

# **THE THERAPEUTIC EFFICACY OF DRY NEEDLING LATENT MYOFASCIAL TRIGGER POINTS.**

by

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Durban Institute of Technology

I, Candice Lara Wilks, do hereby declare that this dissertation represents my own work both in conception and execution.

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## **DEDICATION**

To my **Mom**, you have taught me amazing strength and unconditional love.

I thank you for all your support, encouragement, love and belief in me.

To **Greg**, thank you for all the love, understanding and support. You have taught me much on the subjects of love and kindness. I am indebted to you.

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Thanks to the **Lord**, who is almighty.

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## **ABSTRACT**

The purpose of this study was to investigate the efficacy of dry needling latent myofascial trigger points, in the treatment of Myofascial Pain Syndrome.

The study was a prospective, randomized placebo controlled study. Sixty patients, between the ages of 18-60, from the greater Durban area participated in the study. They underwent a case history, relevant physical examination and a cervical spine examination. The sixty subjects were randomly allocated into two groups of thirty. Group one received sham/ placebo needling while group two received dry needling, after being diagnosed systematically as suffering from latent myofascial trigger points of the trapezius and/or the levator scapulae muscle/muscles.

Each patient received two treatments within a week with a one-week follow-up. Subjective and objective measures were taken at all three visits. Subjective data was obtained from the Numerical Pain Rating Scale 101 and objective data was obtained from the use of the algometer.

This data was used to perform statistical analysis using parametric unpaired and paired t-tests to compare inter- and intra-group data respectively, at a 95% level of confidence.

Inter-group analysis revealed no statistical difference between the two groups, while intra-group analysis revealed that within both groups there was significant subjective and objective improvement.

From the results it appears that both groups responded equally well to their respective treatment protocols in the treatment of Myofascial Pain Syndrome. It can thus be concluded that dry needling appears to be no more effective than placebo in the clinical management of latent myofascial trigger points.

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# **CHAPTER 1**

## **1.0 INTRODUCTION**

### **1.1 THE PROBLEM AND ITS' SETTING**

Myofascial Pain Syndrome, as defined by Travel, Simons and Simons (1999 1:5), presents as a result of the sensory, motor and autonomic symptoms caused by myofascial trigger points.

Myofascial Pain Syndrome is an extremely common condition presenting to primary health care practice and is of a multi-factorial origin (Hubbard, 1998:16; Gatterman, 1990:287 and Travel, Simons and Simons, 1999 1:179). Muscular pain is the most common work-related injury and the second most common cause of visits by patients to physicians (Hubbard, 1998:16). In a review article written by Hans and Harrison (1997:90) the incidence of Myofascial Pain Syndrome is reported as high as 85% at certain American pain clinics, yet it remains to be one of the least understood conditions, often being misdiagnosed, mistreated or simply unrecognized (Auleciems, 1995:18).

Myofascial trigger points, the components of Myofascial Pain Syndrome, are generically described as localized areas of pain within muscles or their fascia,

which are exquisitely tender to touch, and can cause referred pain on manual compression of the myofascial trigger point (Travell, Simons and Simons, 1999 1:5).

Latent myofascial trigger points are associated with muscular stiffness, limited range of motion of a / the joint / joints to which the involved muscle is / are attached, weakness of the involved muscle and latent myofascial trigger points are painful and refer pain only when palpated (Travel, Simons and Simons, 1999 1:4). The latent myofascial trigger point is clinically silent with respect to spontaneous pain.

In opposition to this, an active myofascial trigger point has similar characteristics to the latent myofascial trigger point however it always produces spontaneous referred pain and tenderness in the pain reference zone (Travel, Simons and Simons, 1999 1:1).

According to Travel, Simons and Simons (1999 1:12), latent myofascial trigger points are more common than active myofascial trigger points, this is based on the fact that voluntary skeletal muscle accounts for 40% or more of body weight of which the majority are postural muscles (Bogduk and Twomey, 1987:87) and hence the high prevalence of pain originating from latent myofascial trigger points in these muscles (Gatterman, 1990:285).

A latent myofascial trigger point usually develops in a taut band in response to abnormal muscle stress and psychological stress combined with genetic predisposition. The natural course of a latent myofascial trigger point in a healthy individual is unclear (Hong and Simons, 1998:868-870).

The literature reviewed advocates the application of cold, heat, behavioral therapy, myofascial trigger point injection, manipulation and TENS (Hubbard, 1998:23-26), stretch and spray, stretch and ice, deep massage or ischemic compression, myofascial release, medication, as well as exercises (Auleciems, 1995:25-28) in the treatment of myofascial trigger points, however the effect of the individual therapies have not been individually researched in terms of the latent myofascial trigger points.

Thus, this research is designed to test one of these treatment modalities in terms of the latent myofascial trigger points.

Dry needling is thought to mechanically disrupt the shortened contractile element of the muscle or nerve endings and in so doing break the feedback loop responsible for sustaining the myofascial trigger point (Travell, Simons and Simons, 1999 1:150).

Dry needling has been proven to be as effective as injection therapy in the treatment of active myofascial trigger points (Travell, Simons and Simons, 1999

1:155). Lewit (1979:87) prefers dry needling to local anaesthetic as it permits the location of all the sensitive loci within the myofascial trigger point by preserving their telltale pain reaction.

With reference to the above theory behind dry needling it should be effective in reducing the clinical picture of latent myofascial trigger points that being muscular stiffness, limited range of motion of a joint of the involved muscle, weakness of the involved muscle and pain on palpation.

There is no research to support the dry needling of latent myofascial trigger points to resolve their clinical picture; and as these predispose to active myofascial trigger points (Travel and Simons, 1983:12-13) which have a worse clinical picture in terms of the patient presentation, it is essential to carry out a controlled clinical trial to determine whether dry needling can eliminate latent myofascial trigger points and hence improve on the natural history of the condition.

## **1.2 STATEMENT OF THE PROBLEMS**

The aim of this placebo-controlled study is to determine the effect that dry needling has on latent myofascial trigger points in terms of subjective and objective findings.

### **1.2.1 SUB-PROBLEM ONE**

To determine the efficacy of dry needling of latent myofascial trigger points in the treatment of Myofascial Pain Syndrome in terms of subjective clinical findings (i.e. subjective pain perception) and objective clinical findings (pain threshold algometry).

### **1.2.2 SUB-PROBLEM TWO**

To determine the efficacy of sham / placebo needling of latent myofascial trigger points in the treatment of Myofascial Pain Syndrome in terms of subjective clinical findings (i.e. subjective pain perception) and objective clinical findings (pain threshold algometry).



### **1.3 HYPOTHESES**

#### **1.3.1 THE FIRST HYPOTHESIS**

It is hypothesized that dry needling of latent myofascial trigger points in the treatment of Myofascial Pain Syndrome will be effective in terms of subjective clinical findings (i.e. subjective pain perception) and objective clinical findings (pain threshold algometry).

#### **1.3.2 THE SECOND HYPOTHESIS**

It is hypothesized that sham / placebo needling of latent myofascial trigger points in the treatment of Myofascial Pain Syndrome will be effective in terms of subjective clinical findings (i.e. subjective pain perception) and objective clinical findings (pain threshold algometry).

#### **1.3.3 THE THIRD HYPOTHESIS**

It is hypothesized that dry needling of latent myofascial trigger points will have efficacy beyond placebo in the treatment of Myofascial Pain Syndrome.

## **CHAPTER 2**

### **2.0 REVIEW OF THE RELATED LITERATURE**

#### **2.1 INTRODUCTION**

Myofascial Pain Syndrome is a type of muscular pain disorder (Chaitow and Delany, 2002:124 and Moran, 1992:97-101). The component myofascial trigger points cause local pain and referred pain, muscular stiffness and limited range of motion of the joints associated with the affected muscles. Myofascial trigger points can also be responsible for the weakness of the involved muscles as well as autonomic dysfunction such as salivation, sweating, localized vasoconstriction and lacrimation (Travell, Simons and Simons, 1999 1:5 and Chaitow and Delany, 2002:18).

Myofascial Pain Syndrome is an extremely common condition presenting to primary health care practice (Hubbard, 1998:16), however it is often misdiagnosed, mistreated or simply unrecognized (Auleciems, 1995:18). When treated properly Myofascial Pain Syndrome has an excellent prognosis (Auleciems, 1995:18).

## **2.2 PREVELENCE AND INCIDENCE**

Myofascial Pain Syndrome has been described as a common health problem affecting a substantial portion of the population, which affects the individual in every aspect of their life (Bruce, 1995:469). Gatterman (1990:285) states that a large amount of body pain will occur in muscle, as skeletal muscle makes up over 40% of the total body mass.

Several studies have been carried out on the prevalence and incidence of Myofascial Pain Syndrome:

According to a review article done by Hans and Harrison (1997:90), myofascial pain appears to be a common phenomenon in the clinical setting. In this review article written by Hans and Harrison (1997:90), they quote the Nuprin report (1985), which shows that as many as 53% of the American population suffers from muscular pain.

In the same review by Hans and Harrison (1997:90), it was stated that of the 200 adults presenting for a particular study, 54% of women and 45% of men had latent myofascial trigger points in the shoulder girdle.

Hans and Harrison (1997:90) also claim that American studies done at pain clinics indicate that the incidence of Myofascial Pain Syndrome varies between 30 and 85%. Chaiamnuay et al (1998:1382) found similar results in their study conducted in villages from rural Thailand where 2463 subjects were examined of which 36.2% had musculoskeletal pain with Myofascial Pain Syndrome being the most common diagnosis. In a similar manner, Fishbain et al (1986:197) reported that of 283 consecutive admissions to a pain centre programme, myofascial trigger points (components of Myofascial Pain Syndrome) were the primary cause of pain in 85% of cases.

Auleciems (1995:18) agrees that it is one of the most commonly encountered problems in the outpatient setting and yet is poorly understood.

Myofascial Pain Syndrome occurs in both sexes however it appears to be more common in females as found in a study done by Hou et al (2002:1411-1412) where of the 119 individuals treated for Myofascial Pain Syndrome, 107 were female.

People of any age can develop active myofascial trigger points, which leads to Myofascial Pain Syndrome, but people between the ages of 30-49 are more commonly plagued by the condition, which then decreases with age (Hans and Harrison, 1997:90). As with advancing age comes reduced activity and the stiffness and restricted range of motion of latent myofascial trigger points

becomes more prominent than the pain of active myofascial trigger points (Travell, Simons and Simons, 1999 1:13).

In the literature reviewed no statistics were found with regards to the prevalence of Myofascial Pain Syndrome in South Africa.

The above studies indicate that Myofascial Pain Syndrome is common and that it can result from both latent and active trigger points (Auleciems, 1995:18; Chaiamnuay et al, 1998:1382; Fishbain et al, 1986:197; Hans and Harrison, 1997:90; Hou et al, 2002:1411-1412 and Travell, Simons and Simons, 1999 1:13), however latent myofascial trigger points are found to far more common than active myofascial trigger points (Travell, Simons and Simons, 1999 1:12).

Both latent and active myofascial trigger points cause stiffness, restricted range of motion and pain on manual compression. However only active myofascial trigger points cause spontaneous pain referral (Chaitow and Delany, 2002:18-19 and Travell, Simons and Simons, 1999 1:12). In a study done by Diakow (1992:40-41) it was found that thermography could be used to differentiate latent from active myofascial trigger points. Chaitow and Delany (2002:19) have also shown that cutaneous humidity and cutaneous texture alter when a myofascial trigger point is present.

Latent myofascial trigger points	Active myofascial trigger points
<b><i>Commonalities</i></b>	
Decreased stretch range of motion.	Decreased stretch range of motion.
Muscular stiffness.	Muscular stiffness.
Local twitch response.	Local twitch response
Painful and weak muscle on contraction.	Painful and weak muscle on contraction.
<b><i>Differences</i></b>	
Localized pain on manual compression.	Localized and referred pain on manual compression.
No spontaneous pain referral.	Spontaneous pain referral.
Recognition of an unfamiliar or previous pain.	Recognition of current pain.

**Table 1: Comparison of latent and active myofascial trigger points**

**Compiled from Chaitow and DeLany, 2002:18-19 and Travell, Simons and Simons, 1999 1:1-4.**

### 2.3 AETIOLOGY

According to Travell, Simons and Simons (1999 1:19) the factors responsible for the development of a latent myofascial trigger point are the same, but to a lesser degree, than the ones responsible for the development of an active myofascial trigger point.

In a study done by De Stefano et al (2000:2906-10) it was concluded that there is pathogenetic involvement of the afferent nervous system in the development and perception of Myofascial Pain Syndrome due to peripheral hyperactivity of the peptidergic nervous system.

In addition to this, Travell, Simons and Simons (1999 1:19) and Chaitow and Delany (2002:20) propose several primary factors that may result in the development of myofascial trigger points:

- **Mechanical abuse**- this may be through acute, sustained or repetitive muscle overload i.e. prolonged muscle contraction.
- **Trauma**- which includes the precipitation of myofascial trigger points by means of local inflammatory reaction.

- Leaving a muscle in a **shortened position** for a prolonged period of time especially if the muscle is contracted in the shortened position.
- **Nerve compression**- this can cause identifiable neuropathic electromyographic changes and results in disturbed microtubule communication between the neuron and the endplate.
- **Adverse environmental conditions** – including, but not limited to excessive cold, heat or damp.
- **Febrile Illness**.
- **Systemic Biochemical Imbalances** – for example hormonal disturbances.

And Baldry (1993) goes further to classify secondary activating factors, which are not limited to, but include:

- **Compensating synergist and antagonist muscles**.
- **Satellite referral myofascial trigger points** that evolve within a referral zone.



