



**THE RELATIONSHIP OF MYOFASCIAL TRIGGER
POINTS OF THE PERICRANIAL MUSCULATURE AND
EPISODIC TENSION-TYPE HEADACHE.**

By

Juliette Faye Forsyth

*Dissertation submitted in partial compliance with the requirements
for the Master's Degree in Technology: Chiropractic at Durban
University of Technology.*

*I, Juliette Faye Forsyth, do declare that this dissertation is representative of
my own work in both conception and execution.*

Juliette Faye Forsyth

01-03-2007

Date

APPROVED FOR FINAL EXAMINATION BY:

Supervisor

Dr N. de Busser

M.Tech:Chiropractic (SA)

01-03-2007

Date

DEDICATION

"For God did not give me a spirit of fear, but a spirit of love and of power and of self-discipline."

2 Timothy verse 7

To my parents Will and Kate Forsyth, whose love, support and encouragement, have inspired me to meet each challenge with optimism and determination.

To my brothers, Angus and Gillon Forsyth, for their advice and unwavering faith in me.

ACKNOWLEDGEMENTS

To Dr. Nikki de Busser, thank you for your patience, guidance and valued time.

To Graham Mallen, thank you for your encouragement, for lifting my spirits and for making me smile inside and out.

To Dr. Donna Dippenaar, for your generosity of time and spirit.

Mrs. Twiggs, Mrs. Van Den Berg and Mrs. Ireland for their enduring commitment to all the students.

To Angela Mallen, for your wonderful artistic contributions to this study.

To all the patients, thank you for your much appreciated time and effort.

ABSTRACT

The purpose of this study was to determine the relationship between Myofascial Pain Syndrome (MPS) of the pericranial musculature and the clinical presentation of episodic tension-type headache (ETTH). It set out to determine the extent to which MPS is related to the nature of the ETTH.

ETTH is a very prevalent disorder, common to individuals in their third decade, and particularly females. Current literature suggests a multi-factorial aetiology, combining psychological and neuromusculoskeletal mechanisms, to name a few. Due to the many facets of this disorder, it has, for a long time, provided a challenge to the practitioner with regard to patient treatment and management.

MPS is a condition that may affect any number of muscles, resulting in motor, sensory and autonomic symptoms. MPS of the pericranial muscles, namely the upper Trapezius, Sternocleidomastoid, Temporalis and Suboccipital muscles, produces a referred pain pattern similar to the pain pattern experienced during an ETTH. The literature states that the pain produced by MPS has been somewhat overlooked and it was thus necessary to further investigate the myofascial component of ETTH.

This study was a quantitative, pilot, non-intervention, clinical assessment study, which required forty participants residing in the province of Kwa-Zulu Natal suffering from ETTH. The clinical assessment included a case history and physical and cervical examinations. The participants were requested to complete a headache diary over a period of 14 days. Following this, they returned to the Chiropractic Day Clinic for a second consultation. Data was collected at both consultations and the participant was offered one free treatment. The headache diary and Numerical Pain Rating Scale provided the subjective measurements, while the algometer and Myofascial Diagnostic Scale were used to gather the objective measurements.

Non-parametric statistics were used to summarize the data (reported as medians and ranges) and to perform statistical hypothesis tests. Paired quantitative data were compared with the Wilcoxon signed ranks test; independent quantitative data with the Mann-Whitney test. Spearman's rank correlation was used to assess relationships between two quantitative variables, with scatter plots to graphically display any trends reported.

Active myofascial trigger points (MTrPs) were highly prevalent in the sample, particularly in the upper Trapezius and Sternocleidomastoid muscles, thus the presence of MTrPs was established in persons suffering ETTH. No correlation was found between the algometer and Myofascial Diagnostic Scale collectively, and the headache diary.

It was concluded that there is no correlation between the clinical presentation of ETTH and that of MPS, in terms of subjective and objective findings.

TABLE OF CONTENTS

DEDICATION	i
ACKNOWLEDGEMENTS	ii
ABSTRACT	iii
CHAPTER ONE: INTRODUCTION	
1.0 The problem and its setting	1
1.1 Aim and objectives of the study	3
1.1.1 The research problem	3
1.2 Benefits of the study	4
CHAPTER TWO: LITERATURE REVIEW	
2.0 Introduction	5
2.1 Introduction to the tension-type headache	5
2.2 Tension-type headache classification	5
2.2.1 Definition	6
2.2.2 Prevalence	6
2.2.3 Male/female ratio	7
2.2.4 Age	7
2.2.5 Duration and frequency	7
2.2.6 Site and quality	7
2.2.7 Time of day	8
2.2.8 Associated symptoms	8
2.2.9 Aggravating and relieving	8
2.2.10 Work	9
2.2.11 Consultation	9

2.3 Pathophysiology of the tension-type headache	10
2.3.1 Depression	10
2.3.2 Vascular factors	11
2.3.3 Cervical aetiology	11
2.3.4 Coping and stress	12
2.3.5 Central nervous system	13
2.3.6 Muscular involvement	13
2.4 Differential diagnosis	15
2.4.1 Migraine	15
2.4.2 Cervicogenic headache	16
2.4.3 Myofascial Pain Syndrome (MPS)	16
2.5 Introduction to MPS	17
2.6 Definitions	17
2.7 Aetiology of MPS	18
2.7.1 Primary activation of myofascial trigger points (MTrPs)	
2.7.2 Secondary activation of MTrPs	20
2.8 Physical findings	20
2.9 Management of MPS	21
2.10 Presentation of MTrPs of the pericranial musculature	22
2.10.1 Presentation of MTrPs of the upper Trapezius	22
2.10.2 Presentation of MTrPs of the SCM muscle	24
2.10.3 Presentation of MTrPs of the Temporalis muscle	26
2.10.4 Presentation of MTrPs of the Suboccipital muscle	28
2.11 Diagnosis of MPS	29
2.12 Differential diagnosis	29
2.13 In summary	30

CHAPTER THREE: MATERIALS AND METHODS

3.0 Introduction	32
3.1 The data	33
3.1.1 Primary data	33
3.2 Study design	33
3.3 The subjects	33
3.3.1 Advertising	33
3.3.2 Sampling	33
3.3.3 Procedure of clinical assessment	33
3.3.4 Plan of clinical treatment	36
3.4 Assessment	36
3.4.1 Diagnosis and assessment of MTrPs	36
3.4.1.1 Objective measurements regarding MPS	37
3.4.2 Diagnosis and assessment of ETTH	39
3.5 Statistical analysis	40
3.6 Ethics	40

CHAPTER FOUR: RESULTS

4.0 Introduction	41
4.1 Criteria for the admissibility of data	41
4.2 Demographic data of ETTH	42
4.2.1 Age and gender distribution	42
4.2.2 Occupation	43
4.2.3 Duration of condition	44
4.2.4 Gender comparison	48
4.3 Demographics of the MTrPs	50
4.3.1 Myofascial Diagnostic Scale (MDS)	50
4.3.2 Algometer	52
4.3.3 Active and latent MTrPs	53

4.3.4 MDS and algometer	54
4.4 Correlation between MTrPs and ETTH	55
CHAPTER FIVE: DISCUSSION OF THE RESULTS	
5.0 Introduction	57
5.1 Demographic data	57
5.1.1 Gender distribution	57
5.1.2 Occupation	58
5.1.3 Age	58
5.1.4 Duration of condition	59
5.2 Demographics of the MTrPs	60
5.2.1 MDS	60
5.2.2 Algometer	61
5.2.3 Active and latent MTrPs	61
5.2.4 MDS and algometer	61
5.3 Correlation between MTrPs and ETTH	62
5.3.1 Active MTrPs and ETTH	62
5.3.2 Latent MTrPs and ETTH	62
5.3.3 MDS, algometer and ETTH	62
5.4 Summary	62
CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS	
6.0 Conclusions	64
6.1 Recommendations	66
REFERENCES	68
APPENDICES (AS PER NUMBER)	

LIST OF TABLES

Table 2.13: MPS and ETTH clinical overlap	30
Table 4.2.2: Occupational category of participants	43
Table 4.2.3.1.1: Wilcoxon signed ranks test for comparison of headache episodes between day and night time	45
Table 4.2.3.1.2: Test statistics	45
Table 4.2.3.2: Descriptive statistics for duration of headaches in a 24-hour period (in hours)	46
Table 4.2.3.3: Descriptive statistics for mean NRS score over 24 hours	48
Table 4.2.4.1(a): T-test comparison of mean headache pain between the genders	48
Table 4.2.4.1(b): Mann-Whitney test comparison of median duration of headaches between the genders	49
Table 4.2.4.2: Test statistics	49
Table 4.3.3: Descriptive statistics for number of active and latent trigger points	53
Table 4.3.4: Spearman's rank correlation between total MDS score and total algometer score	54

Table 4.4.1: Spearman's rank correlation between number of active trigger points and duration and frequency of headaches 55

Table 4.4.2: Spearman's rank correlation between number of latent trigger points and duration and frequency of headaches 56

Table 4.4.3: Spearman's rank correlation between severity and tenderness of trigger points and duration and severity of headaches 56

LIST OF FIGURES

Figure 2.10.1(a): Diagram to illustrate TrP1 location and referral pattern of the upper Trapezius muscle	23
Figure 2.10.1(b): Diagram to illustrate TrP2 location and referral pattern of the upper Trapezius muscle	23
Figure 2.10.2: Diagram to illustrate trigger point location and referral pattern of the sternal (A) and clavicular (B) divisions of the SCM	25
Figure 2.10.3: Diagram to illustrate trigger point location and pain referral of the Temporalis muscle	27
Figure 2.10.4: Diagram to illustrate trigger point location and referral pattern of the Suboccipital muscle group	28
Figure 4.2.1: Female and male distribution of subjects	42
Figure 4.2.3.1: Histogram of duration of headaches in a 24-hour period	44
Figure 4.2.3.2: Histogram of the distribution of NRS pain scores in the sample	47
Figure 4.2.4.1: Scatter plot of the relationship between ETTH duration and headache pain	50
Figure 4.3.1: Median MDS scores for all muscles	51

CHAPTER ONE

INTRODUCTION

1.0 The problem and its setting

The episodic tension-type headache (ETTH) is a very prevalent headache disorder for which no single cause has been identified (Schwartz *et al.*, 1998). Current knowledge suggests the headache may be of muscular origin (Millea and Brodie, 2002). It should be noted that it is a multifactorial disorder, with a number of concurrent pathophysiological mechanisms (Jensen R., 1999).

Some of the classical clinical manifestations of the ETTH are:

- Sustained and persistent headache
- Pain is bilateral in 90% of cases and described as a constricting, tight, squeezing pain.

Other characteristics, as given by the International Headache Society (1998) include:

- Pain does not become worse with physical activity
- Phonophobia or photophobia may be present, but nausea is absent (Jamison J.R., 1991).

The age group affected by this type of headache is variable (Jamison, 1991) with a female preponderance (Schwartz *et al.*, 1998). Daily presentation of this headache, that is unremitting in nature, is considered chronic and is often associated with psychological problems, particularly in patients prone to depression. The headache that lasts for thirty minutes to seven days is considered an ETTH (Travell *et al.*, 1999).

In contrast, Myofascial Pain Syndrome (MPS) is described as a muscular disorder resulting in autonomic, sensory and motor symptoms from myofascial trigger points. Active myofascial trigger points produce a local twitch response when palpated and are painful when pressure is applied to the area (Travell *et al.*, 1999).

There are a number of signs and symptoms produced by active myofascial trigger points (MTrPs). The following are those of particular interest to this study:

- Referred pain that is spontaneous, with an active MTrP
- A referred pain pattern that may be recognized by the patient with the application of digital pressure (Hsieh *et al.*, 2000).

Pain due to active MTrPs may be referred locally, or to a distant site, and the individual is often unaware of their presence (Baldry, 1998).

Referred pain from the upper Trapezius, Suboccipital, Sternocleidomastoid and Temporalis muscles is spread collectively over the region of the head and neck. MPS of the upper Trapezius muscle produces a typical tension-type headache picture when its referral pattern overlaps with referral patterns from other muscles, namely the Sternocleidomastoid (SCM) and the Suboccipital muscles (Travell *et al.*, 1999).

A clinical overlap between ETTH and MPS of the pericranial musculature exists. Pain is experienced over the region of the occiput and spreads to the parietal, frontal and facial areas in the case of an ETTH (Diamond and Dalessio, 1992). Similarly the suboccipital muscles produce a referred pain pattern that radiates from the occiput towards the region of the orbit (Travell *et al.*, 1999).

Cold drafts and emotional distress will aggravate both conditions and an alteration in the musculature is noted for both. In the case of MPS there is increased muscle tension with a tender nodule located in taut muscle bands (Travell *et al.*, 1999). As with MPS, there is tautness of the musculature in the region of the face, neck, scalp and jaw with the presence of tender nodules (Diamond and Dalessio, 1992).

Pain produced by active MTrPs has, in the past, been somewhat overlooked as a significant cause of pain. It is poorly recognised and often mismanaged (Baldry, 1998). In the majority of cases head and neck pain, has been found to be of myofascial origin and is, more often than not, related to trigger points (Murphy, 1989).

It has been established that an association exists between the presence of MTrPs and the tension-type headache (Mennell, 1992). An investigation into the role of MPS in the clinical presentation of ETTH is therefore worthwhile.

The purpose of this study is to determine the relationship between MPS of the pericranial musculature and the clinical presentation of the ETTH.

1.1 Aim and objectives of the study

The aim of this study was to determine the relationship between MPS of the pericranial musculature and the clinical presentation of the ETTH. In order to do this the researcher will observe and quantify the following:

1. The nature, i.e. type, number and severity, of the MTrPs in the upper Trapezius, Temporalis, Suboccipital and Sternocleidomastoid musculature.
2. The nature, i.e. frequency, duration and intensity, of the ETTH.

1.1.1 The research problem

To determine if a correlation exists between the clinical presentation of ETTH and MTrPs in the upper Trapezius, Temporalis, Suboccipital and Sternocleidomastoid musculature, in terms of the subjective and objective findings.

Hypothesis: A correlation exists between the ETTH and MTrPs in the upper Trapezius, Temporalis, Suboccipital and Sternocleidomastoid musculature in terms of the subjective and objective findings.

The alternate hypothesis has been selected, as there is sufficient literature to suggest that there is an association between the pericranial musculature and ETTH (Prithipal, 2003).

1.2 Benefits of the study

Literature reveals a relationship between tension-type headaches and MPS (Travell *et al.*, 1999). The exact nature of the relationship, however, is yet to be determined. This study aims at identifying a correlation and the extent of the correlation existing between MPS of the pericranial musculature and the clinical presentation of ETTH. It will then be possible to determine if MPS may be considered a positive predictive factor in ETTH headaches.

