# The relative effectiveness of chiropractic manipulation to the level of main segmental nerve supply as opposed to dry needling in the treatment of muscles with myofascial trigger points.

A dissertation in partial compliance with the requirements for a Master's Degree in Technology in the Department of Chiropractic at Technikon Natal.

By

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I solemly declare this is my own work in compilation and execution

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# DEDICATION

This research is dedicated to my closest family and friends. Thank-you all for your emotional support and thank-you for your financial support throughout my student career.

## ABSTRACT

Myofascial trigger points are a common problem for patients as well as physicians. According to some authors Myofascial Pain Syndromes encompass the largest group of unrecognised and under-treated medical disorders. At present, needling techniques seem to be most effective in treating myofascial trigger points, however, many chiropractors claim that manipulation alone is sufficient for trigger point amelioration. The aim of this study was to determine the effectiveness of chiropractic manipulation to the level of main segmental nerve supply versus dry needling in the treatment of selected muscles with myofascial trigger points.

Extensive advertising was undertaken to acquire subjects for the study. The subjects were examined for recognised signs and symptoms of active myofascial trigger points.

The following criteria were taken into consideration before accepting patients into the study:

1.Patients were between 18 and 75 years of age.

2.Patients suffering from any systemic or local pathology were not included in the study.

3.If contraindications to manipulations were suspected on examination, the patient was not included in the study.

4.Conditions other than myofascial trigger points were not treated in the study.

5.Patients were forbidden to take any analgesics or receive any manual therapy throughout the programme.

A sample size of thirty patients, which were taken from people residing in the greater Durban area, were randomly divided into two groups of fifteen patients each. Group 1 received a chiropractic manipulation to the level of main segmental nerve supply to the affected muscle. Group 2 received dry needling deactivation of active trigger points.

Patients received four treatments within a two-week period and were required to come in for a one-month follow-up evaluation.

Subjective information concerning patient progress was collected with three questionnaires: The Numerical Pain Rating Scale 101, The Short Form McGill Pain Questionnaire and The CCMC Neck Disability Index. These were completed prior to the first, fourth treatments and at the follow-up consultation.

Objective information was gathered with the aid of a CROM cervical range of motion goniometer and a Wagner Force Dial algometer. Readings were taken prior to all consultations.

The data was analysed using Wilcoxon's paired signed rank test for intra-group analysis and Mann-Whitney U test for inter-group analysis. The statistical level of significance was set at 5% for both tests.

In this study both groups showed significant improvement in terms of pain reduction and a decrease in disability. A cervical range of motion comparison was insignificant, although both groups mean cervical range of motion increased. From the statistical evidence gathered no discernable difference could be shown between the two treatment protocols. Both treatments were similar in their level of effectiveness. However, trends in results suggest that Group 1 showed more subjective long-term benefits. Similarly, Group 2 seemed to demonstrate slightly more improvement objectively. Dry needling has previously been proven more effective than placebo for treating myofascial trigger points (Jones 1994). Because manipulation has shown significantly similar results to dry needling in this study it may be fair to surmise that manipulation to the main level of segmental nerve supply to a muscle with myofascial trigger points is also more effective than placebo for this condition.

## TABLE OF CONTENTS

## LIST OF APPENDICES

## LIST OF TABLES

# CHAPTER ONE

# INTRODUCTION

## 1. 1 Introduction

Myofascial trigger points are extremely common and become a distressing part of almost everyone's life at one time or another (Travell and Simons, 1983:5). Sola (1955) described the condition as poorly understood, with response to treatment often poor and unpredictable. According to Skootsky et-al (1989) Myofascial Pain Syndromes encompass the largest group of unrecognised and under-treated acute and chronic medical disorders, deemed the most overlooked cause of disability in clinical practice. Despite remarkable advances in modern medical care, a void still exists in understanding, evaluating and managing common musculoskeletal aches and pains (Bruce, 1990). Currently there is no information available to clarify the role of spinal manipulative therapy in the treatment of Myofascial Pain Syndromes. This study will contribute further information to this subject.

## 1. 2 Objectives of the Study

The purpose of this study was to investigate the relative effectiveness of chiropractic manipulation to the level of main segmental nerve supply versus dry needling in the treatment of selected muscles with myofascial trigger points, in terms of subjective and objective clinical findings.

The first objective was to determine the relative effectiveness of chiropractic manipulation to the level of main segmental nerve supply and dry needling in terms of subjective clinical findings in the treatment of selected muscles with myofascial trigger points.

The second objective was to determine the relative effectiveness of chiropractic manipulation to the level of main segmental nerve supply and dry needling in terms of objective clinical findings in the treatment of selected muscles with myofascial trigger points.

The third objective was to interpret the data from the subjective and objective findings in order to determine which of the treatment protocols is more effective treatment for myofascial pain syndrome.

# CHAPTER TWO

# REVIEW OF RELATED LITERATURE

## 2. 1 Introduction

The purpose of this review of related literature is to summarise the theories and facts surrounding Myofascial Pain Syndrome and its treatment. Currently there is no information available to clarify the role of spinal manipulative therapy in the treatment of Myofascial Pain Syndromes. This study will contribute further information to this subject.

## 2.2 Aetiology

### 2. 2. 1 Direct causes of trigger point development

Travell and Simons (1983:3) explain that a "myofascial trigger point is a hyper-irritable locus within a taut band of skeletal muscle, located in the muscle tissue and/or its associated fascia." The mechanical stresses which tend to cause acute myofascial trigger points include wrenching movements, motor vehicle accidents, falls, dislocations, or a direct blow on the muscle (Travell, 1955). According to Auleciems (1995) trigger points are microscopic lesions resulting from overuse, disuse, or misuse of a muscle or group of muscles. Trigger points are activated directly by acute overload, overwork fatigue, direct trauma, and by chilling (Travell and Simons, 1983:14). According to Baldry (1989:40), the activation of trigger points may occur gradually, for example when a muscle is subjected to repeated episodes of minor trauma or is repeatedly overloaded. Baldry (1989:40) also cites unusual exercise as a main cause of trigger point genesis.

### 2. 2. 2 **Indirect causes of trigger point development**

Sola et-al (1955) describes trigger points as weak points in the muscle or fascia that are more sensitive to stress-induced change thus remaining dormant until a period of emotional or physical stress, when they become active.

Trigger points are activated indirectly by other trigger points, arthritic joints, visceral disease and emotional distress (Travell and Simmons, 1983:14). Goldenberg (1986) found depression to be associated with fibrositis. 71% of the patients participating in Goldenberg's study suffered from depression. However Goldenberg (1987) also states that this condition is not simply a psychologically linked disorder and patients with fibrositis do not generally improve with psychotherapy. Gelb (1980) also recognises a psychological component to fibrositis development and management, but states that there are physical and thus treatable causes apart from these aspects.

According to Gelb (1980) and Sola (1981) physical and emotional strain, insomnia, trauma, exposure to cold or dampness and some systemic disorders are likely to cause myofascial trigger points. These stimuli are, however, moderated by factors such as genetics, personality and conditioning (Sola, 1981).

Good (1950) recognises the effect that emotional stress, worry and anxiety may have, but states that less importance should be placed on these aspects of the condition. Good (1950) also claims that doctors are to blame for increasing the patient's mental stress by being unable to provide a diagnosis to the condition.

Good (1951) and Yunus et-al (1981) both summarise the aetiology of the condition as follows; septic foci, allergic reactions, climatic conditions (sudden weather and temperature changes), endocrine dysfunction, psychological factors, trauma and autonomic dysfunction. Electrolyte and vasomotor imbalance are also included.

According to Donaldson, Nelson and Shulz (1998) dysregulation in the gama motorneuron circuitry is proposed as one mechanism to explain the development of trigger point activity in myofascial pain syndrome.

### 2. 2. 3 **Mechanisms of trigger point development**

Awad (1973); Travel and Simons (1983:32-37); Baldry (1989:41) and Gatterman (1990:291) propose and agree on the following explanation of trigger point genesis:- "Trigger points develop in muscles that are acutely or chronically strained. Disruption of the sarcoplasmic reticulum results in calcium release which results in sustained contraction of the muscle fibers, which produce the taut bands associated with trigger points. The initial damage results in disruption of small blood vessels and the release of platelets resulting in sensitising of the surrounding nerves. Contractures develop as a result of the sustained contraction, which also results in vasoconstriction and ischemia which, ultimately causes pain. Central nervous system interpretation of pain results in further reflex muscle spasm and a self perpetuating local muscular condition is created which is painful, resists stretching and results in decreased range of motion and generalized disability".

## 2. 3 **Prevalence**

According to Travell and Simons (1983:5) myofascial trigger points are a common condition. Latent trigger points are more common than active trigger points (Travell and Simons, 1983:5). Individuals of any age or sex can develop myofascial trigger points (Travell and Simons, 1983:13). In a study by Sola et-al (1955) among 200 asymptomatic young adults he found latent trigger points in shoulder girdle muscles of 54% of the females and 45% of the males. Active trigger points were found in 5% of subjects. In recent estimates the prevalence of this condition, in the USA range from 3 to 6 million people, at any one time (Goldenberg, 1987).

According to a study by Gelb (1980), it was found that 71% of a healthy general population of dental patients suffered from chronic pain, of these 43% had headaches, 17% had neck aches and 11% had both. The chronic pain referred to by Gelb included myofascial trigger points.

Talaat, Dibany and Garf (1986) did a study of the effectiveness of physical therapy for patients with myofascial pain syndrome. Clinical evaluation of 120 patients revealed marked male preponderance and a greater prevalence during the third decade.

## 2. 4 **Perpetuating factors**

Travell and Simons (1983:103-105), Baldry (1989:49) and Gatterman (1990:287) highlight some of the perpetuating factors of myofascial trigger points. Murphy (1989) states that without correction of the perpetuating factors it may be impossible to resolve the

patient's problem. In some patients, elimination of these factors results in complete amelioration without any further treatment of the muscles necessary.

Biomechanical aberrations from skeletal asymmetry, a short leg or upper arms, a hemi-pelvis, structural scoliosis, a Morton's foot structure, excessive pronation or supination and joint dysfunction, may all perpetuate the genesis of myofascial trigger points (Travell and Simons, 1983:103-105).

Deficiencies in vitamins B1, B6, B12 and C as well as folic acid, potassium and iron may be detrimental to normal muscle metabolism and predispose trigger point development and perpetuation (Travell and Simons, 1983:103-155 and Gatterman, 1990:287). According to research done by Morgan (1995) vitamin and mineral deficiency does not enhance trigger point development or perpetuation.

Hypometabolism due to hypothyroidism, hypouricaemia and hypoglcemia and any condition that impairs metabolism, like hypoxia or anemia, also contribute towards trigger point formation (Travell and Simons, 1983:103-155 and Gatterman, 1990:287).

Other perpetuating factors include allergies, fatigue and cold, damp weather, hypothermia, prolonged bed rest or immobilisation (Travel and Simons, 1983:103-155 and Gatterman, 1990:287).

## 2. 5 **Pathology**

Travell and Simmons (1983:6-7) quote Gowers, Llewellyn and Jones who conclude that trigger points are a result of inflammation, resulting localized oedema and hyperplasia of connective tissue, but this was not substantiated in subsequent studies. Schade is also

quoted (Travell and Simons, 1983:7) for his postulation that, trigger point formation was due to increased viscosity of muscle colloid. Subsequent German biopsy studies revealed non-specific changes by light microscope (Travel and Simons, 1983:7).

Bengtsson et-al (1986) examined seventy-seven muscle biopsies from 57 patients with primary fibromyalgia and 17 biopsies from 9 healthy controls. Forty- two biopsies from patients were deemed normal or border-line, while thirty-five showed discreet pathological changes including degeneration, regeneration, inflammatory infiltrates, ragged red fibres and moth eaten fibres. Bengtsson et-al (1986) deemed these changes (although not sufficient to constitute a diagnostic test for primary fibromyalgia) as an indicator that this condition has an organic basis. Later studies showed reduced high-energy phosphate levels in painful muscles of patients with primary fibromyalgia (Bengtsson et-al, 1986).

Travel and Simons (1983:7-8) and Baldry (1989:43) both quote Adwad, Fassbender and Wegner who reported ultra-microscopic findings during biopsy showing abnormalities in the contractile elements of muscle tissue. Adwad (1973) observed abnormally elongated sarcomeres, large accumulations of blood platelets and degranulating mast cells. Adwad (1973) concluded that his findings were indicative of a traumatic aetiology and were not interpreted as an inflammatory process.

Brendstrup et-al (1957) found that fibrosistic muscle showed increased concentration of acid mucopolysaccharides, water and chloride. Brenstrup claimed that the firmer feel of fibrosistic muscle bands is due to oedema. Good (1950) maintains the condition is a result of disturbed circulation.

Alarcon et al. (1998) did immunohistological and molecular studies using snap frozen deltoid muscle tissue samples from 10 patients with chronic fibromyalgia and from 10 healthy control subjects. Attempting to determine whether serotonin and pain modulating peptides were present in fibromyalgic muscle tissue, tissue specimens were examined using immunohistological methods using specific primers as well as antibodies. No differences between the fibromyalgic patients and controls could be detected in the muscle tissue by immunohistochemistry. According to Alarcon et al. (1998) this study showed that serotonin and neuropeptides are not produced in the muscle of patients with fybromyalgia, and therefore do not appear to be involved in the peripheral induction of pain in chronic myofascial pain syndromes.

Emberg et-al. (1999) did a study of 35 patients, either suffering from fibromyalgia or localised temporomandibular myofasciitis, investigating serotonin levels in the masseter muscle and thus determining its role in the modulation of local pain or allodynia. Results showed that serotonin is present in the human masseter muscle and that if levels are higher (as with the fibromyalgic patients) it is associated with pain and allodynia.

## 2. 6 **Clinical Presentation**

### 2. 6. 1 Types of trigger points

According to Baldry (1998:37) there are potential, active and latent myofascial trigger points. Potential myofascial trigger points are no more than a few millimeters in diameter (Travell and Simons, 1983:4). A potential myofascial trigger point will be slightly tender to palpation, whereas firm palpation of active and latent trigger points evokes an involuntary flexion withdrawal (Baldry, 1998:37).