- **Infections** - not necessarily related to febrile illness.
- **Allergies** – not only related to food allergies, but also pollutants, pollen etc.
- **Nutritional deficiency** – especially vitamins C, B-complex and iron.
- **Low oxygenation of the tissues.**

Fomby et al (1997:3) also state that poor work ergonomics also creates mechanical stress. A student sitting with a bad posture when studying, labourers bending and lifting heavy objects everyday and a receptionist cradling a telephone between her shoulder and ear all day all experience musculoskeletal stress and strain.

Gattermann (1990:285) and Chaitow and Delany (2002:21) all indicate that primarily due to postural strain and mechanical stresses, and secondarily to the other aetiological factors (mentioned above), that the most common sites for the development of myofascial trigger points are the postural muscles of the back & neck and the rotator muscles of the shoulders (Gattermann, 1990:285; Hubbard 1998:18; Travell, Simons and Simons, 1999 1:279; and Chaitow and DeLany, 2002:21), the quadratus lumborum (Chaitow and DeLany, 2002:21) and the third finger extensor (Chaitow and DeLany, 2002:21).

The trapezius muscle is probably the muscle most commonly affected by myofascial trigger points (Travell, Simons and Simons, 1999 1:279).

## **2.4 PATHOLOGY**

A myofascial trigger point by definition is found in a taut band of skeletal muscle (Travell, Simons and Simons, 1999 1:5), associated with a hypersensitive palpable nodule (Chaitow and DeLany, 2002:18).

There is no generally recognized pathophysiology to account for the symptoms of myofascial trigger points (Harden et al, 2000:64-72), however the most plausible theory is the “integrated theory” of Simons (1988) and De Stefano et al (2000) indicated by Chaitow and DeLany (2002:18), which follows.

By placing emphasis on neuromuscular dysfunction, Travell, Simons and Simons (1999 1:57) describe a myofascial trigger point as a cluster of numerous microscopic abnormal loci that are scattered throughout the myofascial trigger point nodule. The critical point of abnormality being the neuromuscular dysfunction at the motor endplate of an extrafusal skeletal muscle fiber, after strain, overuse or trauma to the relevant muscle.

According to Simons’s theory (1988:210), this external trauma is thought to cause a disruption of the sarcoplasmic reticulum around the muscle fiber and cause the subsequent release of stored calcium. Chaitow and DeLany (2002:19)

propose that when the stored calcium is released, excessive acetylcholine is released from the nerve ending, due to the opening of the calcium charged gates that regulate acetylcholine release. This supports a previous theory proposed by Hsueh et al (1997:474), where they suggested that excessive acetylcholine release in the dysfunctional endplate region may be responsible for the formation of the taut band, through stimulation of the muscle fibers which contract.

In addition to this Simons (1988:210), proposes that the muscle contraction is further enhanced by the shortening of the sarcoplasmic reticulum and the development of a “localized maximal contracture”. This maximal contracture activity causes “maximal local energy expenditure” by the sarcomeres of the involved muscle fibers along with the stimulation of the muscle fibers by the acetylcholine, which results in further excessive muscle contraction and the development of local ischaemia in the area of the motor end plate (Chaitow and DeLany, 2002:19).

This ischaemia causes an oxygen / nutrient depletion which results in an energy crisis (Chaitow and DeLany, 2002:19), similar to that proposed by Simons’s theory (1988:210). Only Simons (1988:210) goes further to state that the muscle contracture compromises the local blood flow, resulting in a situation of sustained high rate energy expenditure and depletion of the available adenosine triphosphate (ATP). With the depletion of ATP the calcium pumps cannot function and can no longer recover the calcium, which is responsible for the contractile activity. Therefore, as the removal of the calcium, that is sustaining the release of

acetylcholine, requires more energy than that needed to sustain the induced contraction, the muscle (or portion thereof) remains in a contracted state (Chaitow and DeLany, 2002:19).

This results in a self-sustaining vicious cycle (Simons, 1988:210 and Chaitow and DeLany, 2002:19).

Simons (1988:210) supported by Chaitow and DeLany (2002:19) in a more recent investigation, speculates that the tenderness and pain associated with myofascial trigger points is due to the sensitization of peripheral sensory nerve endings, by accumulated metabolic waste products such as histamine, serotonin, prostaglandins, leukotrienes, kinins and hypertonic salt solutions.

The metabolic waste products also have a tendency to increase local muscle acidity resulting in the activation and firing of muscle nociceptors, which is perceived as pain (Hans and Harrison, 1997:92). Hans and Harrison (1997:92) propose that the sensitization of the nerve endings by waste products and / or inflammatory mediators may be primarily responsible for the local twitch response and jump signs.

In addition to this, De Stefano et al (2000:2907-2908) developed a theory relating to the production of substance P, which is thought to be stimulated by the local inflammatory reaction. They (De Stefano et al, 2000:2907-2908) speculate that

substance P, a neurotransmitter of pain in afferent nociceptive fibers, is involved in the pathogenesis of myofascial trigger points. They hypothesized that the peptidergic system is sensitized by trauma and the local inflammatory reaction, resulting in increased substance P production in the neurons of dorsal root ganglia. The increased release of substance P in both the spinal cord and peripheral soft tissue is thought to result in allodynia (decreased pain threshold) and hyperalgesia (increased pain sensitivity). It was therefore concluded by De Stefano et al (2000:2907-2908) that there is pathogenic involvement of the afferent nervous system in the development and perception of latent myofascial trigger points and therefore Myofascial Pain Syndrome is due to peripheral hyperactivity of the peptidergic nervous system.

## **2.5 PERPETUATING FACTORS**

Perpetuating factors are responsible for the reoccurrence of pain after treatment in patients suffering from Myofascial Pain Syndrome. Hence they need to be identified and eliminated for the long-term relief of pain (Esenyel, 2000:50).

Fomby et al (1997:1) agree that the treatment of myofascial trigger points fail due to the perpetuating factors going untreated.

Travell, Simons and Simons (1999 1:178) write of many possible perpetuating factors of myofascial trigger points and hence Myofascial Pain Syndrome:

- **Mechanical stresses**- can be skeletal anomalies such as a short leg, small hemipelvis or a long second metatarsal bone (Morton's foot). Otherwise misfitting furniture, poor posture, prolonged immobility or abuse of muscle is also classified as mechanical stresses.
- **Nutritional inadequacies**- commonly occur with mechanical stresses. Low levels of vitamins B1, B6, B12, folic acid and iron aggravate myofascial trigger points. A vitamin C deficiency results in increased bleeding at the injection site of the myofascial trigger point. Inadequate level of calcium, potassium, and several trace minerals causes abnormal muscle functioning.
- **Metabolic and endocrine inadequacies**- hypometabolism (hypothyroidism), hyperuricemia and hypoglycemia all perpetuate myofascial trigger points.
- **Psychological factors**- such as anxiety and depression can delay the recovery of myofascial trigger points.
- **Chronic infection**- can be viral, bacterial or parasitic.

- **Miscellaneous factors**- impaired sleep, fatigue, cold damp weather, allergy, chronic visceral disease, and radiculopathy.
- **Latent myofascial trigger points**- can persist for years after apparent recovery from injury; they predispose to acute attacks of pain, since minor overstretching, overuse, or chilling of the muscle may suffice to reactivate them (Travel and Simons 1983:12-13). The latent myofascial trigger points also predispose to the development of active myofascial trigger points (Chaitow and DeLany, 2002:18).

Hubbard (1998:16) reiterates that physical and emotional stress; strenuous activity and prolonged immobilization can perpetuate myofascial trigger points.

## **2.6 CLINICAL PRESENTATION AND DIAGNOSIS**

### **2.6.1 SYMPTOMS**

With latent myofascial trigger points pain is only perceived by the patient when pressure is applied to the myofascial trigger point as apposed to an active myofascial trigger point where there is spontaneous pain referral.

Both latent and active myofascial trigger points cause increased muscle tension and muscle-shortening resulting in decreased stretch range of motion (Chaitow

and DeLany, 2002). Both can result in disturbances of autonomic and motor functions, which are mentioned below (Travell, Simons and Simons 1999 1:19-21):

- **Autonomic dysfunction**- abnormal sweating, lacrimation, coryza, excessive salivation, pilomotor activity and proprioceptive disturbances (imbalance, dizziness and tinnitus).
- **Motor dysfunction**- loss of coordination, weakness and decreased work tolerance of the involved muscle as well as spasm of other muscles.

Activation of a latent myofascial trigger point can be due to several factors such as muscle overload, contraction of a muscle while in a shortened position, direct trauma and by radiculopathy (Travell, Simons and Simons, 1999 1:19-20). When a latent myofascial trigger point is converted to an active one the clinical picture worsens with spontaneous pain referral and sleep disturbances (Travell, Simons and Simons, 1999 1:19-20).

People with Myofascial Pain Syndrome complain of persistent pain, most commonly located in the head, neck, shoulders, extremities and lower back. The pain can be described as throbbing, burning, sharp or heavy. Fatigue and depression may also be associated with the syndrome (Hans and Harrison, 1997:92).



### 2.6.2 SIGNS

Manual palpation and patient feedback are the primary tools used for the diagnosis of myofascial trigger points (Sciotti et al, 2001:260).

As stated by Travell, Simons and Simons (1999 1:21-22) myofascial trigger points can be identified clinically by the following common characteristics:

1. **A palpable taut band**. It is the opinion of Gerwin and Shannon (2000:1257) that this is the most important aspect of the physical examination as it distinguishes the myofascial trigger point from other muscle pains such as Fibromyalgia.
2. **A localized spot of tenderness** in a nodule in the palpable taut band of muscle.
3. **Restricted stretch range of motion** (Simons, 2000:706).
4. **Increased pain on passive or active stretch** of the involved muscle.
5. **Weakness** of the involved muscle (Borg-Stein and Stein, 1996:309).

6. Snapping palpation produces a **local twitch response** (Kuan et al, 2002:513).
7. A **jump sign** is usually elicited. A jump sign is a pain response where the patient may wince, cry out or move away from the painful stimulus (Travell, Simons and Simons, 1999 1:4).
8. **Referred pain on manual compression** of the myofascial trigger point (Kuan et al, 2002:513). An active myofascial trigger point will have spontaneous pain referral, whereas a latent myofascial trigger point is a sensitive spot that only causes pain in response to compression (Hou et al, 2002:1406).

### **2.6.3 DIAGNOSTIC TESTING**

No satisfactory biochemical, electromyographic or diagnostic imaging criteria are recognized for the diagnosis of myofascial trigger points, hence manual palpation skills and patient feedback are primarily used for myofascial trigger point diagnosis and treatment (Sciotti et al, 2001:260).

There are however a couple of techniques that may prove valuable as research tools as well as for the diagnosis and treatment of trigger points (Travell, Simons and Simons, 1999 1:22-23):

- Needle Electromyography
- Ultrasound imaging

In needle electromyography studies, endplate noise represents abnormal activity of the motor endplate (Simons et al, 2002:213). This endplate noise is characteristic of, but not restricted to myofascial trigger points. So although needle electromyography and endplate noise are useful in detecting a myofascial trigger point they are not diagnostic (Simons et al, 2002:221). This technique also requires well-trained specialists and is expensive (Hou et al, 2002:1407).

In a study done by Lewis and Tehan (1999:43) they concluded that diagnostic ultrasound could not significantly identify any soft tissue changes in the region of clinically identified myofascial trigger points.

In a study done by Gerwin et al (1997:65) interrater reliability of myofascial trigger point palpation was successfully demonstrated by examiners that had undergone a short training period. Sciotti et al (2001:263-265) were the first to use 3-D measurement techniques to quantify the precision of this manual palpation. The results of this study indicate that experienced, well-trained clinicians can consistently localize latent myofascial trigger points in the trapezius muscle. Contrary to these two studies Hsieh et al (2000:263) found that trigger point palpation is not reliable for identifying local twitch responses and taut bands.

## 2.7 **DIFFERENTIAL DIAGNOSIS**

To diagnose Myofascial Pain Syndrome correctly other sources of myofascial pain need to be considered and eliminated (Fomby, 1997:2).

1. **Fibromyalgia Syndrome**- generalized pain and tenderness over 11 of 18 prescribed anatomical sites, fatigue, non-restorative sleep and morning stiffness. Conditions often associated with Fibromyalgia are irritable bowel syndrome, Raynaud's phenomenon, headaches, psychological stress and marked functional disability (Travell, Simons and Simons, 1999 1:36-39).  
The palpable taut band associated with a myofascial trigger point distinguishes Fibromyalgia from Myofascial Pain Syndrome (Gerwin and Shannon, 2000:1257). In a study done by Kruse et al (1992:822) it was concluded that thermography might play an important role in the clinical differentiation of Myofascial Pain Syndrome from Fibromyalgia. This is because myofascial trigger points appear hyperthermic, with a decrease in temperature when compression is applied. Whereas with a tender point in Fibromyalgia no thermal response occurs after compression.
2. **Articular dysfunction**- a close relationship exists between articular dysfunction and myofascial trigger points that has been recognized by many clinicians. The two are known to aggravate each other: abnormal sensory input from a dysfunctional joint can activate a myofascial trigger

point and increased tension of taut bands associated with myofascial trigger points can maintain displacement stress on a joint (Travell, Simons and Simons, 1999 1:40). These are differentiated by motion palpation techniques that are used to specifically identify joint dysfunction (Schafer, R.C. and Faye, L.J. 1990 and Bergmann, T.F., Peterson, D.H. and Lawrence, D.J. 1993).

3. **Non-myofascial trigger points**- trigger points found in fascia, ligaments and joint capsules (Travell, Simons and Simons 1999 1:42-44). These are differentiated by virtue of their position in relation to the relevant joint that is being examined (Travell, Simons and Simons 1999 1:42-44).