This study will aid in determining which muscle/s, and which specific trigger points within those muscles, should be targeted during treatment as no studies involving specific trigger point therapy of the upper Trapezius, Suboccipital and Sternocleidomastoid muscles have been carried out in order to determine their effect on the tension-type headache (Prithipal, 2003). It has been found that the application of interferential current to the Posterior Cervical and Suboccipital musculature, combined with manipulation of the cervical spine, brought more relief than that of manipulation alone, thus suggesting a myofascial role (Prithipal, 2003).

According to Travell *et al.* (1999), individuals investigating headaches have given little attention to the myofascial trigger point component. With knowledge gained from this study a greater understanding may be gained and a more specific and appropriate treatment may then be applied.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

Chapter two will discuss tension-type headache and myofascial pain syndrome, the pathophysiology and clinical features. The chapter serves to provide a review of the available literature covering these subjects.

2.1 Introduction to the tension-type headache

The headache condition, in general, is a common complaint experienced particularly in Western society. Specific headaches are found to vary in severity and prevalence (Kanji *et al.*, 2006). The episodic tension type headache (ETTH) is a primary headache and is the most common headache type (Ashkenazi and Silberstein, 2004). A study by Schwartz (1998) showed the episodic tension type headache to be more prevalent than its chronic form, with women having a greater prevalence irrespective of race and age.

No single treatment has been found to bring permanent relief from this type of headache and thus far treatment protocols have been less than satisfactory (Ashkenazi and Silberstein, 2004). Pharmacological (i.e. non-steroidal anti-inflammatories) and non-pharmacological (i.e. hypnoses and autogenic training) methods have been used in order to reduce headache frequency and severity (Kanji *et al.*, 2006).

2.2 Tension-type headache classification

The International Headache Society (1988) classifies tension-type headache as follows:

- A. Episodic tension-type headache
- B. Chronic tension-type headache and

- C. A tension-type headache that does not fall into categories A and B above.

2.2.1 Definition

ETTH is described as a headache, which is experienced as a tightening or pressing sensation. It may vary from mild to moderate in intensity and can last from a few minutes to a number of days. Physical activity is not found to aggravate the condition and photophobia or phonophobia may be associated symptoms. Nausea is not present and headache location is typically bilateral (International Headache Society, 1988).

2.2.2 Prevalence

A study by Schwartz *et al.* (1998) showed the peak prevalence among men and women to be between the age of thirty and thirty-nine, with an overall prevalence of 38.3% for that year. ETTH was found to be more prevalent among whites than that in African Americans. Past epidemiological studies have expressed difficulty when determining overall prevalence, as the headache severity and frequency is found to vary vastly, causing the pooling of results to be somewhat confusing (Rasmussen, 1995).

When comparing episodic and chronic tension-type headache, the episodic form is far more prevalent than the chronic form. The episodic form has a greater societal impact, whereas the individual impact or burden of that of the chronic form is far worse, i.e. ETTH has a moderately negative impact over a larger portion of society (Schwartz *et al.*, 1998).

ETTH was found to increase with increasing level of education, while the opposite was found for the chronic form (Schwartz *et al.*, 1998).

2.2.3 Male/female ratio

ETTH is more prevalent in women than men (Janke *et al.*, 2004) irrespective of age or race (Schwartz *et al.*, 1998). A male to female ratio of 1:1.5 exists, which is thought to be due to differences between male and female gender with regard to personality and hormonal factors (Rasmussen and Olesen, 1994).

A higher prevalence was found in women for both episodic and chronic tension-type headache. The female preponderance might be due to the greater likelihood of women seeking treatment than that of men (Rasmussen, 1995).

2.2.4 Age

Headache prevalence is found to decrease with age (Rasmussen and Olesen, 1994), with peak prevalence between the age of thirty and thirty-nine (Schwartz *et al.*, 1998). The noted age of onset is in the second decade (Rasmussen, 1995).

2.2.5 Duration and frequency

As many as 78% of the population suffered from thirty or fewer ETTH episodes per year and one or two a month (Schwartz *et al.*, 1998).

2.2.6 Site and quality

Painful regions involve the occipital region, initially, with spread to the parietal, frontal and facial areas bilaterally (Diamond and Dalessio, 1992).

A study by Schwartz *et al.* (1998), consisting of 13 345 participants, used a ten-point scale to measure pain intensity. A score of 1-3 suggested mild pain intensity, 4-7 moderate and 8-10 severe pain. A quarter of the participants suffered headaches of mild pain intensity, 62.2% moderate and 12.8% suffered headaches of severe pain intensity.

2.2.7 Time of day

Daily and constant pain is common with a majority of patients, who experience headache onset shortly after rising. The pain might persist throughout the day and varies in intensity (Diamond, 1987 and Raskin, 1988).

2.2.8 Associated symptoms

According to IHS criteria, photophobia or phonophobia may be present, but should not exist simultaneously. Patients may experience a loss of appetite, but nausea and vomiting is not present (International Headache Society, 1988).

When experiencing a headache, patients are more likely to have feelings of depression, anger and anxiety than when they are headache free. The individual is inclined to feel that they have a reduced ability to deal with external stressors and have reduced coping skills overall during the headache state (Murphy and Lehrer, 1990).

2.2.9 Aggravating and relieving

Alcohol has been found to bring on a tension headache, while changes in the weather and smoking are two well-known triggers. Stress is one of the most common precipitating factors (Rasmussen, 1995).

Emotional stimulation, psychological distress and tension in the neck and shoulder region have been found to contribute to tension headaches (Murphy and Lehrer, 1990).

2.2.10 Work

Work loss of 8.9 days was reported by 8.3% of respondents in a study consisting of 13 345 participants, with 43.6% of participants experiencing 5.0 days of reduced effectiveness over a period of one year (Schwartz *et al.*, 1998). ETTH was found to have a significant negative impact on the individual's work and daily activities. Women were found to have higher rates of absenteeism than that of men with the same condition (Rasmussen, 1995).

2.2.11 Consultation

Cognitive therapy, electromyographic (EMG) biofeedback and relaxation therapy have been found to be effective in the treatment of ETTH, as described by Bogaards and Kuile (1994). This was particularly noticeable in patients having experienced headaches for a shorter duration than those with protracted and frequent headaches.

Individuals suffering tension-type headache commonly self-medicate, using over-the-counter, non-steroidal, anti-inflammatory drugs. The most common analgesic medications used include aspirin and acetaminophen (Millea and Brodie, 2002).

A study of 1000 men and women aged 25-64 found that one third of the participants used a form of medication one to three times a month, while 13% of the sample size did not use any medication for the entire year of the study. Paracetamol and preparations of aspirin were found to be the analgesics of choice. In this same study, it was found that only one-sixth of the participants had sought help from their general practitioner, and even fewer had consulted a specialist. Women were more likely to seek medical help and consultation was directly related to the frequency of the headache (Rasmussen, 1995).

Thrust manipulation of the upper thoracic vertebrae has been found to bring relatively long-term relief of pain in headache patients, as was found in a

study by Viti and Paris (2000), when they compared thrust to non-thrust manipulation in the treatment of headache sufferers. Manipulation of the cervical spine, combined with soft tissue treatment, was found however not to be more effective than soft tissue treatment alone. Both treatments are, however, able to bring about a reduction in pericranial tenderness and ultimately a degree of pain relief (de Busser, 2001 and Penner, 1994). Chiropractic manipulative therapy was efficient in the management of benign headaches in adults. It was effective in the reduction of autonomic symptoms via modulation through the autonomic nervous system (Vernon, 1982).

Little is known about the prognosis of tension-type headaches. They may be affected by the co-presence of a migraine headache. A long-term presence of ETTH may predispose the patient to chronic tension-type headache; this is thought to have an association with excessive and/or frequent use of analgesics (Rasmussen, 1995).

2.3 Pathophysiology of tension-type headache

The pathophysiology of tension headache is not yet fully known or understood. A number of factors are thought to play a role (Anttila, 2006).

2.3.1 Depression

A study by Janke, Holroyd and Romanek (2004) showed that individuals suffering from depression were more vulnerable to tension-type headaches and had an associated increase in pericranial muscle tenderness. This is thought to be due to central sensitization, which is aggravated by depression. Tension-type headache may present as a symptom of depression (Holroyd *et al.*, 1993).

Headache sufferers have been found to have more psychological symptoms than those who do not experience headaches. Debate exists as to whether the psychological symptoms are a result of the constant head pain, or if they were pre-existing and may then be responsible for the onset of the

headaches. When compared to migraine sufferers, tension-type headache patients have more psychological symptoms than the migraine sufferers. This is thought to be due to the more frequent nature of the tension-type headache and therefore a greater time spent in pain (Holroyd *et al.*, 1993).

2.3.2 Vascular factors

Martin and Mathews (1978) suggested that the headache may be due to vasodilation of the cranial vasculature. Their study discredits the idea that muscle tension is the cause of tension headache, as the results showed decreased electromyographic (EMG) activity, while headache frequency and intensity increased.

Edmeads (1988) states that occipital pain may be produced when the vertebral arteries are occluded by a thrombus or dissection. Simple compression of the vertebral artery as a cause of pain is, however, questionable.

2.3.3 Cervical aetiology

Nociceptive input from the cervical muscles is thought to play a role in the pathophysiology of tension-type headache. This was seen using an animal model whereby the effect of noxious input from the neck muscles on the orofacial sensorimotor processing (jaw-opening reflex) was investigated by electrophysiological means in anesthetized mice (Makowska *et al.*, 2005).

In the aforementioned study, a noxious stimulus was sent to the brainstem by injecting the neck muscles with nerve growth factor (NGF). This produced a sustained central facilitation of the jaw-opening reflex. Similarly, in the case of headache pathophysiology, the NGF is reflective of plastic changes of nociceptive synaptic processing, which may result in a tension-type headache (Makowska *et al.*, 2005).

Edmeads (1988) found that individuals with headache and neck lesions, when treated, obtained a high degree of relief. Individuals without neck lesions also gained temporary relief, with treatment. Edmeads (1988), found that congenital and acquired disease, such as rheumatoid arthritis and ankylosing spondylitis, had a definite causal relationship in headache patients but other conditions such as posterior cervical sympathetic syndrome were still in debate.

Participants in a study by Vernon, Steiman and Hagino (1992), exhibited a marked reduction in the cervical curve. A high percentage were noted to suffer from neck and upper back pain. It can be determined that the neck, and pathology thereof, should be considered as an etiological agent in headache patients (Penter, 1994).

Manipulative thrust technique of the upper thoracic region brought relief of head pain to patients with headaches and concomitant lesions of the neck and subcranial regions. This suggests that the thoracic region may, too, play a role in headache etiology (Viti and Paris, 2000).

2.3.4 Coping and stress

Patients frequently complain of insomnia, feeling overwhelmed and anxious about their work, or other aspects of their life, in which they're experiencing difficulty or added stress. When associated with depression, the patient awakens regularly through the night and wakes early in the day, when compared to headache- and depression-free individuals (Diamond and Dalessio, 1992).

Ukestad and Wittrock (1996) determined that women suffering tension-type headache had a lower pain threshold than that of the headache-free control group. This same study showed that headache sufferers cope differently and, to an extent, less competently and have a tendency to rely on negative cognitions and engage in a higher degree of catastrophizing, when compared to headache-free individuals.

2.3.5 Central nervous system

Chronification of tension-type headache is thought to be largely due to central sensitization. This is still not fully understood. It is thought that episodic pain is converted to chronic pain when prolonged nociceptive input from the periphery results in central sensitization (Buchgreitz *et al.*, 2006).

A study by Buchgreitz *et al.* (2006) showed total tenderness scores, revealing the point that tenderness was significantly increased in females with frequent ETTH, compared to males. Pain intensity increased positively with increasing pressure in patients with more frequent headaches. Women, in particular, were found to have lower pain pressure thresholds, as were the men with ETTH, when compared to healthy subjects. The study concludes by identifying the distinct relationship existing between chronification of headache and altered pain perception, which is more than probably explained by central sensitization.

2.3.6 Muscular involvement

Tightness of the neck and shoulder muscles prior to a headache is a common clinical observation. Murphy and Lehrer (1990) found that stronger EMG readings for the Trapezius suggested a greater involvement of the neck and shoulder muscles than that of the facial muscles. It is for this reason that Murphy and Lehrer (1990) place emphasis on the possible muscular aetiology of the tension headache. Edmeads (1988), on the other hand, questions the muscular involvement, as his study showed no increased activity of surface EMG in headache patients.

Using posturography and spectral analysis of body sway, Giacomini *et al.* (2004) revealed that, although overall stability is maintained in tension headache patients, a greater effort is required when the patient closes his eyes. This is due to disrupted proprioceptive mechanisms as a result of chronic contraction and tenderness of the pericranial muscles.

A study by Vernon *et al.* (1992) showed that patients suffering migraine and tension-type headache had a high degree of neck and occipital pain, as well as a number of tender points located in the upper cervical region, thus reiterating a possible myofascial involvement.

Diamond and Dalessio (1992) propose the following mechanism behind tension-type headache and relate it to that of chronic muscle contraction in other regions of the body. This mechanism consists of four steps and three reflex arcs:

1. Initial muscle spasm is caused by a multisynaptic reflex of withdrawal. The pathological process stimulates nerve fibres and the impulse is transmitted to the ventral roots via the spinal cord. The impulse is then transmitted to the neuromuscular junction via the efferent nerve fibres resulting in muscular contraction and thus movement away from the painful stimulus.
2. The painful stimulus is perceived at the central and thalamic levels. This occurs as a result of the polysynaptic spinal pathways and lemniscal system, which conduct the initial stimulus up the spinal cord, to be received at the higher levels.
3. The brain then sends an impulse to the reticulospinal system, which activates the gamma efferent neurons, causing the muscle spindle to contract.
4. A monosynaptic stimulus, evoked by the muscle spindle contraction, is sent to the ventral horn, which brings about efferent peripheral nerve discharge and muscle contraction.

Muscle spindle contraction, which is the third reflex arc, is similar to the simple tendon stretch reflex in that it is also a monosynaptic reflex. Ordinarily, the muscle spindle would be inhibited by the contracting muscle, which terminates the stretch reflex and allows muscular relaxation. The activity of the gamma motor system determines muscular tone to a large degree. Therefore if the gamma efferent continues to fire as a result of cortical influences or other

causes, e.g. local/systemic disease, the muscle spindle will remain in a state of contraction. Similarly, the muscle will continue to contract and become painful, resulting in a cycle of pain, spasm and ultimately a tension-type headache (Diamond and Dalessio, 1992).