An active myofascial trigger point's nociceptors have undergone sufficient trauma-induced sensitization and activation to cause a zone of referral pain once stimulated by pressure or stretch, while latent myofascial trigger points nociceptors although sensitized, have not reached painful activation levels (Baldry, 1998:37-38).

### 2. 6. 2 **Characteristics of activated trigger points**

According to Baldry (1998:88) activated myofascial trigger points have the following characteristics;

1. Trigger points may occur in muscles, tendons, joint capsules, ligaments, the periosteum and skin.
2. Trigger points may be latent or active.
3. Neural hyperactivity causes both active and latent trigger points to be exquisitely tender to palpation, evoking an involuntary flexor withdrawal from the patient called the "jump sign".
4. Active trigger points may cause both local and/or referred pain.
5. Each muscle has its own characteristic specific pattern of pain referral from trigger points contained in it.
6. The spontaneous pattern of pain complained of by a patient may sometimes be reproduced by, exerting sustained pressure on, or inserting a needle into, the active trigger point.

7. Active trigger points are some times associated with autonomic disturbances in the zone of referred pain.

8. Active trigger points may shorten and weaken the concerned muscle.

9. Snapping palpation of a superficial palpable band may result in a local twitch response.

10. A trigger point's neural hyperactivity may be maintained indefinitely by motor or sympathetic efferent activity, setting up a self-perpetuating circuit or it may ameliorate spontaneously.

### 2. 6. 3 **Common symptoms of active myofascial trigger points**

Pain is referred from irritated trigger points in specific patterns characteristic of each muscle (Travell and Simons, 1983:13; Baldry, 1989:47 and Gatterman, 1990:295). The pain may involve many segments and does not follow dermatomes, myotomes or sclerotomes precisely (Good, 1951 and Travell and Simons, 1983:14).

According to Travell and Simons (1983:31-33), four known mechanisms are utilised to explain referred pain: 1) transmission by autonomic pathways; 2) peripheral branching of pain nerves; 3) convergence – projection and 4) convergence facilitation.

Travell and Simons (1983:16) state that deep tenderness and dysthesiae are frequently experienced at the referred pain zone. Travell and Simons (1983: 6-13) and Gatterman (1990:295) describe the pain as deep dull and aching with intensities ranging from mild discomfort to severe pain. Trigger points may also cause stiffness, weakness, shortening and decreased range of motion of the involved muscles (Travell and Simons, 1983:15; Goldenberg, 1987; Baldry, 1989:43 and Gatterman, 1990:295). Goldenberg (1987) also

states that the stiffness and aching pain are worsened through overuse and exertion. A local muscle spasm (palpable band) is also present.

### 2. 6. 4 **Common signs of active myofascial trigger points**

The trigger point is located in a taut palpable band of muscle and is extremely tender to palpation (Adwad, 1973; Travell and Simons, 1983:6 and Gatterman, 1990:295). Adjacent muscles may also be tense (Travell and Simons, 1983:16).

Digital pressure applied to the trigger point may result in a visible "jump sign", where the patient may cry out and withdraw from the painful stimulus, usually this will be an apparently exaggerated response (Travell and Simons, 1983:16; Baldry, 1989:47 and Gatterman 1990:295). A local twitch response may also be elicited via snapping palpation and this transient contraction may be vigorous enough to cause a jerking movement of the involved body part (Travel and Simons, 1983:16; Baldry, 1989:47 and Gatterman, 1990:296).

Muscle shortening, restricted range of motion and weakness is also apparent (Travell and Simons, 1983:15).

## 2. 7. **Findings on examination and diagnosis**

According to Travell and Simons (1983:15-17):

1. There is a history of insidious pain, during or shortly after an overload stress or unfamiliar activity.

2. Each muscle has specific pain patterns referred from the trigger point.

3. There will be weakness and restriction of the stretch range of motion.

4. A taut band is palpable in this muscle.

5. Trigger points will be tender to palpation, eliciting a twitch response during snapping palpation or precise dry needling.

6. Pressure on the trigger point should reproduce the patients symptoms.

7. Responds positively to trigger point therapy.

Goldenberg (1987) uses different criteria:

Chronic aches and pains in 3 or more sites for 3 months or more, absence of systemic conditions to account for these symptoms, multiple tender points at characteristic sites, sleep disturbances, fatigue, pain in the neck and shoulders and chronic headaches.

Baldry (1998:33) states that Myofascial Pain Syndrome is characterised by muscle pain which localizes to one particular region of the body and which develops in the presence of a normal erythrocyte sedimentation rate and in absence of any specific histological, biochemical or serological abnormalities.

## 2. 8 Muscle overview

### 2. 8. 1 Levator Scapulae

According to Travel and Simons (1983:334) pain from this muscle is referred to the angle of the neck, along the vertebral border of the scapulae to the shoulder, resulting in a stiff neck. The pain is concentrated at the angle of the neck and the patient struggles to turn his head to the same side, without turning his whole body. On examination there is poor neck flexion and rotation. Shoulder range of motion is usually unaffected (Travel and Simons, 1983:334).

Activation of levator scapulae trigger points can occur from occupational stresses, typing, tilting of the neck during sleep, mental stress, high arm rests on a chair or a cane that is to long, over exercise, tennis swimming, infections and torticolis (Travel and Simons, 1983:334).

### 2. 8. 2 Supraspinatous

According to Travel and Simons (1983:368) pain from supraspinatous trigger points is felt in the mid-deltoid region and may sometimes extend down the arm up to the wrist. Night pain is also common with this trigger point and the pain is worsened with abduction and extension of the arm at the shoulder. On examination there is a decreased range of motion of the affected shoulder and marked tenderness to deep palpation (Travel and Simons, 1983:368).

Supraspinatous trigger points are activated by over-head lifting or by carrying heavy objects with the arm hanging by the side (Travel and Simons, 1983:368).

2. 8. 3 **Infraspinatous**

According to Travell and Simons (1983:377-386) pain from infraspinatous trigger points deep in the anterior aspect of the shoulder, within the shoulder joint and also down the arm forearm and hand. Patients usually present with an inability to perform daily tasks, such as doing up a bra or dress zip, or putting a coat on and taking a wallet out from a back pocket. There is often shoulder girdle fatigue, a weakened grip and decreased mobility of the shoulder (Travell and Simons, 1983:377-386).

Activation of the trigger points is usually from overload stress while reaching up and back (Travell and Simons, 1983:377-386).

2. 8. 4 **Rhomboid (major)**

According to Travell and Simons (1983:425-430) the shallow aching pain from rhomboid trigger points is felt over the vertebral border of the scapula and paraspinal muscles, but not into the neck. Range of motion of the affected shoulder joint is seldom affected (Travell and Simons, 1983:425-430).

Activation is usually related to poor posture ie. prolonged work leaning forward with rounded shoulders (Travell and Simons, 1983:425-430).

2. 8. 5 **Deltoid**

According to Travel and Simons (1983:431) the dull aching pain from active trigger points in the deltoid muscle is only felt locally to the region of the affected (anterior or posterior) part of the muscle. Anterior deltoid trigger points weaken abduction of the externally rotated arm, while those of the posterior deltoid affect the same movement, only with the arm internally rotated (Travel and Simons, 1983:431).

Activation is usually the result of direct trauma, over training or from irritation via hypodermic injection (Travel and Simons, 1983:431).

## 2. 9 **Treatment of myofascial trigger points**

### 2. 9. 1 **Introduction**

Referred pain in remote areas of the musculoskeletal system from stimulus to trigger zones is described by many authors and appears to have some form of neural mechanism operative, as yet undefined (Homewood, 1963). According to Homewood (1963), external stimulation to the musculoskeletal system via acupuncture, acupressure, moxibustion, injection of trigger zones or manipulative therapy seems to influence referred pain and alterations in visceral functions. These mechanisms continue to be obscure, but the clinical effectiveness of these therapies seems to justify their inclusion in the armamentarium of the physician until scientific identification of these mechanisms is available (Homewood, 1963).

The techniques mentioned above are shared by all physicians who treat patients with myofascial trigger points. It is thus the intention of this clinical trial to put forward a chiropractic approach for the treatment of myofascial trigger points

### 2. 9. 2 **Dry needling for myofascial trigger points**.

Over the years it has been established that it is possible to deactivate myofascial trigger points by injecting into them a large number of disparate substances (Lu and Needham, 1980). The only reasonable conclusion to be drawn from this is that trigger point

amelioration is not dependent on the substance injected, but rather on the stimulating effect of the needle used for their injection (Baldry, 1989:36).

The results of a study performed by Garvey et al. (1989) indicated that the substance injected during trigger point therapy was not critical. The dry needle group showed a better rate of improvement than two groups receiving anaesthetic injection, backing the idea that the mechanical stimulation of the needling is the critical factor during trigger point deactivation (Garvey, 1989). Jones (1994) found dry needling to be more effective than a placebo treatment in a study of twenty patients with myofascial pain dysfunction syndrome.

Tschopp and Gysin (1996) investigated local injection therapy in 107 patients with cervicogenic myofascial trigger points. Results using bupivicaine 0.25%, lignocaine 1% and Saline 9% were compared. 49% were asymptomatic after treatment, 38% reported significant relief and 13% had unchanged symptoms. Once more findings suggest that pain relief is mainly achieved due to reflex mechanisms rather than to the pharmacological effects of the injected solutions.

Baldry (1989:37) suggests that the type of needle used may influence treatment results. Baldry (1989:37) explains that the cutting edge from a hypodermic needle (used for saline or anaesthetic injection), causes micro-trauma and blood vessel damage, which has undesirable effects on myofascial trigger points. Solid, pointed needles are thinner and less traumatic during insertion (Baldry, 1989:37).

Travell and Rinzler (1952) suggested the effectiveness of dry needling myofascial trigger points, more than 40 years ago. Lewit (1979) reported favorable results using dry needling in a study of 312 patients with musculoskeletal pain. Lewit (1979) reported that in 86.6%

of cases, immediate analgesia was produced with dry needling. Lewit (1979), Jaeger and Skootsky (1987) have both determined that the success of dry needling is dependent on the depth and precision of needle insertion. Gunn (1989) also advocates deep needle insertion.

Chu's study (1997) on the effects of EMG (dry needling) for myofascial pain symptoms due to cervical nerve root irritation showed that EMG at tender points in myofascial bands improved symptoms and induced more relief than when needling random points in 122 patients.

Needling techniques employ one of the oldest methods of pain relief by using hyper-stimulation analgesia to interrupt or prevent recurrence of abnormal neural activity (Melzack, 1981). The needle mechanically disrupts the dysfunctioning nerve endings or contractile elements of the muscle which are thought to sustain trigger point activity (Melzack, 1981).

Travel and Simons (1983:79-80) postulate several mechanisms that may be active during trigger point deactivation: 1) Needling may mechanically disrupt both muscle fibers and/or nerve endings, breaking the pain-spasm-pain cycle. 2) Muscle fiber disruption may result in the release of intracellular potassium, which causes a depolarization block of the reverberating nerve fibers. 3) Injected fluid helps to "wash out" or dilute any nerve-sensitizing substances (Travel and Simons, 1983:79-80).

The invasive needling technique described by Travell and Simons (1983:84:85) is consistent for dry needling and trigger point injection. The trigger point is located by palpation and trapped between the fingers. Needle insertion occurs at one to two centimeters distal to the trigger point and the needle is directed towards the trigger point at approximately a thirty degrees angle to the skin. Trigger point penetration results in

referred pain and a twitch response of the concerned muscle. A fanning technique is employed where the trigger point is completely and accurately needled. All tender spots in the region should be eliminated before considering the needling procedure as completed (Travell and Simons, 1983:84:85).

Travell and Simons (1983:18) state that several treatments may be required for complete trigger point amelioration and that should localised therapy fail, usually it is due to some unresolved perpetuating factor. Sandman (1981) states that nutritional supplementation and daily stretching aids recovery. According to Travel and Simons (1983:65) exacerbated post-treatment soreness is due to a vitamin B or C deficiency, however, in a more recent study by Morgan (1995) no association was established.

Baldry (1989:93) claimed to deactivate trigger points with a superficial, dry needling technique. MacDonald et-al (1983) confirmed these findings by alleviating lower back pain using superficial dry needling technique (insertion depth of only 4 millimeters). Bowsher (1990) explained that superficial dry needling works by stimulating A-delta sensory afferents which are located mainly but not exclusively in the skin and just beneath it. This technique is, however, extremely similar to Chinese acupuncture (Bowsher, 1990).

According to Levine et-al (1976) needling techniques effectiveness was strongly influenced by the placebo effect. High anxiety and depression test scores as well as good doctor-patient relationship, were remarkable predictors of hyper-stimulation analgesia.

Complications associated with dry needling include vaso-vagal attacks, convulsions, post-treatment drowsiness, pneumothorax and subcutaneous haematoma (Baldry, 1989:98-99).

### 3. 9. 2 Spinal manipulation for myofascial trigger points

In a review by Walter Herzog (1995), he stated that due to former research done by Gillette (1987), Haldeman (1986), Zusman (1986) and Wyke (1985) it had been hypothesised that the thrust-like forces produced during high velocity spinal manipulation may elicit reflex responses in mechanoreceptors embedded in the capsules of articular facet joints and in the treatment area. This increase in sensory imput has also been associated with diminished pain perception and reflex activation of skeletal muscles (Herzog, 1995).

Herzog (1995) demonstrated a hypo-reflexive response of the target muscles appearing within 50–200 ms of the onset of the treatment thrust in thoracic spine manipulation of two asymptomatic subjects receiving a total of 15 spinal manipulations. Suter (1994) confirmed the above results in a study of 11 asymptomatic subjects receiving a total of 86 spinal manipulations and in addition found reflex responses in the back musculature not directly located in the area of thrust application. The short, burst-like EMG responses following the onset of manipulation were associated with type II mechanoreceptor responses from the capsule of the facet joints. Such reflex responses were not observed for slow applications of the treatment forces or following isolated audible releases occurring during slow treatments (Suter, 1994).

Triano (1992) did a study on the biomechanical effects of the spinal adjustment and found that higher velocity spinal manipulations performed on the cervical spine have also been shown to elicit reflex responses in the neck musculature.