## **2.8 TREATMENT**

A major part of managing patients with Myofascial Pain Syndrome is recognizing underlying problems that influence the patient's pain by increasing tension and irritability in the muscle involved (Fomby, 1997:3). The treatment protocol must therefore take into consideration the contributing and perpetuating factors of the syndrome, such that long-term relief can be obtained (Esenyl et al, 2000:51).

The main goals of myofascial trigger point therapy are to relieve pain and spasm of the involved muscles (Esenyl et al, 2000:49). Hou et al (2002:1406) state that

despite all the research done on Myofascial Pain Syndrome the clinical efficacy of treatment has not been well established.

Treatment modalities include myofascial trigger point injection/ dry needling, medication, massage, exercise, ultrasound, electrical stimulation, stretch and spray, transcutaneous electrical nerve stimulation (TENS), biofeedback and psychological interventions (Hans and Harrison, 1997:95; Hubbard, 1998:23). Some of the many treatment methods are discussed below.

### **2.8.1 TRIGGER POINT PRESSURE RELEASE**

This concept replaces ischemic compression. It is considered by Travell, Simons and Simons (1999 1:140) to be less vigorous and more patient friendly. To perform myofascial trigger point pressure release the involved muscle must be lengthened to the point of increased resistance within the patient's comfort zone. Pressure is then applied gradually on the myofascial trigger point until the finger encounters an increase in tissue resistance. The patient should feel discomfort and not pain. The pressure is maintained until the clinician can feel a release of tension under his finger. Pressure is then increased until the new point of tissue resistance is felt, then maintained until the muscle tension again releases.

The advantage of this technique as apposed to ischemic compression is that it is painless and so is more likely to be used by the patient at home (Travell, Simons and Simons, 1999 1:141).

### **2.8.2 STRETCH AND SPRAY**

The goal of this technique is to decrease pain, improve range of motion and restore the muscle to its normal length. The involved muscle is passively stretched while a cooling agent (ice, Fluori-Methane or ethyl chloride) is applied. The sudden drop in skin temperature produces a temporary anesthesia by blocking the spinal stretch reflex and the sensation of pain in higher centers of the brain. The muscle can then be stretched which is thought to inactivate the myofascial trigger point and decrease muscle spasm (Hans and Harrison, 1997: 97). Hubbard (1998:25) feels that this is a very effective technique.

### **2.8.3 MODALITIES**

Transcutaneous Electrical Nerve Stimulation (TENS) has been successfully used in the treatment of Myofascial Pain Syndrome; however it does not have any long-term effect on the condition (Hans and Harrison, 1997:97).

Ultrasound consists of sound waves with a frequency of more than 20 000Hz/s, and these are absorbed differently in tissue with low and high protein content

(Gam et al, 1998:73). In a randomized controlled trial done by Gam et al (1998:79) they found that ultrasound gave no pain reduction and was ineffective in the treatment of Myofascial Pain Syndrome.

#### **2.8.4 STRESS MANAGEMENT**

Reducing emotional tension is an important step in managing chronic muscle pain. The patient needs to be educated about the connection between emotional triggers and the resulting muscle pain (Hubbard, 1998:25). Psychological interventions focus on reducing environmental stressors that precipitate and increase pain (Hans and Harrison, 1997:96).

#### **2.8.5 MYOFASCIAL TRIGGER POINT INJECTION AND DRY NEEDLING**

Myofascial trigger point injection and dry needling are widely accepted treatment interventions even though few controlled studies on their efficacy have been conducted (Alvarez, 2002:657). Dry needling appears to be as effective as injection therapy in the treatment of Myofascial Pain Syndrome (Hans and Harrison, 1997:97). The long-term therapeutic effect of these two techniques appears to be attributed to the needle rather than to any substance injected into the myofascial trigger point (Lewit, 1979:90 and Hong, 1994:256).



Myofascial trigger point injections are commonly performed in clinical practice; however the underlying mechanisms responsible for the efficacy of this treatment remain unclear (Borg-Stein and Stein, 1996:313-318). Hubbard (1998:24) speculates that it may be due to the multiple, rapid penetrations that cause “pithing” of the affected muscle spindle. In a review done by Borg-Stein and Stein (1996:316) they concluded that myofascial trigger point injections are effective in the treatment of Myofascial Pain Syndrome and that treatment should include a home program of local cooling and stretching exercises. Hans and Harrison (1997:96) propose that myofascial trigger point injection is one of the most effective treatments available for Myofascial Pain Syndrome.

Proposed mechanisms of injection therapy (Hans and Harrison 1997:96):

1. Mechanical disruption of muscle fibers, causing a release of potassium, which results in depolarization of nerve fibers.
2. Mechanical disruption of nerve endings.
3. Interruption of the central feedback mechanism that perpetuates pain.
4. Vasodilatory effect of the local anaesthetics, which increases the removal of metabolites.

5. Local dilution of the nerve sensitizing substances by the local anaesthetic or saline that is injected.

The therapeutic effect of dry needling relies on direct stimulation and mechanical disruption of the myofascial trigger point (Hans and Harrison, 1997:97).

The analgesia produced by dry needling of the myofascial trigger point has been called the needle effect (Lewit, 1979:84), and the most analgesia is achieved when the most painful spot is penetrated with a fine needle such as an acupuncture needle (Lewit, 1979:83-90). According to Borg-Stein and Stein (1996:314) the needle, if inserted correctly should generate a local twitch response. The dry needling should be repeated until a twitch response can no longer be elicited.

The needle effect is a good indication that the dry needling has been successful (Lewit, 1979:87). Hong (1994:263) hypothesized that the needle stimulation of the myofascial trigger point signals the central nervous system to induce a strong reflex, a local twitch response, and subsequently, to relieve or reorganize central nervous system control of the taut band and myofascial trigger point. The greatest analgesic effect is reached when all the tender points within the myofascial trigger point are penetrated with the needle (Hans and Harrison, 1997:97). Post needling soreness is common after dry needling but disappears within a week (Hong, 1994:263).

The gate control theory proposes that neural mechanisms in the dorsal horns of the spinal cord act like a gate, which can either increase or decrease the flow of nerve impulses from peripheral fibers to the central nervous system. Afferent input is therefore subjected to the modulating influence of the gate before it evokes pain perception and response. The large fiber inputs tend to close the gate while the smaller fiber inputs open it. The gate is also profoundly influenced by descending inhibition from the brain (Melzack, 1981:114-115).

The mechanism of pain relief by brief intense stimulation of myofascial trigger points by a needle can be explained in terms of this gate control theory. Insertion of the needle results in hyperstimulation analgesia and “closing of the gate” by disrupting the reverberatory neural circuits in the central nervous system.

## **2.9 PLACEBO**

According to *Mosby's Medical, Nursing and Allied Health Dictionary* (1994:1224) the placebo effect is “A physical or emotional change occurring after a substance is taken or administered that is not the result of any special property of the substance. The change could be beneficial, reflecting the expectations of the patient.”

With respect to the literature in respect of latent myofascial trigger points, it has been established that there is a “most urgent requirement for further research to

establish the efficacy beyond placebo of trigger point needling in the treatment of latent myofascial trigger point pain.” (Cumming and White, 2001:990). This is based on the lack of well constructed clinical trials assessing latent myofascial trigger points and the various treatment modalities that are assumed to be effective for latent myofascial trigger points, based on the fact that the treatment is appropriate for active myofascial trigger points (Cumming and White, 2001:990; Hesse et.al, 1994 and Chu, 1997).

Therefore a placebo group has been included in this study as it is not known if dry needling is more effective than placebo in the treatment of myofascial trigger points.

For this purpose a placebo needle will be utilized. Borg-Stein and Stein (1996:315) comment that in research the potent placebo effect associated with injections / dry needling has to be controlled for properly. This research has attempted to do so with the use of the sham / placebo needle developed by Streitberger and Kleinhenz. This needle looks like a normal acupuncture needle however the needle is not fixed inside the copper handle. Its tip is blunt, and when it touches the skin a pricking sensation is felt by the patient, simulating the puncturing of the skin. The needle moves inside the handle and appears to be shortened (Streitberger and Kleinhenz, 1998:364-5).

## **2.10 ANATOMY OF RELATED MUSCLES**

### **2.10.1 THE TRAPEZIUS MUSCLE**

The trapezius is a large, flat, triangular muscle that covers the posterior aspect of the neck and superior half of the trunk. It attaches from the pectoral girdle to the skull and the vertebral column (Moore and Dalley, 1999:692 and 1001). It is innervated by the spinal root of the accessory nerve (CN XI) (mainly motor) and the 3<sup>rd</sup> and 4<sup>th</sup> cervical nerves (mainly sensory) (Moore and Dalley, 1999:467 and 1002).

The trapezius muscle is responsible for the retraction, elevation and rotation of the scapula, with the superior fibers of the muscle elevating the scapulae, the middle fibers retracting the scapulae and the inferior fibers lowering or depressing the shoulder and aiding in retraction of the scapulae. The superior and inferior fibers act together to facilitate rotation of the scapula (Moore and Dalley, 1999:692 and 1002). When the shoulder girdle is fixed the trapezius muscle acts as a head and neck extensor muscle, when contracting bilaterally; and ipsilateral lateral flexion and contralateral rotation of the head and neck when contracting unilaterally (Foreman and Croft, 1995:36).

#### 2.10.1.1 Upper fibers

- Anatomical attachments- The upper fibers of the trapezius muscle attach superiorly to the medial third of the superior nuchal line, inferiorly to the outer third of the clavicle and in the midline to the ligamentum nuchae and to the spinous processes of the 1<sup>st</sup> five cervical vertebrae (Travell, Simons and Simons, 1999 1:282).
- Trigger point locality- Trigger point 1 is located in the midportion of the anterior border of the upper free margin of the trapezius. Trigger point 2 is found caudal and slightly lateral to trigger point 1 (Travell, Simons and Simons, 1999 1:282-291).

#### 2.10.1.2 Middle fibers

- Anatomical attachments- The middle fibers of the trapezius muscle attach medially to the spinous processes and interspinous ligaments from the 6<sup>th</sup> cervical to the 3<sup>rd</sup> thoracic vertebrae and laterally to the acromion and superior lip of the spine of the scapulae (Travell, Simons and Simons, 1999 1:282-283).
- Trigger point locality- Trigger point 5 is located in the horizontal fibers medial to the vertebral border of the scapula between the superior

angle of the scapula and the root of its spine. Trigger point 6 is found in the lateral fibers of the muscle over the lateral end of the supraspinatus muscle, near the acromion. Trigger point 7 is located in the most superficial fibers of the muscle, where the fibers cross the levator scapulae muscle (Travell, Simons and Simons, 1999 1:282-291).

#### 2.10.1.3 Lower fibers

- Anatomical attachments- The lower trapezius fibers attach medially to spinous processes and interspinous ligaments of the 4<sup>th</sup> through to the 12<sup>th</sup> thoracic vertebrae (Travell, Simons and Simons, 1999 1:283).
- Trigger point locality- Trigger point 3 is located in the lateral border of the muscle close to where the fibers cross the medial border of the scapulae. Trigger point 4 is located inferiorly to the spine of the scapula over the medial aspect of the infraspinatus muscle (Travell, Simons and Simons, 1999 1:282-291).

### 2.10.2 THE LEVATOR SCAPULAE MUSCLE

The levator scapulae is a strap-like muscle, which lies deep to the sternocleidomastoid and trapezius muscles. The dorsal scapula nerve and the 3rd and 4th cervical nerves innervate it. The main actions of the muscle are to elevate the scapula and tilt the glenoid cavity inferiorly by rotating the scapula (Moore and Dalley, 1999:1026).

- Anatomical attachments- It attaches superiorly to the transverse processes of the 1<sup>st</sup> four cervical vertebrae and inferiorly to the superior medial border of the scapula (Moore and Dalley, 1999:1026).
- Trigger point locality- Two trigger points are found in this muscle. The primary one is found at the angle of the neck beneath the anterior border of the upper trapezius. The secondary one is located slightly superior to the superior angle of the scapula (Travell, Simons and Simons, 1999 1:492-497).



## **CHAPTER 3**

### **3.0 MATERIAL AND METHODS OF THE STUDY**

#### **3.1 INTRODUCTION**

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

This study was conducted at the Chiropractic Day Clinic, Durban Institute of Technology, Durban, South Africa.

#### **3.2 STUDY DESIGN AND PROTOCOL**

##### **3.2.1 OBJECT OF THE STUDY**

The study was designed as a prospective, randomized placebo controlled clinical trial.

The object of the study was to determine the efficacy of dry needling on latent myofascial trigger points in patients presenting with Myofascial Pain Syndrome.

On conclusion of treatment protocol the two groups were then analyzed for inter-group and intra-group improvement, to determine the efficacy of the treatment.

### **3.2.2 SAMPLE GROUP**

A sample size of sixty patients, thirty in each group, was selected by means of convenience sampling.

The sample size of sixty was chosen as it gives a greater chance of normal distribution and allows for parametric testing. It is also practical in the context of a single researcher study. Similar studies have used the same sample size (Cumming, 2003).

During the year of 2002 advertisements were placed around campus and pamphlet distribution was done in both the Westville and Umbilo residential areas. The sample of patients was drawn from the greater Durban area to eliminate the problem of patients not returning to follow up appointments due to transport costs or difficulties.

The study was limited to patients between the ages of eighteen and sixty, of any sex, race or occupation. The individuals who responded to the advertisements were screened and accepted into the study based on the inclusion and exclusion criteria for the study (see page 50-53).

