0.763	19.1882	56.1333
NRS-101 visit 6	25.7065	31.7500	0.025	22.8539	46.1667

Fig. 4.3 Bar Chart Comparing the mean values for NRS-101 data between Group A and Group B



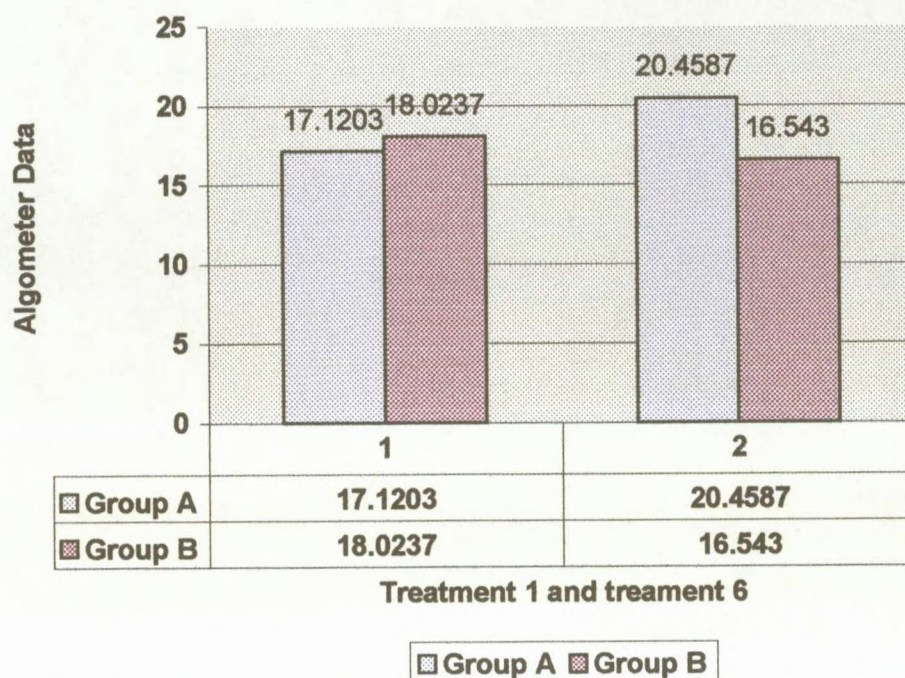
There was no statistically significant difference between the two groups for the NRS-101 questionnaire, prior to the first visit, as $p \geq 0.05$ (α). The null hypothesis was accepted.

There was a statistically significant difference between the two groups for the NRS-101 questionnaire following the sixth visit as $p < 0.05$ (α). The null hypothesis was rejected and the alternative hypothesis was accepted.

Table 4.4: Two sample analysis of the Algometer data

VARIABLE	GROUP A		p-VALUE	GROUP B	
	S.D.	MEAN		S.D.	MEAN
Algometer 1 st rec.	7.9812	17.1203	0.709	10.5205	18.0237
Algometer 2 nd rec.	8.9428	20.4587	0.109	9.6708	16.5430

Fig. 4.4 Bar chart comparing the mean values of Algometer readings between Group A and Group B



There was no statistically significant difference between the two groups for the algometer readings taken prior to the first visit as $p \geq 0.05$ (α). There was no statistically significant difference in the algometer readings following the sixth visit between the two groups as $p \geq 0.05$ (α). Therefore the null hypothesis was accepted regarding the algometer readings for the two comparisons.

Table 4.5: Two sample analysis of the CROM measurements

VARIABLE	GROUP A		p-VALUE	GROUP B	
	S.D.	MEAN		S.D.	MEAN
CROM visit 1 flex.	12.4155	68.8333	0.684	14.0509	70.2333
CROM visit 6 flex.	13.1920	73.8000	0.295	11.9669	70.3667
CROM visit 1 ext.	14.4997	48.9667	0.130	15.7074	54.9667
CROM visit 6 ext.	14.5918	57.1000	0.913	13.6057	56.7000
CROM visit 1 LFL	9.3157	40.9000	0.077	10.8202	45.6000
CROM visit 6 LFL	8.1116	44.8333	0.897	9.7653	45.1333
CROM visit 1 LFR	9.2242	39.1333	0.043	10.4274	44.4000
CROM visit 6 LFR	6.4833	41.3667	0.265	9.5047	43.7333
CROM visit 1 RL	13.7467	70.1667	0.567	14.0754	72.2333
CROM visit 6 RL	14.5515	74.3333	0.601	10.6822	72.6000
CROM visit 1 RR	14.3012	70.0500	0.341	12.9925	74.2333
CROM visit 6 RR	12.8913	74.2333	0.591	10.8871	72.5667

There were no statistically significant differences between the two groups regarding cervical flexion, extension, lateral flexion to the left (LFL), rotation to the left (RL) and rotation to the right (RR) prior to the first visit, as $p \geq 0.05$. Therefore the null hypothesis is accepted for these comparisons.

There were no statistically significant differences between the two groups regarding cervical flexion, extension, lateral flexion to the left (LFL), rotation to the left (RL) and rotation to the right (RR) following the sixth visit, as $p \geq 0.05$. Therefore the null hypothesis is accepted for these comparisons.

There was a statistically significant difference between the two groups regarding lateral flexion to the right prior to the first visit as $p < 0.05$. Therefore, the null hypothesis is rejected for this comparison and the alternative hypothesis is accepted.

No statistically significant difference in lateral flexion to the right following the sixth treatment was noticed as $p \geq 0.05$. Therefore, the null hypothesis is accepted as $p \geq 0.05$.

Results of the Wilcoxon Signed Ranks Test for Categorical Variables

Table 4.6: Intra-group analysis of Short-Form McGill Pain Questionnaire.

GROUP A				GROUP B			
VISIT	MEAN		p- VALUE	VISIT	MEAN		p- VALUE
MG1-MG6	14.41	12.20	0.002	MG1-MG6	9.97	10.17	0.009

MG = Short-Form McGill Pain Questionnaire

There was a statistically significant difference in the readings of the Short-Form McGill Pain Questionnaire seen from the first to the last visit in Group A and in Group B, indicating that the patient's perception of the quality of pain experienced was reduced in both groups. Therefore, the null hypothesis was rejected and the alternative hypothesis accepted for this comparison within both groups.