To conclude, the pathophysiology of tension-type headaches should be considered a complex involvement of emotional, autonomic and muscular factors (Murphy and Lehrer, 1990).

2.4 Differential diagnosis

2.4.1 Migraine

Individuals suffering from migraine headache suffer a headache with or without aura. Previously known terms for migraine include "common migraine" for those without aura and "classical" for those with aura. Migraine with aura is described as a recurring disorder, which develops neurological symptoms over a period of five to ten minutes and may last up to one hour. The headache may be entirely absent following aberrant neurological function, but headache and nausea usually follow within an hour.

Migraine without aura is described as a unilateral, pulsating headache, which is aggravated by physical activity and may be moderate or severe in intensity. Photophobia, phonophobia and nausea are commonly associated with this type of headache. The attack may last from four to seventy-two hours (International Headache Society, 1988).

Difficulty is experienced when attempting to separate migraine without aura and ETTH, particularly when one considers that the two may coexist. Migraine may be considered a more constitutional disorder, while tension-type headache is a more complex condition, with multiple psychosocial variables (Rasmussen, 1995).

The International Headache Society (1988) used the term "combination headache" previously, but this term has yet to be defined. It has since been decided to diagnose the patient as having a migraine and a tension-type headache, should both be present, rather than forming a new headache type. Migraine headaches may further aggravate or bring about the onset of a tension-type headache as a result of the noxious peripheral input, converging at the trigeminal nucleus (Ulrich *et al.*, 1996).

2.4.2 Cervicogenic headache

The cervicogenic headache is described as a unilateral headache originating in the neck. The headache usually involves the same side of the neck and head; is felt in the suboccipital area initially and then spreads to the vertex and the eye region. Associated symptoms may include vomiting, tinnitus, tearing and facial flushing of the affected side.

Cervicogenic headache may be differentiated from migraine headache by the unilateral involvement of the associated symptoms, i.e. visual disturbances, when compared to the bilateral involvement in the case of a migraine headache. Headache onset is common in the third decade and individuals are often capable of producing a headache by placing the head and neck in certain positions (Sjaastad, 1987).

2.4.3 Myofascial Pain Syndrome

Myofascial Pain Syndrome (MPS), as defined by Travell *et al.* (1999), is the autonomic, sensory and motor symptoms caused by myofascial trigger points. MPS of the upper Trapezius muscle produces a typical tension-type headache picture when its referral pattern overlaps with referral patterns from other muscles, namely the Sternocleidomastoid (SCM) and the Suboccipital muscles (Travell *et al.*, 1999).

Pain referral from the Temporalis muscle includes the eyebrow and temporomandibular joint and may result in a headache in the temporal region

(Travell *et al.*, 1999). It should therefore be considered when investigating episodic tension-type headache, as the parietal and frontal areas are similarly involved.

Prolonged contraction of muscles such as the upper Trapezius, Suboccipital and Sternocleidomastoid muscles may bring about the symptoms experienced in relation to the tension-type headache (Prithipal, 2003). It is thus vital to assess the presence of myofascial trigger points in the headache patient.

2.5 Introduction to MPS

Myofascial trigger points are common and may be found to affect almost everyone at some stage of their life (Travell *et al.*, 1999). In past times the presence and effect brought about by myofascial pain syndrome has been somewhat overlooked, until it became noted to be the commonest cause of musculoskeletal pain (Baldry, 1998).

All the muscles of the body represent possible sites for the development of myofascial trigger points (MTrPs), which may bring about the referral of pain to other areas and possibly motor dysfunction. Referral MTrPs may mimic other conditions such as appendicitis, atypical migraine and tension type headache, thus emphasizing the importance of myofascial assessment in these patients (Travell *et al.*, 1999).

2.6 Definitions

Myofascial Pain Syndrome (MPS)

"The sensory, motor, and autonomic symptoms caused by myofascial trigger points" (Travell *et al.*, 1999).

A myofascial trigger point (MTrPs)

"A hyperirritable spot in skeletal muscle that is associated with a hypersensitive palpable nodule in taut band. The spot is painful on compression and can give rise to characteristic referred pain, referred

tenderness, motor dysfunction and autonomic phenomena" (Travell *et al.*, 1999).

A latent myofascial trigger point

"A myofascial trigger point that is clinically quiescent with respect to spontaneous pain; it is painful only when palpated. A latent trigger point may have all the other clinical characteristics of an active trigger and always has a taut band that increases muscle tension and restricts range of motion" (Travell *et al.*, 1999).

An active myofascial trigger point

"A myofascial trigger point that causes a clinical pain complaint. It is always tender, prevents full lengthening of the muscle, weakens the muscle, refers a patient-recognized pain on direct compression, mediates a local twitch response of muscle fibres when adequately stimulated and, when compressed within the patient's pain tolerance, produces referred motor phenomena and often autonomic phenomena, generally in its pain reference zone, and causes tenderness in the pain reference zone" (Travell *et al.*, 1999).

Pericranial muscle

This refers to a muscle which has its origin at the cranium and is in proximity to the external periosteum of the skull e.g. Trapezius, Suboccipital and Sternocleidomastoid muscles (Fumihiko *et al.*, 1995).

2.7 Aetiology of MPS

2.7.1 Primary activation of MTrPs

There are a number of factors involved in the development, activation and perpetuation of MTrPs Travell *et al.*, (1999 1:178) and Baldry (1998) include the following factors:

Mechanical stress

Mechanical stress is divided into three sub-divisions:

- a) Structural inadequacies (e.g. lower limb inequality and/small hemipelvis)
- b) Postural stresses (e.g. misfitting furniture) and
- c) Constriction of muscles (e.g. prolonged immobility) (Travell *et al.*, 1999).

Nerve compression

A common occurrence in the paraspinal muscles, increased MTrPs occur as a result of nerve compression made distinguishable by the presence of neuropathic electromyographic changes. Activation occurs as a result of aberrant communication at the neuron-motor endplate level (Travell *et al.*, 1999).

Trauma

Damage to the muscular tissue results in the release of a number of chemicals, namely bradykinin, histamine and potassium ions, as part of the inflammatory response (Chaitow and Delany, 2002). This serves to sensitize C and A delta sensory nerve fibres (Baldry, 1998).

Metabolic and endocrine inadequacies

Any factor resulting in impaired muscle metabolism will result in, more commonly, the perpetuation of MTrPs. Hyperuricemia, hypometabolism and hypoglycaemia are included (Travell *et al.*, 1999).

Environmental factors

Excessive cold, heat, damp and exposure to drafts will bring about the activation of MTrPs (Chaitow and Delany, 2000).

Other

Psychological factors such as anxiety and depression (Travell *et al.*, 1999) will bring about prolonged muscle contraction, resulting in the activation and perpetuation of MTrPs (Baldry, 1998).

Chronic infection, sleep deprivation and allergy will also contribute to the perpetuation of MTrPs (Travell *et al.*, 1999).

2.7.2 Secondary activation of MTrPs

- Synergistic muscles, which compensate for the affected muscles, become activated due to their being overloaded following primary activation. This compensation causes these muscles to be overloaded, resulting in secondary activation of MTrPs in those muscles (Baldry, 1998).
- Muscles within the vicinity of pain referral from affected muscles develop satellite MTrPs (Baldry, 1998).
- Latent trigger points may become activated through the aforementioned mechanisms (Travell *et al.*, 1999).

2.8 Physical findings

Travell *et al.* (1999) outline the following characteristics common to MPS:

- ❖ The presence of a taut band: By moving the fingers over the muscle fibres, one will be able to palpate a nodule at the MTrP. In deeper muscles, one should snap or roll the taut band under digital pressure.
- ❖ A tender nodule: A well localized, highly tender spot is usually found in the taut band.
- ❖ Local twitch response: The taut band gives a transient twitch response when palpated, using snapping palpation.
- ❖ Limited range of motion (ROM): Active myofascial trigger points cause a reduction in ROM. Passive stretching of the involved muscle increases pain considerably, as the muscle is already under an increased level of tension.

- ❖ Pain during contraction: This occurs particularly when the muscle is in a shortened position.
- ❖ Muscular weakness: This varies, depending on the muscle, and may be as a result of reflex inhibition (Chaitow and Delany, 2000).
- ❖ Recognition: A referred pain pattern may be elicited through palpation of an active or latent MTrP. However, if the patient acknowledges the pain as a familiar experience the MTrP is diagnostically active.
- ❖ Referred sensory signs: Presence of sensory changes such as dysesthesias.
(Travell *et al.*, 1999).

2.9 Management of MPS

Travell *et al.* (1999) state that when treating MPS the emphasis should be on the activating and perpetuating factors and not simply on the clinical presentation of the condition. A number of techniques are used in the treatment of MPS, namely:

1. Ischemic compression: Fryer and Hodgson (2005) found that ischemic compression is effective in the treatment of MPS in their study of MPS in the upper Trapezius muscle, as did Webb (2003) with its use in treatment of MPS of the Levator Scapulae muscle. A study by Alonso-Blanco *et al.* (2006) confirmed the use of ischemic compression to be effective, but this was no more effective than that of transverse friction massage. The term "ischemic compression" is now referred, using the term "trigger point pressure release" (Travell *et al.*, 1999).
2. Trigger point injection: Dry needling or injection with drugs such as procaine are effective in the deactivation of active MTrPs (Travell *et al.*, 1999). The overall treatment of MPS is diverse and a number of injectable variants may be used effectively, such as Bupivacaine and Botulinum toxin A (Graboski *et al.*, 2005).
3. Spray and stretch: Where non-invasive treatment is concerned, Travell *et al.*, (1999) consider this option to be the treatment of

choice. Spray and stretch may be used in addition to other methods. Patients do, however, experience difficulty with a home programme due to the requirement of a second person.

4. Ultrasound: Trigger point injection, combined with neck stretching exercises, is as effective as ultrasound combined with these same exercises (Esenyel *et al.*, 2000). Ultrasound is also used in the diagnosis and assessment of MTrPs (Chaitow and Delany, 2000).
5. Home programme and patient education: A study by Hanten *et al.* (2000) showed that MPS could be effectively managed by advising their patients to follow a home programme, which included self-ischemic compression, followed by a sustained stretching protocol.
6. Post-isometric relaxation and strain/counterstrain technique: Used effectively to improve the range of motion of tissues with MTrPs (Blanco *et al.*, 2006).
7. Other: Hydrotherapy, cryotherapy, massage and muscle energy technique are just a few of a number of techniques effective in the treatment and management of MPS (Chaitow and Delany, 2000).

2.10 Presentation of MPS of the pericranial musculature

2.10.1 Presentation of MTrPs of the upper Trapezius:

The first trigger point (TrP1) is located in the middle of the upper portion of the Trapezius, muscle at its anterior border. Pain referral from this point is up the neck of the involved side posterolaterally and ends at the mastoid. When severe, the pain referral pattern may include the side of the head, temporal region, posterior orbit and the angle of the jaw. Travell *et al.* (1999) found that pain referral may extend to, and include, the occiput and the molar teeth of the lower jaw. Patients often complain of tension in the region of the neck. Additional pain may result when trigger points in surrounding muscles become activated. These are known as "satellite trigger points" (Travell *et al.*, 1999).

The second trigger point (TrP2) is lateral and caudal to the first. Pain referral from this point is along the posterior region of the neck; posterior to that of TrP1, and overlaps the first in the region of the ear (Travell *et al.*, 1999).

Figure 2.10.1

Diagram to illustrate TrP1 location and referral pattern of the upper Trapezius muscle

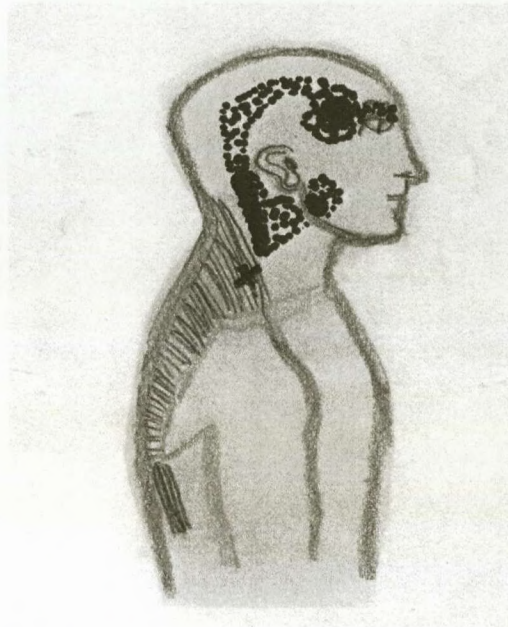
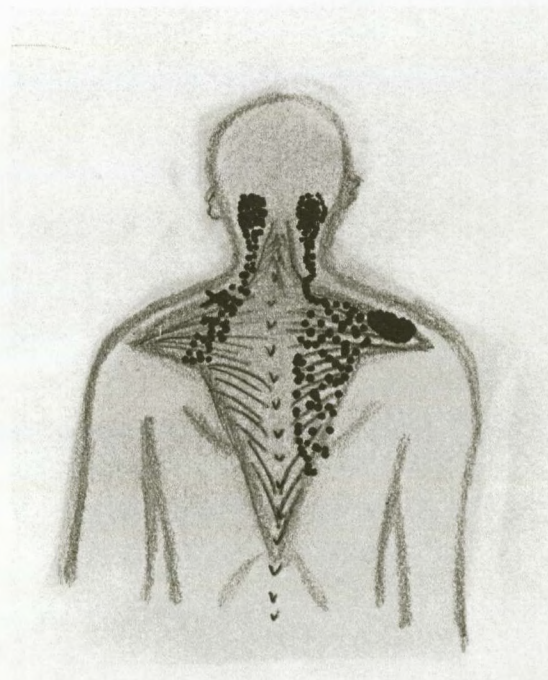


Diagram to illustrate TrP2 location and referral pattern of the upper Trapezius muscle



2.10.2 Presentation of MTrPs of the Sternocleidomastoid muscle (SCM)

MTrPs may be distributed throughout various points of the sternal and clavicular divisions of this muscle:

- a) The clavicular division: MTrPs are found in the upper and midfibre regions. Referred pain from midfibre MTrPs spreads to the frontal region and may include the opposite forehead when severe, while the upper MTrPs refer pain to the cheek and molar teeth of the involved side (Travell *et al.*, 1999).
- b) The sternal division: MTrPs are located in the upper, midfibre and lower areas of the muscle. MTrPs of the upper muscle fibres refer pain to the occipital area and to the top of the head. Scalp tenderness is common in this case. Pain referral from the midlevel MTrPs spreads across the cheek, into the maxilla, into the orbit and incorporates the supraorbital ridge. Lastly, the lower MTrPs refer pain over the cephalad portion of the sternum (Travell *et al.*, 1999).