Dr Khalsa (1995) disagreed that the focus on joint receptors as the putative agent for the EMG response is unwarranted based on the methods employed during Suter's study (1994). He suggests that the work of Johansson et-al (1991) is more accurate. Johansson's study on the cruciate ligaments showed that lower threshold joint-ligament receptor afferents evoke only weak and rare effects in skeletomotor neurons, while they frequently and powerfully influence fusimotor neurons. That is, mechanoreceptors have weak reflexive effects on skeletal muscles, but do appear to affect the neurons, which influence motor tone (Johansson et-al 1991).

The cruciate ligaments contain receptors that are different from the receptors of spinal ligaments (Wyke, 1985). The type-III mechanoreceptors which are present in the cruciate ligaments are absent in the spinal ligaments and different from the type-I and type-II mechanoreceptors located in the joint capsule of the apophyseal joints (Wyke, 1985).

The work of Avramow et-al (1992) and Yamashita et-al (1993) is suggestive that joint receptors are also only a minor contributor to overall neural response during an adjustment, but that receptors have different thresholds and sense different phenomena. Therefore a small number of receptors with a low threshold may produce a larger effect than a large number with a higher threshold (Wyke, 1985).

Wyke (1985) also discusses the central effects of articular mechanoreceptor activity. He claims that the afferent discharges derived from articular mechanoreceptors, especially from the type-I and type-II receptors embedded in the joint capsules, are of particular importance to manipulative therapists. This is by virtue of the threefold effects that they produce when they enter the neuraxis, in response to joint manipulation or traction (or in response to active joint movement). These effects are as follows: reflexogenic effects,

perceptual effects and pain inhibitory effects. Most relevant to Wyke's study were his comments on the reflexogenic effects of spinal manipulation. He determined that since the articular mechanoreceptor afferent nerve fibers give off collateral branches that are distributed intersegmentally as well as segmentally throughout the neuraxis, that manipulation of an individual joint should not only affect motor unit activity in the muscles operating over the joint being manipulated, but also in more remote muscles (even on the opposite side of the body). It is through this mechanism that manipulation of joints by therapists gives rise to the reflex changes in muscle tone (involving both facilitation and inhibition of motor unit activity) that have long been empirically familiar to practitioners of manipulative therapy. Grice (1974) has also demonstrated decreased muscle activity following manipulation.

Two reflex systems have been implicated as possible mechanisms whereby muscle hypertonicity is reduced by manipulation. The first, is the stretch reflex which involves the muscle spindles of the intersegmental muscles (Korr, 1975). The second suggests the arthrokinetic response involving both joint receptors and intersegmental muscles (Wyke, 1967). Korr (1975) suggests that if the attachments of short spinal muscles are approximated by unguarded movement and silence annulospiral receptor activity, the lack of input to the CNS then results in a turning up of the Gama motor neuron gain, increasing the intensity of the muscle contraction producing the spasm. It is therefore feasible that a high velocity manipulative thrust performed at the extreme of the joints motion activates the Golgi-tendon organs, inhibiting muscle activity therefore reducing muscle spasm (Korr, 1975). Wyke (1967) refers to this joint regulation of postural muscle tone as the arthrokinetic reflex and it is that the afferent input from the nociceptors type IV receptor is

inhibited by static and dynamic mechanoreceptors type I and II – a form of presynaptic inhibition (Wyke, 1967).

Lewit (1978) believes that most of these reflex mechanisms are a response to nociceptive stimuli and that pain stimulus gives rise to reflex protective spasm, guarding a painful joint. However, if pain stimulus is not articular e.g.: myofascial pain, we again have a defensive muscle spasm usually involving the segmental back muscles (Lewit 1978: 16). Lewit (1978) suggests that this in turn acts on and interferes with normal mobility of the involved functional spinal unit. Hence the rationale for adjusting the spinal level of main segmental nerve supply.

In 1986, another model relating to Korr's (1975) findings was forwarded by Patterson and Steinmetz (1986), based on their research in which a spinal fixation was created experimentally in rats. Patterson and Steinmetz (1986) found that a small cerebellar lesion in an anesthetised rat would cause the limbs on one side to actively flex and remain in that position. Immediate severance of the spinal cord at T7 would result in complete hind limb paralysis, however if hind limb flexion was allowed to remain for as little as 45 minutes, it would become "learned" by the spine and remain despite cord section. Patterson and Steinmetz (1986) concluded that in an area of segmental dysfunction, with accompanying motor disorder and muscle hypertonicity, if the initial stimulus is sufficient or lasts long enough, there may be segmental facilitation even after the instigating stimulus is removed. Once facilitation is initiated, despite amelioration of afferent stimulation, the abnormal segmental reflex circuit creates a cycle of increased output with any sensory input, thus maintaining the symptoms. According to this model, spinal manipulation would be highly effective in breaking the cycle, especially if applied shortly after the establishment of the initial stimulus. However, if the excitability changes became fixated in the cord, a "neural

scar" of facilitated neurons would remain. This entity would not be easily removed establishing increased susceptibility after the acute problem is resolved (Patterson and Steinmetz, 1986).

Skoglund (1989) demonstrated the pathological erector spinae reflex (PESR) as a proprioceptive reflex response to tapping using needle electrodes in erector spinae muscles. Manipulation restores the erector muscles to their normal responses. Skogland (1989) proposed that the PESR is the result of mechanoreceptor activity in the skin and muscle and via increased motor neuron excitability causes long lasting segmental facilitation. According to Simons and Hong (1989) the PESR is similar to the local twitch response observed in the myofascial trigger point as PESR's needle EMG findings were identical to the findings at local twitch responses in the quadriceps, deltoid and peroneus longus muscles.

Dvorak (1985) proposes that segmental dysfunction creates both articular pain and reflex muscle changes. Dvorak suggests that segmental dysfunction causes shortening of postural slow-twitch muscles and the formation of palpable bands similar to those found in muscles with myofasciitis. Fast-twitch phasic muscles respond to overuse with fatigue (Dvorak, 1985).

Mense (1991) predicts that a mechanical spinal lesion may cause release of vasoneuractive substances that cause edema, ischemia, ATP depletion, and failure of the calcium pump, muscle spasm and further tissue hypoxia.

Greenman (1978) mentions somatic dysfunction as defined by Rumney (1975) who refers to it as an area of impaired function of related components of the musculoskeletal system and its associated or related parts of the vascular, lymphatic and nervous system. To him,

somatic dysfunction has three diagnostic findings: asymmetry, restricted motion and tissue texture abnormality. The entity of MFTP's seems to comply with these diagnostic criteria, depending on the area affected and the severity of the condition (Travel and Simons, 1983). Greenman postulated that SMT could alter the tissue texture abnormalities of somatic dysfunction and indicated that work by Osteopath, Hoag et-al (1969) demonstrated its influences on referred pain and alterations in visceral function.

Another early concept was that of the Meric system (Stephenson, 1927) .It attempted to correlate segmental dysfunction and visceral disorders and preceded Korr's model of hypersympathiconia and somatovisceral reflexes (Korr, 1975).

Fitzgerald (1991) made some interesting observations on trigger points, fibromyalgia and the cervical syndrome, and claims that all are the result of intervertebral disc lesions. Implementing methods from James Cyriax (1984), he observed the effectiveness of manipulation in general practice over 36 years. According to Fitzgerald, trigger points originate from two sources: the lumbogenic, which occur only below the L1 level, and the cervicogenic, which occur only above the waist, but also anywhere in the body, not infrequently over lapping the lumbogenic area, even as far as the feet. Fitzgerald (1991) states that these trigger points move after manipulation according to a particular and unvarying pattern. Lumbogenic trigger points move to the L4 or L5 spine, where they disappear. The cervicogenic trigger points move to the C6 spine and disappear there. Fitzgerald agrees that dry needling can also make trigger points disappear, but in this case there is no movement, so that they will return in the same places sooner or later although this may not be for many months. With spinal manipulative therapy trigger points only disappear after they have reached C6 or L5, in which case there is no recurrence unless the disc lesion recurs which may not be for several years (Fitzgerald, 1991).

In 1994 a similar study was completed, investigating the short –term effects of spinal manipulation on pain/pressure threshold in 30 patients with chronic mechanical low back pain (Cote, Mior and Vernon, 1994). Pain and pressure thresholds of selected myofascial points were evaluated before, after and 15 and 30 minutes post-intervention. Unfortunately repeated measured analysis of variance failed to show clinical or statistical significance between the two treatment groups

In Schafer's book (1987:156-157) on upper body complaints he discusses the phenomenon of "Shoulder Girdle Neuralgia" describing a degree of fibrositis and multiple trigger points in the supraclavicular and rhomboid areas. In a treatment protocol he mentions the adjunct of articular adjustment and that contributing spinal majors will likely be found from C5-T1. It is worth noting that the level main segmental nerve supply to the rhomboids is C5.

Miller (1988) also suggests joint mobilisation options in the treatment of myofascial pain and dysfunction, referring to Korrs research (1975) and his description of somatosomatic and viscerosomatic reflexes in which both joint dysfunction and visceral dysfunction may result in both referred pain or even tenderness.

While treating the myofascia may often result in temporary abatement or cessation of pain, ultimately the source of the problem must be addressed to avoid relapse. Thus apparent myofascial pain can arise from structures other than the myofascia and in instances where joint dysfunction may be causing the pain, it is most effectively treated with joint mobilisation and manipulation. Obviously the assessment of response to treatment will lend further corroboration to the source of the dysfunction and whether that source is due to the condition of the structure itself or in the nature of the function(s) involving that structure.

# CHAPTER THREE

# MATERIALS AND METHODS

## 3. 1 INTRODUCTION

This chapter deals with the location and collection of data and the research methodology utilized. Treatment interventions and process of statistical analysis are also discussed.

## 3. 2. METHOD OF MEASUREMENT

### 3. 2. 1 SUBJECTIVE MEASUREMENT

1). Numerical Pain Rating Scale 101 (Appendix A) - The patient was required to indicate by means of a percentage, the intensity of the pain experienced prior to treatment when, (a) it was at its worst, and (b) when it was at its least. The average between these two figures gives an indication of the average pain intensity experienced by the patient. The results of a study by Jenson et-al (1986) this study indicated that the Numerical Pain Rating Scale 101 had practical advantages over the other measures because :

a) it was simple and practical to administer and score;

b) it can be administered in either written or verbal form and

c) the scale does not appear to be associated with age.

2). CMCC Neck Disability Index Questionnaire (Appendix B) - This questionnaire is designed to give the researcher an indication of how the neck pain affects the subjects ability to manage in everyday life. The questionnaire consists of ten questions, each scoring a maximum of 5 points and a minimum of 0. The questionnaire is scored out of fifty and can be represented as a percentage disability (Vernon and Mior, 1991).

3). The Short Form McGill Pain Questionnaire (Appendix C)- This questionnaire gathers further information concerning pain intensity and its use, along with conformation of its reliability, validity and consistency are provided by Melzack and Katz (1992:152-164). This questionnaire allows the patient to describe the exact nature of their pain and then rate the relative intensity associated with each pain description. It consists of 15 options each with a minimum score of 0 and a maximum of 3, giving each patient a raw score out of 45.

3. 2. 2 OBJECTIVE MEASUREMENT

1). Cervical range of motion was assessed using a CROM goniometer. Measurements were taken for Flexion, Extension, Left Lateral Flexion, Right Lateral Flexion, Left Rotation and Right Rotation. A cervical goniometer objectively measures cervical range of motion (Yodas et-al. 1991).

2). An algometer was used to determine sensitivity to pain caused by pressure. According to Fischer (1987), pressure threshold measurement is used for the evaluation of the therapeutic efficiency in myofascial pain dysfunction syndrome. It

thus provides an objective assessment of treatment results. Fischer (1986) states that pressure threshold is the minimum pressure that induces pain or discomfort. Fischer (1987) performed a study using an algometer to obtain pressure threshold measurements, for trigger point diagnosis and treatment evaluation. It was determined that changes in pressure threshold obtained under standard clinical conditions can be regarded as reliable objective data (Fischer, 1987).

The procedure of taking a pressure reading was as follows:

The algometer was set to zero and then pressed precisely over the marked, active trigger point up to the pressure threshold of that patient. This reading, obtained in kilograms per square centimeter, indicated the sensitivity of the trigger point to pain.

## 3. 3. STUDY PROTOCOL AND DESIGN

### 3. 3. 1 OBJECT OF THE STUDY

The objective of this study was to identify the relative effectiveness of each treatment method in terms of the objective and subjective measurements. This study attempts to identify the relatively more effective treatment method which could be put to use by the chiropractic profession in the treatment of myofascial pain syndrome.

### 3. 3. 2 ALLOCATION OF THE SUBJECTS

The sample size of thirty patients were randomly assigned into one of two groups using thirty slips of paper (15 of each of the two treatment protocols) which were placed into a hat and randomly drawn to plan the sequence of treatments in the study. This process was

carried out until fifteen patients were selected for group 1. All remaining patients went to group 2. This procedure ensured that groups 1 and 2 would have fifteen randomly selected patients each. Group 1 was treated with dry needling and Group 2 was treated with spinal manipulation at the level of main segmental supply to the muscle with myofascial trigger points.

### .3. 3. 3 CRITERIA FOR ACCEPTANCE OF SUBJECTS

This study was limited to patients from the province of Kwazulu- Natal who would be referred by advertisements (Appendix-D) placed at the Technikon or Chiropractic Clinic as well as at local gyms, sports clubs, daily newspapers and on radio. Rugby clubs in the Durban area were visited and briefed to obtain patients.

At the initial consultation patients received a covering letter (Appendix-E), which briefly explained the inclusion/exclusion criteria which assessed their acceptability for the study. The criteria were as follows:-

1.) Only patients between 18 – 75 years of age were accepted into this study and conditions other than myofascial trigger points of the selected muscles were not treated in this study.

2.) Any patient with a systemic or local pathology was not included.

3.) If any contra-indications to spinal manipulation were suspected on examination, the patient was not included in this study.

4.) Diagnostic requirements for trigger points are described by Travell and Simons (1983: 16-17) and unless these requirements were met the patient did not partake in the study.

5.) Patients were not allowed to take analgesics or receive any other manual treatment (including stretching) while participating in this study.