Results of the paired t-tests for continuous variables for both Group A and Group B

Table 4.7: Intra-group analysis of NRS-101 data

GROUP A				GROUP B			
VISIT	MEAN		p- VALUE	VISIT	MEAN		p- VALUE
NS1-NS6	57.6333	31.7500	0.000s	NS1-NS6	56.1333	46.1667	0.001s

NS = Numerical Pain Rating Scale-101

There was a statistically significant difference from visit one to visit six in the NRS-101 data in Group A and in Group B as $p < 0.05$. Thus the null hypothesis was rejected and the alternative hypothesis accepted.

This indicates that the patient's perception of the pain intensity was reduced in both groups.

Table 4.8: Intra-group analysis of the algometer readings for Group A and Group B

GROUP A				GROUP B			
VISIT	MEAN		p- VALUE	VISIT	MEAN		p- VALUE
AL1-AL6	17.1203	20.4587	0.000s	AL1-AL6	18.0237	16.5430	0.015

Both groups showed a statistically significant improvement in pain-pressure threshold from visit 1 to visit 6 as $p < 0.05$. Thus the null hypothesis was rejected and the alternative hypothesis accepted.

Thus the tenderness over the facet joints was reduced in both groups over the treatment period.

Table 4.9: Intra-group analysis of the CROM measurements with respect to each group

VISIT	GROUP A			GROUP B		
	MEAN		p-VALUE	MEAN		p-VALUE
FI1-FI6	68.8333	73.8000	0.003	70.2333	70.3667	0.915
Ex1-Ex6	48.9667	57.1000	0.001	54.9667	56.7000	0.189
Lfl1-Lfl6	40.9000	44.8333	0.013	45.6000	45.1333	0.698
Lfr1-Lfr6	39.1333	41.3667	0.042	44.4000	43.7333	0.655
RI1-RI6	70.1667	74.3333	0.011	72.2333	72.6000	0.860
Rr1-Rr6	70.0500	74.2333	0.010	73.4333	72.5667	0.603

Key: FI = Flexion, Ex = Extension, Lfl = lateral flexion to the left, Lfr = lateral flexion to the right, RI = Rotation to the left, Rr = Rotation to the right.

Group A showed a statistically significant improvement in all ranges of cervical motion from visit 1 to visit 6 as $p < 0.05$. Group B did not show a statistically significant improvement in any of the ranges of cervical motion from visit 1 to visit 6 as $p \geq 0.05$. Thus the null hypothesis was rejected and the alternative hypothesis accepted for Group A. Therefore, that the cervical range of motion was increased in patients from Group A.

CHAPTER FIVE

DISCUSSION

5.1 Introduction

In this chapter the results of the objective and subjective data presented in chapter four are discussed. There will also be a discussion of the limitations of the study.

5.2 Discussion of the Subjective Measurement Results

5.2.1 The Short-Form McGill Pain Questionnaire

Intra-group Analysis

The Wilcoxon's signed rank test was used to analyse the SFMPQ data. There was a statistically significant difference in the data of the SFMPQ seen from the first to the last visit within both groups ($p < 0.05$). Therefore, there was a significant improvement in the patients' perceptions of the sensory dimension of pain within each group.

Inter-group Analysis

Results of the two sample analysis of the SFMPQ using the Mann-Whitney U-test, revealed that there was no statistically significant difference between the two groups for the Short-Form McGill Pain Questionnaire prior to the first treatment or following the last visit. The p-value prior to the first treatment for the SFMPQ was 0.988 ($p \geq 0.05$). The p-value following the last treatment for the SFMPQ was 0.157 ($p \geq 0.05$). Thus, there was no statistically significant difference between the two groups in the patients' sensory perceptions of pain prior to treatment one and following treatment six.

5.2.2 Numerical Pain Rating Scale***Intra-group Analysis***

Results of the one sample analysis of the NRS-101 data for Group A and Group B, using the paired t-test, revealed that there was a statistically significant change from treatment one to treatment six within both groups (Group A – $p = 0.000$; Group B – $p = 0.001$). This suggests that the patient's perception of pain intensity was reduced within both groups from treatment one to treatment six.

Inter-group Analysis

Two sample analysis of the NRS-101 data revealed that there was no statistically significant difference in the NRS-101 data between Group A and Group B ($p = 0.763 \geq 0.05$) prior to the first treatment.

Two sample analysis of the NRS-101 data revealed that there was a statistically significant difference in the NRS-101 data between Group A and Group B ($p = 0.025 < 0.05$) following the last treatment. The results showed that between treatment one and treatment six, Group A showed a greater reduction in the perception of pain intensity than Group B.

5.3 Discussion of Objective measures**5.3.1 Algometer Readings*****Intra-group Analysis***

One sample analysis of the algometer readings using the paired t-test to analyse the algometer readings revealed that both groups showed a statistically significant improvement in pain-pressure threshold from visit one to visit six ($p = 0.000 < 0.05$). Therefore, there was a statistically significant reduction in the tenderness over the fixated facet joints in both groups.

Inter-group Analysis

Two sample analysis of the algometer data taken prior to the first treatment, using the unpaired t-test, revealed that there was no significant difference between the two groups in the pain-pressure threshold ($p = 0.709 \geq 0.05$). Therefore, there was no difference between the two groups, in the tenderness over the facet joints prior to the first treatment.

Analysis of the algometer data following the sixth treatment using the unpaired t-test, revealed that there was no significant difference between the two groups in the pain-pressure threshold ($p = 0.109 \geq 0.05$). Therefore, there was no difference between the two groups, in the tenderness over the facet joints following the sixth treatment.

Since there was a statistically significant reduction in the tenderness over the joints within both groups and there was no difference between the groups following the sixth treatment, it can be deduced that muscle energy technique with de-tuned laser reduced the patients' tenderness to a similar extent as de-tuned laser alone.