MPS of the SCM muscle may result in autonomic (sternal division) and proprioceptive (clavicular division) aberrations (Travell *et al.*, 1999).

Symptoms such as conjunctival reddening and excessive lacrimation of the eyes may present as a result of MTrPs in the sternal division of the SCM.

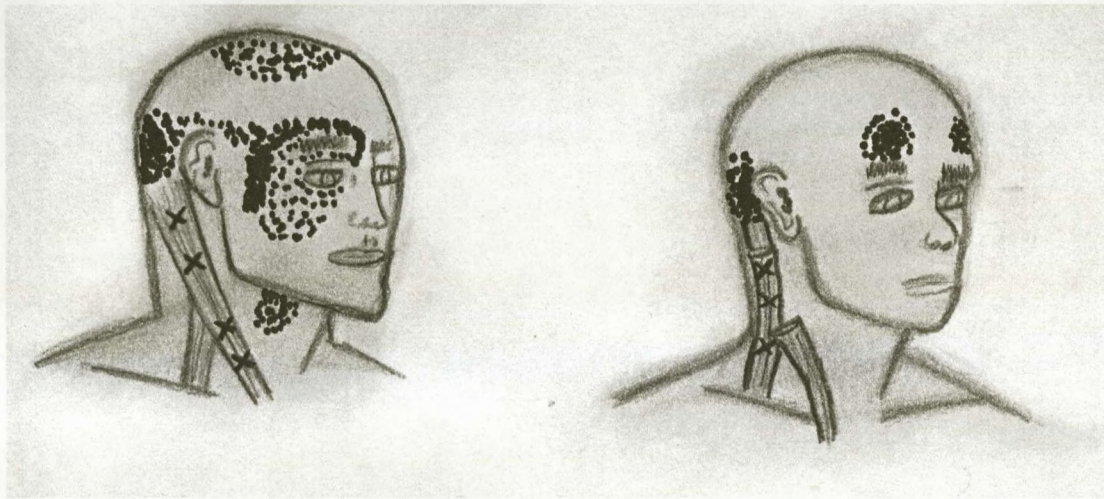
Patients experience dizziness and, rarely, vertigo, as a result of MTrPs in the clavicular division; this is because the SCM plays a vital role in proprioception (Travell *et al.*, 1999). The SCM also serves to compensate for structural inadequacies and aids in the correction of abnormal postures (Chaitow and Delany, 2000).

Figure 2.10.2.

Diagram to illustrate trigger point location and referral pattern of the sternal (A) and clavicular (B) divisions of the SCM

A)

B)



2.10.3 Presentation of MTrPs of the Temporalis muscle

There are four sites at which one may locate MTrPs in the Temporalis muscle. Three of the MTrPs occur commonly at the musculotendinous junction, while the fourth is located at the mid-centre of the muscle. Referred pain from these MTrPs covers the region of the temples, spreads to the eyebrow and upper teeth and may extend as far as to include the maxilla and the temporomandibular joint (Travell *et al.*, 1999).

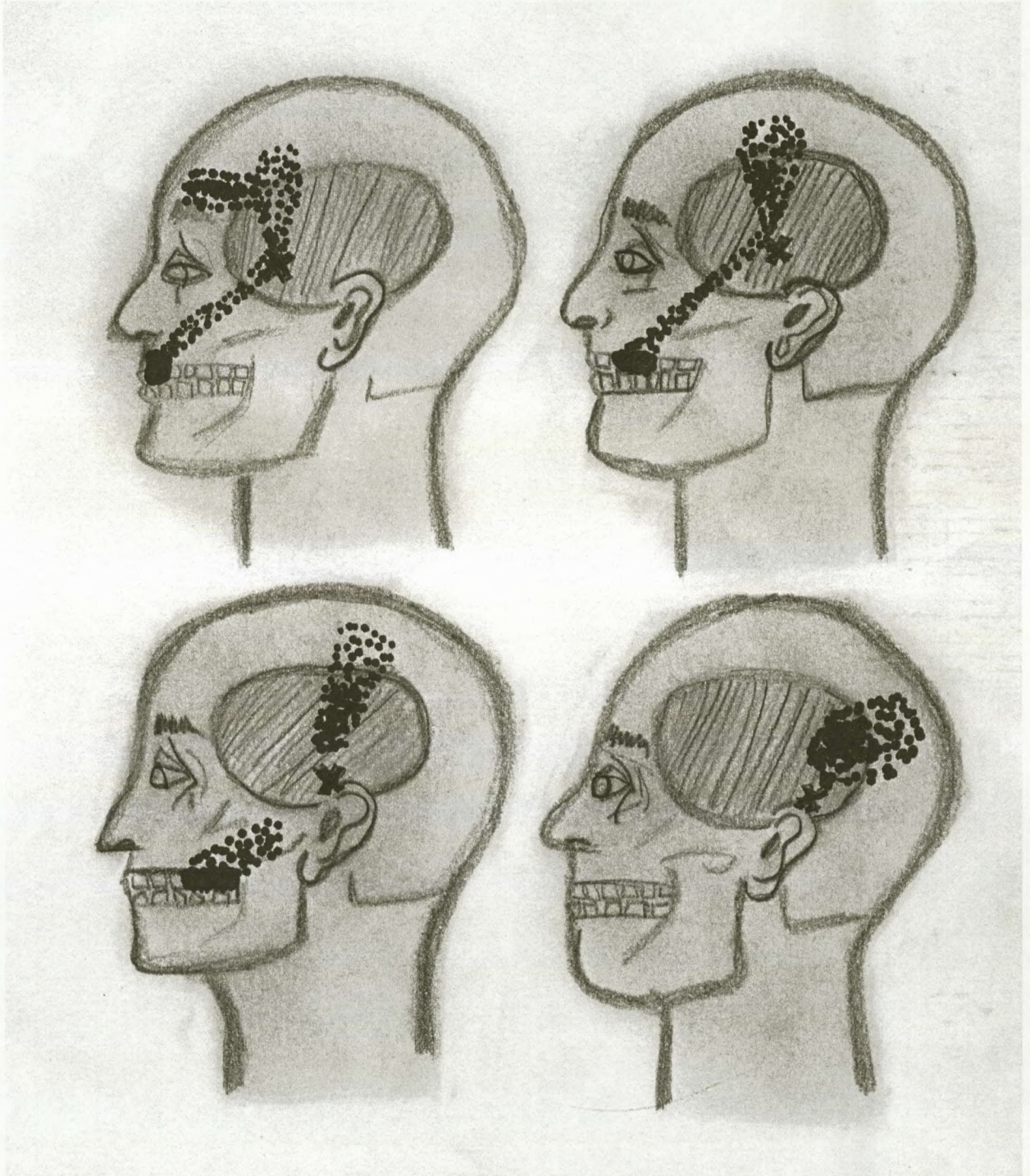
MPS of the Temporalis muscle is capable of producing a temporal headache, and possibly maxillary toothache, and increased sensitivity of the upper teeth to cold and heat is not uncommon (Travell *et al.*, 1999).

Figure 2.10.3

Diagram to illustrate trigger point location and pain referral of the Temporalis muscle

A) TrP1

B) TrP2



C) TrP3

D) TrP4

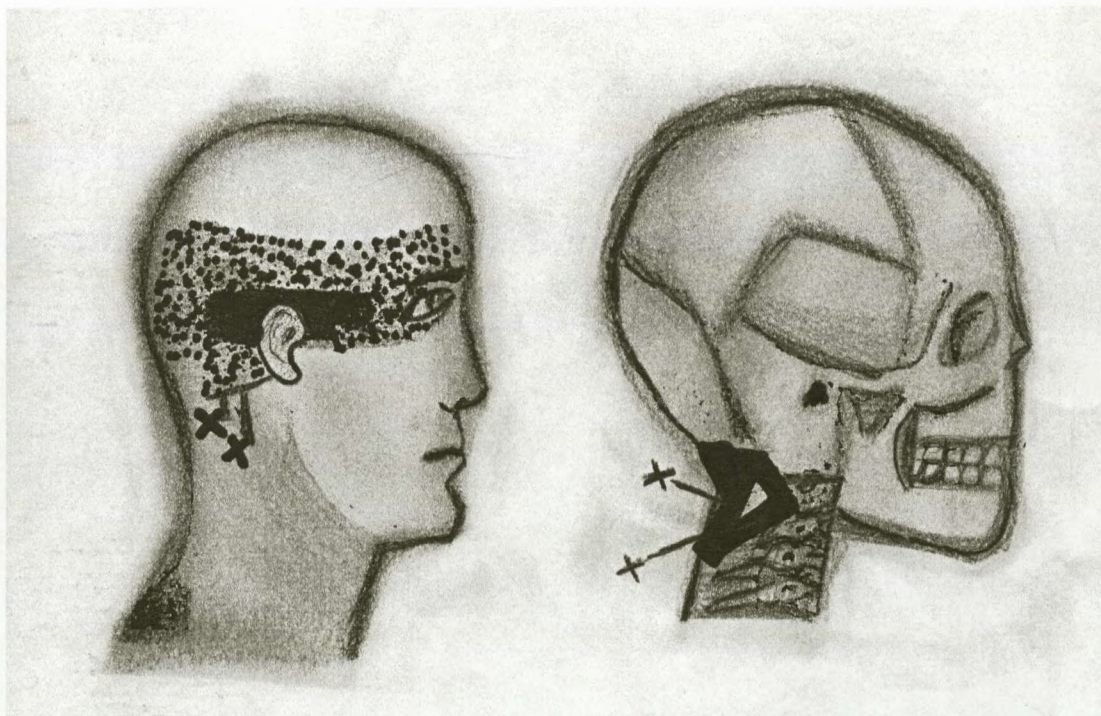
2.10.4 Presentation of MTrPs of the Suboccipital muscles:

The Suboccipital muscles are found deep in the region of the occiput and are comprised of four muscles on each side of the occiput, namely the Recti Capitis Posteriores Major and Minor, and the Obliqui Inferior and Superior (Moore and Dalley, 1999). The pain pattern produced by MTrPs in these muscles is poorly defined in its distribution from the occiput anteriorly to the orbit of the eye (Travell *et al.*, 1999).

Head pain and headache is common in the case of MPS of the Suboccipital muscles, with patients experiencing head pain extending from the occiput to include the eye and forehead of the involved side (Travell *et al.*, 1999).

Figure 2.10.4

Diagram to illustrate trigger point location and referral pattern of the Suboccipital muscle group



2.11 Diagnosis of MPS

The following findings are reliable indicators for the diagnosis of MPS:

- a. Extreme tenderness of a nodule located in a taut band
- b. Pain produced by digital pressure on the MTrP, which produces pain concurrent to the patient's complaint of pain
- c. A pain referral pattern recognizable by the patient, which indicates an active MTrP
- d. The presence of a local twitch response

Increased muscle tension and reduced stretch range of motion are also strongly characteristic of the presence of MTrPs (Travell *et al.*, 1999; Chaitow and Delany, 2000).

2.12 Differential diagnosis

The following conditions should be ruled out before diagnosing MPS of the pericranial muscles:

- Articular dysfunction of the cervical and/or thoracic spine
- Vestibular dysfunction, Meniere's disease, congenital and spasmodic torticollis
- Polymyalgia rheumatica, temporal arteritis and tendonitis, dental pathology and internal derangement of the temporomandibular joint
- Occipital neuralgia, cervicogenic and tension-type headache (Travell *et al.*, 1999).

2.13 In summary

It is now evident as with tension-type headache (TTH) that the aetiological factors for MPS are multifactorial. MPS is a differential for TTH and the opposite is true for TTH. The following table serves to summarise the clinical overlap existing between MPS and TTH and further substantiates the need for further research regarding these two conditions:

Table 2.13

	ETTH	MPS
Aetiology	Cervical dysfunction, i.e. reduced cervical lordosis.	Cervical dysfunction, i.e. history of trauma to the cervical spine.
Age	Headache frequency decreases as age increases.	Latent MTrPs are more common than active as age increases.
Signs and symptoms	Painful regions involve the occipital region initially, with spread to the parietal, frontal and facial areas.	MPS of the Suboccipital muscles produce a referred pain pattern that radiates from the occiput towards the region of the orbit.
	Tautness of the musculature in the region of the face, neck, scalp and jaw, with the presence of tender nodules.	A tender nodule is present within the taut band in the muscle. There is increased muscle tension.
	Altered proprioception.	Altered proprioception particularly when the SCM is involved.
	Neck and upper back pain.	Neck and upper back pain is common when the Trapezius muscle is involved.
Aggravating/precipitating factors	Emotional distress aggravates/causes the condition.	Emotional distress aggravates/causes the condition.

	ETTH	MPS
Aggravating/ precipitating factors	Cold drafts and smoking are found to aggravate and/or precipitate the headache.	Cold drafts and smoking are found to aggravate and/or precipitate MPS.
Associated symptoms	Disrupted sleep patterns.	Impaired or interrupted sleep is common in severe MPS
	Depression increases risk of TTH and delays recovery.	Depression delays recovery.

The above ETTH table is compiled using references from the following: Janke *et al.*, 2004; Holroyd *et al.*, 1993; Vernon *et al.*, 1982; Makowska *et al.*, 2005; Diamond and Dalessio, 1992; Giacomini *et al.*, 2004; Schwartz *et al.*, 1998; and Rasmussen and Olesen, 1994.

The above MPS table is compiled using references from the following: Chaitow and Delany, 2000; Travell *et al.*, 1999; Baldry, 1998; Esenyel *et al.*, 2000; Alonso-Blanco *et al.*, 2006; Hanten *et al.*, 2000 and Fryer *et al.*, 2005.

CHAPTER THREE

MATERIALS AND METHODS

3.0 Introduction

The aim of this research is to determine the relationship between Myofascial Pain Syndrome (MPS) of the pericranial musculature and the presentation of episodic tension-type headache (ETTH).

Chapter three will provide a description of the data (primary and secondary), the subjects, the design and the intervention employed.

3.1 The data

The data consisted of primary and secondary data.

3.1.1 Primary data

The following provided the primary data:

1. Case history (Appendix E)
2. Physical examination (Appendix F)
3. Cervical regional examination (Appendix G)
4. Myofascial Diagnostic Scale (Appendix H)
5. Algometer readings for pressure-pain threshold (Appendix J)
6. Numerical Pain Rating Scale (Appendix I)
7. Headache Diary (Appendix I)

3.2 Study Design

The design was a quantitative, pilot, non-intervention clinical assessment study of forty participants.