6.) A signed consent form (Appendix-F) was required prior to treatment.

7.) If a patient became ill they had to withdraw from the study, as illness (or use of medication) often alters the patients pain threshold.

### 3. 3. 4 CRITERIA FOR MUSCLE SELECTION

Criteria for muscle selection was as follows:

1.) Muscle's chosen for this study have a small segmental supply, in general, from no more than two segments. For example infraspinatous and deltoid with supply from segments C5 and C6 (with C5 as the main supply).

2.) Muscles selected did not have a complex or alternative neural supply for example, the trapezius muscle was not selected due to its supply by the Accessory nerve. All muscles had spinal segmental innervation only.

3.) Muscles not commonly affected by myofascial trigger points were not included, as determined by Travell and Simons (1983).

**TABLE OF MUSCLES SELECTED**

| NAME | NERVE SUPPLY* | SEGMENT ADJUSTED |
|---|---|---|
| 1) LEVATOR SCAPULA | (C4),C5,C6 | C5 |
| 2) RHOMBOIDS | C4,C5 | C5 |
| 3) SUPRASPINATOUS | (C4),C5,C6 | C5 |
| 4) INFRASPINATOUS | C5,C6 | C5 |
| 5) DELTOIDS | C5,C6 | C5 |

***Nerve supply from Travell and Simons (1983).**

### 3. 3. 5 CRITERIA FOR SPINAL MANIPULATIVE THERAPY

Criteria for spinal manipulative therapy was as follows:

1) Chiropractic spinal manipulation was only given to the main segment (see table). The involved facets would be adjusted using a high-velocity, low-amplitude manipulation as described by Szaraz (1990).

2) The chiropractic spinal manipulation was given so that the affected muscle was not put on the stretch as this could bias the results, for example if the right levator scapulae was being treated, C5 (it's main segmental supply) was adjusted in right lateral flexion. This avoided super-stretching the muscle and thus activating the stretch reflex suggested by Korr (1975).

### 3. 3. 6 DETAILED PATIENT PROCEDURE AND INTERVENTIONS

Probable candidates underwent a case history (Appendix-G), a physical examination (Appendix-H) and a regional examination (Appendix-I). Positive trigger points for each patient were identified and recorded on the patient information sheet (Appendix-J) at the first treatment so that the same points were treated on the subsequent visits.

Subjects in Group A, had the procedure explained to them and were treated with dry needling according to the techniques described by Travell and Simons (1983:83-85). The area containing the TP was swabbed with alcohol and once correctly isolated between the fingers, the TP was carefully needled. The Group B subjects had the procedure explained to them and were given a chiropractic spinal manipulation to the spinal level of main-segmental supply to that muscle with myofascial trigger points.

Each patient received four treatments over a two-week period, as recommended by Travell and Simons (1983: 85-86), and a one-month follow-up evaluation.

Both groups were informed of the perpetuating factors that may re-activate their specific trigger points, as per Travell and Simons (1983: 103).

For all treatments, pre-treatment measurements were taken using the Algometer (Fischer 1987) and Goniometer (Yodas 1991). These instruments give objective measurements for pain threshold and cervical range of motion respectively. The following pain questionnaires were filled out at the first, fourth and follow-up treatments: a) the short-form McGill pain questionnaire (Melzack 1987) which establishes the type of pain perceived. b) The Numerical Pain Rating Scale-101 (Jenson 1986) which establishes the severity of the pain perceived. And c) the CMCC Neck Disability Index form (Vernon and Mior 1991) which determines the amount of physical disability experienced due to pain perceived. This obtained the objective and subjective data respectively.

### 3. 3. 7. THE LOCATION OF THE DATA

The primary data was obtained from the algometer and goniometer readings, the Numerical Pain Rating Scale 101. the CMCC Neck Disability Index Questionnaire and the Short-Form McGill Pain Questionnaire. These were answered by, and performed on all subjects before the first treatment, at the end of the treatment period and again on the one month follow up consultation. All treatments and consultations took place at the Technikon Natal chiropractic day clinic.

The secondary data was collected from current journals, text books, CD-Rom and the internet. This data was obtained through the Technikon Natal library.

## 3. 4 STATISTICAL ANALYSIS

### 3. 4. 1.THE SAMPLE SIZE OF STUDY

The sample size of the study was 15 patients per group. Group 1 consisted of 15 patients who made up the first treatment group. Group 2 consisted of the remaining 15 patients who made up the second treatment group.

11 clinical experiments were done: Flexion, Extension, Left lateral flexion, Right lateral flexion, Left rotation, Right rotation, ALG, CCMC, NRS1 (for least pain) and NRS2 (for worst pain). For each clinical experiment, readings were taken 3 times (beginning, end and follow-up). Flexion, Extension, Left lateral flexion, Right lateral flexion, Left rotation, Right rotation, ALG, NRS1 and NRS2 were continuous variables. CCMC and McGill were categorical variables.

### 3.4.2. THE USE OF PARAMETRIC AND NON-PARMETRIC TESTS FOR STATISTICAL DATA ANALYSIS

Continuous variables were analyzed using parametric methods, while categorical variables were analyzed using non-parametric methods regardless of the sample size per group.

**Procedure 1.1: Comparison between groups 1 and 2 with respect to categorical variables**

The Mann-Whitney U-test was used to compare Groups 1 and 2 with respect to each categorical variable. The null hypothesis states that there is no significant difference between Groups 1 and 2 with respect to the variable of comparison at the $\alpha = 0.05$ level of significance. The alternative hypothesis states that there is a significant difference at the same level of significance.

**Decision rule:**

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

**Procedure 1.2: Comparison between Groups 1 and 2 with respect to continuous variables**

The two-sample unpaired t-test was used to compare Groups 1 and 2 with respect to each continuous variable. The null hypothesis states that there is no significant difference between Groups 1 and 2 with respect to the variable of comparison at the $\alpha = 0.05$ level of significance. The alternative hypothesis states that there is a significant difference at the same level of significance.

**Decision rule:**

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

**Procedure 2.1: Comparison between related samples within Group1 with respect to categorical variables**

Wilcoxon's signed rank test was used to compare results from related samples. In each test, the null hypothesis states that there is no significant improvement between the 2 related samples being compared, at the $\alpha$ level of significance. The alternative hypothesis states that there is a significant improvement.

**Decision rule:**

The null hypothesis is rejected at the $\alpha$ level of significance if $p < \alpha$ where p is the observed significance level or probability-value. Otherwise, the null hypothesis is accepted at the same level.

**Procedure 2.2: Comparison between related samples within Group 1 with respect to continuous variables**

The two-sample paired t-test was used to compare results from related samples. In each test, the null hypothesis states that there is no significant improvement between the 2 related samples being compared, at the $\alpha$ level of significance. The alternative hypothesis states that there is a significant improvement.

**Decision rule:**

The null hypothesis is rejected at the $\alpha$ level of significance if $p < \alpha$ where p is the observed significance level or probability-value. Otherwise, the null hypothesis is accepted at the same level.

**Procedure 3.1: Comparison between related samples within Group 2 with respect to categorical variables**

Procedure 2.1 was repeated within Group 2 with the same decision rule.

**Procedure 3.2: Comparison between related samples within Group 2 with respect to continuous variables**

Procedure 2.2 was repeated within Group 2 with the same decision rule.

**Procedure 4: Averages and variances and standard deviations for continuous variables for Groups 1 and 2**

Averages were needed for the construction of bar- charts. Averages and variances were used for power analysis.

**Procedure 5: Frequencies and percentages for categorical variables in Groups 1 and 2**

**Procedure 6: Comparison using bar-charts**

Visual summaries of analytical findings were given by use of barcharts to compare Groups 1 and 2 with respect to continuous variables of study only. Average readings were used to make barcharts.

**Procedure 7: Power analysis for continuous variables**

Power analysis was done for continuous variables only.

**Statistical package**:

The statistical package SPSS was used for data entry and analysis.

# CHAPTER FOUR

# RESULTS

## 1 Demographic Data

Table 4. 1. 1 **Patient Data**

| | **Group 1**(15) | **Group 2**(15) | **Total**(30) |
|---|---|---|---|
| **Age Distribution** | | | |
| 20-30 | 11 | 9 | 20 |
| 30-40 | 0 | 1 | 1 |
| >40 | 4 | 5 | 9 |
| **Average Age** | 31<br>(Min age: 20)<br>(Max age: 55) | 35<br>(Min age: 20)<br>(Max age: 61) | 33<br>(Min age: 20)<br>(Max age: 61) |
| **Gender Distribution** | | | |
| Females | 6 | 8 | 14 |
| Males | 9 | 7 | 16 |
| **Racial Distribution** | | | |
| Asian | 0 | 2 | 2 |
| Black | 0 | 0 | 0 |
| Coloured | 0 | 1 | 1 |
| Oriental | 0 | 0 | 0 |
| White | 15 | 12 | 27 |

Table 4. 1. 2 **Trigger Point Type and Distribution**.

| Trigger Point Type | Group 1 | Group 2 | Total |
|---|---|---|---|
| **Deltoid** | 1 | 0 | 1 |
| **Infraspinatous** | 1 | 3 | 4 |
| **Levator Scapulae** | 9 | 9 | 18 |
| **Rhomboid** | 4 | 3 | 7 |
| **Supraspinatous** | 0 | 0 | 0 |
| Total | 15 | 15 | 30 |

## 4. 2. **Results of Statistical Analysis**

The remainder of this chapter deals with the results obtained from statistical analysis of data collected from the following measurement criteria:

-Algometer, Cervical (CROM) Goniometer and the Numerical Pain Rating Scale 101 for continuous variables.

-CCMC Neck Disability Index and The Short-Form McGill Pain Questionnaire for categorical variables

Please note that measurements were taken before each treatment in that consultation.

The results obtained from the statistical analysis are tabulated to show the mean for each group as well as the exceedance probability value (p-value) which is compared to the level of significance at 0.05 for all the tests.

## 4. 2. 1 Results of Mann-Whitney Test Comparing Categorical Variables between Group1 and Group2

Table 4. 2. 1. 1 **Results of Mann-Whitney Test Comparing Categorical Variables between Group1 and Group2 for CCMC**.

| CMCC | | Mean Rank | p-value |
|---|---|---|---|
| Treatment 1 | Group 1 | 12.80 | 0.098 |
| | Group 2 | 18.20 | |
| Treatment 4 | Group 1 | 12.73 | 0.089 |
| | Group 2 | 18.27 | |
| 1 Month Follow-up | Group 1 | 14.2 | 0.436 |
| | Group 2 | 16.8 | |

The results indicate that at the 5% level of significance there is no statistically significant difference between the two groups.

Table 4. 2. 1.2 **Results of Mann-Whitney Test Comparing Categorical Variables between Group1 and Group2 for McGill**

| McGill | | Mean Rank | p-value |
|---|---|---|---|
| Treatment 1 | Group 1 | 15.13 | 0.838 |
| | Group 2 | 15.87 | |
| Treatment 4 | Group 1 | 15.87 | 0.838 |
| | Group 2 | 15.13 | |
| 1 Month Follow-up | Group 1 | 14.93 | 0.744 |
| | Group 2 | 16.07 | |

The results indicate that at the 5% level of significance there is no statistically significant difference between the two groups.

4. 2. 2 **Results of the Two-Sample Unpaired T-Test, comparing the continuous variables between groups 1 and 2.**

Table 4. 2. 2 1 **Results of the Two-Sample Unpaired T-Test, comparing Flexion between groups 1 and 2.**

| | Flexion | Ave Reading | Variances p-Value | Means p-Value |
|---|---|---|---|---|
| Treatment 1 | Group1 | 60.3 | .658 | .698 |
| | Group2 | 58.1 | | |
| Treatment 2 | Group1 | 62.5 | .618 | .977 |
| | Group2 | 62.6 | | |
| Treatment 3 | Group1 | 64.4 | .681 | .442 |
| | Group2 | 61.3 | | |

The results indicate that at the 5% level of significance all pairs have equal means and variances, thus there is no statistically significant difference between the two groups.

Table 4. 2. 2. 2 **Results of the Two-Sample Unpaired T-Test, comparing Extension between groups 1 and 2.**

| | Extension | Ave Reading | Variances p-Value | Means p-Value |
|---|---|---|---|---|
| Treatment 1 | Group1 | 53.6 | .466 | .881 |
| | Group2 | 52.8 | | |
| Treatment 2 | Group1 | 58.0 | .056 | .675 |
| | Group2 | 59.5 | | |
| Treatment 3 | Group1 | 58.6 | .136 | .889 |
| | Group2 | 59.3 | | |

The results indicate that at the 5% level of significance all pairs have equal means and variances, thus there is no statistically significant difference between the two groups.

Table 4. 2. 2. 3 **Results of the Two-Sample Unpaired T-Test, comparing Right Lateral Flexion between groups 1 and 2.**

| | Right Lateral Flx. | Ave Reading | Variances p-Value | Means p-Value |
|---|---|---|---|---|
| Treatment 1 | Group1 | 39.3 | .387 | .563 |
| | Group2 | 37.2 | | |
| Treatment 2 | Group1 | 41.7 | .202 | .961 |
| | Group2 | 41.9 | | |
| Treatment 3 | Group1 | 43.9 | .831 | .704 |
| | Group2 | 42.5 | | |

The results indicate that at the 5% level of significance all pairs have equal means and variances, thus there is no statistically significant difference between the two groups.

Table 4. 2. 2. 4 **Results of the Two-Sample Unpaired T-Test, comparing Left Lateral Flexion between groups 1 and 2.**

| | Left Lateral Flx. | Ave Reading | Variances p-Value | Means p-Value |
|---|---|---|---|---|
| Treatment 1 | Group1 | 38.3 | .270 | 1.0 |
| | Group2 | 38.3 | | |
| Treatment 2 | Group1 | 41.1 | .572 | .383 |
| | Group2 | 43.5 | | |
| Treatment 3 | Group1 | 41.7 | .632 | .845 |
| | Group2 | 41.1 | | |

Table 4. 2. 2. 5 **Results of the Two-Sample Unpaired T-Test, comparing Right Rotation between groups 1 and 2**

| | Right Rotation | Ave Reading | Variances p-Value | Means p-Value |
|---|---|---|---|---|
| Treatment 1 | Group1 | 61.2 | .141 | .467 |
| | Group2 | 57.9 | | |
| Treatment 2 | Group1 | 64.1 | .260 | .224 |
| | Group2 | 59.3 | | |
| Treatment 3 | Group1 | 62.0 | .834 | .259 |
| | Group2 | 58.1 | | |

The results indicate that at the 5% level of significance all pairs have equal means and variances, thus there is no statistically significant difference between the two groups.