5.3.2 Cervical Range of Motion Measurements

Intra-group Analysis

One sample analysis of the CROM measurements using the paired t-test revealed a statistically significant improvement in all ranges of cervical motion from visit one to visit six in Group A ($p < 0.05$).

One sample analysis of the CROM measurements using the paired t-test did not reveal a statistically significant improvement in any of the ranges of cervical motion from visit one to visit six in Group B ($p \geq 0.05$).

Inter-group Analysis

Two sample analysis of the CROM measurements revealed no statistically significant differences between the two groups regarding cervical flexion, extension, lateral flexion to the left, rotation to the left and rotation to the right prior to the first treatment ($p \geq 0.05$). There was, however, a statistically significant difference between the two groups in right lateral flexion prior to the first treatment ($p < 0.05$).

Two sample analysis of the CROM measurements revealed no statistically significant differences between the two groups for all ranges of cervical motion following the last treatment ($p \geq 0.05$).

Even though muscle energy technique with de-tuned laser improved the patients' cervical ranges of motion, the treatment was still not statistically significantly different from de-tuned laser in improving cervical ranges of motion.

5.4 Limitations

5.4.1 Sampling

Most patients who participated in the study responded to advertisements placed in local newspapers and notice boards. It was assumed that the sample group was a reflection of the majority of people suffering with mechanical neck pain.

There were no unbiased independent observers in this study to administer the treatment to either of the groups.

5.4.2 Treatment

An undergraduate chiropractic student administered muscle energy technique to the patients. Furthermore, an undergraduate chiropractic student collected the data. It may be wise to assume that a qualified practitioner would have been better adapted and experienced than a student to administer treatment and collect data.

At least two patients from Group B and one patient from Group A dropped out of the study because of resolution of symptoms before the sixth treatment. Therefore, the second set of data could not be collected from these patients following the sixth treatment and their results had to be excluded. Another three patients had to be included in the study to have a sample of sixty subjects.

All patients were treated six times within a period of three weeks. However, there were no standardised intervals between successive treatment sessions.

There was lack of a suitable placebo treatment in this study.

5.4.3 Subjective questionnaires

Some patients had difficulty in understanding the questionnaires and this could have biased the study. Patients complained that not all of the responses available on the SFMPQ described their pain. Patients also had difficulty in quantifying their pain in percentages for the NRS-101 questionnaire.

English was not the first language of one of the patients. However, this patient reported no difficulty in understanding the questionnaires or treatment technique.

It was possible that some patients may have reported improvement in pain perception to please the researcher.

5.4.4 Objective Measures

An algometer was used to measure the tenderness over the facet joints. Tenderness from surrounding neck muscles was not taken into account in the study design. It should be noted that all patients had some degree of cervical myofascial pain dysfunction syndrome. Therefore, in future studies of this type, patients need to be screened for the severity of their cervical myofascial pain dysfunction syndrome. It is the opinion of the researcher that patients with severe myofascial pain dysfunction syndrome should be excluded from the study.

Complete isolation of neck movements from thoracic spine movements could not be guaranteed when using the CROM. However, data was collected from both groups in the same way and this may rule out any discrepancies between Groups A and B.

5.5 Comparison of the results with other research

It was difficult to compare this study to other studies as the effectiveness of muscle energy technique combined with de-tuned laser compared to de-tuned

laser therapy alone had not been found in journals, textbooks, internet searches, MANTIS search or SABINET search. Furthermore, a placebo-controlled study of the efficacy of muscle energy technique in the treatment of chronic mechanical neck pain was not done previously.

A study by Schenk et al. (1994) testing the effects of muscle energy technique on cervical range of motion in eighteen asymptomatic volunteers, revealed that in all six ranges of cervical motion, the MET treated group demonstrated increased range while the control group showed little or no change following seven treatments over a four week period. The increases in right and left rotation between the two groups were statistically significant. Similarly in this study, Group A showed a statistically significant improvement in all ranges of cervical motion from visit one to visit six. However, compared to the study by Schenk et al. (1994), a sample of sixty symptomatic randomly selected patients were used. Six treatments were administered over a three-week period while Schenk et al. (1994) administered seven treatments over a four-week period. Therefore it is difficult to make a direct comparison between these two studies.

When muscle energy technique was compared to spinal manipulation by Scott-Dawkins (1996) in a randomly selected sample of thirty patients, it was found that the MET treated group had a reduction in pain over a three-week treatment period. However, there was no statistically significant difference between the two groups after the three-week treatment period or after the three-week follow-up period with regards to pain. Similarly, in this study, there was a statistically significant reduction in pain within both groups after six treatments with MET combined with de-tuned laser. There was no statistically significant difference between the two groups after the treatment period with regards to the SFMPQ. However according to the NRS-101 data Group A had a reduction in pain intensity that was statistically significant when compared to Group B. Even though the same subjective measurements were used in the study by Scott-Dawkins (1996) and this study, a direct comparison could not be made because the sample sizes were different and this study was a placebo controlled study.

In a study by Brodin (1987) testing the effects of MET compared to a control in a sample of forty-one patients, it was found that the after three weeks of treatment, the pain reduction in the MET treated group was statistically greater than in the

non-treated control group. A comparison to Brodin (1987) could not be made as all subjects in Brodin's study complained of pain from one or two lumbar segments and not multiple segments, while this study accepted subjects with pain from one or multiple cervical levels.

5.6 Summary

Subjectively both groups showed a statistically significant reduction in pain intensity. There was also a statistically significant difference between the two groups with regards to pain intensity following all six treatments with Group A responding better than Group B. Both groups also showed statistically significant improvement with regards to their perception of the sensory dimension of pain from treatment one to treatment six. However, there was no difference between the two groups with regards to their perception of the sensory dimension of pain following the sixth treatment.

Objectively, both groups showed a statistically significant improvement in pain-pressure threshold tested over the cervical facet joints from treatment one to treatment six. There was no statistically significant difference between the two groups following the sixth treatment.