3.3 The subjects

The subjects consisted of volunteers residing in the province of Kwa-Zulu Natal suffering from ETTH.

3.3.1 Advertising

Advertisements were placed in the local newspaper and posted at the Durban University of Technology and University of Kwa-Zulu Natal Durban campuses. They served to inform the public of the intended study and called on individuals between the ages of 18 and 45 and suffering from headaches to participate.

All interested participants were contacted and underwent a simple telephonic interview (Appendix D), in order to establish their suitability for the study.

3.3.2 Sampling

The first forty patients found to be suitable following the telephonic interview (Appendix D) were requested to attend the Chiropractic Day Clinic, for further assessment regarding specific inclusion and exclusion criteria. No grouping was necessary for this study.

3.3.3 Procedure of clinical assessment

Regarding assessment, the initial consultation included the following:

- a) A case history (Appendix E),

- b) Physical examination (Appendix F) and
- c) Cervical spine examination (Appendix G)

The patients were then accepted to the study, provided they met the specific inclusion criteria. These included:

Inclusion criteria

- Participants had to be between the ages of 18 and 45 years, to minimize the coexistence of other disorders such as those associated with degenerative and chronic conditions (Travell *et al.*, 1999).
- Patients had to fulfil the diagnostic criteria for ETTH specified by the International Headache Society (1988).

A) At least ten previous headache episodes fulfilling criteria B-D listed below. Number of days with such headache fewer than a hundred and eighty a year (fewer than fifteen a month).

B) Headache lasting from thirty minutes to 7 days.

C) At least two of the following characteristics:

1. Pressing/tightening (non-pulsating) quality.
2. Mild or moderate intensity (may inhibit, but does not prohibit activity.)
3. Bilateral location.
4. No aggravation by walking stairs or similar routine physical activity.

D) Both of the following:

1. No nausea or vomiting (anorexia may occur).
2. Photophobia and phonophobia are absent, or one but not the other is present.

E) None of the following:

1. History and physical or neurological examinations suggesting one of the following:
 - a) Trauma.
 - b) Vascular disorders.
 - c) Non-vascular intracranial disorders.
 - d) Substances or their withdrawal.
 - e) Non-cephalic infection.
 - f) Metabolic disorders.
 - g) Disorders of the cranium, neck, eyes, nose, sinuses, teeth, mouth or other facial or cranial structures.
2. History and/or physical and/or neurological examinations do suggest such a disorder, but it is ruled out by appropriate investigation.

Exclusion criteria

Patients were excluded from the study for the following reasons:

- A disorder mentioned in E (1) above was present.
- Participants that failed to sign the informed consent form.

- If they received any form of therapy during the course of the research period (medicinal therapy was permitted with the requirement that a note of it was made in the Headache Diary and the type of medication and frequency of intake was consistent with their past therapy).
- If they suffered from any other type of headache, e.g. migraine headache, during the research period.

All forty participants were given a letter of information (Appendix A) and were requested to sign an informed consent form (Appendix B).

3.3.4 Plan of clinical treatment

Data was collected at the first and second consultations. One free treatment was offered at the second consultation, which took place two weeks after the initial consultation.

3.4 Assessment

3.4.1 Diagnosis and assessment of myofascial trigger points (MTrPs)

Patients were screened for MTrPs following their inclusion in the study. The signs of an active MTrP, as described by Travell *et al.* (1999) and Chaitow and Delany (2000), include:

1. A painful limit to full range of motion when stretched
2. Palpable taut band
3. Referred pain in the zone of reference and
4. Focal tenderness.

Other observations include a local twitch response, that may be visual or tactile, and the patient may experience a feeling of altered sensation in the reference zones (Chaitow and Delany, 2000). Other studies have used the above diagnostic criteria successfully and are in agreement with this method (Hanten *et al.*, 2000 and Murphy, 1989).

3.4.1.1 Objective measurements regarding MPS

3.4.1.1.a. MTrP location (Appendix H)

Travell *et al.* (1999) give the following specific trigger point locations for the pericranial muscles:

The upper Trapezius

- The first trigger point (TrP1) is located in the middle of the upper portion of the Trapezius muscle, at its anterior border.
- The second trigger point (TrP2) is lateral and caudal to the first.

The Sternocleidomastoid muscle

This muscle is divided into two divisions, the sternal and clavicular divisions.

- The sternal division may contain trigger points in the upper, midfibre and lower fibre regions.
- The clavicular may contain MTrPs in the upper and midfibre regions. This division sits posterior and deep to the sternal portion of the muscle.

The Temporalis muscle

There are four sites at which one may locate MTrPs in the Temporalis muscle.

- Three of the MTrPs occur commonly at the musculotendinous junction, just above the zygomatic arch.
- The fourth MTrP is located at the mid fibre region of the posterior portion of the muscle and can be located in the area just behind the ear.

The Suboccipital muscles (Recti Capitis Posteriores Major and Minor and Obliqui Inferior and Superior)

- MTrPs in the Suboccipital muscles are found deep in the region of the occiput.

3.4.1.1.b. The myofascial diagnostic scale (MDS) (Appendix H)

The MDS was used to determine if MTrPs were active or latent and the extent to which the patient was suffering from pain due to MTrPs. The total score was 17; a score below 9 was considered a latent trigger point, while a score above 9 was an active MTrP. Measurements were taken at each MTrP and repeated at the second consultation.

The MDS has been found to give consistent readings and is the most appropriate tool for this purpose (Chettiar, 2001).

3.4.1.1.c. Algometer (Appendix J)

The algometer was used to determine the pressure threshold measurement. Initially, the MTrPs of each muscle were located through palpation. Following this, the footplate of the algometer was placed over the MTrP and a pressure was applied at approximately 1kg per centimetre squared per second, in the direction of the painful MTrP.

When the patients first felt pain they were requested to say "yes". At that point the algometer was removed and a reading in kg/cm squared was taken. Readings were taken for each MTrP and were repeated at the second consultation.

The force dial algometer, manufactured by Wagner Instruments with an 11kg pressure range, was used for this study. Their address is P.O. Box 1217, Greenwich CT 06836, U.S.A.

This tool has been proven as an effective tool in diagnosing, assessing and managing MTrPs (Fischer, 1987).

3.4.2 Diagnosis and assessment of ETTH

The diagnosis was made using the diagnostic criterion for ETTH specified by the International Headache Society (1988) and given in the inclusion criteria.

3.4.2.1 Subjective readings regarding ETTH

3.4.2.1.a. Headache Diary (Appendix I)

A Headache Diary was completed over a period of two weeks. This included details of headache frequency, intensity and duration. The 24 hours of each day were divided into a day and night category and the patient was requested to cross each half hour for the period of time they were experiencing a headache. If the patient took any medication, they were asked to fill it in above the time at which it was taken and give a brief description of the medication. The Headache Diary was collected at the second consultation, 14 days after the initial consultation. The number of headaches per half hour per day and per night was then calculated.

Use of a Headache Diary has been found to give a qualitatively and quantitatively more precise diagnosis (Rasmussen *et al.*, 1992). A Headache Diary was used effectively by de Busser (2001) to compare the effectiveness of chiropractic manipulation with and/or without soft tissue treatment in the management of tension-type headaches in children.

3.4.2.1.b. Numerical Pain Rating Scale (NRS) (Appendix I)

The NRS formed part of the Headache Diary and was filled in daily, for a period of 14 days. Patients were asked to rate their headaches on a scale of zero to 10, zero representing an absence of pain and 10 representing pain at its worst. An average of their pain was taken at 24 hours.

The NRS is effective in assessing pain intensity, as interpreted by the patient. Recording subjective data with the NRS 101 is reported to be a valid and reliable method when relating to the patient's level of pain (Jenson *et al.*, 1986).

3.5 Statistical analysis

Data were entered into a MS Excel spreadsheet and imported into SPSS version 13.0 (SPSS Inc., Chicago, Illinois, U.S.A.) for analysis. A p value of <0.05 was considered statistically significant.

Since most of the data were highly skewed, non-parametric statistics were used to summarize the data (reported as medians and ranges) and to perform statistical hypothesis tests. Paired quantitative data were compared with the Wilcoxon signed ranks test; independent quantitative data with the Mann-Whitney test. Spearman's rank correlation was used to assess relationships between two quantitative variables, with scatter plots to graphically display any trends reported.

3.6 Ethics

The guidelines, given by the Durban University of Technology were strictly adhered to. Patients were requested to read, complete and sign an informed consent form (Appendix B). Patient confidentiality was maintained throughout the study.

CHAPTER FOUR

RESULTS

4.0 Introduction

Chapter four presents the results of the statistical analysis of the primary data.

The following measurements were used:

- ❖ Algometer readings (objective)
- ❖ Myofascial Diagnostic Scale (objective)
- ❖ Trigger point location (objective)
- ❖ Headache Diary (subjective)
- ❖ Duration of conditions (objective)
- ❖ Numerical Pain Rating Scale (subjective)

4.1 Criteria for the admissibility of data

The researcher utilized subjective and objective readings from the patients meeting the research criteria.

4.2 Demographic data of ETTH

4.2.1 Age and gender distribution

The sample consisted of forty participants (10 males and 30 females), as represented in Figure 4.2.1. The ages ranged from 19 to 45, with a mean age of 27.7 (SD 6.8) years.

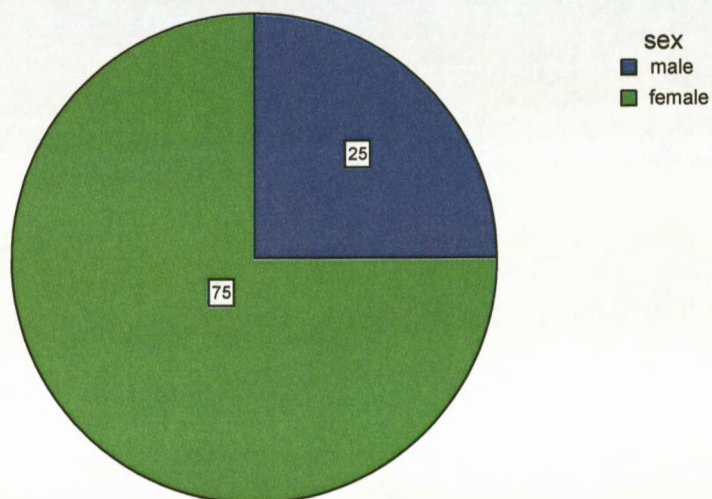


Figure 4.2.1: Female and male distribution of subjects

4.2.2 Occupation

Subjects' occupations were divided into five main categories, shown in Table 4.2.2. A large portion (37.5%) of the subjects had careers of a professional nature and students formed 30% of the study.

Table 4.2.2. Occupational category of participants

	Frequency	Percent
Professional	15	37.5
Technical and sales	6	15.0
Housewife	2	5.0
Student	12	30.0
Self-employed	5	12.5
Total	40	100.0

4.2.3 Duration of condition

Headache episodes were converted to hours of headache over a 24-hour period. The distribution of this variable was highly positively skewed as seen in Figure 4.2.3.1 below.

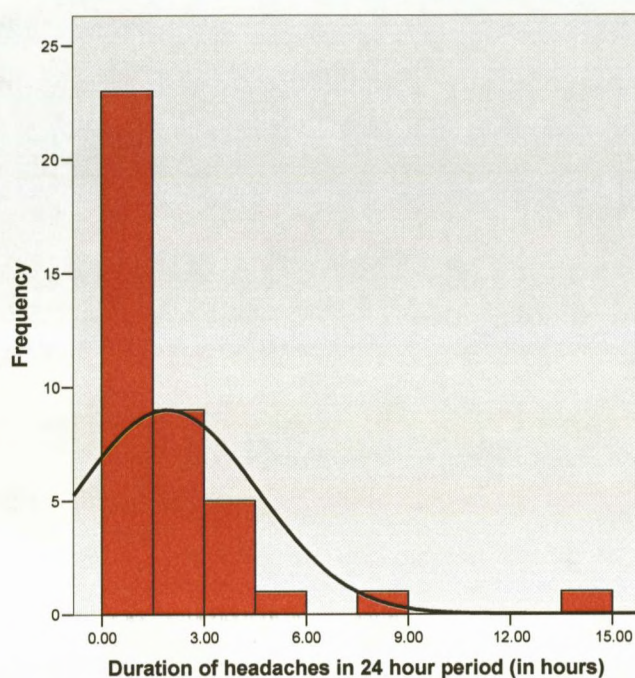


Figure 4.2.3.1 Histogram of duration of headaches in a 24-hour period.

The Wilcoxon signed ranks test was used to compare day-time and night time headache episodes, and the test statistics followed (Table 4.2.3.1.2). The comparison of medians between day and night is shown in Table 4.2.3.1.1.

Table 4.2.3.1.1 Wilcoxon signed ranks test for comparison of headache episodes between day and night time

		N	Mean Rank	Sum of Ranks
Mean episodes of night-time headaches	Negative Ranks	32(a)	23	689
Mean episodes of day-time headaches	Positive Ranks	8(b)	16.4	131
	Ties	0(c)		
	Total	40		

a) Mean episodes of night-time headaches < Mean episodes of day-time headaches

b) Mean episodes of night-time headaches > Mean episodes of day-time headaches

c) Mean episodes of night-time headaches = Mean episodes of day-time headaches

Table 4.2.3.1.2 Test statistics

	Mean episodes of night-time headaches - Mean episodes of day-time headaches
Z	-3.752(a)
Asymp. Sig. (2-tailed)	<0.001

a) Based on positive ranks.

The median number of half-hour headache episodes during the day-time over the two-week period was 1.29 (range 0.7 to 21.4), while the median episodes of night time headaches was 0.64 (range 0 to 7.3). There was a significant difference ($p < 0.001$), with daytime headaches being more frequent than night-time headaches.

Table 4.2.3.2 Descriptive statistics for duration of headaches in 24-hour period (in hours)

N	Valid	40
	Missing	0
Median		0.77
Minimum		0.11
Maximum		14.32
Percentiles	25	0.45
	50	0.77
	75	2.6

Table 4.2.3.2 shows that the shortest duration of a headache episode was 0.11 hours and the longest was 14.32 hours, while the median duration was 0.77 hours. It was determined that 50% of the sample experienced under one hour of headache over a 24-hour period and 25% of the sample experienced over 2.5 hours in a 24-hour period.

Headache pain using the NRS scale was averaged over the two-week period. The distribution of pain was relatively Gaussian as illustrated by Figure 4.2.3.2 below.