### **3.2.3 PROCESS OF RANDOMIZATION**

Random allocation of patients was carried out using sixty pieces of paper, thirty of which had the number one written on them and thirty of which had the number two written on them. The marked papers were placed in a box, the box was shaken and the papers were drawn one at a time. The sequence of numbers drawn was then recorded next to a list numbered one to sixty, and hence the point in the list at which the patient entered the study determined which group the patient was allocated to:

Group one received sham / placebo needling.

Group two received dry needling.

All patients received a letter of information (Appendix D) and were required to sign an informed consent form (Appendix E) before treatment commenced.

### **3.2.4 INCLUSION AND EXCLUSION CRITERIA**

#### **3.2.4.1 The inclusion criteria for the study were as follows:**

1. Patients of either gender had to be between the ages of 18 and 60.

Individuals of either sex and of any age can develop myofascial trigger points (Travel and Simons, 1983:13).

2. Patients had to have a latent trigger point in either their trapezius or levator scapulae muscles. These muscles were selected for inclusion as myofascial trigger points are common in the postural muscles of the neck and shoulder (Gattermann, 1990:285; Hubbard, 1998:18; Travell, Simons and Simons, 1999 1:279 and Chaitow and DeLany, 2002:21), with the trapezius muscle being the most commonly involved muscle (Gattermann, 1990:285; Hubbard, 1998:18; Travell, Simons and Simons, 1999 1:279; Sciotti et al, 2000:259 and Chaitow and DeLany, 2002:21).

3. The criteria for diagnosis of latent myofascial trigger points were:

- A tender, taut palpable band in the affected muscle (Travel and Simons, 1983:12),
- The myofascial trigger point must be clinically silent with respect to pain (Travel and Simons, 1983:12).

#### 3.2.4.2 The exclusion criteria for the study were as follows:

1. Patients taking any form of medication that would have influenced the results of the study i.e. analgesics, muscle relaxants, NSAIDS or steroids. A washout period as recommended by Poul et al. (1993) was applied.
2. Any patient outside of the ranges 18- 60 years of age (see inclusion criteria).

3. Patients who had any contra-indications to dry needling e.g. systemic illness, fever, high anxiety or emotional stress, feeling of faintness or bleeding disorders (Hans and Harrison, 1997:96).
4. Patients who had active trigger point in either in their trapezius and levator scapulae muscles (Travell, Simons and Simons, 1999 1:1).
5. Women who were pregnant (Liggins, 1999).
6. Patients with diagnosed blood dyscrasias or those on any form of anti-coagulant therapy (Liggins, 1999; Hans and Harrison, 1997:96).
7. Individuals with confirmed cervical or thoracic radiculopathy, degenerative disc disease, vertebral fractures or dislocations, muscle pathology (myopathy), structural deformities or cancer. The clinical history was used to exclude these conditions.
8. Individuals that had a history of epilepsy or those prone to convulsions (Forster and Palastanga, 1985).
9. Patients who had received any needling of the relevant muscles within the past three months, to ensure maximal naivety of the participating patients and

to ensure that the placebo treatment was not perceived as a sham (Mouton, 1996).

### **3.3 INTERVENTION**

At the initial consultation each patient underwent a comprehensive case history (Appendix A), a relevant physical examination (Appendix B) and a cervical spine examination (Appendix C).

A diagnosis of latent myofascial trigger points was confirmed after manual palpation and patient feedback (Chaitow and DeLany, 2002:18).

This was followed by two treatments and a one-week follow-up. In a previous clinical trial conducted by Rowley (2001) a similar treatment plan was used and it was indicated that a greater frequency of intervention was not required. The patients were treated twice in a one-week period with at least a two-day break between treatments (Rowley 2001) and with a one-week follow up treatment. The above treatment period was chosen such that any extraneous variables could be reduced as much as possible. Extraneous variables being anything that may affect the outcome of the research e.g. strenuous activity, which may aggravate the myofascial trigger points.

Patients were asked to refrain from any other treatment protocol for Myofascial Pain Syndrome, including drugs and manual interventions (Poul et al, 1993). They were also expected to not alter their current lifestyle. All patients were instructed not to ice, stretch or rub the area needled after the treatment and for the duration of the study.

The trapezius and levator scapulae muscles were chosen for this study. This is because Gattermann (1990:285) suggests that due to postural strain and mechanical stresses, the most common sites for the development of myofascial trigger points are the postural muscles of the back & neck and the rotator muscles of the shoulders (Hubbard, 1998:18; Travell, Simons and Simons, 1999 1:279; Sciotti et al, 2001:259 and Chaitow and DeLany, 2002:21). For this reason the likelihood of finding latent myofascial trigger points in these muscles is high.

### **3.3.1 THE CONTROL GROUP**

The placebo group was treated using a sham needle designed by Streitberger and Kleinhenz. This needle looks like a normal acupuncture needle however the needle is not fixed inside the copper handle. Its tip is blunt, and when it touches the skin a pricking sensation is felt by the patient, simulating the puncturing of the skin. The needle moves inside the handle and appears to be shortened (Streitberger and Kleinhenz, 1998:364-5). This is in accordance with the *Mosby's Medical, Nursing and Allied Health Dictionary* (1994:1224), where the

placebo effect is defined as a physical or emotional change occurring after a substance is taken or administered that is not the result of any special property of the substance. The change may be beneficial, reflecting the expectations of the patient.

### **3.3.2 DRY NEEDLING**

The treatment group was treated with a 25 mm, 0.25G acupuncture needle.

The technique of invasive needling used in this study is described by both Sola (1981:42) and Travel and Simons (1983:84-85):

The myofascial trigger point was located by palpation. The needle was then inserted between the fingers that had located the myofascial trigger point. The needle was inserted 1 to 2cm away from the myofascial trigger point such that the needle penetrated the myofascial trigger point at an angle of about 30° to the skin. The fanning technique was used, where the needle is repeatedly withdrawn from the myofascial trigger point and is reinserted to penetrate a new part of the myofascial trigger point. The site was then repalpated for any remaining tender spots. If one was found, it was accurately trapped between the fingers and needled using the method used above (Travel and Simons, 1983:84- 85).



With both groups the area to be treated was sterilized with alcohol prior to treatment.

Both groups had a maximum of 3 latent myofascial trigger points that would be treated in each patient, with the same trigger points being treated at both appointments. The area to be needled was marked with a spot of henna such that the same spot was needled on both occasions.

### **3.4 THE DATA**

Three sets of data were collected before treatment at the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> consultations. Each set comprised of subjective and objective data. This study included both primary and secondary data.

#### **3.4.1 THE PRIMARY DATA**

- Case history (Appendix A)
- Physical examination (Appendix B)
- Cervical spine regional (Appendix C)
- Numerical Rating Scale (Appendix F)
- Myofascial Diagnostic Scale (Appendix F)
- Algometer readings (Appendix G)

### **3.4.2 THE SECONDARY DATA**

The secondary data was obtained from textbooks and current journals.

## **3.5 METHODS OF MEASUREMENT**

### **3.5.1 SUBJECTIVE DATA**

#### **1. The Numerical Pain Rating Scale - 101 (NRS)**

This is a subjective questionnaire whereby the subjects estimated their levels of pain prior to the first and second consultations and at the one week follow up appointment. This scale showed the progression or regression of the subjects' pain levels throughout the study. It was chosen due to the ease at which it can be administered and scored and has been found to be an accurate tool for the measurement of pain intensity in clinical trials (Jenson et al, 1986:125).

Before each treatment the patient was asked to mark off a point on a 10cm line, between 0 and 100 when the pain is at its worst and likewise when the pain is at its least. With 0 indicating no pain and 100 indicating the worst pain ever experienced. The value from the worst pain and the one from the least pain were added together and divided by two to get an average level of pain intensity experienced by the patient.

### 3.5.2 OBJECTIVE DATA

#### 3.5.2.1 Pressure threshold algometry

Pressure algometry appears to be a reliable diagnostic tool used to quantitatively document the sensitivity of myofascial trigger points (Hans and Harrison, 1997:95). The algometer as defined by Anderson (1989:18) is an instrument used in the measuring of sensitivity to painful stimuli. Algometry is a recognized diagnostic method used to quantitatively document the sensitivity of trigger points (Kruse et al, 1992:819). The reliability of the algometer as an index of myofascial trigger point sensitivity was demonstrated in studies by Reeves et al (1986:313-321) and Fischer (1987:207) who found that it demonstrated both high inter- and intra-examiner reliability in measuring marked myofascial trigger points.

The algometer used in this study was the FDK20 force dial used by Wagner Instruments (Address: P.O. Box 1217 Greenwich, CT, 06836, U.S.A.).

The algometer uses  $\text{kg/cm}^2$  to show pressure threshold over the myofascial trigger point, the more sensitive the trigger point the smaller the reading. Fischer (1987:207) defines pressure threshold as the minimum pressure that induces pain or discomfort. The algometer can register forces of up to  $11\text{kg/cm}^2$ .

#### Steps taken for algometer reading:

- The dial was set to zero.
- The algometer was placed over the chosen trigger point with the metal rod being perpendicular to the surface of the skin.
- The patient was instructed to express the point at which pain was perceived.
- Pressure was applied with an increasing rate of 1kg/second as recommended by Fischer (1987:209).
- The procedure was halted once the patient expressed the point at which the pain was perceived. (The pain threshold).
- The reading on the algometer was then recorded in kg/cm<sup>2</sup>.

#### 3.5.2.2 Myofascial Diagnostic Rating Scale.

The Myofascial diagnostic scale was developed by Chettier (2001). It is used to assess the extent to which a patient suffers from Myofascial Pain Syndrome. It is made up of four indicators. The 1<sup>st</sup> indicator consists of five grades of soft tissue tenderness. Each grade was scored as follows:

- Grade 0- no tenderness (score= 0),
- Grade 1- tenderness to palpation without grimace or flinch (score= 1),
- Grade 2- tenderness to palpation with grimace and/or flinch (score= 2),

- Grade 3- tenderness with withdrawal (score= 3) and
- Grade 4- withdrawal to non-noxious stimuli (score= 4).

The second and third indicators were the presence of a local twitch response and a taut muscle band respectively; both scored a value of 4 individually.

The final indicator was the presence of referred pain and was given a score of 5 points. This scale was used for standardisation purposes.

### **3.6 STATISTICAL PROCEDURES**

#### **3.6.1 METHOD OF DATA ANALYSIS**

The sample size for each group was  $n \geq 30$  and hence parametric tests were used to analyse both the subjective and objective data. The Durban Institute of Technology research statistician was consulted with regards to which tests were to be run. All the subjective and objective data were then entered into a spreadsheet and analysed using the SPSS® package version 9 (SPSS Inc. 1999).

#### **3.6.2 INTER-GROUP COMPARISON USING THE UNPAIRED T-TEST**

The unpaired t-test was used for inter-group comparison of each of the continuous variables (NRS 101 and algometer). In each test, the null hypothesis

( $H_0$ ) states that there is no difference between the two independent samples being compared, with respect to the variable being tested, at the  $\alpha=0.05$  level of significance. The alternative hypothesis ( $H_1$ ) states that there is a difference.

$H_0$ : There is no difference between treatment groups.

$H_1$ : There is a difference between treatment groups.

$\alpha=0.05$

Decision rule- If  $p < \alpha$ , reject  $H_0$

If  $P \geq \alpha$ , accept  $H_0$

Where  $p$  is the observed significance level or P-value.

### **3.6.3 INTRA-GROUP COMPARISON USING THE PAIRED T- TEST**

The paired t-test was used for intra-group comparison of the continuous variables (NRS 101 and algometer readings). In each test, the null hypothesis ( $H_0$ ) states that there is no change between the two related samples being compared, with respect to the variable being tested, at the  $\alpha = 0.05$  level of significance. The alternative hypothesis ( $H_1$ ) states that there is an improvement.

$H_0$ : There is no improvement between treatments.

$H_1$ : There is an improvement between treatments.

$\alpha= 0.05$  (one- tailed test)

Decision rule for one-tailed test- If  $p < \alpha$ , reject  $H_0$

If  $p \geq \alpha$ , accept  $H_0$

Where  $p = \text{reported P-value} / 2$  if  $\{H_0 \text{ is of form } < \text{ and } z \text{ is negative}$

$\{H_0 \text{ is of form } > \text{ and } z \text{ is positive}$

Or

$P = 1 - (\text{reported P-value} / 2)$  if  $\{H_0 \text{ is of form } < \text{ and } z \text{ is negative}$

$\{H_0 \text{ is of form } > \text{ and } z \text{ is positive}$

### **3.7 FLOW DIAGRAM OF METHODOLOGY**

ADVERTISEMENTS FOR PATIENTS SUFFERING FROM NECK AND SHOULDER STIFFNESS  
WERE POSTED TO VARIOUS AREAS.



INITIAL CONSULTATION WHICH INCLUDED A CASE HISTORY, RELEVANT PHYSICAL AND  
CERVICAL SPINE REGIONAL.



SIXTY PATIENTS WHO MET THE INCLUSION CRITERIA WERE ACCEPTED INTO THE  
STUDY.



RANDOM ALLOCATION INTO TWO GROUPS OF 30.



EACH GROUP HAD TWO TREATMENTS WITH A ONE WEEK FOLLOW-UP.

GROUP 1= SHAM/ PLACEBO NEEEDLING

GROUP 2= DRY NEEDLING



DATA COLLECTION.



THE DATA WAS STATISTICALLY ANALYSED USING THE SPSS STATISTICAL PACKAGE.

### **3.8 DIAGRAMMATIC REPRESENTATION**

Bar charts/ pie charts and tables were constructed to represent demographic data and major findings of the study, giving summary to the results obtained from the paired and unpaired t-tests.