Table 4. 2. 2. 6 **Results of the Two-Sample Unpaired T-Test, comparing Left Rotation between groups 1 and 2**

| | Left Rotation | Ave Reading | Variances p-Value | Means p-Value |
|---|---|---|---|---|
| Treatment 1 | Group1 | 64.1 | .741 | .429 |
| | Group2 | 60.3 | | |
| Treatment 2 | Group1 | 67.1 | .500 | .884 |
| | Group2 | 67.6 | | |
| Treatment 3 | Group1 | 66.0 | .692 | .869 |
| | Group2 | 65.5 | | |

The results indicate that at the 5% level of significance all pairs have equal means and variances, thus there is no statistically significant difference between the two groups.

Table 4. 2. 2. 7 **Results of the Two-Sample Unpaired T-Test, comparing Algometer Readings between groups 1 and 2**

| | Algometer | Ave Reading | Variances p-Value | Means p-Value |
|---|---|---|---|---|
| Treatment 1 | Group1 | 3.5 | .361 | .984 |
| | Group2 | 3.5 | | |
| Treatment 2 | Group1 | 5.7 | .918 | .404 |
| | Group2 | 6.4 | | |
| Treatment 3 | Group1 | 5.7 | **.020** | **.594** |
| | Group2 | 6.1 | | |

The results indicate that at the 5% level of significance all pairs have equal means and variances, except for the follow-up consultation where variances are assumed unequal, thus there is a statistically significant difference between the two groups at the one-month follow-up evaluation.

Table 4. 2. 2. 8 **Results of the Two-Sample Unpaired T-Test, comparing NRS1 Readings between groups 1 and 2**

| | NRS1 Least Pain | Ave Reading | Variances p-Value | Means p-Value |
|---|---|---|---|---|
| Treatment 1 | Group1 | 11.7 | .868 | .481 |
| | Group2 | 14.7 | | |
| Treatment 2 | Group1 | 6.3 | .146 | .354 |
| | Group2 | 10.0 | | |
| Treatment 3 | Group1 | 2.7 | **.040** | **.145** |
| | Group2 | 10.3 | | |

The results indicate that at the 5% level of significance all pairs have equal means and variances, except for the follow-up consultation where variances are assumed unequal,

thus there is a statistically significant difference between the two groups at the one-month follow-up evaluation.

Table 4. 2. 2. 9 **Results of the Two-Sample Unpaired T-Test, comparing NRS2 Readings between groups 1 and 2**

| | NRS2 Worst Pain | Ave Reading | Variances p-Value | Means p-Value |
|---|---|---|---|---|
| Treatment 1 | Group1 | 67.0 | .271 | .126 |
| | Group2 | 77.0 | | |
| Treatment 2 | Group1 | 39.7 | .325 | .589 |
| | Group2 | 44.7 | | |
| Treatment 3 | Group1 | 27.7 | .143 | .135 |
| | Group2 | 44.6 | | |

The results indicate that at the 5% level of significance all pairs have equal means and variances, thus there is no statistically significant difference between the two groups.

4. 2. 3 **Results of Wilcoxon Signed Ranks Tests for the CCMC for Both Group 1 and Group 2.**

Table 4. 2. 3. 1 **Results of Wilcoxon Signed Ranks Tests for the CCMC for Both Group 1 and Group 2.**

| **CMCC** | **Assessment 1** (Treatment 1 and Treatment 4) | **Assessment-2** (Treatment 1 and Follow-up) | **Assessment-3** (Treatment 4 and Follow-up)( |
|---|---|---|---|
| Group1-p values | 0.010 | 0.001 | **0.171** |
| Group2-p values | 0.002 | 0.031 | **0.969** |

The results indicate that at the 5% level of significance both groups show a significant improvement between treatments 1 and 4 and between treatment 1 and the one-month follow-up evaluation. Both groups fail to show any significant improvement between treatment 4 and the one-month follow-up evaluation.

Table 4. 2. 3. 2 **Results of Wilcoxon Signed Ranks Tests for the McGill for Both Group 1 and Group 2.**

| McGill | Assessment 1 | Assessment 2 | Assessment 3 |
|---|---|---|---|
| Group 1-p values | **0.070** | 0.005 | 0.034 |
| Group 2-pvalues | 0.016 | 0.001 | **0.322** |

The results indicate that at the 5% level of significance Group 1 showed a significant improvement between treatments 1 and the one-month follow-up evaluation. Group 2 showed a significant improvement between treatments 1 and 4 and between treatment 1 and the one-month follow-up evaluation.

4. 2. 4 **Results of the Paired T-Tests Within Group 1 and Within Group 2.**

Table 4. 2. 4. 1 **Results of Paired T-Tests Within Group 1 and Within Group 2 for Cervical Range of Motion.**

| | | | P-Value |
|---|---|---|---|
| Flx. | Treatment 1 | Group 1 | .439 |
| | | Group 2 | .123 |
| | Treatment 4 | Group 1 | .087 |
| | | Group 2 | .293 |
| | Follow-up | Group 1 | .378 |
| | | Group 2 | .367 |
| Ext. | Treatment 1 | Group 1 | .096 |
| | | Group 2 | .069 |
| | Treatment 4 | Group1 | .099 |
| | | Group2 | **.018** |
| | Follow-up | Group1 | .740 |
| | | Group2 | .934 |
| RLF. | Treatment 1 | Group1 | .271 |
| | | Group2 | **.010** |
| | Treatment 4 | Group1 | .056 |
| | | Group2 | **.010** |
| | Follow-up | Group1 | .353 |
| | | Group2 | .587 |
| LLF. | Treatment 1 | Group1 | .171 |
| | | Group2 | .057 |
| | Treatment 4 | Group1 | .142 |
| | | Group2 | .059 |
| | Follow-up | Group1 | .697 |
| | | Group2 | .285 |
| Rrot. | Treatment 1 | Group1 | .145 |
| | | Group2 | .492 |
| | Treatment 4 | Group1 | .718 |
| | | Group2 | .866 |
| | Follow-up | Group1 | .123 |
| | | Group2 | .605 |
| Lrot. | Treatment 1 | Group1 | .179 |
| | | Group2 | **.011** |
| | Treatment 4 | Group1 | .487 |
| | | Group2 | .062 |
| | Follow-up | Group1 | .492 |
| | | Group2 | .096 |
| | | | |

Statistically significant improvements for cervical range of motion were only occasionally observed for Group 2.

Table 4. 2. 4. 2 **Results of the Paired T-Tests Within Group 1 and Within Group 2 For The Algometer and NRS1 and NRS2 Readings.**

| | | | |
|---|---|---|---|
| Algomter | Assessment 1 | Group1 | **.002** |
| | | Group2 | **.00** |
| | Assessment 2 | Group1 | **.00** |
| | | Group2 | **.00** |
| | Assessment 3 | Group1 | 1.00 |
| | | Group2 | .521 |
| NRS 1 Least Pain | Assessment 1 | Group1 | .084 |
| | | Group2 | .178 |
| | Assessment 2 | Group1 | **.005** |
| | | Group2 | .331 |
| | Assessment 3 | Group1 | .135 |
| | | Group2 | .951 |
| NRS 2 Worst Pain | Assessment 1 | Group1 | **.00** |
| | | Group2 | **.00** |
| | Assessment 2 | Group1 | **.00** |
| | | Group2 | **.001** |
| | Assessment 3 | Group1 | .063 |
| | | Group2 | 1.00 |

The Algometer results indicate that at the 5% level of significance both Group 1 and Group 2 showed a significant improvement between treatments 1 and 4 and between treatment 1 and the one-month follow-up evaluation.

The NRS1 results indicate that at the 5% level of significance Group 1 showed a significant improvement between treatment 1 and the one-month follow-up evaluation.

The NRS2 results indicate that at the 5% level of significance both Group 1 and Group 2 showed a significant improvement between treatments 1 and 4 and between treatment 1, and the one-month follow-up evaluation

4. 2. 5 **Means and Variances For Continuous Variables in Groups 1 and 2.**

Table 4. 2. 5. 1 **Means and Variances for Flexion in Groups 1 and 2.**

| | Flexion | Mean | Variance |
|---|---|---|---|
| Treatment 1 | Group1 | 60.3 | 186.210 |
| | Group2 | 58.1 | 259.124 |
| Treatment 2 | Group1 | 62.5 | 157.410 |
| | Group2 | 62.6 | 167.810 |
| Treatment 3 | Group1 | 64.4 | 109.257 |
| | Group2 | 61.3 | 122.667 |

Table 4. 2. 5. 2 **Means and Variances for Extension in Groups 1 and 2.**

| | Extension | Mean | Variance |
|---|---|---|---|
| Treatment 1 | Group1 | 53.6 | 285.287 |
| | Group2 | 52.8 | 133.029 |
| Treatment 2 | Group1 | 58.0 | 145.143 |
| | Group2 | 59.5 | 35.124 |
| Treatment 3 | Group1 | 58.6 | 276.952 |
| | Group2 | 59.3 | 58.095 |

Table 4. 2. 5. 3 **Means and Variances for Right Lateral Flexion in Groups 1 and 2.**

| | Right Lateral Flx. | Mean | Variance |
|---|---|---|---|
| Treatment 1 | Group1 | 39.3 | 86.667 |
| | Group2 | 37.2 | 113.029 |
| Treatment 2 | Group1 | 41.7 | 35.924 |
| | Group2 | 41.9 | 73.410 |
| Treatment 3 | Group1 | 43.9 | 105.410 |
| | Group2 | 42.5 | 75.124 |

Table 4. 2. 5. 4 **Means and Variances for Left Lateral Flexion in Groups 1 and 2**

| | Left Lateral Flx. | Mean | Variance |
|---|---|---|---|
| Treatment 1 | Group1 | 38.3 | 75.924 |
| | Group2 | 38.3 | 125.067 |
| Treatment 2 | Group1 | 41.1 | 47.352 |
| | Group2 | 43.5 | 62.552 |
| Treatment 3 | Group1 | 41.7 | 67.924 |
| | Group2 | 41.1 | 102.781 |

Table 4. 2. 5. 5 **Means and Variances for Right Rotation in Groups 1 and 2**

| | Right Rotation | Mean | Variance |
|---|---|---|---|
| Treatment 1 | Group1 | 61.2 | 221.029 |
| | Group2 | 57.9 | 85.981 |
| Treatment 2 | Group1 | 64.1 | 129.410 |
| | Group2 | 59.3 | 94.095 |
| Treatment 3 | Group1 | 62.0 | 92.571 |
| | Group2 | 58.1 | 76.267 |

Table 4. 2. 5. 6 **Means and Variances for Left Rotation in Groups 1 and 2**

| | Left Rotation | Mean | Variance |
|---|---|---|---|
| Treatment 1 | Group1 | 64.1 | 157.410 |
| | Group2 | 60.3 | 190.210 |
| Treatment 2 | Group1 | 67.1 | 126.781 |
| | Group2 | 67.6 | 70.791 |
| Treatment 3 | Group1 | 66.0 | 100.571 |
| | Group2 | 65.5 | 53.981 |

Table 4. 2. 5. 7 **Means and Variances for AlgometerReadings in Groups 1 and 2**

| | Algometer | Mean | Variance |
|---|---|---|---|
| Treatment 1 | Group1 | 3.5 | 1.018 |
| | Group2 | 3.5 | 1.534 |
| Treatment 2 | Group1 | 5.7 | 5.063 |
| | Group2 | 6.4 | 5.570 |
| Treatment 3 | Group1 | 5.7 | 1.705 |
| | Group2 | 6.1 | 5.482 |

Table 4. 2. 5. 8 **Means and Variances for NRS1 Readings in Groups 1 and 2**

| | NRS1 Least Pain | Mean | Variance |
|---|---|---|---|
| Treatment 1 | Group1 | 11.7 | 120.238 |
| | Group2 | 14.7 | 144.524 |
| Treatment 2 | Group1 | 6.3 | 58.810 |
| | Group2 | 10.0 | 167.857 |
| Treatment 3 | Group1 | 2.7 | 24.524 |
| | Group2 | 10.3 | 351.667 |

Table 4. 2. 5. 9 **Means and Variances for NRS2 Readings in Groups 1 and 2**

| | NRS2 Worst Pain | Mean | Variance |
|---|---|---|---|
| Treatment 1 | Group1 | 67.0 | 370.714 |
| | Group2 | 77.0 | 231.429 |
| Treatment 2 | Group1 | 39.7 | 524.544 |
| | Group2 | 44.7 | 712.381 |
| Treatment 3 | Group1 | 27.7 | 645.952 |
| | Group2 | 44.6 | 1187.381 |

4. 2. 6 **Frequencies and Percentages for Categorical Variables in Groups 1 and 2.**

Table 4. 2. 6. 1 **Score's with Highest Frequencies for CCMC**.

| | CCMC | Score With Highest Frequency | Frequency | Percentage |
|---|---|---|---|---|
| Treatment 1 | Group1 | 5.0 | 4 | 26.7 |
| | Group2 | 6.0 and 7.0 | 3 each | 26.7 each |
| Treatment 2 | Group1 | 0.0 | 4 | 26.7 |
| | Group2 | 3.0 | 4 | 26.7 |
| Follow-up | Group1 | 0.0 | 6 | 40.0 |
| | Group2 | 0.0 | 5 | 33.3 |