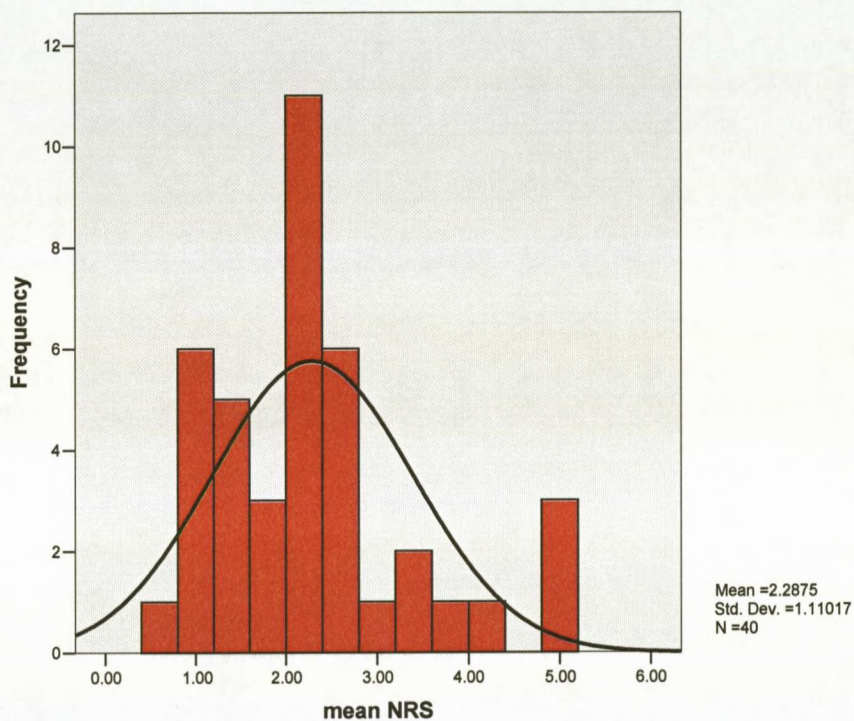


Figure 4.2.3.2 Histogram of the distribution of NRS pain scores in the sample

The mean and standard deviation were used to summarise these values. Mean NRS score over a 24-hour period was 2.3 (SD 1.1), with a range of 0.7 to 5.1. See Table 4.2.3.3.

Table 4.2.3.3 Descriptive statistics for mean NRS score over 24 hours

N	Valid	40
	Missing	0
Mean		2.3
Std. Deviation		1.11
Minimum		0.71
Maximum		5.07

4.2.4 Gender comparison

When comparing male and female gender with regard to pain no significant difference was found ($p=0.421$) as seen in Table 4.2.4.1 (a)

Table 4.2.4.1(a) T-test comparison of mean headache pain between the genders

	Sex	N	Mean	Std. Deviation	Std. Error Mean	t	p
NRS	Male	10	2.54	0.96	0.30	0.81	0.42
	Female	30	2.20	1.16	0.21		

The median episodes and duration of headaches were compared between the genders using Mann-Whitney tests in Table 4.2.4.1 (b)

Table 4.2.4.1(b) Mann-Whitney test comparison of median duration of headaches between the genders

Sex		Episodes of daytime headaches	Episodes of night time headaches	Duration of headaches in 24 hour period (in hours)
Male	Median	1.46	0.50	0.98
	Minimum	0.21	0.00	0.18
	Maximum	12.43	5.50	8.96
Female	Median	1.29	0.68	0.77
	Minimum	0.07	0.00	0.11
	Maximum	21.36	7.29	14.32
Total	Median	1.29	0.64	0.77
	Minimum	0.07	0.00	0.11
	Maximum	21.36	7.29	14.32

Table 4.2.4.2 Test statistics

	Mean episodes of day-time headaches	Mean episodes of night-time headaches	Mean duration of headaches in 24-hour period (in hours)
Mann-Whitney U	147.50	139.00	142.50
p value	0.94(a)	0.75(a)	0.82(a)

a) Not corrected for ties.

There were no significant differences between the genders in terms of headache pain and duration as seen in Table 4.2.4.2. There was a statistically

significant positive relationship between the duration of the headache and pain ($\rho = 0.402$, $p=0.010$). Figure 4.2.4.1 shows this relationship. Generally, as the duration increased so did the pain. However, there were some participants with very long durations and moderate levels of pain.

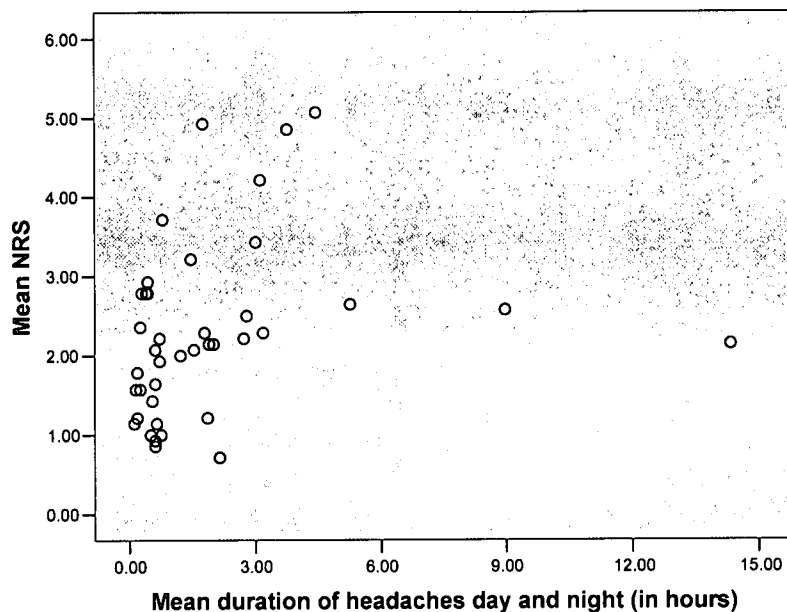


Figure 4.2.4.1 Scatter plot of the relationship between ETTH duration and headache pain

4.3 Demographics of the MTrPs

4.3.1 Myofascial Diagnostic Scale (MDS)

MDS scores were averaged over the two time-points and presented as median values for the sample. MTrP number one, located in the right upper Trapezius muscle, had the highest median (median = 10.25). The second highest was the uppermost MTrp in the clavicular portion of the right Sternocleidomastoid (SCM) muscle (median = 9.75), followed by the second MTrP in the upper Trapezius bilaterally, as well as the upper MTrP in the left clavicular portion of the SCM (median = 9.25). See Figure 4.3.1.

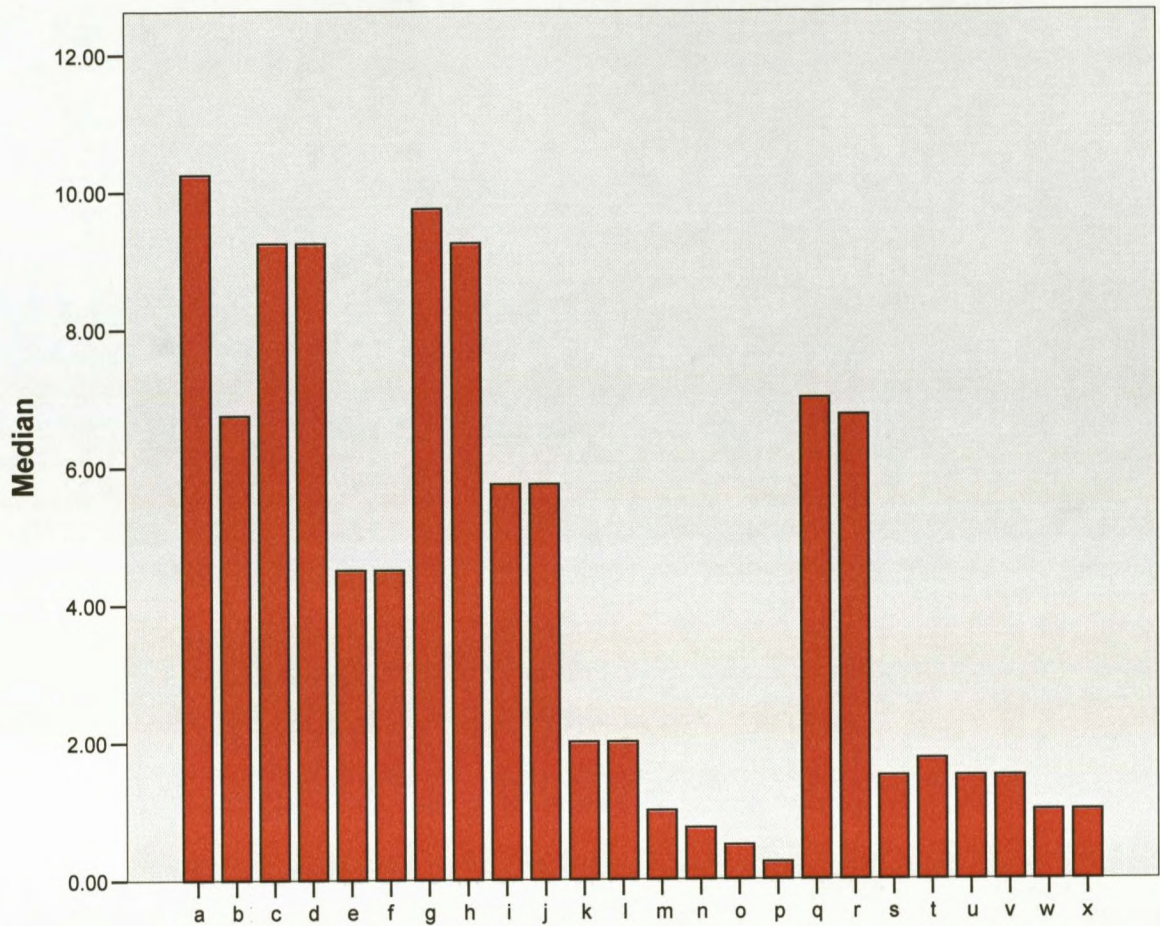


Figure 4.3.1 Median MDS scores for all muscles

Key

a) Right upper Trapezius MTrP number one	m) Right SCM midlevel MTrP
b) Left upper Trapezius MTrP number one	n) Left SCM midlevel MTrP
c) Right upper Trapezius MTrP number two	o) Right SCM lower MTrP
d) Left upper Trapezius MTrP number two	p) Left SCM lower MTrP
e) Right Suboccipital MTrP	q) Right Temporalis MTrP number one
f) Left Suboccipital MTrP	r) Left Temporalis MTrP number one
g) Right Sternocleidomastoid (SCM) upper clavicular MTrP	s) Right Temporalis MTrP number two
h) Left SCM upper clavicular MTrP	t) Left Temporalis MTrP number two
i) Right SCM clavicular midlevel MTrP	u) Right Temporalis MTrP number three
j) Left SCM clavicular midlevel MTrP	v) Left Temporalis MTrP number three
k) Right SCM upper sternal MTrP	w) Right Temporalis MTrP number four
l) Left SCM upper sternal MTrP	x) Left Temporalis MTrP number four

4.3.2 Algometer readings

Algometer scores were averaged over the two time-points and presented as median values for the sample in Figure 4.3.2. The scores were lowest in the clavicular portions of the SCM muscles and highest in the Temporalis and upper Trapezius muscles.

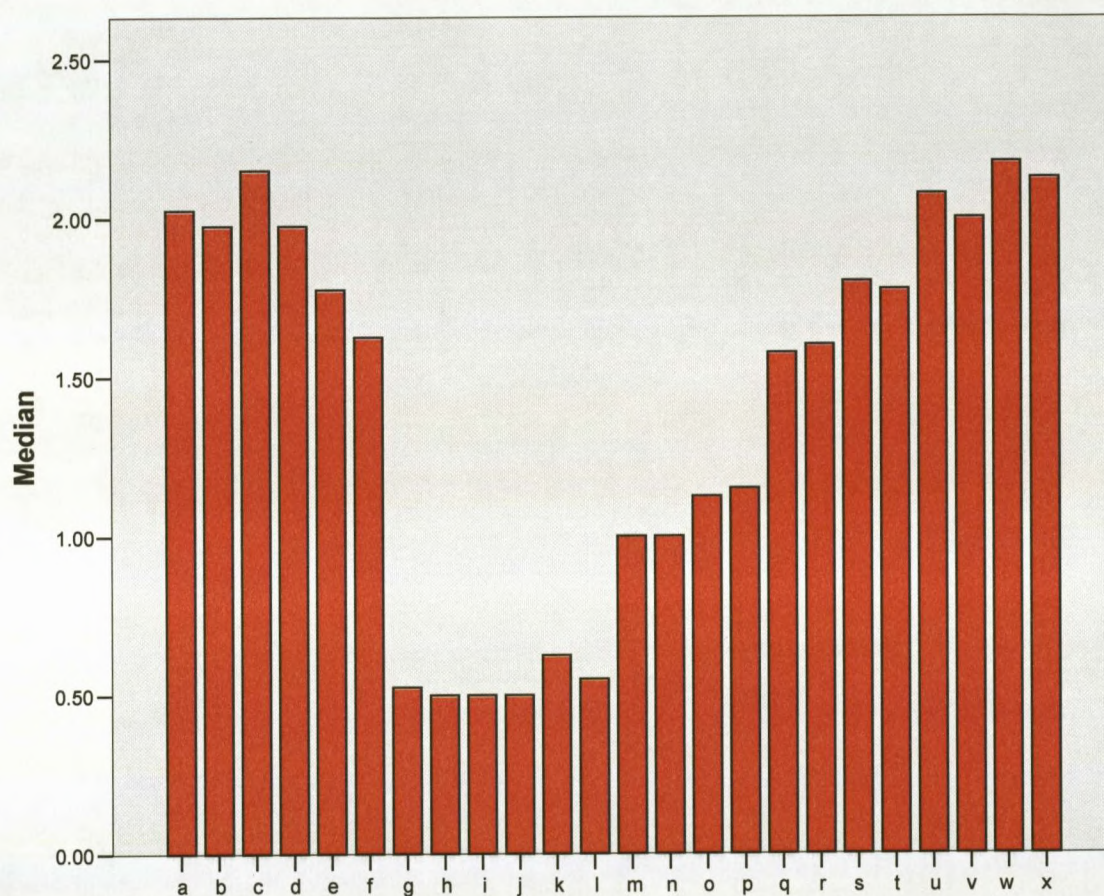


Figure 4.3.2 Median algometer scores for all muscles

Key

a) Right upper Trapezius MTrP number one	m) Right SCM midlevel MTrP
b) Left upper Trapezius MTrP number one	n) Left SCM midlevel MTrP
c) Right upper Trapezius MTrP number two	o) Right SCM lower MTrP
d) Left upper Trapezius MTrP number two	p) Left SCM lower MTrP
e) Right Suboccipital MTrP	q) Right Temporalis MTrP number one
f) Left Suboccipital MTrP	r) Left Temporalis MTrP number one
g) Right Sternocleidomastoid (SCM) upper clavicular MTrP	s) Right Temporalis MTrP number two
h) Left SCM upper clavicular MTrP	t) Left Temporalis MTrP number two
i) Right SCM clavicular midlevel MTrP	u) Right Temporalis MTrP number three
j) Left SCM clavicular midlevel MTrP	v) Left Temporalis MTrP number three
k) Right SCM upper sternal MTrP	w) Right Temporalis MTrP number four
l) Left SCM upper sternal MTrP	x) Left Temporalis MTrP number four

4.3.3 Active and Latent MTrPs

The median number of active trigger points per participant was 5.5 (range 0 – 14), while the median number of latent trigger points was 18.5 (range 10-24) as seen in Table 4.3.3. The average ratio of active to latent trigger points was 1:3.36.