### **3.9 ETHICAL CONSIDERATIONS**

All patients participated in the study voluntarily. They were informed that they had a fifty percent chance of receiving "sham" or placebo treatment. They were also informed that they were able to leave the study at any time with no repercussions and that all patient information would be considered confidential. As stated previously each patient was asked to complete and sign an informed consent form (Appendix E) prior to treatment commencing.



## **CHAPTER 4**

### **4.0 RESULTS**

#### **4.1 INTRODUCTION**

This chapter tabulates the results obtained from the statistical analysis of the primary data collected over the duration of the study. The measurement criteria included:

- Numerical Pain Rating Scale 101 (NRS 101)
- Pressure threshold algometry readings

#### **4.2 CRITERIA GOVERNING THE ADMISSIBILITY OF DATA**

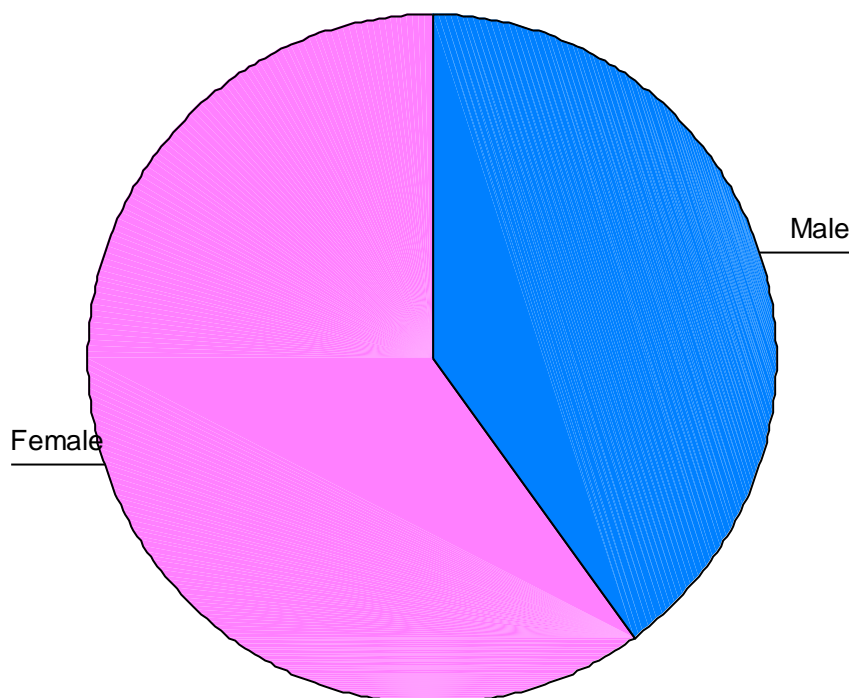
Data was collected only from those patients who met the research criteria and who participated for the full duration of the research program. Only subjective pain perception data that was completed by the patients under supervision of the researcher were utilized. Only objective pressure threshold readings recorded by the researcher were utilized.

### 4.3 DEMOGRAPHIC DATA

#### 4.3.1 GENDER DISTRIBUTION

Gender	Group 1 Sham needling	Group 2 Dry needling	Total % of patients
Females	17	19	60%
Males	13	11	40%

Table 2: Gender distribution.

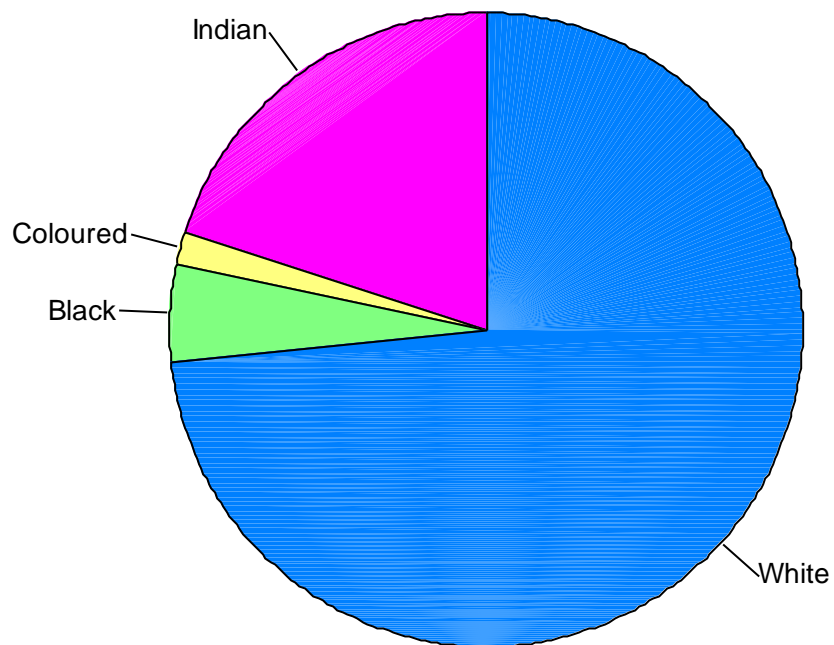


Graph 1: Summary gender distribution.

#### 4.3.2 RACE DISTRIBUTION

Race	Group 1 Sham needling	Group 2 Dry needling	Total % of patients
White	23	21	73,3%
Black	1	2	5%
Indian	5	7	20%
Mixed race	1	0	1,7%

Table 3: Race distribution.



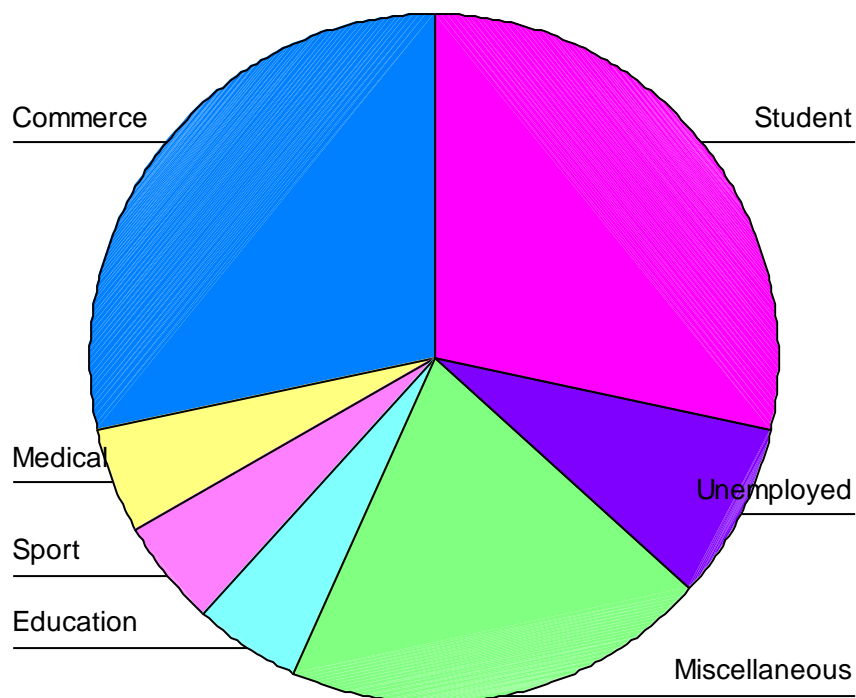
Graph 2: Summary of race distribution.

### 4.3.3 OCCUPATION OF RESEARCH SUBJECTS

<b>Occupation</b>	<b>Group 1 Sham needling</b>	<b>Group 2 Dry needling</b>	<b>Total % of patients</b>
Accountant	2	0	3.3%
Account executive	1	0	1.7%
Administrator	1	2	5%
Assoc. director	1	0	1.7%
Audiologist	0	1	1.7%
Chef	1	0	1.7%
Chiropractor	0	2	3.3%
Clerk	1	1	3.3%
Consultant	1	0	1.7%
Cricket scorer	0	1	1.7%
Driver	0	1	1.7%
Estate agent	0	1	1.7%
Finance	1	0	1.7%
Graphic designer	0	1	1.7%
Hairdresser	1	0	1.7%
Housewife	2	1	5%
Judo coach	0	1	1.7%
Lecturer/ teacher	2	1	5%
Manager	2	3	8.3%
Rep	1	2	5%

Occupation	Group 1 Sham needling	Group 2 Dry needling	Total % of patients
Researcher	0	1	1.7%
Self-employed	0	3	5%
Student	9	8	28.3%
Technician	2	0	3.3%
Unemployed	2	0	3.3%

**Table 4: Occupation.**

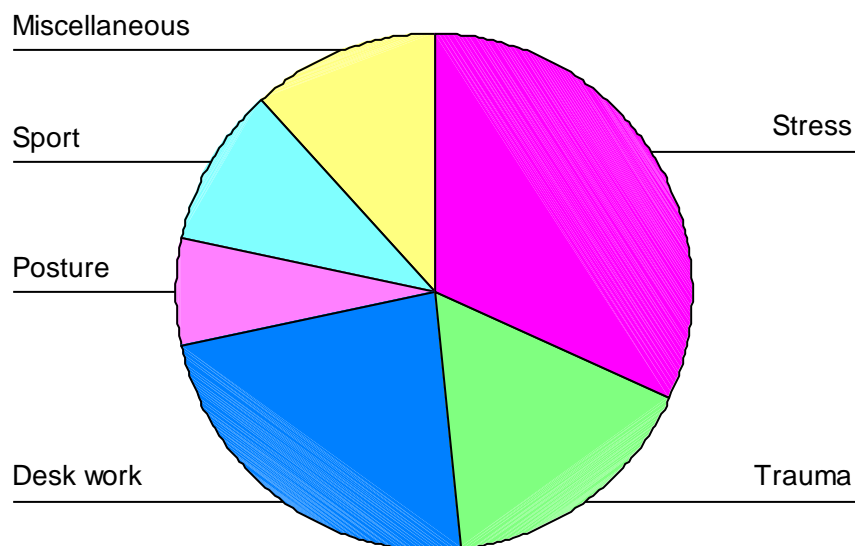


**Graph 3: Summary of occupations.**

#### 4.3.4 AGGRAVATING FACTORS

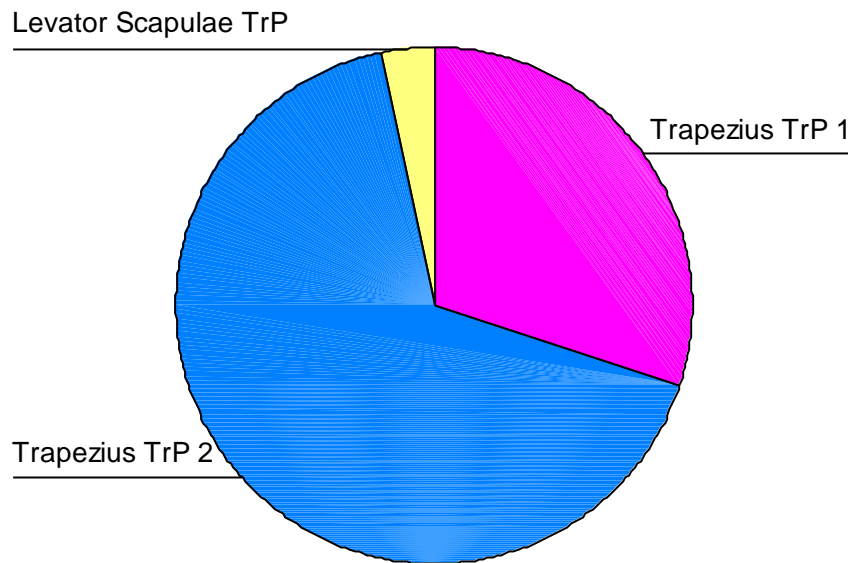
<b>Activity</b>	<b>Group 1 Sham needling</b>	<b>Group 2 Dry needling</b>	<b>Total % of patients</b>
Computer work	6	7	21.7%
Cricket scoring	1	0	1.7%
Driving	1	3	6.7%
Exercise	2	3	8.3%
Gardening	0	1	1.7%
Golf	1	0	1.7%
Lifting	1	0	1.7%
Posture	1	3	6.7%
Stress	12	12	40%
Studying	2	2	6.7%
Trauma	7	4	18.3%
Unknown	1	2	5%

**TABLE 5: Aggravating factors.**



**Graph 4: Summary of aggravating factors.**

#### 4.3.5 MUSCLE TREATED



**Graph 5: Myofascial trigger points treated.**

#### 4.4 RESULTS OF DATA ANALYSIS

##### 4.4.1 ABBREVIATIONS

S.D. = Standard Deviation

S.E. = Standard Error Mean

P-value = The observed significance level of the test

Tx = Treatment



#### 4.4.2 STATISTICAL RESULTS FOR INTER-GROUP COMPARISON

NRS 101							
	CONTROL				DRY NEEDLING		
Treatment	Mean	S.D	S.E	P-value	Mean	S.D	S.E
<b>Tx 1</b>	36.7833	18.3893	3.3574	<b>0.250</b>	41.9500	15.9748	2.9166
<b>Tx 2</b>	31.2667	17.5454	3.2033	<b>0.707</b>	29.5167	18.3831	3.3563
<b>Tx 3</b>	28.4333	17.4750	3.1905	<b>0.406</b>	24.9167	14.9931	2.7374

**TABLE 6: Inter-group comparison between the control group and the dry needling group, using the Unpaired t-test to analyze results obtained from the NRS 101 questionnaire, at the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> treatments.**

For treatment 1, the null hypothesis was accepted for the NRS101 questionnaire, indicating that there was no difference between the two groups, at the  $\alpha=0.05$  level.

For treatment 2, the null hypothesis was accepted for the NRS101 questionnaire, indicating that there was no difference between the two groups, at the  $\alpha=0.05$  level.

For treatment 3, the null hypothesis was accepted for the NRS101 questionnaire, indicating that there was no difference between the two groups, at the  $\alpha=0.05$  level.