The MET treated group showed a statistically significant improvement in all ranges of motion from visit one to visit six, whereas the placebo controlled group showed no statistically significant difference in any of the ranges of motion from visit one to visit six. However it should be noted that there was no difference between the two groups prior to the first treatment or following the sixth treatment session.

The limitations that were discussed should be taken into consideration for further research in this field.

CHAPTER SIX

Recommendations and Conclusions

6.1 Recommendations

To enhance the reliability of future studies the following recommendations are made.

Inclusion and exclusion criteria:

The inclusion and exclusion criteria used to accept suitable patients into this study could have been more streamlined. The cause, onset, amount of joint dysfunction and the associated complaints could also have been taken into account when considering subjects for the study. As suggested by Schenk *et al.* (1994), all subjects should have had similar limitations in neck movement allowing for subjects to be treated in the same fashion. There could have been a limit to the duration of time that the patient was experiencing the pain for, as some patients had neck pain for about six weeks while others were experiencing pain for about 10 years or more.

Double blind study, Data collection and Measurement:

Since the researcher had knowledge of the pre-treatment results this may have influenced the researcher's collection of the post-treatment results. It is therefore recommended that an unbiased independent observer should carry out such data collection.

An unbiased independent observer should also carry out the placebo or treatment interventions.

The data was collected prior to the first treatment and then a day following the last (sixth) treatment. However, some patients were feeling completely better before the sixth treatment. The methodology should have taken this into account and readings should have been taken a day after their symptoms resolved. This would may have reduced the number of dropouts from the study, as three patients who were feeling better did not complete the entire course of treatment. Additional patients were seen to cover up for the number of dropouts.

Furthermore, some patients who were feeling worse with the treatment did not complete the entire course of treatment. To compensate for this, data could have been collected at the third visit to give an indication of the initial effects of the treatment.

It is the opinion of the researcher that data should have also been collected at a one-month follow-up, because of the nature of chronic pain (Wiesel, 1992) and to assess the long-term effects of muscle energy technique.

Difficulties arose while using the digital algometer. A constant pressure needed to be used by the researcher against the spine with the applicator tip. However, any small decrease in pressure caused the algometer to stop reading and it re-calibrated to zero even before the patient experienced pain. This lead to more tenderness and a possible error in the true reflection of the patients' pain thresholds.

The number of treatments:

A study should be carried out to determine the optimal number of treatments needed to treat a patient with chronic mechanical neck pain using muscle energy technique. Perhaps a longer treatment period may show different results from those in this study. The time period between treatments, which was not standardised in this study, also needs to be researched. The approximate time interval between successive treatments was three days and the aim was to treat a patient twice weekly for three weeks. The lack of standardised intervals between successive treatments may have had an impact in outcome of treatment.

6.2 Conclusion

There were sixty patients who completed this study. Once the subjects were screened for suitability to the study, they underwent a full case history, physical examination and a cervical spine regional examination as set out by the Technikon Natal Chiropractic Day Clinic. All subjects that were accepted into this study had to comply with the exclusion and inclusion criteria. All sixty patients were diagnosed with chronic mechanical neck pain.

Patients were then randomly allocated to either the treatment (muscle energy technique treatment) or placebo laser groups (Group A and Group B respectively). Six treatments were given within a period of three weeks.

Data was collected prior to the first consultation and a day following the final (sixth) consultation. Data was then analysed using the SPSS Version 9.0 for Windows®.

Both groups showed a statistically significant improvement from treatment one to treatment six with regards to the Short-Form McGill Pain Questionnaire (SFMPQ) readings, the NRS-101 data and the algometer readings.

In terms of the cervical ranges of motion, only Group A showed a statistically significant improvement in all ranges of cervical motion from visit 1 to visit 6.

There was no statistically significant difference between the two groups following the sixth treatment with regards to the SFMPQ, algometer readings and cervical ranges of motion. It was evident from the data that Group A responded favourably to the muscle energy technique with de-tuned laser treatment with regards to the pain intensity, as there was a statistically significant difference between the two groups for the NRS-101 questionnaire data following the sixth treatment.

This study therefore suggests that muscle energy technique may reduce the pain intensity and increase the cervical ranges of motion in patients with chronic mechanical neck pain. However, further research needs to be done in this field.

REFERENCES

- Aker, P.D., Gross, A.R., Goldsmith, C.H. and Peloso, P. 1996. Conservative Management of Mechanical Neck Pain: Systematic Overview and Meta-analysis. British Medical Journal. Vol. 313: 1291-1296p.
- Antonaci, F., Bovim, G., Fasano, M.L., Bonamico, L. and Shen, J.M. 1992. Pain Threshold in Humans. A study with the Pressure Algometer. Functional Neurology. Vol. 4(7): 283-288p.
- Bolton, J.E. and Wilkinson, R.C. 1998. Responsiveness of Pain Scales: A comparison of Three Pain Intensity Measures in Chiropractic Patients. Journal of Manipulative and Physiological Therapeutics. Vol.21(1): 1-7p.
- Brodin, H. 1987. Inhibition-Facilitation Technique for Lumbar Pain Treatment. Manual Medicine. Vol. 3(1): 24-26p.
- Cote, P., Cassidy, J.D. and Carroll, L. 1998. The Saskatchewan Health and Back Pain Survey. The Prevalence of Neck Pain and Related Disability in Saskatchewan Adults. Spine. Vol.23(15): 1689-1698p.

Cote, P., Cassidy, J.D. and Carroll, L. 2000. The factors associated with neck pain and its related disability in the Saskatchewan population. Spine. Vol.25(9): 1109-1117p.

David, J., Modi, S., Aluko, A.A., Robertshaw, C. and Farebrother, J. 1998. Chronic Neck Pain: A Comparison of Acupuncture Treatment and Physiotherapy. British Journal of Rheumatology. Vol. 37(10): 1118-1122p.

Drews, E.R. 1994. A Study of Demographic and Epidemiological Factors of Private Chiropractic Practices and a Chiropractic Teaching Clinic. Master's Diploma in Technology: Chiropractic, Technikon Natal, Durban, South Africa. 163p.