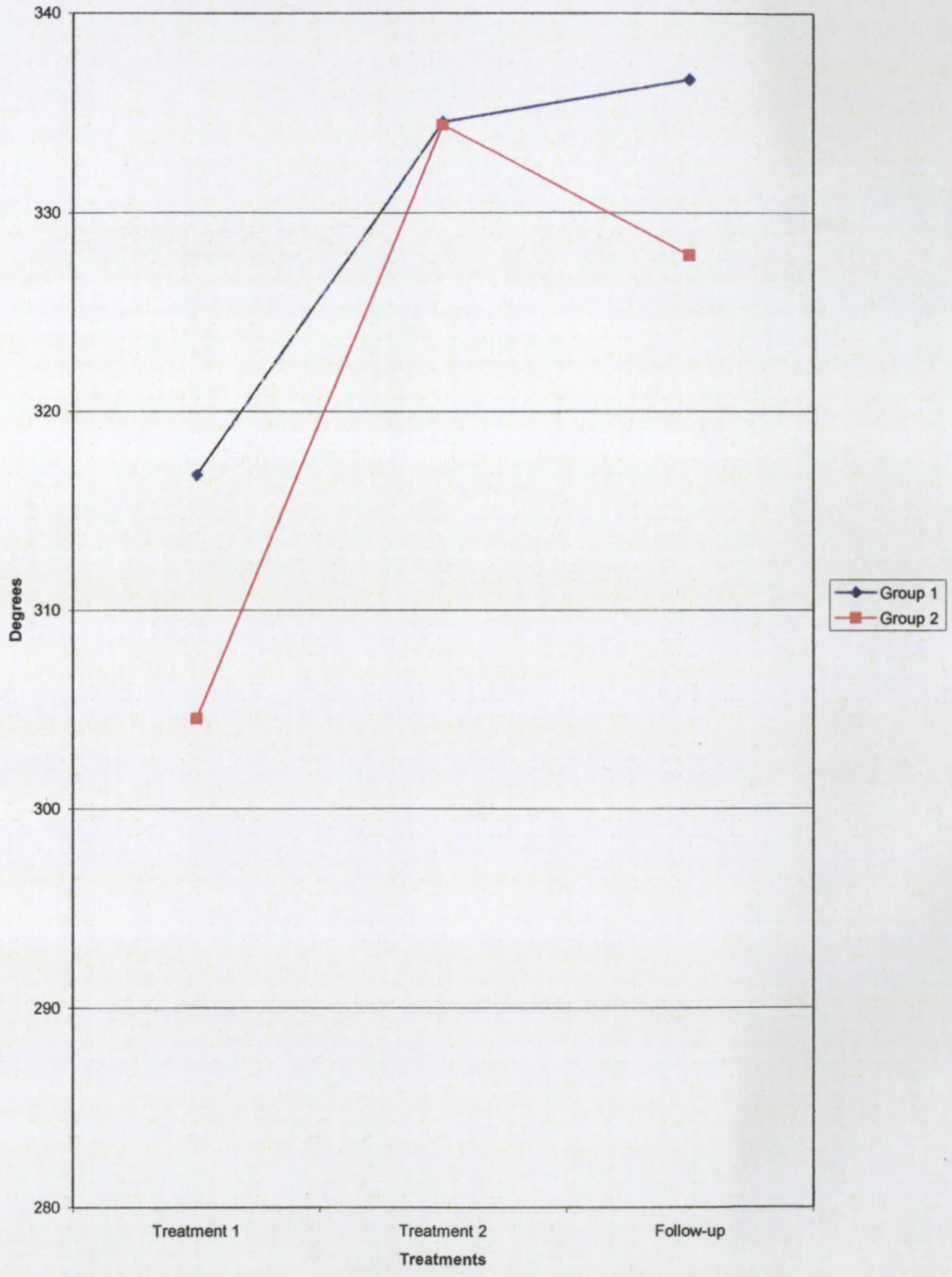
Table 4. 2. 6. 2 **Score's with Highest Frequencies for McGill**.

| | McGill | Score With Highest Frequency | Frequency | Percentage |
|---|---|---|---|---|
| Treatment 1 | Group1 | 2.0 | 4 | 26.7 |
| | Group2 | 2.0 | 4 | 26.7 |
| Treatment 2 | Group1 | 0, 1, 2 and 3 | 3 each | 20 each |
| | Group2 | 1.0 | 6 | 53.3 |
| Follow-up | Group1 | 0.0 | 6 | 40 |
| | Group2 | 1.0 | 6 | 40 |

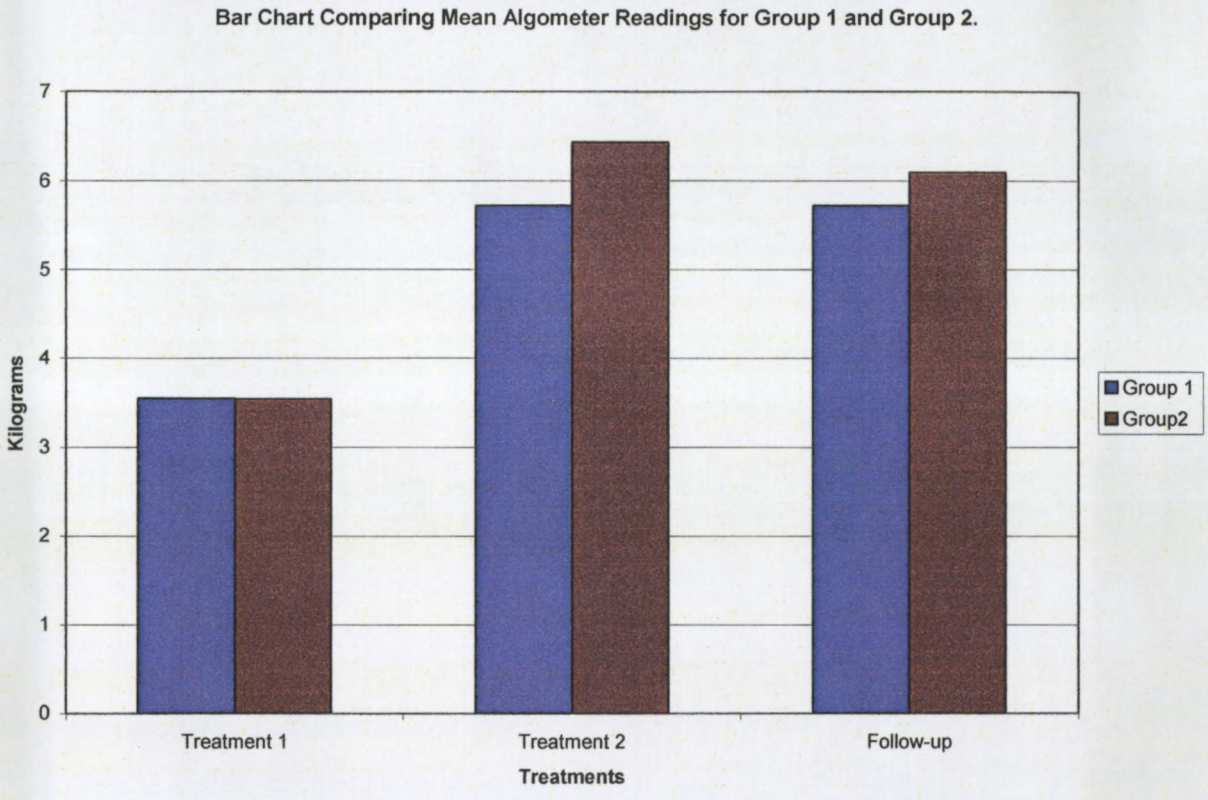
4. 2. 7. **Selected Barcharts for Continuous Variables**.

Barchart 4. 2. 7. 1

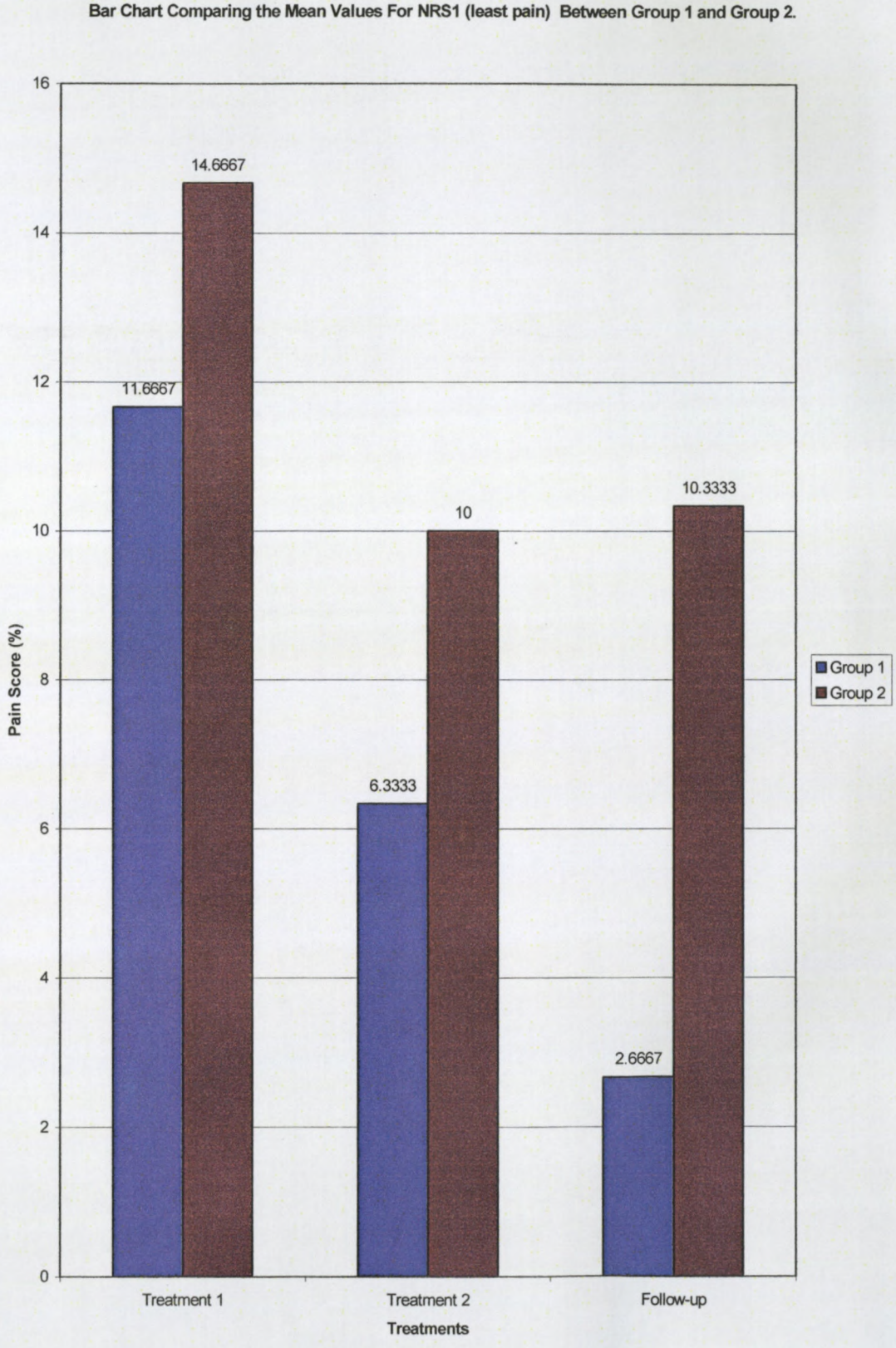
**Barchart Comparing Overall Mean Range of Motion**.



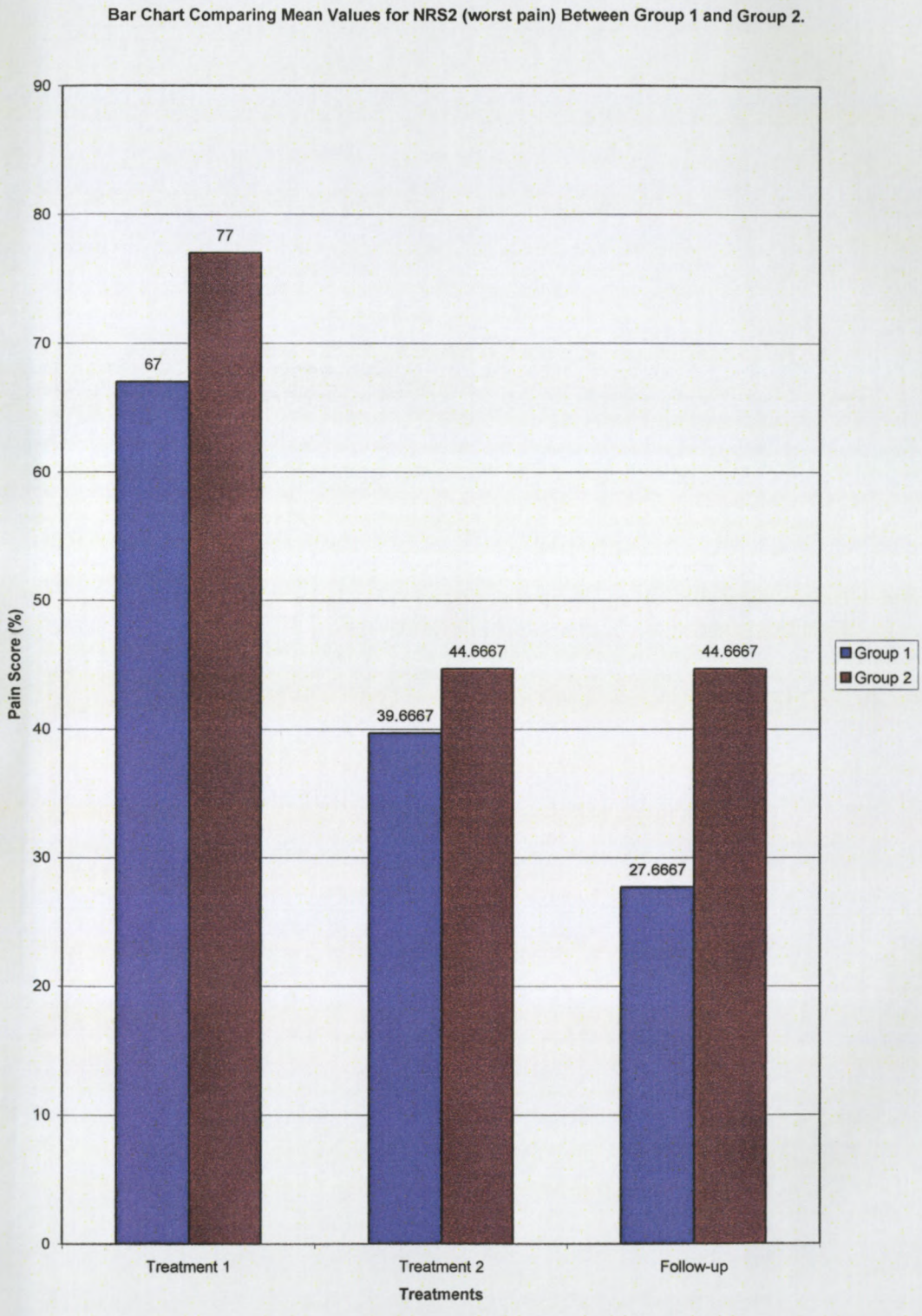
Barchart 4. 2. 7. 2



Barchart 4. 2. 7. 3



Barchart 4. 2. 7. 4



4. 2. 8 **Power Analysis For Continuous Variables**.