ALGOMETER THRESHOLD READINGS							
	CONTROL				DRY NEEDLING		
Treatment	Mean	S.D	S.E	P-value	Mean	S.D	S.E
<b>Tx 1</b>	2.0167	0.6869	0.1254	<b>0.2741</b>	2.0733	1.3349	0.2437
<b>Tx 2</b>	2.1800	0.8339	0.1523	<b>0.2664</b>	2.2233	1.1970	0.2185
<b>Tx 3</b>	2.3933	0.9028	0.1648	<b>0.3101</b>	2.5533	1.4386	0.2626

**TABLE 7: Inter-group comparison between the control group and the dry needling group, using the Unpaired t-test to analyze results obtained from the Algometer readings, at the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> treatments.**

For treatment 1, the null hypothesis was accepted for the algometer readings, indicating that there was no difference between the two groups, at the  $\alpha=0.05$  level.

For treatment 2, the null hypothesis was accepted for the algometer readings, indicating that there was no difference between the two groups, at the  $\alpha=0.05$  level.

For treatment 3, the null hypothesis was accepted for the algometer readings, indicating that there was no difference between the two groups, at the  $\alpha=0.05$  level.

#### 4.4.3 STATISTICAL RESULTS FOR INTRA-GROUP COMPARISON

NRS 101								
	CONTROL				DRY NEEDLING			
Treatment	Mean	S.D	S.E.	P-value	Mean	S.D	S.E.	P-value
<b>Tx1-Tx2</b>	5.5167	13.7944	2.5185	<b>0.037</b>	12.4333	15.6595	2.8590	<b>0.000</b>
<b>Tx2-Tx3</b>	2.8333	8.5786	1.5662	<b>0.081</b>	4.6000	10.9082	1.9916	<b>0.028</b>
<b>Tx1-Tx3</b>	8.3500	16.7281	3.0541	<b>0.011</b>	17.0333	14.7753	2.6976	<b>0.000</b>

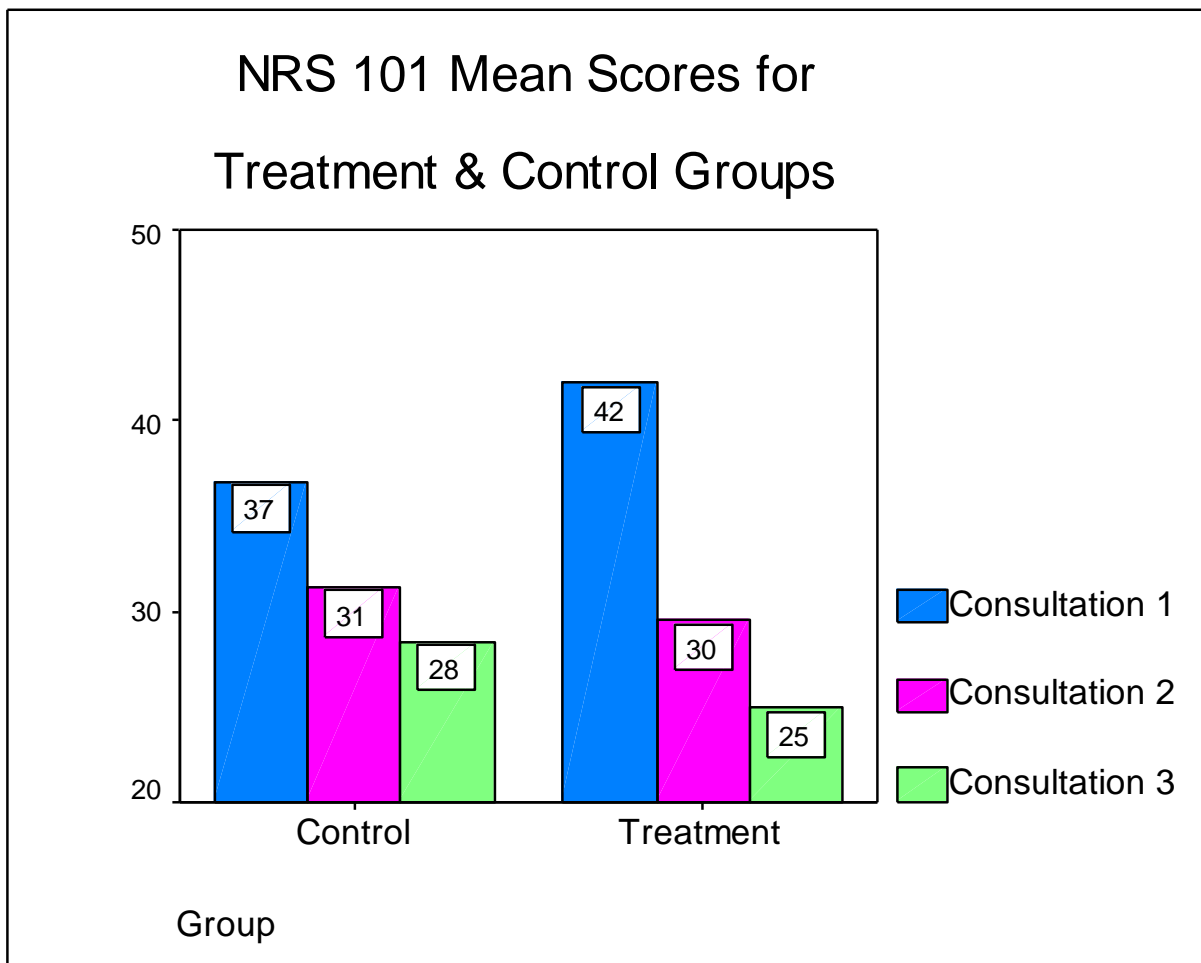
**TABLE 8: Intra-group comparison for the control group and the dry needling group, using the Paired t-test to analyze results obtained from the NRS 101 questionnaire, between the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> treatments.**

In both groups, for the initial and final treatments, the null hypothesis was rejected for the NRS 101 questionnaire, indicating that there was a significant difference between treatments for both the placebo and dry needling groups.

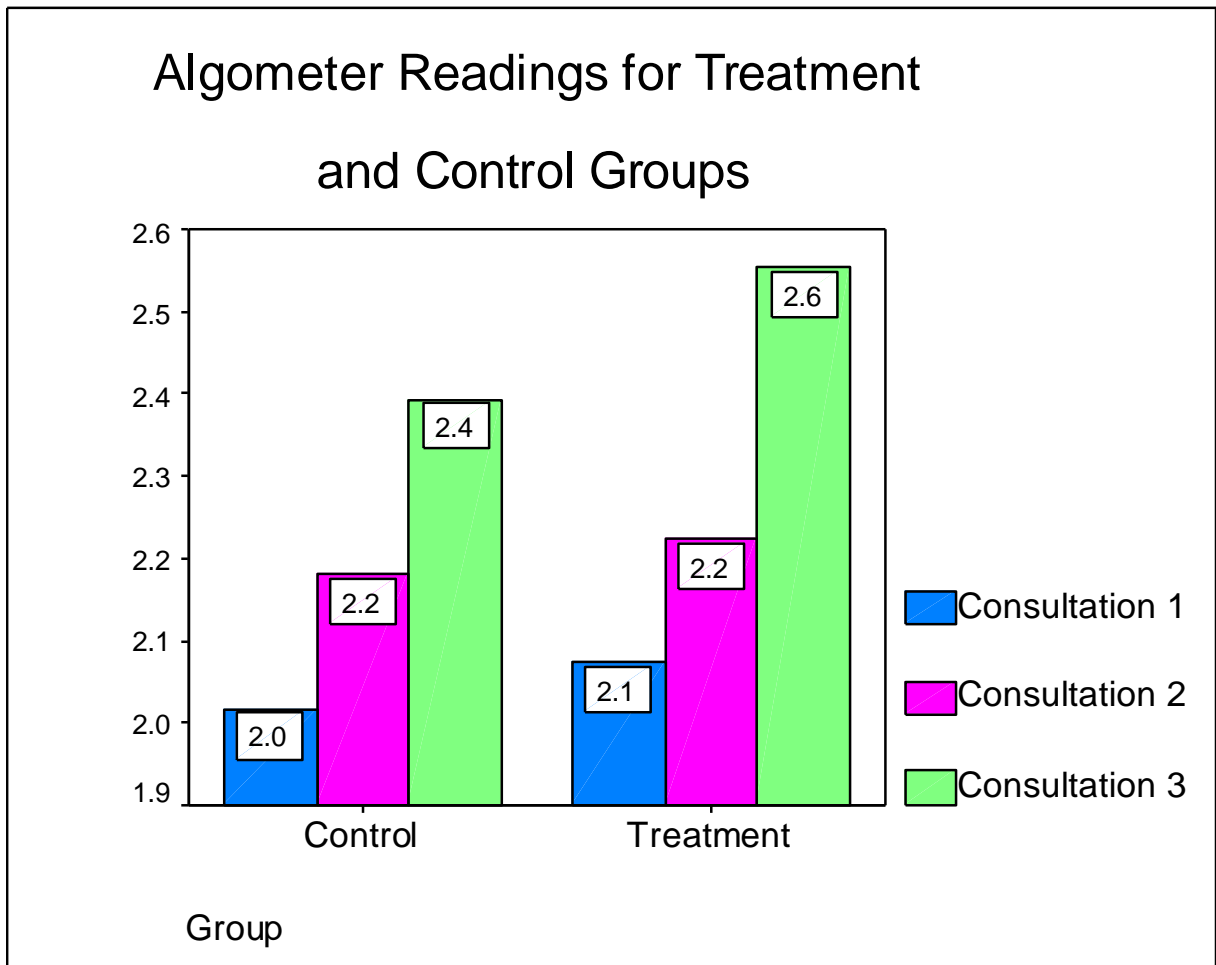
ALGOMETER THRESHOLD READINGS								
	CONTROL				DRY NEEDLING			
Treatment	Mean	S.D	S.E.	P-value	Mean	S.D	S.E.	P-value
<b>Tx1-Tx2</b>	0.1633	0.8580	0.1567	<b>0.306</b>	0.1500	0.7147	0.1305	<b>0.260</b>
<b>Tx2-Tx3</b>	0.2133	0.5431	9.916E-02	<b>0.040</b>	0.3300	0.6889	0.1258	<b>0.014</b>
<b>Tx1-Tx3</b>	0.3767	0.7731	0.1412	<b>0.012</b>	0.4800	0.7717	0.1409	<b>0.002</b>

**TABLE 9: Intra-group comparison for the control group and the dry needling group, using the Paired t-test to analyze results obtained from the algometer readings, between the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> treatments.**

In both groups, for the initial and final treatments, the null hypothesis was rejected for the algometer readings, indicating that there was a significant difference between treatments for both the control and dry needling groups.



**Graph 6: Mean NRS 101 values of the control and treatment groups.**



**Graph 7: Mean Algometer reading values for the control and treatment groups.**

## **CHAPTER 5**

### **5.0 DISCUSSION OF RESULTS**

#### **5.1 INTRODUCTION**

This chapter involves the discussion of the demographic data and the results gained from the statistical analysis of the subjective (Numerical Pain Rating Scale 101) and objective (algometer threshold readings) data. Problems encountered through the course of this study are also discussed in this chapter.

The results will be discussed in two parts, firstly the inter-group comparison and then the intra-group comparison. The subjective results obtained from the Numerical Pain Rating Scale 101 (NRS 101) and the objective results obtained from the algometer threshold readings will be discussed under both headings.

##### **5.1.1 INTER-GROUP COMPARISON**

The evaluation of the inter-group results from treatment 1 reveals any variances in mean values of subjective and objective data between the two groups at the start of the study. The evaluation of the inter-group results from treatment 3 give an indication of any differences between subjective and objective findings in the

two groups. This indicates the relative efficacy of dry needling in the management of Myofascial Pain Syndrome.

### **5.1.2 INTRA-GROUP COMPARISON**

The evaluation of the intra-group results from treatment 1 to treatment 3 represents the relative effectiveness of the treatment protocol in the management of Myofascial Pain Syndrome.

## **5.2 REDEFINITION OF THE STATEMENT OF THE PROBLEM**

The aim of this study is to determine the effect that dry needling has on latent myofascial trigger points in terms of subjective and objective findings.

### **5.2.1 SUB-PROBLEM ONE**

To determine the efficacy of dry needling of latent myofascial trigger points in the treatment of Myofascial Pain Syndrome in terms of subjective clinical findings (i.e. subjective pain perception) and objective clinical findings (pain threshold algometry).



## **5.2.2 SUB-PROBLEM TWO**

To determine the efficacy of sham/placebo needling of latent myofascial trigger points in the treatment of Myofascial Pain Syndrome in terms of subjective clinical findings (i.e. subjective pain perception) and objective clinical findings (pain threshold algometry).

## **5.2.3 HYPOTHESES**

### **5.2.3.1 The first hypothesis**

It is hypothesized that dry needling of latent myofascial trigger points in the treatment of Myofascial Pain Syndrome will be effective in terms of subjective clinical findings (i.e. subjective pain perception) and objective clinical findings (pain threshold algometry).

### **5.2.3.2 The second hypothesis**

It is hypothesized that sham/placebo needling of latent myofascial trigger points in the treatment of Myofascial Pain Syndrome will be effective in terms of subjective clinical findings (i.e. subjective pain perception) and objective clinical findings (pain threshold algometry).

#### 5.2.3.3 The third hypothesis

It is hypothesized that dry needling of latent myofascial trigger points will have efficacy beyond placebo in the treatment of Myofascial Pain Syndrome.