Edwards C.R.W., Bouchier I.A.D., Haslett C., Chilvers E.R. 1995. Principles and Practice of Medicine. Seventeenth Edition. Churchill Livingstone Inc. 1203p. ISBN: 0443056072.

Fischer, A.A. 1987. Pressure Threshold Measurement for Diagnosis of Myofascial Pain and Evaluation of Treatment Results. The Clinical Journal of Pain. Vol. 2: 207-214p. Raven Press, New York.

Fourie, T.M. 1997. The Value of Therapeutic Exercise in the Management of Chronic Mechanical Cervical Spine Conditions. Master's Degree in Technology: Chiropractic, Technikon Natal, Durban, South Africa.

Gatterman, M.I. 1990. Chiropractic Management of Spine Related Disorders. Baltimore: Williams and Wilkins. 437p. ISBN: 0-683-03438-3.

Gore, D.R. 1998. The Epidemiology of Neck Pain. Available from: <http://www.medscape.com/Medscape/OrthopSportsMed/journal/1998/v02.n05/mos4567.gore/mos4567.gore-01.html>: [Accessed 11 August 2000].

Greenman, P. 1996. Principles of Manual Medicine. Second Edition. Baltimore: Williams and Wilkins. 572p. ISBN: 0-683-03558-4.

Grieve, G.P. 1988. Common Vertebral Joint Problems. Second Edition. Edinburgh: Churchill Livingstone, Longman Group Limited. 787p. ISBN: 0-443-03365-x.

Gross, A.R., Aker, P.D. Goldsmith, C.H., Peloso, P. 1999. Physical medicine modalities for neck disorders. The Cochrane Library. Issue 3. ISSN: 1469-493X.

Jensen, M.P., Karoly, P. and Brave, S. 1986. The Measurement of Clinical Pain Intensity: A Comparison of Six Methods. Pain. Vol. 27: 117-126p.

Katz, J. and Melzack, R. 1999. Measurement of Pain. Surgical Clinics of North America. Vol.79(2): 231-252p.

Livingston, T., Bernadi, D. and Carroll, M. 1998. Algometer™ Commander & Digitrack™ Commander: User's Manual. JTech Medical Industries.

Laakso, E.L., Cramond, T., Richardson, C., Galligan, J.P. 1994. Plasma ACTH and Beta-Endorphin Levels in Response to Low Level Laser Therapy (LLLT) for Myofascial Trigger Points. Laser Therapy. Vol. 6: 133-142p.

Lakhani, E. 1999. The efficacy of motion palpation used as a post-adjustive assessment tool in the cervical spine to monitor patient progress. Master's degree in Technology: Chiropractic, Technikon Natal, Durban, South Africa. 117p.

Lau, E.M., Sham, A., Wong, K.C. 1996. The Prevalence of and Risk Factors for Neck Pain in Hong Kong Chinese. Journal of Public Health Medicine. Vol. 18 (6): 396-399p.

Magee, D.J. 1992. Orthopaedic Physical Assessment. Second Edition.

W.B. Saunders Company: U.S.A. 655p. ISBN: 0-7216-4344-2.

Medtronic Sofamor Danek 2001. Nonsurgical Treatment Options [online].

Available from: http://www.neckreference.com/nonsurgical_treatment_options.html [Accessed 15 October 2001].

Melzack, R. 1987. The Short-form McGill Pain Questionnaire. Pain. Vol. 30: 191-197p.

Ordway, N.R., Seymour, R., Donelson, R.G., Hojnowski, L., Lee, E. and Edwards, W.T. 1997. Cervical sagittal range-of-motion analysis using three methods. Cervical range-of-motion device, 3space, and radiography. Spine. Vol.22(5): 501-508.

Palmer, K.T., Walker-Bone, K., Griffin, M.J., Syddall, H., Pannett, B., Coggon, D. and Cooper, C. 2000. Prevalence and occupational associations of neck pain in the British population. Scandinavian Journal of Work and Environmental Health. Vol.27(1): 49-56p.

Rheault, W., Albright, B., Byers, C., Franta, M., Johnson, A., Skowronek, M., Dougherty, R. 1992. Intertester Reliability of the Cervical Range of Motion Device. Journal of Orthopaedic Sports Physical Therapy. Vol. 15(3): 147-150p.

Roberts, B.L. 1997. Soft Tissue Manipulation: Neuromuscular and Muscle Energy Techniques. Journal of Neuroscientific Nursing. Vol. 29(2): 123-127p.

Schafer, R.C., Faye, L.J. 1990. Motion Palpation and Chiropractic Technic – Principles of Dynamic Chiropractic. Second Edition. The motion palpation institute: California. 426p. ISBN: 0924889-00-4.

Schenk, R., Adelman, K., Rouselle, J. 1994. The Effects of Muscle Energy Technique on Cervical Range of Motion. Journal of Manual and Manipulative Therapy. Vol. 2(4): 149-155p.

Schneider, W., Dvorak, J., Dvorak, V., Tritschers, T. 1988. Manual Medicine Therapy. New York: Georg Thieme Verlag Medical Publishers Inc. 148p. ISBN: 3-13-713901-5.

Scott-Dawkins, C.A. 1996. The Comparative Effectiveness of Adjustments versus Mobilisation in Chronic Mechanical Neck Pain. Master's Degree in Technology: Chiropractic, Technikon Natal, Durban, South Africa. 112p.

The Cervical Spine Research Society, Editorial Committee 1989. The Cervical Spine. Second Edition. Philadelphia: J.B. Lippincott Company. 881p. ISBN: 0-397-50827-1.

Triano, J.J., Hondras, A., McGregor, M. 1992. Differences in Treatment History with Manipulation for Acute, Subacute, Chronic and Recurrent Spine Pain. Journal of Manipulative and Physiological Therapeutics. Vol.15 (1): 24-30p.

Wiesel, S.W., Boden, S.C., Borensteini, D.G., Feffer, H.L. 1992. Neck Pain. Second Edition. Charlottesville: Michie. 491p. ISBN: 0-87473-823-7

Wolfson, M.D. 1991. The effect of muscle energy technique for increasing flexion of the lumbar spine. Master's thesis, D'Youville College, Buffalo, New York.