Table 4. 2. 8. 1 **Results of Power Analysis for Continuous Variables**.

The sensitivity of a statistical test can be measured using the power test. The power of a test depends on the size of the sample, accuracy of measurements involved in the study and the level of significance of the study, $\alpha$. The smaller the power of the test, the larger becomes the likelihood of a Type II error (incorrectly accepting the null hypothesis).

| | Flexion | Extension | Right Lateral Flexion | Left Lateral Flexion | Right Rotation | Left Rotation |
|---|---|---|---|---|---|---|
| Treatment 1 | 0.0650 | 0.0522 | 0.0840 | 0.0500 | 0.1042 | 0.1157 |
| Treatment 4 | 0.0501 | 0.0676 | 0.0502 | 0.1309 | 0.2152 | 0.0521 |
| Follow-up | 0.1118 | 0.0519 | 0.644 | 0.0538 | 0.1907 | 0.0527 |

| | Algometer Readings | NRS 1 | NRS 2 |
|---|---|---|---|
| Treatment 1 | 0.0500 | 0.1014 | 0.3215 |
| Treatment 4 | 0.1235 | 0.1421 | 0.0796 |
| Follow-up | 0.0790 | 0.3051 | 0.3074 |

# CHAPTER FIVE

# DISCUSSION

## 5.1 **Discussion**.

It is recognised that the sample size utilized for this research of only thirty patients is far too small from which to draw any accurate and statistically significant conclusions.

Of the 42 patients who responded to the advertisements only 37 qualified to take part and of these only 34 completed the full course of treatments. 30 completed scripts were randomly selected from the final 34, ensuring 15 patients for each group.

Three patients did not complete the full course due to the following reasons:

1) One patient failed to attend their one-month follow-up evaluation.
2) One patient did not respond favorably to treatment and consulted their General Practitioner for some pain-killers and anti-inflammatory medication. This immediately disqualified the patient from further participation.
3) Although partaking in a thorough case history and physical examination one patient failed to remember that they had psoriasis and in fact had previously suffered from psoriatic arthritis of their left knee. Any systemic pathology warranted disqualification.

## 5.2 **The Demographic Data**.

The average age of the symptomatic patient in this study was 33 years of age and of the thirty patients participating, 16 were male (53%) and 14 were female (47%). These findings seem to be comparable to those of Sola et-al (1955), whose study

investigating the prevalence of latent and active myofascial trigger points in 200 asymptomatic subjects, revealed trigger points in 45% of males and 55% of females with the largest group between the ages of 31 and 50 years.

Twenty of the thirty (67%) patients in this study were between 20 and 30 years of age and there was a slight male preponderance (53%). This is in accordance with research done by Talaat, el-Dibany and Garf (1986), where clinical evaluation of 120 patients revealed marked male preponderance and a greater prevalence during the third decade.

In a previous study by Sola et al (1955), it was advocated that the most commonly affected muscles with trigger points were: Trapezious, Levator Scapulae, Infraspinatous and Scaleneii.

Although trigger points in the trapezious muscle could not be treated due to the muscles neural supply from the Accessory nerve, the most commonly affected shoulder girdle muscles in this study were: Levator Scapulae (60%), Rhomboids (23%), Infraspinatous (13%) and Deltoid (3%).

The present study showed that 90% of the sample size were White with the remaining10% being Coloured and Asian. This is probably an unrealistic sample, as most of the Black, Coloured and Asian communities are not educated as to the exact nature of the profession of Chiropractic. It would be realistic to say that only a rapidly growing proportion of the wealthier suburbs surrounding the Technikon Natal Berea Campus are aware of the nature and benefits of Chiropractic care. The majority of the

clients were thus European in origin and therefore these are probably deceiving statistics.

## 5.3 **Discussion of the Results**.

It is important to remember the following:

1.) All patients received 4 treatments within a two-week period and were required to come in for a one-month follow-up evaluation.

2.) Group 1 was treated with spinal manipulation to the main level of segmental nerve supply to the muscle with active myofascial trigger points.

3.) Group 2. was treated by dry needling the concerned active myofascial trigger point.

4.) Subjective data was collected via the CCMC Neck Disability Index, the Numerical Pain Rating Scale-101 and the Short-Form McGill pain Questionnaire.

5.) Objective data was collected via a Cervical Range Of Motion Goniometer and an Algometer readings.

6.) All measurements and questionnaires were completed before treatment at each consultation.

7.) Data was analysed from the first, fourth and follow-up treatments in the following way: **Assessment 1** - between treatment 1 and 4, **Assessment 2** – between treatment 1 and the one-month follow-up evaluation and **Assessment 3** – between treatment 4 and the one-month follow-up evaluation.

5.3.1 **The First Objective**.

The first objective was to determine the relative effectiveness of chiropractic manipulation to the level of main segmental nerve supply and dry needling in terms of subjective clinical findings in the treatment of selected muscles with myofascial trigger points.

Subjective data was collected via the CCMC Neck Disability Index, the Numerical Pain Rating Scale-101 and the Short-Form McGill pain Questionnaire.

5.3.1.1 **Intra-Group Analysis**.

Results from the analysis of the **CMCC** using the Wilcoxon signed rank test revealed that both Groups 1 and 2 showed a statistically significant improvement for Assessment 1 and Assessment 2. That is, that between treatments 1 and 4 and between treatment 1 and the one-month follow-up evaluation, both groups significantly improved. No significant improvement was noted between treatment 4 and the one-month follow-up evaluation (Assessment 3) for either group.

Results from the analysis of the **Short–Form McGill Pain Questionnaire** using the Wilcoxons signed rank test revealed that both Groups 1 and 2 showed statistically significant improvement for Assessment 2. That is, that between treatments 1 and the one-month follow-up evaluation a significant improvement was noted for both groups. No significant improvement was noted between treatment 1 and treatment 4 (Assessment 1) for Group1, however Group 2 showed a more short-term benefit with

significant improvement between these treatments. Group 1 showed a more long-term benefit with a significant improvement noted for Assessment 3, while Group 2 showed no significant improvement for this assessment between treatment 4 and the one-month follow-up evaluation.

Results from the analysis of the **Numerical Pain Rating Scale-101 (for least pain)** using the Paired T-Test revealed that both Groups 1 and 2 showed no statistically significant improvement for Assessment 1 and Assessment 3. That is, that between treatments 1 and 4 and between treatment 4 and the one-month follow-up evaluation there was no significant improvement for both groups. No significant improvement was noted between treatment 1 and the one-month follow-up evaluation (Assessment 2) for Group2, however Group 1 showed some benefit with a statistically significant improvement between these treatments.

Results from the analysis of the **Numerical Pain Rating Scale-101 (for worst pain)** using the Paired T-Test revealed that both Groups 1 and 2 showed statistically significant improvement for both Assessment 1 and Assessment 2. That is, that between treatments 1 and 4 and between treatment 1 and the one-month follow-up evaluation there was a significant improvement for both groups. No significant improvement was noted for either group for Assessment 3. This meant that there was no further significant improvement in terms of worst pain perceived for both groups between treatment 4 and the one-month follow-up evaluation.

To conclude, according to the CCMC and NRS2 results Group1 and Group 2 both showed a statistically significant subjective improvement (in terms of disability and worst pain

perceived, respectively) between treatments 1 and 4 and between treatment 1 and the one-month follow-up evaluation. Again both groups exhibited statistically significant improvements in terms of pain severity between treatment 1 and the one-month follow-up evaluation for the McGill Questionnaire. According to McGill results Group 1 also showed a statistically significant subjective decrease in pain between treatment 4 and the one-month follow-up evaluation (longer lasting), while Group 2 also showed statistically similar results between treatments 1 and 4 (short-term). Group 1 also showed a statistically significant decrease in least pain perceived from the NRS1 results, between treatment 1 and the one-month follow-up evaluation.

**5.3.1.2** Inter-Group Analysis.

The Mann-Whitney test was used to compare the results of the **CCMC** between Group 1 and Group 2. For all comparisons the P-value was greater than the level of significance, this means that when compared, Group1 and Group 2's results in terms of decreased patient disability were similar. Group 2 showed a more long-term improvement in disability than Group 1.

The Mann-Whitney test was also used to compare the results of the **Short-Form McGill Pain Questionnaire** between Group 1 and Group 2. For all comparisons the P-value was greater than the level of significance. This means that when compared, Group1 and Group 2's results in terms of pain severity were similar. Group 2 showed

a more short-term improvement in pain than Group 1. Group 1 showed a more long-term improvement in pain than Group 2.

The Two Sampled Unpaired T-Test test was used to compare the results of the Numerical Pain Rating Scale-101 (least pain) between Group 1 and Group 2. For the comparison of readings taken at treatment 1 and treatment 4 the P-value was greater than the level of significance, so both pairs were similar with no significant difference between the two groups in terms of NRS1 results. Comparison of readings taken at the one-month follow-up evaluation gave Group 1 a statistically significant improvement when compared to Group 2 in terms of least pain experienced.

The Two Sampled Unpaired T-Test test was also used to compare the results of the Numerical Pain Rating Scale-101 (worst pain) between Group 1 and Group 2. For all comparisons the P-value was greater than the level of significance, so all three pairs were similar with no significant difference between the two groups in terms of NRS2 results. Both groups showed dramatic decreases in the levels of worst pain experienced, however neither group was statistically significantly more effective.

To conclude, when the subjective results were compared between Group 1 and Group 2, the two groups' results were not significantly different enough to draw any conclusions. At the one-month follow-up evaluation Group 1 showed a statistically significant improvement when compared to Group 2 in terms of lowering subjective levels of least pain perceived.

### 5.3.2 The Second Objective.

The second objective was to determine the relative effectiveness of chiropractic manipulation to the level of main segmental nerve supply and dry needling in terms of objective clinical findings in the treatment of selected muscles with myofascial trigger points.

Objective data was collected via an Algometer (pain threshold measurements) and a Cervical Range of Motion Goniometer (neck range of motion in degrees).

#### 5.3.2.1 Intra-Group Analysis.

Results from the analysis of the **Algometer** readings using the Paired T-Test revealed that both Groups 1 and 2 showed statistically significant improvement for both Assessment 1 and Assessment 2. That is, that between treatments 1 and 4 and between treatment 1 and the one-month follow-up evaluation there was a significant improvement (increased pain threshold) for both groups. No significant improvement was noted for either group for Assessment 3. This meant that there was no further significant improvement in terms of increased pain threshold for both groups between treatment 4 and the one-month follow-up evaluation.

Analysis of the **CROM Goniometer** readings using the Paired T-Test revealed that the only statistically significant improvements in range of motion were for Group 2.

Left Rotation improved significantly for Assessment 1 only. Right Lateral Flexion improved significantly for both Assessment 1 and Assessment 2. Extension improved significantly for Assessment 2 only. Both treatment protocols did improve cervical range of motion.

To conclude Group1 and Group 2 both showed a statistically significant objective improvement between treatments 1 and 4 and between treatment 1 and the one-month follow-up evaluation in terms of increased pain threshold. No substantial statistically significant objective improvement was noted for either group in terms of increased range of cervical motion in this study, however both groups did show increases in overall mean cervical range of motion (Barchart 4.2.7.1). Group 2 did display a trend towards range of motion increases with 4 statistically significantly increased assessments in three degrees of freedom.

5.3.2.2 **Inter-Group Analysis**.

The Two-Sampled Unpaired T-Test was used to compare the results of the CROM Goniometer between Group 1 and Group 2. For all comparisons the P-value was greater than the level of significance, so all eighteen pairs were similar with no significant differences between the two groups in terms of CROM results.

The Two Sampled Unpaired T-Test test was also used to compare the results of the **Algometer** readings between Group 1 and Group 2. The results indicate that at the 5% level of significance all pairs had equal means and variances, except for the follow-up

consultation where Group 2 showed a statistically significant improvement when compared to Group 1 in terms of increased pain threshold. The average reading taken for Group 2 at the one-month follow-up evaluation was 6.1 Kg's compared to Group 1's 5.7 Kg's.

To conclude, when the objective results for cervical range of motion were compared between Group 1 and Group 2, the two groups' results were not significantly different enough to draw any conclusions. Group 2's average Algometer readings at the one-month follow-up evaluation proved to be significantly better than Group 1's, perhaps an indicator that dry-needling is significantly more effective in sustaining increased trigger point pain threshold, when compared to manipulation.

## 5.4 **Problems with the Subjective Data**.

As this study was not blinded in any way it was possible that the subjects tried to please the researcher by subjectively reporting improvement in at successive consultations. This phenomenon would, however not have been isolated to one group only and therefore did not prejudice one group more than another.

The lack of statistically significant differences between the two groups queries the sensitivity of the questionnaires and perhaps subtle changes in patient disability and pain intensity were undetected. Some patients expressed a degree of difficulty as they attempted to describe and quantify their pain and disability within the parameters of the questionnaires. The CCMC questionnaire was not designed specifically for

determining disability in Myofascial Pain Dysfuction Syndrome, perhaps affecting patient responses in terms of improvement.

Emotional stresses, occupation daily activity and posture were neglected as exclusion criteria and factors such as these would have influenced the patient's degree of pain and disability between treatments.

5.6 **Problems with the objective Data**.