### 5.3 **DEMOGRAPHIC DATA**

Of the 60 patients who participated in this study, 36 were female and 24 were male, creating a 60:40 female is to male ratio (see table 2 and graph 1). The gender distribution within each group was similar. The higher number of female patients in this study is in keeping with many authors who state that Myofascial Pain Syndrome is more common in females than males (Hou et al 2002:1411-1412; Travell, Simons and Simons 1999 1:13; Hans and Harrison 1997:90).

Race distribution within the study is summarized in table 3 and graph 2. The vast majority of patients were white (73.3%), with only 20% being Indian, 5% Black and 1.7% mixed races. No studies on the prevalence of Myofascial Pain Syndrome among different racial groups have been done. However this is an unrealistic sample of the general South African population. It is the authors' opinion that this may due to several compounding factors:

1. The majority of advertising was done in predominantly White and Indian areas.

2. Another possible factor could be transport problems and costs involved, as it is assumed that a large percentage of the Black and Mixed races rely on public transport.
3. Lastly chiropractic may not be a popular choice of treatment among the Black and Mixed races. No study investigating this point could be found by the author. This proposes to be a good topic of investigation in future research projects.

The occupations of the research subjects were very varied and has been tabulated in table 4 and summarized in graph 3. A large percentage of the patients (28.3%) were students with an equal percentage being involved in commerce. Poor posture associated with prolonged periods of sitting explains the high prevalence of Myofascial Pain Syndrome in these two occupations (Hans and Harrison 1997:92).

This correlates with the high percentages of desk work (23%) and stress (31%) being the main aggravating activities (see table 5). This data also supports Fomby et al (1997:3) who state that poor work ergonomics also creates mechanical stress and Hubbard (1998:16) who feels that physical and emotional stress perpetuate myofascial trigger points.

The muscle most commonly treated in the study was myofascial trigger point 2 of the trapezius muscle and myofascial trigger point 1 of the same muscle.

## **5.4 INTER-GROUP COMPARISON**

The comparison of the subjective and objective data of both groups from the initial consultation will reveal any differences between the two groups in terms of their original signs and symptoms. The comparison of the results from the final consultation confirms which treatment protocol has been relatively more effective.

### **5.4.1 NUMERICAL PAIN RATING SCALE (NRS 101)**

The NRS 101 data can be found in table 6. Comparison of the two groups, using the Unpaired t-test at the first consultation revealed no statistical difference ( $p=0.250$ ) between them, denoting a similarity between the two groups with respect to pain perception as evaluated by the NRS 101.

The analysis of the readings from the final consultation reveals no statistical difference ( $p=0.406$ ) between the two groups, indicating that both treatment protocols were effective.

### **5.4.2 THE ALGOMETER THRESHOLD READINGS**

The algometer data can be found in table 7. The comparison of the initial algometer readings presents no statistically significant difference ( $p=0.2741$ )

between the two groups indicating that pain sensitivity to pressure was similar at the outset of the study.

The comparison of the data from the final consultation reveals that there is no statistically significant difference ( $p=0.3101$ ) between the two groups. It can therefore be said that neither treatment was more effective than the other in terms of pain sensitivity to pressure.

## **5.5 INTRA-GROUP COMPARISON**

The assessment of the subjective and objective data within each group from the initial to final consultation represents the relative effectiveness of both the treatment protocols.

### **5.5.1 NUMERICAL PAIN RATING SCALE (NRS 101)**

The NRS 101 data can be found in table 8. Comparison of the initial and final consultations revealed a statistically significant difference in the dry needling group ( $p=0.000$ ) and control group ( $p=0.011$ ). This indicates a decrease in the amount of pain perceived by the patients in both the groups.

### **5.5.2 THE ALGOMETER THRESHOLD READINGS**

The algometer data can be found in table 9. Analyses of the algometer readings for the initial and final consultations revealed a statistically significant difference in the dry needling group ( $p=0.002$ ) and control group ( $p=0.012$ ). This indicates an increase in pain threshold in patients from both of the groups.

### **5.6 CONCLUSION OF DATA**

The hypotheses that dry needling would be effective in the treatment of Myofascial Pain Syndrome in terms of subjective (hypothesis 1) and objective clinical findings (hypothesis 2) were both accepted by this study. The hypothesis that dry needling would have efficacy beyond placebo (hypothesis 3) was rejected by this study.

Inter-group analysis of the data obtained from the dry needling and control groups revealed no significant difference at the end of the study in terms of the subjective (NRS 101) and objective (algometer readings) measurements. This suggests that the dry needling group responded as favorably as the control group. This is supported by the improvement noted in both groups with regards to the mean values for the NRS 101 and algometer readings.

Although statistically there is no difference between the two groups if one analyses the means certain trends can be identified. In the dry needling group the NRS 101 mean scores decrease from 41.9500 at the 1<sup>st</sup> treatment to 24.9167 at the 3<sup>rd</sup> treatment, a difference of 17.0333. Whereas in the control group the mean decreases from 36.7833 at the 1<sup>st</sup> treatment to 28.4333 at the 3<sup>rd</sup> treatment, a difference of only 8.3500. This implies that although it is not statistically significant a greater improvement can be seen in the treatment group.

A very similar pattern can be identified with regards to the algometer threshold readings. A possible reason for the similarity between the two groups could be that post-needling stiffness in the treatment group masked their improvement and hence in future research a 1-month follow-up should be introduced.

Intra-group analysis between the 1<sup>st</sup> and 3<sup>rd</sup> treatments showed a statistical difference in both groups however the results of the treatment group were more significant, meaning that there was more improvement in the treatment group than the control group.

Unfortunately no current literature could be found, to which these results could be compared. Cumming and White (2001:990) did a review article on all the current literature regarding needling of myofascial trigger points and it is their opinion that more placebo research needs to be done with regards to trigger point needling in the treatment of Myofascial Pain Syndrome: as the only two similar

research studies (Chu, 1997 and Hesse, 1994) did not specify if they were active or latent myofascial trigger points. In addition to this the methodology used in these studies (Chu, 1997 and Hesse, 1994) did not have the same outcome as the current research therefore results can not be reliably compared.

## **5.7 LIMITATIONS OF THE STUDY**

### **5.7.1 THE SUBJECTIVE DATA**

There are various reasons as to why the NRS 101 questionnaire had its limitations in terms of the condition being treated and the treatment protocol being administered.

The first such limitation is that the questionnaire was not designed purely for Myofascial Pain Syndrome. In future research, questionnaires relating specifically to this condition should be designed and used.

The second limitation is possible misunderstanding of the questionnaire by the patients, which may have affected their response and the outcome of the study. The patients may have tried to please the researcher by reporting improvements beyond those that were actually felt. This is described as the Hawthorne effect (Mouton, 1996).



Thirdly the NRS 101 is used to grade the pain experienced by the patient and pain is not the major clinical symptom in patients with latent myofascial trigger points. A more suitable questionnaire with regards to stiffness and range of motion should in the future be used.

Lastly the questionnaire does not accommodate for post needling stiffness or the patients' perception thereof.

### **5.7.2 THE OBJECTIVE DATA**

There are various reasons as to why the objective measures may have been faulty. Firstly one cannot exclude human error when recording calibrations and the risk of incorrect user methods. It is suggested that an independent examiner be included to ensure correct recording and calibration of equipment and exclude examiner bias.

The second reason is the accuracy with which the same myofascial trigger point could be found on the second and third visits. A henna marker was used however it does not show up on darker skin individuals and could have washed off before the final consultation. A more permanent solution should be introduced in future studies of this nature.

A goniometer or cervical range of motion device should be introduced into future research of this nature. Pain is not a main complaint with latent myofascial trigger points, but decreased range of motion is, especially lateral flexion away from the affected side and arm abduction (Travell, Simons and Simons 1999 1:289).

### **5.7.3 DEMOGRAPHICS**

A larger percentage of the patients were female and the race distribution within the study did not represent the race distribution within the general South African population. In future studies a more statistically correct sample should be used.

### **5.7.4 RESEARCHER INEXPERIENCE**

Manual palpation and patient feedback are the primary tools used for the diagnosis of myofascial trigger points (Sciotti et al 2001:260). Hsieh et al (2000:263) feel that extensive clinical experience in myofascial trigger point examination is important in obtaining examiner reliability. As the researcher has little clinical experience it is suggested that in future research a second more experienced examiner confirm the presence of the latent myofascial trigger point.

## **CHAPTER 6**

### **6.0 RECOMMENDATIONS AND CONCLUSIONS**

#### **6.1 RECOMMENDATIONS**

In future studies a sample that is more representative of the general population should be used i.e. with regards to gender and race distribution.

In future studies of this nature double blinding should be used to exclude examiner bias. The experience and reliability of the examiner needs to be considered.

A more reliable testing tool, such as thermography, should be employed in the diagnosis of myofascial trigger points.

A questionnaire more specific to Myofascial Pain Syndrome and post needling stiffness should be developed to provide more accurate subjective data.

The use of a rubberized tip at the end of the algometer will reduce the amount of pain caused by the algometer and so decrease the chances of altered pain perception and incorrect readings.

It is recommended that with regard to objective measures the goniometer / cervical range of motion device should be employed as an additional testing tool for an accurate assessment of the condition.

A one-month or sixth month telephonic interview should be incorporated into the research design in order to assess the long-term effects of this treatment protocol.

In future research an alternative to henna marking, something slightly more permanent should be considered.

An investigation into the popularity of chiropractic amongst the Black community should be considered as a future research topic.

A study similar to this one should be done comparing dry needling alone to dry needling with life style modifications.

## **6.2 CONCLUSIONS**

The purpose of this study was to investigate the efficacy of dry needling latent myofascial trigger points, in the treatment of Myofascial Pain Syndrome.

The study was a prospective, randomized placebo controlled study. Sixty patients from the greater Durban area participated in the study. They underwent a case history, relevant physical examination and a cervical spine examination. The sixty subjects were randomly allocated into two groups of thirty. Group one received sham/ placebo needling while group two received dry needling.

Each patient received two treatments within a week with a one-week follow-up. Subjective and objective measures were taken at all three visits. Subjective data was obtained from the Numerical Pain Rating Scale 101 and objective data was obtained from the use of the algometer.

From the results it appears that both groups responded equally well to their respective treatment protocols in the treatment of Myofascial Pain Syndrome. The dry needling group however showed a more significant clinical, but not statistical, response to treatment. It is possible that this treatment may maintain a more favorable response and that there may be less likelihood of the symptoms returning. It can be concluded that dry needling appears to be a reliable

intervention in the treatment of latent myofascial trigger points, but no more effective than placebo.

Future research should concentrate on whether dry needling has a possible preventative effect in the development of myofascial trigger points in the long term.

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# **APPENDIX A**

**DURBAN INSTITUTE OF TECHNOLOGY CHIROPRACTIC DAY CLINIC**

**CASE HISTORY**

Patient:..... Date:.....

File #:..... Age:.....

Sex:..... Occupation:.....

Intern:..... Signature:.....

**FOR CLINICIAN USE ONLY:**

Initial visit

Clinician:..... Signature:.....

**Case History:**

Examination:

Previous:

Current:

X-ray Studies:

Previous:

Current:

Clinical Path. Lab:

Previous:

Current:

**Case Status:**

PTT:.....

Signature:..... Date:.....

Conditional:

Reason for Conditional:.....

Signature:..... Date:.....

All Conditions met in Visit No.:.....

To be signed into PTT:.....

Signature:..... Date:.....

Signed off:.....

## **Intern's Case History:**

### **1. Source of History:**

### **2. Chief Complaint: (patient's own words):**

### **3. Present Illness:**

- Location:
- Onset: Initial:  
Recent:
- Cause:
- Duration:
- Frequency:
- Pain (character):
- Progression:
- Aggravating Factors:
- Relieving Factors:
- Associated S & S:
- Previous Occurrences:
- Past Treatment:
- **Outcome:**

<u>Complaint 1</u>	<u>Complaint 2</u>

### **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 Lifestyle:**

- Allergies
- Immunizations
- Screening Tests incl. x-rays
- Environmental Hazards (Home, School, Work)
- Exercise and Leisure
- Sleep Patterns
- Diet
- Current Medication  
Analgesics/week:
- 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

# **APPENDIX B**

## DURBAN INSTITUTE OF TECHNOLOGY 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 C**

# DURBAN INSTITUTE OF TECHNOLOGY CHIROPRACTIC DAY CLINIC

## REGIONAL EXAMINATION- CERVICAL SPINE

Patient:.....File:.....

Date:.....Intern/Resident:.....

Clinician:.....Sign:.....

### **OBSERVATION:**

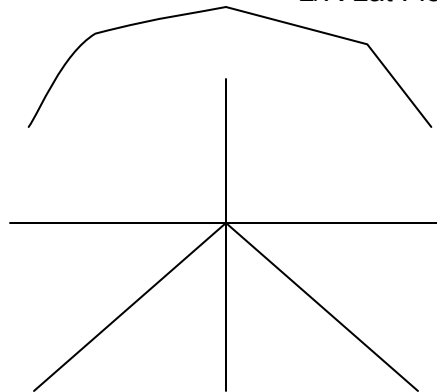
Posture  
Swellings  
Scars  
Discolouration  
Hair Line  
Bony & Soft Tissue Contours

Shoulder position:  
Left:  
Right:  
Muscle spasm  
Fascial 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

**NEUROLOGIC EXAMINATION:**

<b>Dermatomes</b>	Left	right	<b>Myotomes</b>	Left	right	<b>Reflexes</b>	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
<b>Blood pressure</b>		
<b>Carotid arts.</b>		
<b>Subclavian arts.</b>		

**MOTION PALPATION & JOINT PLAY:**

Left: Motion Palpation:  
Joint Play:

Right: Motion Palpation:  
Joint Play:

**Basic Exam: Shoulder**

Case History:

ROM: Active:  
Passive:  
RIM:

Orthopaedic/Neuro:

Vascular:

Observ/Palpation:

Upper Thoracics:

Motion Palpation:

Joint Play:

**Basic Exam: Thoracic Spine**

Case History:

ROM: Motion Palp.:  
Active:  
Passive:

Orthopaedic/Neuro:

Vascular:

Observ/Palpation:

# **APPENDIX D**



## **COVERING LETTER FOR PATIENTS ENTERING THE STUDY**

Dear Patient,

**Title of the research:** The therapeutic efficacy of dry needling latent myofascial trigger points.

**Principal investigator:** Candice Wilks

Welcome to my research study. I am investigating the effect of dry needling on latent myofascial trigger points. The study will be conducted at the Durban Institute of Technology Chiropractic Day Clinic and all treatment will be free of charge.