Table 4.3.3 Descriptive statistics for number of active and latent trigger points

		Number of active trigger points	Number of latent trigger points
N		40	40
Median		5.50	18.50
Minimum		0	10
Maximum		14	24
Percentiles	25	2.00	16.00
	50	5.50	18.50
	75	8.00	22.00

4.3.4 MDS and algometer

Summing up all the values for each participant across all the trigger points generated a total algometer and MDS score reflected in Table 4.3.4. There was a moderate and significant negative correlation between the total algometer score and total MDS score ($\rho = -0.676$, $p < 0.001$), indicating that as the severity of the MTrP's increased, so did the pain, measured by a decrease in algometer score.

Table 4.3.4 Spearman's rank correlation between total MDS score and total algometer score

Spearman's rho		Total algometer score
Total MDS score	Correlation Coefficient	-0.68(**)
	Sig. (2-tailed)	<0.001
	N	40

** Correlation is significant at the 0.01 level (2-tailed).

4.4 Correlation between MTrPs and ETTH

No correlation between the number of active MTrPs and the frequency and severity of ETTH was found as shown in Table 4.4.1 ($\rho = 0.077$ and 0.242 , respectively).

Table 4.4.1 Spearman's rank correlation between number of active trigger points and duration and frequency of headaches

Spearman's rho		Number of active trigger points
Mean headache NRS score	Correlation Coefficient	0.24
	Sig. (2-tailed)	0.13
	N	40
Mean duration of headaches in 24-hour period (in hours)	Correlation Coefficient	0.08
	Sig. (2-tailed)	0.64
	N	40

No correlation was found between the number of latent trigger points and the frequency and severity of headaches. The signs of the correlation coefficients were simply reversed when the number of latent trigger points was correlated against the pain and duration of headaches (see Table 4.4.2).

Table 4.4.2 Spearman's rank correlation between number of latent trigger points and duration and severity of headaches

		Number of latent trigger points
Mean headache NRS score	Correlation Coefficient	-0.24
	Sig. (2-tailed)	0.13
	N	40
Mean duration of headaches in 24-hour period (in hours)	Correlation Coefficient	-0.08
	Sig. (2-tailed)	0.64
	N	40

Table 4.4.3 Spearman's rank correlation between severity and tenderness of trigger points and duration and severity of headaches

Spearman's rho		Mean headache NRS score	Mean duration of headaches in 24-hour period (in hours)
Total MDS score	Correlation Coefficient	0.25	0.18
	Sig. (2-tailed)	0.11	0.26
	N	40	40
Total algometer score	Correlation Coefficient	-0.025	0.04
	Sig. (2-tailed)	0.88	0.82
	N	40	40

In Table 4.4.3 ETTH severity (NRS score) was not correlated with the MDS (rho = 0.254, p=0.113) or algometer score (rho = -0.025, p=0.881). The duration of the headache was not correlated with the MDS score (rho = 0.183, p = 0.258), or with the algometer score (rho =0.037, p = 0.823).

CHAPTER FIVE

DISCUSSION OF THE RESULTS

5.0 Introduction

Chapter five discusses the results provided by the statistical analysis presented in Chapter Four. The subjective and objective measurements and results, i.e. algometer and Myofascial Diagnostic Scale readings, trigger point location, duration of conditions and the Headache Diary, will also be discussed.

The demographic data will be discussed, followed by the correlation comparisons.

5.1 Demographic data

5.1.1 Gender distribution

The sample consisted of forty participants, of whom 25% were male and 75% were female. This is in keeping with a study by Rasmussen (1995), which found that a greater number of females suffered from ETTH than males. This is thought to be due to female hormones and the fact that women are more likely to seek help than men (Rasmussen, 1995).

Jensen (1999) found that women were more frequently affected than men, were more sensitive to mechanical pressure and exhibited marked tenderness of the pericranial muscles and tendon insertions.

ETTH has a female predominance (Prithipal, 2003) regardless of age, educational level and race (Schwartz *et al.*, 1998).

See Figure 4.2.1

5.1.2 Occupation

Occupations were categorized into five main types namely professional, technical and sales, housewife, student and self-employed. Professional persons formed a large portion of the study (37.5%); followed by students, who formed 30% of the study. Individuals with occupations such as accountancy, engineering and teaching were included in the professional category.

The findings in this study are consistent with an epidemiological study by Schwartz *et al.* (1998), which found that individuals working in a professional capacity were more likely to suffer from ETTH. The prevalence of ETTH increased with increasing educational levels and peaked at graduate levels. This may explain the high percentage of student participants in the present study.

See Table 4.2.2

5.1.3 Age

The age range in this study was from 19 to 45. Schwartz *et al.* (1998) found that the prevalence of ETTH decreased with increasing age with peak prevalence in the third decade. In the present study, the peak prevalence was the late twenties; this may be as a result of a smaller sample size (40), when compared to the larger sample size of the aforementioned study (13 345). The prevalence of ETTH is decreased with increasing age (Schwartz *et al.*, 1998) and is thus a possible reason for the majority of participants falling between the ages of twenty and thirty years. The proximity of the Durban University of Technology to the central business district and surrounding institutes of learning may have led to the inclusion of participants of a younger demographic group.

5.1.4 Duration of condition

Day-time headaches, from 06:00 to 17:30, were found to be more frequent than night time headaches, from 18:00 to 05:00.

See Tables 4.2.3.1.1 and 4.2.3.1.2

It was determined that 50% of the sample experienced under one hour of headache over a 24-hour period. Twenty five percent of the sample experienced over 2.5 hours in a 24-hour period. This is concurrent with the episodic nature of the headache, as described by the International Headache Society (1988). Day-time headaches were significantly more frequent than night-time headaches.

See Figure 4.2.3.1 and Table 4.2.3.2

Headache pain using the Numerical Pain Rating Scale (NRS) was averaged over the two-week period. Mean NRS score over a 24-hour period was 2.3 (SD 1.1), with a range of 0.7 to 5.1. This concurs with Schwartz *et al.* (1998) who found pain severity to be more commonly mild to moderate, than of a severe nature.

See Table 4.2.3.3

When comparing male and female gender with regard to pain, no significant difference was found ($p=0.421$).

See Table 4.2.4.1(a)

There were no significant differences between the genders with regard to the number of headache episodes and the duration of the headache. One can deduce that, although there is a female preponderance for ETTH (Rasmussen, 1995), there is no gender difference in the nature of the headache.

See Table 4.2.4.1(b) and Table 4.2.4.2

There was a statistically significant positive relationship between the duration of headache and the pain ($\rho = 0.402$, $p=0.010$). Figure 4.2.4.1 shows this relationship. Generally, as the duration increased so did the pain. However, there were some participants with very long durations and moderate levels of pain. It can be seen that patients with regular headache episodes are predisposed to chronic tension-type headache due to decreased coping skills and a state of continual pain (Ukestad and Wittrock, 1996).

5.2 Demographics of the MTrPs

5.2.1 Myofascial Diagnostic Scale (MDS)

MDS scores were averaged over the two time points and presented as median values for the sample. MTrP number one, located in the right upper Trapezius muscle, had the highest median. The second highest was the uppermost myofascial trigger point (MTrP), in the clavicular portion of the right Sternocleidomastoid (SCM) muscle, followed by the second MTrP in the upper Trapezius, bilaterally, as well as the upper MTrP in the left clavicular portion of the SCM. This does not concur with Prithipal (2003), who found that the posterior Cervical muscles on the left side were more commonly involved.

It is, however, in agreement with Travell *et al.* (1999), who name the SCM, upper Trapezius and SCM as muscles not to be overlooked in the diagnosis and treatment of ETTH.

See Figure 4.3.1

5.2.2 Algometer

Algometer scores were lowest in the clavicular portions of the SCM muscles and highest in the Temporalis and upper Trapezius muscles.

This shows that participants exhibited the greatest sensitivity to pressure in the SCM and could withstand substantially more pressure in the upper Trapezius and Temporalis muscles.

See Figure 4.3.2

5.2.3 Active and latent MTrPs

The median number of active trigger points per participant was 5.5, while the median number of latent trigger points was 18.5. The average ratio of active to latent trigger points was 1:3.36.

A study by Fernandez de las Penas *et al.* (2006) found that active MTrPs were more frequent in patients suffering mechanical neck pain, but that the number of latent MTrPs were similar when compared to the control group. This supports the definition of a latent MTrP, in that although it may be tender it does not produce pain spontaneously. The higher frequency of latent MTrPs should thus not be considered exclusive to subjects with ETTH.

See Table 4.3.3

5.2.4 MDS and algometer

There was a moderate and significant negative correlation between the total algometer score and total MDS score, indicating that as the severity of the MTrPs increased, so did the pain, measured by a decrease in algometer score.

From the above, one can conclude that the MDS and algometer may be used effectively in the measurement of Myofascial Pain Syndrome.

See Table 4.3.4

5.3 Correlation between MTrPs and ETTH

5.3.1 Active MTrPs and ETTH

No correlation between the number of active MTrPs and the nature, i.e. frequency and severity, of ETTH was found.

See Table 4.4.1

5.3.2 Latent MTrPs and ETTH

No correlation was found between the number of latent trigger points and the frequency and severity of headaches.

See Table 4.4.2

5.3.3 MDS, Algometer and ETTH

ETTH severity was not correlated with the MDS or algometer score. In addition, the duration of the headache was not correlated with the MDS score or the algometer readings. See Table 4.4.3

5.3 Summary

In Chapter one the alternative hypothesis was that: *a correlation exists between the ETTH and MTrPs in the upper Trapezius, Temporalis,*

Suboccipital and Sternocleidomastoid musculature in terms of the subjective and objective findings.

The findings in Chapter four conclude that there is no correlation between the ETTH and MTrPs in the upper Trapezius, Temporalis, Suboccipital and Sternocleidomastoid musculature in terms of the subjective and objective findings. The alternative hypothesis is therefore not accepted, thus the null hypothesis is accepted.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.0 Conclusions

The researcher set out to determine the nature of the relationship between myofascial trigger points (MTrPs) of the pericranial musculature and episodic tension-type headaches (ETTH). A significant overlap exists between ETTH and MPS with regard to the clinical presentation. The following signs and symptoms are common to both:

- ❖ Painful area extends from the occiput and includes the parietal and frontal regions
- ❖ Tautness of the muscles, with increased muscle tension
- ❖ Presence of tender nodules in the muscles
- ❖ Possible alteration in proprioception
- ❖ Neck and upper back pain
- ❖ Associated depression and anxiety
- ❖ Altered sleep pattern
- ❖ Pain is aggravated by smoking and cold drafts

According to Travell *et al.* (1999), the referred pain pattern from the upper Trapezius, Sternocleidomastoid (SCM), Temporalis and Suboccipital muscles extends to include the following regions:

- ❖ The neck posterolaterally
- ❖ Temporal region
- ❖ Occipital area and the top of the head
- ❖ Posterior orbit
- ❖ Supraorbital ridge and eyebrow
- ❖ Cheek, upper teeth, molar teeth of the lower jaw and maxilla

❖ Temporomandibular joint and angle of the jaw

The above pain referral pattern is similar to that of the ETTH. Regarding ETTH, painful regions involve the occipital region initially, with spread to the parietal, frontal and facial areas bilaterally (Diamond and Dalessio, 1992).

Results of the present study may be influenced by an insufficient sample size and the lack of a control group that would represent a baseline of myofascial involvement in headache free individuals. The decision to exclude a control group was made upon findings by Mennell (1992) that identified an association between MPS and ETTH.

The present study showed that participants suffering prolonged headache episodes experienced pain of a more severe nature as reflected on the Numerical Pain Rating Scale. This may be as a result of central sensitization and the resultant alteration in pain perception as suggested by Buchgreitz *et al.* (2006).

The higher percentage of females suffering ETTH that is evident in the present study is in keeping with previous studies (Janke *et al.*, 2004). This may be as a result of the fact that females are more likely to seek consultation than their male counterparts (Rasmussen, 1995). Headache episodes were found to be more common during the day-time which is in agreement with findings provided by Diamond (1987) and Raskin (1988).

The relatively high prevalence of active MTrPs documented in this sample is in keeping with Jensen's (1999) study, in which participants suffering from ETTH, when compared to headache-free individuals, were found to have significantly higher levels of pericranial tenderness. It can be deduced through the present study, and those previous to it, that individuals suffering from ETTH have a greater degree of pericranial tenderness compared to headache-free persons.

Travell *et al.* (1999) name the upper Trapezius and SCM muscles MTrPs as those that are commonly found in individuals suffering ETTH. In the present study the upper Trapezius MTrPs and the uppermost MTrP in the clavicular division of the SCM were prevalent, and exhibited the lowest algometer scores. This finding further confirms the presence of MPS in persons suffering ETTH as given by Mennell (1992). The need for assessment of MPS in the treatment and management of these individuals is thus highlighted.

In the present study no correlation was found between the algometer and Myofascial Diagnostic Scale, collectively, and the Headache Diary. It can be concluded that there was no correlation between the clinical presentation of ETTH and that of MPS, in terms of subjective and objective findings. This finding is consistent with a study by Fernández de las Peñas *et al.* (2006) with regard to the Suboccipital muscles in particular. Their study found that active MTrPs may contribute to the maintenance of the ETTH but the actual role they play requires further investigation.

6.1 Recommendations

- ETTH frequency and intensity in the sample may not have shown sufficient variability for a correlation to be detected. To counteract this, it is recommended that, in future research, a larger sample size be used.
- Future studies may benefit from the use of a control group so as to represent a baseline.
- The researcher, a sixth-year chiropractic student, performed the palpation of the MTrPs. It is likely that a qualified chiropractor would have been able to provide more reliable findings with regard to the palpation of the MTrPs, particularly in muscles such as the Suboccipital muscles.