The CROM Goniometer readings must be viewed with discretion as user error may have contributed to variations in terms of the authenticity and accuracy of cervical range of motion. Minor variations in Algometer placement due to human error may have influenced trigger point sensitivity and pain threshold readings.

Sports participation or occupational and recreational activities may have lead to untimely muscular stiffness at times with decreased cervical range of motion. This may account for unexplained variations in goniometer readings.

The major limitation of this study was the small sample size of 30 patients, which can be reflected by the minor sensitivity of the power readings. Financial and time restraints do not allow for a larger sample size.

It must also be noted that a sixth year chiropractic student and not a qualified doctor of chiropractic carried out all manipulations and measurements.

## 5.6 **Comparison of the Results**.

No study involving manipulation to the level of main segmental nerve supply as a treatment for muscles with myofascial trigger points of any description could be found in journals, CD-ROMs, text books or the internet, thus it was impossible to make direct comparisons to other research studies.

Vernon and Terrett (1983) did a controlled study, with 50 asymptomatic under graduate students, on the effect of spinal manipulation on paraspinal cutaneous pain tolerance levels. A statistically significant elevation of pain tolerance (140%) occurred after manipulation as compared to a control group. Although there was no measurement of pain tolerance in the present study, Group 1 showed a statistically significant elevation in pain threshold levels at active myofascial trigger point sites following manipulation to the main level of segmental nerve supply of the affected muscle.

Cote, Mior and Vernon's (1994) study investigating the immediate effects of spinal manipulation and mobilisation on pain/pressure thresholds in patients with chronic mechanical low back pain, failed to show clinical or statistical significance between the two treatment groups. Perhaps immediate post intervention analysis does not allow enough time for the effects of the manipulation to occur. Based on the results of the present study, manipulation to the level of main segmental nerve supply of the affected muscles may also have altered their findings.

Pollard's (1996) study on post-manipulative muscle strength found an overall statistically significant short –term increase in quadriceps femoris muscle strength 60 seconds after manipulation of the L3/L4 vertebral motion segment. It is worth noting that L4 is the main segmental nerve supply to the quadriceps femoris muscle. This study also supports the existence of a neurological pathway that affects muscle and is prone to external stimulation via manipulation.

Nansel et-al. (1993) completed a randomised double-blinded study, using 68 asymptomatic patients, investigating the effect of cervical spinal adjustments on lumbar paraspinal muscle tone and although the main segmental nerve segment was not manipulated results indicated that upper cervical adjustments produced changes in lumbar tissue compliance which were only slight ($p<.05$) and not significantly different from that which occurred following upper cervical sham manipulation ($p>.1$). Lower cervical adjustments induced increases in tissue compliance (decreases in tone) which were highly significant ($p<.001$).

## 5.7 **Conclusion.**

In this study both groups showed significant improvement in terms of pain reduction and a decrease in disability. A cervical range of motion comparison was insignificant, although both groups mean cervical range of motion increased. From the statistical evidence gathered no discernable difference could be shown between the two treatment protocols. Both treatments were similar in their level of effectiveness. However, trends in results suggest that Group 1 showed more subjective long-term benefits. Similarly, Group 2 seemed to demonstrate slightly more improvement

objectively. Dry needling has previously been proven more effective than placebo for treating myofascial trigger points (Jones 1994). Because manipulation has shown significantly similar results to dry needling in this study it may be fair to surmise that manipulation to the main level of segmental nerve supply to a muscle with myofascial trigger points is also more effective than placebo for this condition, however a study to directly investigate this assumption would prove its validity.

# CHAPTER SIX

# CONCLUSIONS AND RECOMMENDATIONS

## 6.1 Conclusion.

### 6.1.1 The Third objective

The third objective was to interpret the data from the subjective and objective findings in order to determine which of the treatment protocols was more effective for treating myofascial trigger points.

According to the results of this study, both dry needling and manipulation to the main segmental nerve supply of muscles with myofascial trigger points, are effective forms of treatment for myofascial trigger points.

This study failed to show which of the two treatment protocols was significantly most effective in the treatment of myofascial trigger points.

## 6.2 Recommendations.

This study should be repeated using a larger sample size, so that more accurate conclusions can be drawn from the derived information. A follow-up study at 6 months, 1 year and 2years might help establish how effective the treatment is over a longer period.

Perhaps a more sensitive pain questionnaire and disability index pertaining more to the patient who suffers with myofasciitis, would help identify more subtle changes during subjective evaluation. A more reliable instrument with less of a margin for

human error would help obtain more accurate measurements for cervical range of motion.

A patient's sporting and recreational activities as well as occupation should have been taken into account during patient selection, as frequent strenuous exercise obviously aggravates trigger point activity. For example, results to treatment of a more sedentary person would differ greatly from those of an athlete.

It would also be of interest to ascertain the effectiveness of manipulation when combined with dry needling in the treatment of myofascial trigger points. Another study that should be recommended is to analyse the effectiveness of manipulation.

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# APPENDICES

APPENDIX-A

## NUMERICAL PAIN RATING SCALE- 101 QUESTIONNAIRE

Patient Name: _____ File no: _____ Date:_____

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 would mean "pain as bad as it could be". Please write only one number.

_____

# CMCC NECK DISABILITY INDEX APPENDIX-B

atient Name:_____ File no.:_____ Date:_____

iis questionnaire has been designed to give the doctor information as to how your back pain has affected your ability to manage everyday life. Please swer every section and mark in each section only ONE box as it applies to you. We realize you may consider that two of the statements in any one section uld relate to you, but please just mark the box which most closely describes your problem.

**Section 1 - Pain Intensity**

- ☐ I have no pain at the moment.
- ☐ The pain is very mild at the moment.
- ☐ The pain is moderate at the moment.
- ☐ The pain is fairly severe at the moment.
- ☐ The pain is very severe at the moment.
- ☐ The pain is the worst imaginable at the moment.

**Section 2 - Personal Care (Washing, Dressing ...)**

- ☐ I can look after myself normally without causing extra pain.
- ☐ I can look after myself normally but it causes extra pain..
- ☐ It is painful to look after myself and I am slow and careful.
- ☐ I need some help but manage most of my personal care.
- ☐ I need help every day in most aspects of self care.
- ☐ I do not get dressed, I wash with difficulty and stay in bed.

**Section 3 - Lifting**

- ☐ I can lift heavy weights without extra pain.
- ☐ I can lift heavy weights but it gives extra pain.
- ☐ Pain prevents me from lifting heavy weights off the floor, but I can manage if they are conveniently positioned, for example on a table.
- ☐ Pain prevents me from lifting heavy weights, but I can manage light to medium weights if they are conveniently positioned .
- ☐ I can lift only very light weights.
- ☐ I cannot lift or carry anything at all.

**Section 4 - Reading**

- ☐ I can read as much as I want to without pain in my neck.
- ☐ I can read as much as I want to with slight pain in my neck.
- ☐ I can read as much as I want with moderate pain in my neck.
- ☐ I cannot read as much as I want because of moderate pain in my neck.
- ☐ I can hardly read at all because of severe pain in my neck.
- ☐ I cannot read at all.

**Section 5 - Headaches**

- ☐ I have no headaches at all.
- ☐ I have slight headaches which come infrequently.
- ☐ I have moderate headaches which come infrequently.
- ☐ I have moderate headaches which come frequently.
- ☐ I have severe headaches which come frequently.
- ☐ I have headaches almost all the time.

**Section 6 - Concentration**

- ☐ I can concentrate fully when I want to with no difficulty.
- ☐ I can concentrate fully when I want to with slight difficulty.
- ☐ I have fair degree of difficulty in concentrating when I want to.
- ☐ I have a lot of difficulty in concentrating when I want to.
- ☐ I have a great deal of difficulty in concentrating when I want to.
- ☐ I cannot concentrate at all.
- ☐

**Section 7 - Work**

- ☐ I can do as much work as I want to .
- ☐ I can do only my usual work, but no more.
- ☐ I can do most of my usual work, but no more.
- ☐ I cannot do my usual work.
- ☐ I can hardly do any work at all.
- ☐ I cannot do any work at all.
- ☐

**Section 8 - Driving**

- ☐ I can drive my car without any neck pain.
- ☐ I can drive my car as long as I want with slight pain in my neck.
- ☐ I can drive my car as long as I like with moderate pain in my neck.
- ☐ I cannot drive my car as long as I want because of moderate pain in my neck.
- ☐ I can hardly drive at all because of severe pain in my neck..
- ☐ I cannot drive at all.

**Section 9 - Sleeping**

- ☐ I have no trouble sleeping.
- ☐ My sleep is slightly disturbed (<1 hour sleep loss).
- ☐ My sleep is mildly disturbed (1-2 hours sleep loss).
- ☐ My sleep is moderately disturbed (2-3 hours sleep loss).
- ☐ My sleep is greatly disturbed (3-5 hours sleep loss).
- ☐ My sleep is completely disturbed (5-7 hours sleep loss).

**Section 10 - Recreation**

- ☐ I am able to engage in all my recreation activities with no neck pain at all.
- ☐ I am able to engage in all my recreation activities, with some pain in my neck.
- ☐ I am able to engage in most, but not all of my usual recreation activities because of pain in my neck.
- ☐ I am able to engage in a few of my usual recreation activities because of pain in my neck.
- ☐ I can hardly do any recreation activities because of pain in my neck.
- ☐ I cannot do any recreation activities at all.

Vernon/Hagino, modified from Foubister et al.,Physiotherapy, 1980

# APPENDIX-C

## SHORT-FORM McGILL PAIN QUESTIONNAIRE ( SF-MPQ)

Ronald Melzack

Patients Name:_____ File #: _____ Date: _____

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

# NECK PAIN ?
# SHOULDER PAIN ?
# ARM PAIN ?
# UPPER BACK PAIN?

More effective and safe forms of treatment are currently being researched. Should you qualify for this research, all consultations and treatments will be *free of charge.*

**Contact Hayden Pooke at the following numbers:**

**Ph. 204 2205 or 204 2512**

# APPENDIX-E

COVERING LETTER FOR PATIENTS ENTERING THIS STUDY.

Dear Patient,

Welcome to my research study in myofascial trigger points. I am investigating the effect of chiropractic manipulation to the level of main segmental nerve supply in the treatment of muscles with myofascial trigger points.

Trigger points are tender areas in muscles that, when active, may refer pain that mimics other painful conditions. Trigger points are very common and are often over looked as a source of pain. Trigger points usually develop in muscles that are acutely or chronically strained.

All treatment will be free of charge and will be conducted at the Technikon Natal Chiropractic Day Clinic. Please be assured that all information will be regarded as strictly confidential.

The group to which you have been assigned has been randomly predetermined. To participate in this study the following will be required:-

a. You must be between 18-75 years of age.
b. If you are suffering from any systemic or local pathology, you may not be included in this study.
c. If any contraindications to manipulation are suspected on examination, you may not be included in this study.
d. Conditions other than myofascial trigger points will not be treated in this study.
e. You may not take any analgesics or receive any manual therapy (including stretching) throughout the programme.
f. A consent form will be required to be filled out prior to treatment.

Side-effects of manipulation may include slight feelings of muscular stiffness and side-effects of dry needling may include a degree of post–needling tenderness.

You will receive 4 treatments within a two-week period and a one-month follow-up evaluation. You will remain in the study as long as you commit to the appointment schedule. At this point I also ask that you be truthful and as accurate as possible in your responses to all questions. There are no wrong or right answers, but your specific answers will affect the outcome of the study.

Yours Sincerely

Hayden Pooke.

## INFORMED CONSENT FORM

To be completed in duplicate by patient / subject.

**Title of research project:**

**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. Who have you spoken to ? _____

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 -
   a) at any time
   b) without having to give a reason for withdrawing, and
   c) without affecting your future health care ? YES / NO

9. Do you agree to voluntarily participate in this study ? YES / NO

Patient / Subject Name: _____ Signature: _____

Parent / Guardian Name: _____ Signature: _____

Witness Name: _____ Signature: _____

Research Student Name: _____ Signature: _____

Date: _____

# APPENDIX-G

## 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

## 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 & X Gag reflex:
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:

# APPENDIX-I

## TECHNIKON NATAL CHIROPRACTIC DAY CLINIC
## REGIONAL EXAMINATION - *CERVICAL SPINE*

Patient: _____ File: _____

Date: _____ Intern/Resident: _____

Clinician: _____ Sign: _____

**OBSERVATION:**

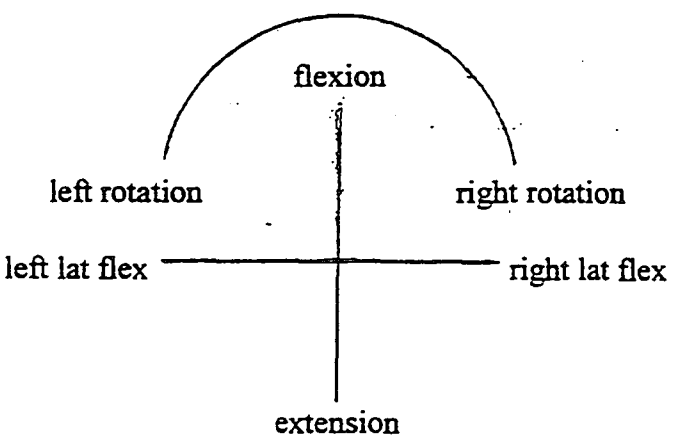
Posture
Swellings
Scars
Discolouration
Hair Line
Bony & Soft Tissue Contours

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 T horacics:
Motion Palpation:
Joint Play:

**Basic Exam: Thoracic Spine:**
Case History:

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

# APPENDIX-J

PATIENT INFORMATION FORM

PATIENT NAME:_____

FILE NO._____

GROUP:_____

TRIGGER POINTS:_____

GONIOMETER READINGS

| VISIT NUMBER | 1 | 2 | 3 | 4 | FOLLOW-UP |
|---|---|---|---|---|---|
| FLX. | | | | | |
| EXT. | | | | | |
| R.LAT.FL. | | | | | |
| L.LAT.FL | | | | | |
| R.ROT. | | | | | |
| L.ROT. | | | | | |

ALGOMETER READINGS

| VISIT NUMBER | *READING* |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| FOLLOW-UP | |