The purpose of this study is to improve current knowledge on the treatment of stiff aching muscles which is becoming extremely common with today's stresses.

There will be two treatment groups each consisting of thirty patients and the group to which you will be assigned will be randomly determined. One group will receive the dry-needling technique while the control group will receive the sham needle. There is a 50 % chance that you may be placed in the control group.

Latent myofascial trigger points are areas in muscle that are tender to touch and cause muscle stiffness and or spasm. The term dry needle is used to explain a very thin solid needle and is hence not used for the injection of medication. The sham needle is a needle which appears to pierce the skin but in fact does not.

At the first consultation a case history will be taken, the relevant physical and neck examination will be performed and you will be asked to indicate on a scale your intensity of discomfort. If you fit into the study the treatment will be as follows- the area to be needled will be marked with a spot of henna then cleaned with alcohol. I will then proceed to use either the dry or sham needle depending on which group you have been assigned to. The needle will remain in the muscle for a short period of time and then removed. You will be asked to come back for two more appointments which will follow the same procedure.

If you are allocated into the placebo group three free treatments will be offered at the end of the research.

Side effects of needling may include muscular stiffness, tiredness, fainting, nausea and vomiting. None of the above mentioned signs and symptoms pose as risk factors in the participants overall health and all possible precautions will be taken to avoid such from happening. A new and sterile dry needle will be used at each treatment to avoid the possibility of infection.

Please note that to participate in the study, the following will be required of you.

1. You must be between the ages of 18 and 60 years.
2. A consent form must be completed prior to commencement of treatment.
3. Inform the researcher of any medication that is to be taken for the duration of the study.
4. You will receive two treatments within a one-week period with a one-week follow-up appointment.
5. You may not receive any other chiropractic treatment, physiotherapy or massage for the duration of the study as this will influence the outcome of the study.
6. You are asked to avoid any vigorous or unaccustomed physical activity for the duration of the study, as this may aggravate your condition and affect the outcome of the study. You will remain in the study as long as you commit to the appointment schedule.

You may be removed from the study if you fail to comply with the above six points as these could affect the outcome of the study.

As mentioned earlier there is no cost involved as you will receive free treatment.

Please be assured that all information will be regarded as strictly confidential. All data will be kept for a period of five years in the Chiropractic Day Clinic and then shredded.

At this point I would like you to be as accurate as possible in your responses to all questions. There are no right or wrong answers, but your specific answers will affect the outcome of the study.

Should you have any questions at a later date please feel free to contact me at the Chiropractic Day Clinic.

Yours sincerely,

Candice Wilks

Tel no: (031) 2042205

## **INCWADI ECHAZELA IZIGULI NGOKUNGENELA ISIFUNDO**

Siguli esithandekayo,

**Isihloko socwango:** Ukwelapha okugculisayo ngokujova ngenaliti eyomile ezicutshini zomzimba lapho uma zithinteka zitshengise ukunyakaza ngokwethuka zithunukale.

**Umcwangingi omkhulu:** Candice Wilks

Ngiyanimukela esifundweni sami sokucwanginga. Ngizocwanginga ngokusetshenziswa kwenaliti eyomile ngendlela egculisayo kulezindawo othi uma uzithinta emzimbeni wakho zithi ukuthuka kube sengathi ziyathunukala ziqine. Isifundo ngokocwangingo sizobe senzela e Durban Institute of Technology eMtholampilo wokwelashwa kwamathambo kanti futhi konke ukwelashwa kuzobe kutholakala mahhala ngaphandle kokukhokha.

Injongo enkulu yalesisifundo ukuthuthukisa ulwazi ngokwelapha izicubu zomzimba ezithanda ukuqina nezibuhlungu okuyinto esiyande kakhulu kulezizinsuku zanamuhla.

Kuzoba khona amaqembu amabili alashwayo ngalinye iqembu lizoba neziguli ezinga 30 futhi iqembu ozokhethelwa ukuba ube kulona lizohlungwa nje ngokuthi litonyulwe esikhaleni. Lilinye iqembu lizothola ukusebenzisa inaliti eyomile (dry needle) elinye iqembu lizosebenzisa *I sham needle*. Ungaba sethubeni elingamaphesenti awu 50 okuthi uqokelwe ukuba segenjini elibusayo.

*Latent myofascial trigger points* izindawo ezisemzimbeni lezi okuthi uma zithinteka kube khona ukuqina kanye nokuthuka kwezicubu zomzimba. Igama elithi “*dry needle*” lisetshenziswa ukuchaza inaliti encane kakhulu futhi ayisetshenziselwa ukujovela ukwelashwa. I “*sham needle*” inaliti ebukeka engathi ibukhali lokhu engathi izokusika isikhumba kanti cha ayisiki.

Uma uzobonwa okokuqala kuzothathwa umlando wakho, kuzokwenziwa ukuhlolwa komzimba wakho, futhi uzocelwa ukuba utshengise izinga noma ubungako bokungaphatheki kahle kwakho. Uma usilungele lesisifundo, ukwelashwa kuzoba njengalokhu okulandelayo – indawo ezohlatshwa ngenaliti izomakwa ngebala likadaye ongathi ubomvu sabubende bese igezwa ngento engathi inotshwala phakathi. Ngizobe sengiqhubeka nokusebenzisa I *dry needle* noma I *sham needle* kuzoya ngokuthi iliphi iqembu okhethekwe ukuba ube kulona. Inaliti izohlala ezicutshini zomzimba wakho isikhathi esincane ebese iyasuswa. Uzocelwa ukuba ubuye kabili uzokwenza lokhu okuchazwe ngenhla.

Uma ubukhethelwe iqembu elibusayo elinikwe imithi okungeyona eyangempela, uzonikezwa imithi kathathu mahhala ekugcineni kocwangingo.

Imiphumela emibi yokusetshenziswa kwezinaliti ingambandakanya ukuqina komzimba, ukukhathala, ukuquleka, isiyezi kanye nokuphalaza. Kuzoqikelelwa kakhulu ekutheni imiphumela emibi esibalwe ngenhla ingenzeki. Inaliti eyomile entsha nehlanzekile izosetshenziswa njalo uma umuntu elashwa ukugwema ukuthathelana kwezifo okungase kube khona.

Ukubamba iqhaza kulesisifundo, kudingeka ube nalokhu okulandelayo.

1. Kufanele ube neminyaka ephakathi kuka 18 no 60 ubudala.
2. Ifomu yesivumelwano kufanele ube usuyigcwalisile ngaphambi kokuqala ukwelashwa.
3. Yazisa umcwaningi ngemithi okufanele uyithathe ngesikhathi kuqhubeka lesisifundo.
4. Uzothola ukwelashwa kabili evikini elilodwa nokuba ubonwe isikhathi esingangesonto elilodwa.
5. Ngeke ukwazi ukwelashwa amathambo, ukwelashwa ngokunyakazisa umzimba noma ukupotozwa komzimba ngesikhathi kusaqhutshekwa nalesisifundo njengoba lokhu kungaletha umthelela empumelelweni yalesisifundo.
6. Uyacelwa ukuba ungawuvocavoci umzimba noma ukuwunyakazisa ngendlela engajwayelekile umzimba ngesikhathi kusaqhutshekwa nocwaningo lwalesisifundo.,njengalokhu kungasenza sibe sibi kakhulu isimo okusona futhi kungaphazamisa imiphumela yesifundo. Uzohlala kulesisifundo uma uzinikele ukuba ubonwe ngendlela ebekelwe ukuthi ubonwe ngayo.

Ungasuswa kulesisifundo uma ungakwazi ukuhlangabezana nalamaphuzu ayisithupha abekwe ngenhla njengoba lokhu kungaphazamisa imiphumela yalesisifundo.

Njengoba bese kushiwo ngaphambilini ukuthi akukho ozokukhokhela njengoba uzothola ukwelashwa mahhala.

Uyacelwa ukuba ube nesiqiniseko sokuthi lonke ulwazi mayelana nawe luzoba yimfihlo. Lonke ulwazi luzogcinwa isikhathi esingangeminyaka emihlanu eMtholampilo wokwelashwa kwamathambo ebese luyalahlwa iphele indaba yalo.

Okwamanje bengingathanda ukuba yonke imibuzo niyiphendule ngokweqiniso. Azikho izimpendulo ezihlaba esikhonkosini nezingahlabi esikhonkosini zonke izimpendulo zamukelekile, kodwa ezinye zezimpendulo ongaba nazo zingayiphazamisa imiphumela yalesisifundo.

Uma kwenzeka uba nemibuzo ethile ngelinye ilanga noma ngesinye isikhathi unelungelo lokuthintana nami eMtholampilo wokwelashwa kwamathambo.

Ozithobayo,

Candice Wilks Tel no: (031) 204 2250

# **APPENDIX E**

# INFORMED CONSENT FORM

(To be completed by patient / subject )

Date :

Title of research project : The therapeutic efficacy of dry needling latent latent myofascial trigger points.

Name of supervisor : Dr C. Korporaal

Tel : 031 2042611

Name of research student : Candice Lara Wilks

Tel : 031 2042205/ 0721797873

## Please circle the appropriate answer

## YES /NO

- |  |     |    |
|--|-----|----|
| 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. Do you understand the implications of your involvement in this study?   | Yes | No |
| 7. Do you understand that you are free to withdraw from this study?<br>at any time<br>without having to give any a reason for withdrawing, and<br>without affecting your future health care. | Yes | No |
| 8. Do you agree to voluntarily participate in this study   | Yes | No |
| 9. Who have you spoken to? _____   |     |    |

**If you have answered NO to any of the above, please obtain the necessary information before signing.**

## Please Print in block letters:

Patient /Subject Name:.....Signature:.....

Witness Name:.....Signature:.....

Research Student Name:.....Signature:.....

## USHICILELO Cii

### INCWADI EGUNYAZAYO

**Usuku** :

**Isihloko socwaningo** : Ukwelapha okugculisayo ngokujova ngenaliti eyomile ezicutshini zomzimba lapho uma zithinteka zitshengise ukunyakaza ngokwethuka zithunukale.

**Igama lika Supervisor** : Dr C. Korporaal  
031 2042611

**Igama lomfundi ongumcwaningi** : Candice Lara Wilks  
031 2042205/ 0721797873

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#### Uyacelwa ukuba ukhethe impendulo

**Yebo Cha**

- |  |          |
|--|----------|
| 1. Ulifundile yini iphepha elinolwazi ngocwaningo?                 | Yebo Cha |
| 2. Ube naso yini isikhathi sokubuza imibuzo mayelana nocwaningo?   | Yebo Cha |
| 3. Wanelisekile yini izimpendulo ozitholile emibuzweni yakho?      | Yebo Cha |
| 4. Ube nalo yini ithuba lokuthola kabanzi ngocwaningo?             | Yebo Cha |
| 5. Uyithole yonke imininingwane eyanele ngalolucwaningo?           | Yebo Cha |
| 6. Uyayiqonda imiphumela yokuzimbhandakanya kwakho kulolucwaningo? | Yebo Cha |
| 7. Uyaqonda ukuthi ukhululekile ukuyeka lolucwaningo?              | Yebo Cha |

**noma inini**

ngaphandle kokunika isizathu sokuyeka

ngaphandle kokubeka impilo yakho ebungozini

- |   |          |
|---|----------|
| 8. Uyavuma ukuvolontiya kulolucwaningo? | Yebo Cha |
| 9. <b>.Ukhulume nobani?</b> -----       |          |

Uma uphendule ngokuthi cha kokungaphezulu, sicela uthole ulwazi ngaphambi kokusayina.

#### BHALA NGAMAGAMA AMAKHULU:

Igama lesiguli:.....Sayina:.....

Umzali/Umgad:.....Sayina:.....

Igama Witness:.....Sayina:.....

Igama lomfundi ongumcwaningi:.....Sayina:.....

# **APPENDIX F**



## **Myofascial Diagnostic Scale**

Patients name:..... Muscles:.....

Treatment no.:..... Date:.....

Researcher: .....

### 1) Soft tissue tenderness

#### Grade

0	No tenderness	0
1	Tenderness to palpation <u>without</u> grimace or flinch	1
2	Tenderness <u>with</u> grimace &/or flinch to palpation	2
3	Tenderness with <u>withdrawal</u> (+ jump sign)	3
4	Withdrawal (+ jump sign) to non-noxious stimuli (ie. Superficial palpation, pinprick, gentle percussion)	4

2) Snapping palpation of the trigger point evokes a local twitch response. 4

3) The trigger point is found in a palpable taut band. 4

4) Moderate, sustained pressure on the trigger point causes or intensifies pain in the reference zone. 5

**Total:**

## **Numerical Rating Scale- 101 Questionnaire**

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

.....

# **APPENDIX G**

Algometer readings			
Muscle			
Treatment 1			
Twitch response			
Treatment 2			
Twitch response			
Treatment 3			
Twitch response			