ADDENDUM A

TECHNIKON NATAL CHIROPRACTIC DAY CLINIC
CASE HISTORY

Patient: _____ Date: _____
file #: _____ X-Ray#: _____
Age: _____ Sex: _____ Occupation: _____
Intern: _____ Signature: _____

FOR CLINICIAN'S USE ONLY

Initial visit clinician: _____ Signature: _____

Case History:

Examination:

Previous:

Current:

X-Ray Studies:

Previous:

Current:

Clinical Path. lab:

Previous:

Current:

Case Status:

PTT:

Conditional:

Signed Off:

Final Sign out:

Recommendations:

Intern's Case History

1. Source of History:
2. Chief Complaint: (patient's own words)

3. Present Illness:

- ▶ Location
- ▶ Onset
- ▶ Duration
- ▶ Frequency
- ▶ Pain (Character)
- ▶ Progression
- ▶ Aggravating Factors
- ▶ Relieving Factors
- ▶ Associated S & S
- ▶ Previous Occurrences
- ▶ Past Treatment and Outcome

4. Other Complaints:

5. Past Medical History:

- ▶ General Health Status
- ▶ Childhood Illnesses
- ▶ Adult Illnesses
- ▶ Psychiatric Illnesses
- ▶ Accidents/Injuries
- ▶ Surgery
- ▶ Hospitalizations

6. Current health status and life-style:

- ▶ Allergies
- ▶ Immunizations
- ▶ Screening Tests
- ▶ Environmental Hazards (Home, School, Work)
- ▶ Safety Measures (seat belts, condoms)
- ▶ Exercise and Leisure
- ▶ Sleep Patterns
- ▶ Diet
- ▶ Current Medication
- ▶ Tobacco
- ▶ Alcohol
- ▶ Social Drugs

7. Immediate Family Medical History:

- ▶ Age
- ▶ Health
- ▶ Cause of Death
- ▶ DM
- ▶ Heart Disease
- ▶ TB
- ▶ Stroke
- ▶ Kidney Disease
- ▶ CA
- ▶ Arthritis
- ▶ Anaemia
- ▶ Headaches
- ▶ Thyroid Disease
- ▶ Epilepsy
- ▶ Mental Illness
- ▶ Alcoholism
- ▶ Drug Addiction
- ▶ Other

8. Psychosocial history:

- ▶ Home Situation and daily life
- ▶ Important experiences
- ▶ Religious Beliefs

9. Review of Systems:

- ▶ General
- ▶ Skin
- ▶ Head
- ▶ Eyes
- ▶ Ears
- ▶ Nose/Sinuses
- ▶ Mouth/Throat
- ▶ Neck
- ▶ Breasts
- ▶ Respiratory
- ▶ Cardiac
- ▶ Gastro-intestinal
- ▶ Urinary
- ▶ Genital
- ▶ Vascular
- ▶ Musculoskeletal
- ▶ Neurologic
- ▶ Haematologic
- ▶ Endocrine
- ▶ Psychiatric

TECHNIKON NATAL CHIROPRACTIC DAY CLINIC

PHYSICAL EXAMINATION

Patient: _____ File#: _____ Date: _____
Clinician: _____ Signature: _____
Intern: _____ Signature: _____

1. VITALS

Pulse rate: _____

Respiratory rate: _____

Blood pressure: R _____ L _____

Temperature: _____

Height: _____

Weight: _____

2. GENERAL EXAMINATION

General Impression: _____

Skin: _____

Jaundice: _____

Pallor: _____

Clubbing: _____

Cyanosis (Central/Peripheral): _____

Oedema: _____

Lymph nodes - Head and neck:
- Axillary:
- Epitrochlear:
- Inguinal:

Urinalysis: _____

3. CARDIOVASCULAR EXAMINATION

1) Is this patient in Cardiac Failure ?

2) Does this patient have signs of Infective Endocarditis ?

3) Does this patient have Rheumatic Heart Disease ?

Inspection - Scars
- Chest deformity:
- Precordial bulge:
- Neck -JVP:

Palpation: - Apex Beat (character + location):
- Right or left ventricular heave:
- Epigastric Pulsations:
- Palpable P2:
- Palpable A2:

- Pulses: - General Impression:
 - Radio-femoral delay:
 - Carotid:
 - Radial:
- Dorsalis pedis:
 - Posterior tibial:
 - Popliteal:
 - Femoral:
- Percussion: - borders of heart
- Auscultation: - heart valves (mitral, aortic, tricuspid, pulmonary)
 - Murmurs (timing, systolic/diastolic, site, radiation, grade).

4. RESPIRATORY EXAMINATION

1) Is this patient in Respiratory Distress ?

- Inspection - Barrel chest:
 - Pectus carinatum/cavinatum:
 - Left precordial bulge:
 - Symmetry of movement:
 - Scars:
- Palpation - Tracheal symmetry:
 - Tracheal tug:
 - Thyroid Gland:
 - Symmetry of movement (ant + post)
 - Tactile fremitus:
- Percussion - Percussion note:
 - Cardiac dullness:
 - Liver dullness:
- Auscultation - Normal breath sounds bilat.:
 - Adventitious sounds (crackles, wheezes, crepitations)
 - Pleural frictional rub:
 - Vocal resonance - Whispering pectoriloquy:
 - Bronchophony:
 - Egophony:

5. ABDOMINAL EXAMINATION

1) Is this patient in Liver Failure ?

- Inspection - Shape:
 - Scars:
 - Hernias:
- Palpation - Superficial:
 - Deep = Organomegally:

- Masses (intra- or extramural)
- Aorta:

Percussion - Rebound tenderness:

- Ascites:
- Masses:

Auscultation - Bowel sounds:

- Arteries (aortic, renal, iliac, femoral, hepatic)

Rectal Examination

- Perianal skin:
- Sphincter tone & S4 Dermatome:
- Obvious masses:
- Prostate:
- Appendix:

6. G.U.T EXAMINATION

External genitalia:

Hernias:

Masses:

Discharges:

7. NEUROLOGICAL EXAMINATION

Gait and Posture

- Abnormalities in gait:
- Walking on heels (L4-L5):
- Walking on toes (S1-S2):
- Rombergs test (Pronator Drift):

Higher Mental Function

- Information and Vocabulary:
- Calculating ability:
- Abstract Thinking:

G.C.S.:

- Eyes:
- Motor:
- Verbal:

Evidence of head trauma:

Evidence of Meningism:

- Neck mobility and Brudzinski's sign:
- Kernigs sign:

Cranial Nerves:

I Any loss of smell/taste:
Nose examination:

II External examination of eye:

- Visual Acuity:
- Visual fields by confrontation:

Pupillary light reflexes = Direct:
= Consensual:

Fundoscopy findings:

III Ocular Muscles:
Eye opening strength:

IV Inferior and Medial movement of eye:

V a. Sensory - Ophthalmic:
- Maxillary:
- Mandibular:
b. Motor - Masseter:
- Jaw lateral movement:
c. Reflexes - Corneal reflex
- Jaw jerk

VI Lateral movement of eyes

VII a. Motor - Raise eyebrows:
- Frown:
- Close eyes against resistance:
- Show teeth:
- Blow out cheeks:
b. Taste - Anterior two-thirds of tongue:

VIII General Hearing:
Rinnes = L: R:
Webers lateralisation:
Vestibular function - Nystagmus:
- Rombergs:
- Wallenbergs:
Otoscope examination:

IX & Gag reflex:
X Uvula deviation:
Speech quality:

XI Shoulder lift:
S.C.M. strength:

XII Inspection of tongue (deviation):

Motor System:

a. Power
- Shoulder = Abduction & Adduction:
= Flexion & Extension:
- Elbow = Flexion & Extension:
- Wrist = Flexion & Extension:

- Forearm = Supination & Pronation:
- Fingers = Extension (Interphalangeals & M.C.P's):
- Thumb = Opposition:
- Hip = Flexion & Extension:
- = Adduction & Abduction:
- Knee = Flexion & Extension:
- Foot = Dorsiflexion & Plantar flexion:
- = Inversion & Eversion:
- = Toe (Plantarflexion & Dorsiflexion):

- b. Tone
- Shoulder:
 - Elbow:
 - Wrist:
 - Lower limb - Int. & Ext. rotation:
 - Knee clonus:
 - ankle clonus:

- c. Reflexes
- Biceps:
 - Triceps:
 - Supinator:
 - Knee:
 - Ankle:
 - Abdominal:
 - Plantar:

Sensory System:

- a. Dermatomes
- Light touch:
 - Crude touch:
 - Pain:
 - Temperature:
 - Two point discrimination:

- b. Joint position sense
- Finger:
 - Toe:

- c. Vibration:
- Big toe:
 - Tibial tuberosity:
 - ASIS:
 - Interphalangeal Joint:
 - Sternum:

Cerebellar function:

Obvious signs of cerebellar dysfunction:

- = Intention Tremor:
- = Nystagmus:
- = Truncal Ataxia:

Finger-nose test (Dysmetria):
Rapid alternating movements (Dysdiadochokinesia):
Heel-shin test:
Heel-toe gait:
Reflexes:
Signs of Parkinsons:

8. SPINAL EXAMINATION:(See Regional examination)

Obvious Abnormalities:
Spinous Percussion:
R.O.M:
Other:

9. BREAST EXAMINATION:

Summon female chaperon.

Inspection - Hands rested in lap:
- Hands pressed on hips:
- Arms above head:
- Leaning forward:

Palpation - masses:
- tenderness:
- axillary tail:
- nipple:
- regional lymph nodes:

ADDENDUM C

TECHNIKON NATAL CHIROPRACTIC DAY CLINIC
REGIONAL EXAMINATION - CERVICAL SPINE

Patient: _____ File: _____

Date: _____ Intern/Resident: _____

Clinician: _____ Sign: _____

OBSERVATION:

Posture
Swellings
Scars
Discolouration
Hair Line
Bony & Soft Tissue Contours

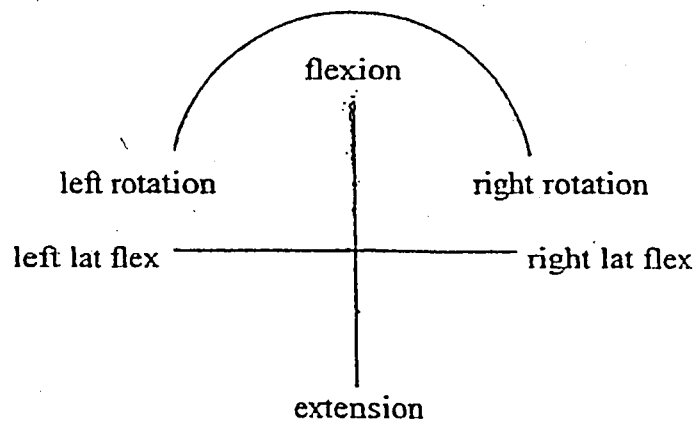
Shoulder position:

Left:
Right:
Muscle spasm
Facial expression

RANGE OF MOTION:

Flexion (45°):
L/R Rotation (70°):

Extension (70°):
L/R Lat Flex (45°):



PALPATION:

Lymph Nodes
Thyroid Gland

Trachea

ORTHOPAEDIC EXAMINATION:

Tenderness

Trigger Points:

SCM
Scalenii
Post Cervicals

Trapezius
Lev Scap

Doorbell sign
Kemp's test
Cervical distraction
Halstead's test
Hyperabduction test
Shoulder abduction test

Cervical compression
Lateral compression
Adson's test
Costoclavicular test
Eden's test
Shoulder depression test

Dizziness rotation test
Brachial plexus tension

Lhermitte's sign

NEUROLOGICAL EXAMINATION:

Dermatomes	Left	Right	Myotomes	Left	Right	Reflexes	Left	Right
C2			C1			C5		
C3			C2			C6		
C4			C3			C7		
C5			C4					
C6			C5					
C7			C6					
C8			C7					
T1			C8					
			T1					

VASCULAR:

	Left	Right
Blood Pressure		
Carotid arts.		
Subclavian arts.		
Wallenberg's test		

MOTION PALPATION & JOINT PLAY:

Left: Motion Palpation:
Joint Play:

Right: Motion palpation:
Joint Play:

Basic Exam: Shoulder:
Case History:

ROM: Active:
Passive:
RIM:
Orthopaedic/Neuro/
Vascular:
Observ/Palpation:

Upper Thoracics:
Motion Palpation:
Joint Play:

Basic Exam: Thoracic Spine:
Case History:

ROM: Motion Palp:
Active:
Passive:
Orthopaedic/Neuro/
Vascular:
Observ/Palpation:

ADDENDUM D

RESEARCH INFORMATION SHEET

Dear Patient,

Title of Study: The therapeutic efficacy of "muscle energy technique" in the treatment of chronic mechanical neck pain.

Welcome to the Technikon Natal Chiropractic Day Clinic, Durban. This research project forms part of the requirement for completion of my Master's Degree in Technology: Chiropractic. I, Vilash Boodhoo, will be conducting the study, while Dr. H. Kretzmann will be supervising.

The study aims to determine an effective treatment for chronic mechanical neck pain and involves two types of therapies, one of which is a placebo control treatment. You will be randomly allocated to either the treatment group or control group. Prior to any treatment given, you will be questioned extensively on your neck pain and your health in general. A thorough physical examination will be conducted, you will be required to complete questionnaires, and measurements will be taken at certain intervals over the treatment period. Please try to be as accurate as possible when completing the questionnaires and rating scales.

Should you decide to participate in the study, kindly refrain from taking certain forms of medication (e.g. anti-inflammatories, muscle relaxants and/or topical rubs) or undergoing other treatment for your condition during the period of the study – including, neck exercises, electromagnetic treatment, infrared, acupuncture, traction, electrotherapeutic treatment, massage, sprays and spinal manipulation.

Management will involve approximately six treatments over a three-week period.

Treatment is free of charge.

You can rest assured that all information disclosed would be kept strictly confidential.

Should you require any further information pertaining to this study, please do not hesitate to ask. I will provide additional information where possible.

I would like to take this opportunity to thank you for your co-operation. Your participation in this study will certainly aid in contributing to the current body of knowledge on this subject which will eventually benefit numerous people including you.

Yours sincerely,

Mr. Vilash Boodhoo

Date: _____

Short-form McGill Pain Questionnaire (SF-MPQ)

Ronald Melzack (1984)

Date: _____ File no.: _____ Visit no: _____

Patient name: _____

	NONE 0	MILD 1	MODERATE 2	SEVERE 3
THROBBING				
SHOOTING				
STABBING				
SHARP				
CRAMPING				
GNAWING				
HOT-BURNING				
ACHING				
HEAVY				
TENDER				
SPLITTING				
TIRING-EXHAUSTING				
SICKENING				
FEARFUL				
PUNISHING-CRUEL				

Numerical Rating Scale - 101 Questionnaire

Date: _____ File no: _____ Visit no: _____

Patient name: _____

Please indicate on the line below, the number between 0 and 100 that best describes the pain you experience when it is at its worst. A zero (0) would mean "no pain at all", and one hundred (100) would mean "pain as bad as it could be".

Please write only one number.

Please indicate on the line below, the number between 0 and 100 that best describes the pain you experience when it is at its least. A zero (0) would mean "no pain at all" and one hundred (100) would mean "pain as bad as it could be".

Please write only one number.

ADDENDUM G

Patient Name:

File number:

Treatment Number	Date	CROM Readings
(1)		Left rot: Right Rot: Left lat. Flex: Right lat. Flex: Flexion: Extension:
(6)		Left rot: Right rot: Left lat. Flex: Right lat. Flex: Flexion: Extension:

INFORMED CONSENT FORM

(To be completed in duplicate by patient /subject)

Date : _____

Title of Research Project : _____

Name of Patient : _____

Name of Supervisor : _____

Name of Research Student : _____

Please circle the appropriate answer

- | | | | |
|----|---|-----|----|
| 1. | Have you read the research information sheet? | Yes | No |
| 2. | Have you had an opportunity to ask questions regarding this study? | Yes | No |
| 3. | Have you received satisfactory answers to your questions? | Yes | No |
| 4. | Have you had an opportunity to discuss this study? | Yes | No |
| 5. | Have you received enough information about this study? | Yes | No |
| 6. | Whom have you spoken to? _____ | Yes | No |
| 7. | Do you understand the implications of your involvement in this study? | Yes | No |
| 8. | Do you understand that you are free to withdraw from this study? | Yes | No |
| | a) at any time | Yes | No |
| | b) without having to give any a reason for withdrawing, and | Yes | No |
| | c) without affecting your future health care. | Yes | No |
| 9. | Do you agree to voluntarily participate in this study | Yes | No |

Please Print in block letters:

Patient /Subject Name: _____ Signature: _____

Parent /Guardian Name: _____ Signature: _____

Witness Name: _____ Signature: _____

Research Student Name: _____ Signature: _____

ADDENDUM I

Patient name:

File number:

Treatment number	Date	Algometer Readings	
		Left – (Level)	Right – (Level)
(1)			
(6)			

ADDENDUM J

Screening algorithm for study on the treatment of Chronic Mechanical Neck Pain.

(Questions to be asked over the telephone or once the patient presents to the chiropractic day clinic. This will be before commencing an initial consultation)

How old is the patient?

If older than 18 and younger than 60



Where is the pain?

Pain located in the region of the neck and/or trapezius muscle will be considered for this study.



How long has the pain been troubling the patient?

The patient must have been experiencing pain for about 42 to 50 days or more to be considered for this study.



Has there been any trauma?

Patients who had recent trauma i.e. within the past 50 days, will not be included in the study.