- Throughout the study, the researcher noted that there were a number of patients exhibiting upper cervical spine dysfunction, in the form of a cervical facet syndrome, particularly at the level of the second cervical vertebrae. The researcher thus questions the association, or lack thereof between cervical dysfunction, MPS and ETTH.

- Future research should focus on the treatment and management of co-existing MPS in patients suffering ETTH, so as to further define its involvement as a possible perpetuating, causative or concomitant factor.

- It may be of interest to compare groups of differing occupation, to further identify at-risk individuals regarding MPS and ETTH, e.g. limit the study to individuals who have desk jobs and/or compare them to groups with physically demanding occupations.

- A study should be carried out with groups suffering from combined ETTH and migraine headache to investigate the relationship with MPS, as individuals suffering ETTH often suffer from migraine headache at some point (Rasmussen, 1995).

REFERENCES

- Alonso-Blanco, C., Fernández de las Peñas, C., Fernandez-Carnero, J. and Miangolarra-Page, J. 2006. The immediate effect of ischemic compression technique and transverse friction massage on tenderness of active and latent myofascial trigger points: A pilot study. *Journal of Bodywork and Movement Therapies*, 10(1): 3-9.
- Anttila, P. 2006. Tension-type headache in childhood and adolescence. *The Lancet Neurology*, 5(3): 268-274.
- Ashkenazi, A. and Silberstein, S. 2004. Headache management for the pain specialist. *Regional anaesthesia and pain medicine*, 29(5): 462-475.
- Baldry, P., 1998. Acupuncture, trigger points and musculoskeletal pain. Churchill Livingstone, Edinburgh, Scotland.
- Blanco, C., Fernandez de la Penas, C., Xumet, J., Algaba, C., Rabadan, F. and Quintana, M. 2006. Changes in active mouth opening following a single treatment of latent myofascial trigger points in the masseter muscle involving post-isometric relaxation or strain/counterstrain. *Journal of Bodywork and Movement Therapies*, 10(3): 197-205.
- Bogaards, M. and Kuile, M. 1994. Treatment of Recurrent Tension Headache: A meta-analytic review. *The Clinical Journal of Pain*, 10:174-190.
- Buchgreitz, L., Lyngberg, A., Bendtsen, L. and Jensen, R. 2006. Frequency of headache is related to sensitisation: A population study. *Pain*, 123(1-2): 19-27.

Chaitow, L. and Delany, J. 2000. Clinical application of neuromuscular techniques. Volume 1 – The upper body. London: Churchill Livingstone. 74 pp. ISBN 0-443-06270-6.

Chettiar, A. 2001. The therapeutic efficacy of action potential therapy in the treatment of myofascial pain syndrome. M.Tech: Chiropractic dissertation, Technikon Natal, Durban, South Africa.

de Busser, N.L. 2001. The relative effectiveness of chiropractic manipulation in conjunction with soft tissue treatment, as compared with soft tissue treatment alone, in the management of tension-type headaches in children. M.Tech:Chiropractic Dissertation, Durban Institute of Technology, Durban, South Africa.

Diamond, S. 1987. Muscle contraction headache. In Dalessio, D.J. (ed.). *Wolff's Headache and other Head Pain*. 5th ed. Pp.171-189. New York: Oxford University Press. 434pp. ISBN 0-19-504356-1.

Diamond, S. and Dalessio, D. 1992. *The Practicing Physician's Approach to Headache*. 5th ed. USA: Williams and Wilkins. 295pp. ISBN 0-683-02506-6.

Edmeads, J. 1988. The cervical spine and headache. *Neurology*, 38:1874-1878.

Esenyel, M., Caglar, N. and Aldemir, T. 2000. Treatment of myofascial pain. *American Journal of Physical Medicine and Rehabilitation*, 79(1):48-52.

Fischer, A.A. 1987. Pressure Threshold Measurement for Diagnosis of Myofascial Pain and Evaluation of Treatment Results. *The Clinical Journal of Pain*, 2:207-214.

Fernández de las Peñas, C., Alonso-Blanco, C. and Luz Cuadrado, M. 2006. Myofascial trigger points in the suboccipital muscles in episodic tension-type headache. *Manual Therapy*, 11(3): 225-230.

Fernández de las Peñas, C., Alonso-Blanco, C. and Miangolarra, J.C. 1996. Myofascial trigger points in subjects presenting with mechanical neck pain: A blinded, controlled study. *Manual Therapy*. [Online] Available from: <http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=pubmed>, [Accessed 3 December 2006].

Fryer, G. and Hodgson, L. 2005. The effect of manual pressure release on myofascial trigger points in the upper Trapezius muscle. *Journal of Bodywork and Movement Therapies*, 9(4): 248-255.

Fumihiko, S., Ebihara, S., Akiyama, M., Horikawa, M. 1995. Pericranial muscle hardness in tension-type headache. *Brain*, 118(2): 523-531.

Giacomini P.G., Alessandrini, M., Evangelista, M., Napolitano, B., Lanciani, R. and Camaioni, D. 2004. Impaired postural control in patients affected by tension-type headache. *European Journal of Pain*, 8(6): 579-583.

Graboski, C.L., Gray, D.S. and Burnham, R.S. 2005. Botulinum toxin A versus bupivacaine trigger point injections for the treatment of myofascial pain syndrome: A randomised double blind crossover study. *Pain*, 8(1-2):170-175.

Hanten, W., Olson, S., Butts, N. and Nowicki, A. 2000. Effectiveness of a home program followed by sustained stretch for treatment of myofascial trigger points. *Physical Therapy*, 80(10).

Holroyd, K., France, J., Nash, J. and Hursey, K. 1993. Pain state as artifact in the psychological assessment of recurrent headache sufferers. *Pain*, 53: 129-235.

Hsieh, C-YJ. Hong, C-Z., Adams, AH., Platt, KJ., Danielson, CD., Hoehler, FK., Tobis, JS. 2000. Interexaminer Reliability of the palpation of Trigger Points in the Trunk and Lower Limb Muscles. *American Academy of Physical Medicine and Rehabilitation*, 81: 258.

International Headache Society. 1988. Classification and diagnostic criteria for headache disorders, cranial neuralgias and facial pain. *Cephalgia*, 8 (suppl 7).

Jamison, J.R. 1991. *Health Promotion for Chiropractic Practice*. Gaithersburg, Maryland: Aspen Publishers. 255p. ISBN 0-8342-0178-X

Janke, E., Holroyd, K. and Romanek, K. 2004. Depression increases the onset of tension-type headache following laboratory stress. *Pain*, 3(3): 230-238.

Jensen, R. 1999. Pathophysiological mechanisms of tension-type headache: a review of epidemiological and experimental studies. *Cephalgia*, 19(6): 602-621.

Jensen, M., Karoly, P. and Braver, S. 1986. The measurement of clinical pain intensity: A comparison of six methods. *Pain*, 117-126.

Kanji, N., White, A. and Ernst, E. 2006. Autogenic training and tension-type headache. *Complementary therapies in medicine*, 14(2): 144-150.

Makowska, A., Panfil, C. and Ellrich, J. 2005. Nerve growth factor injection into semispinal muscle evokes sustained facilitation of the jaw-opening reflex in anaesthetised mice~ possible implications for tension-type headache. *Experimental Neurology*, 191(2): 301-309.

Martin, P., and Mathews, M. 1978. Tension Headaches. Psychophysiological investigation and treatment. *Journal of Psychosomatic Research*, 22:389-399.

Mennell, J.M. 1992. *The Musculoskeletal System: Differential Diagnosis from Symptoms and Physical Signs*. Gaithersburg, Maryland: Aspen Publishers. 191pp. ISBN 0-8342-0255-7.

Millea, P., Brodie, J. 2002. Tension-Type Headache. American Family Physician. (Online). Available from: <http://www.aafp.org/afp/20020901/797.html> (Accessed 26 March 2006).

Moore, K. and Dalley, A. 1999. Clinically orientated anatomy. 4th ed. Canada: Lippincott Williams and Wilkins. 1164pp. ISBN 0-683-06141-0.

Murphy, G.J. 1989. Myofascial Trigger Points. Journal of Clinical Orthodontics, 23:627-631.

Murphy, A. and Lehrer, P. 1990. Headache versus nonheadache state: A study of electrophysiological and affective changes during muscle contraction headaches. Behavioral Medicine, 16: 23-30.

Penter, C. 1994. Determining the role chiropractic plays in the management of tension-type headache. M.Tech: Chiropractic Dissertation, Durban University of Technology, Durban, South Africa.

Prithipal, A. 2003. The effectiveness of myofascial trigger point therapy in the treatment of episodic tension-type headache in adults: A comparison of three manual interventions applied to the posterior cervical musculature. M.Tech:Chiropractic Dissertation, Durban Institute of Technology, Durban, South Africa.

Raskin, N.H. 1988. Headache. 2nd ed. New York: Churchill Livingstone. 96pp. ISBN 0-443-08547-1.

Rasmussen, B. and Olesen, J. 1994. Epidemiology of migraine and tension-type headache. Current Opinion in Neurology, 7:264-271.

Rasmussen, B. 1995. Epidemiology of headache. Cephalgia, 15:45-68.

Schwartz, B., Walter, F., Simon, D. and Lipton, R. 1998. Epidemiology of Tension-Type Headache. *Journal of American Medical Association*, 279(5):381-383.

Sjaastad, O. Cervicogenic Headache. 1987. In Dalessio, D.J. (ed.). *Wolff's Headache and other Head Pain*. 5th ed. Pp.171-189. New York: Oxford University Press. 434pp. ISBN 0-19-504356-1.

Travell, J.G., Simons, D.G. and Simons, L.S. 1999. *Travell and Simons' Myofascial Pain and Dysfunction: The Trigger Point Manual: Volume 1, Upper half of body*. 2nd edition. Baltimore, Maryland: Williams and Wilkins. 2 vols. 1038pp. ISBN 0683-08367-8.

Ukestad, L. and Wittrock, D. 1996. Pain perception and coping in female tension headache sufferers and headache-free controls. *Health Psychology*, 15(1):65-68.

Ulrich, V., Russell, M., Jensen, R. and Olesen, J. 1996. A comparison of tension-type headache in migraineurs and in non-migraineurs: a population-based study. *Pain*, 67:501-506.

Vernon, H. 1982. Chiropractic Manipulative Therapy in the treatment of Headaches: A Retrospective and Prospective Study. *Journal of Manipulative and Physiological Therapeutics*, 5(3):109-112.

Vernon, H., Steiman, I. and Hagino, C. 1992. Cervicogenic Dysfunction in Muscle Contraction Headache and Migraine: A Descriptive Study. *Journal of Manipulative and Physiological Therapeutics*, 15(7): 418-427.

Viti, J., and Paris, S. 2000. The use of Upper Thoracic manipulation in a patient with headache. *The Journal of Manual and Manipulative Therapy*, 8(1): 25-28.

Webb, Q. 2003. The effectiveness of a home programme of ischaemic compression compared with self applied ischaemic compression under clinical observation for the treatment of myofascial pain syndrome of the Levator Scapulae muscle. M.Tech: Chiropractic Dissertation, Durban University of Technology, Durban, South Africa.

APPENDIX A – Letter of information

Dear Patient

Welcome to my research study on Episodic Tension-type headaches. I am investigating the relationship between Myofascial trigger points of the pericranial musculature and the clinical presentation of Episodic Tension-type headaches.

Procedure:

This study will consist of forty participants. A case history, physical and cervical spine regional examination will form the clinical assessment. Myofascial Diagnostic Scale and algometer measurements will be done at the first and second visit two weeks later. A headache diary will be given to you to complete over a period of fourteen days so as to achieve a mean headache severity. This will be collected at the second visit at which time you will be offered one free treatment.

Please be assured that all information will be regarded as strictly confidential and you are free to withdraw from the study at any time. No financial remuneration will be given for participating in the study.

To participate in the study the following criteria are required:

1. You must be between the ages of 18-45 years.
2. There should be no change from your usual daily activities.

Risks/Discomfort:

Slight discomfort may be experienced during or after the examination due to the use of the algometer (a tool to measure your pain levels). It should, however, be noted that the algometer maybe of benefit as it mimics a therapeutic intervention.

Benefits:

One free treatment will be offered to all participants at the second consultation.

Please note that you will be asked to complete a number of questionnaires during the study. It should be noted that there are no right or wrong answers and I appeal to you to answer as accurately as possible. All patient interaction and later treatment will be performed under supervision of a qualified chiropractor. For any queries please contact:

Julie Forsyth (w) 031-2042511 or Dr N. de Busser (w) 031-2042244

Yours sincerely,
Juliette Forsyth (Chiropractic Intern)

APPENDIX B- Informed consent form

Date: _____

Title of research project: The relationship between Myofascial trigger points of the pericranial musculature and Episodic tension-type headaches.

Supervisor: Dr. de Busser

Student researcher: Juliette Forsyth

Please circle the appropriate answer

- o Have you read the research information sheet? Yes No
- o Have you had an opportunity to ask questions regarding this study? Yes No
- o Have you received satisfactory answers to your questions? Yes No
- o Have you had an opportunity to discuss this study? Yes No
- o Have you received enough information about this study? Yes No
- o Who have you spoken to? _____
- o Do you understand the implications of your involvement in this study? Yes No
- o Do you understand that you are free to withdraw from this study
 - at any time
 - without having to give any reason for withdrawing, and
 - without affecting your future health care. Yes No
- o Do you agree to voluntarily participate in this study? Yes No

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

Please print in block letters:

Patient/subject Name: _____

Signature: _____

Witness Name: _____

Signature: _____

Research Student Name: _____

Signature: _____

Are you aged between 18-45 and
suffering from



HEADACHES?

Research is currently being carried
out on

EPISODIC TENSION-TYPE HEADACHE

at the Durban University of
Technology
Chiropractic Day Clinic.

ONE FREE TREATMENT
(IF YOU FIT THE RESEARCH CRITERIA)

Contact Julie Forsyth on
2042205/2042512 or

082 323 8689

APPENDIX D

Questions to be asked during the telephonic interview:

Inclusion Criteria:

1. Are you between the ages of 18 and 45 years?
2. Does the headache you experience give a feeling of pressing or tightening around your head on both sides?
3. For how long does your headache last?
4. How often do you get a headache?
5. Is your pain not aggravated by routine physical activity e.g. walking upstairs?
6. Do your eyes or ears feel sensitive at the time of your headache?

Exclusion Criteria:

1. Was the initial onset of your headache in association with any of the following:
 - Trauma
 - Vascular disorders
 - Non-vascular intracranial disorders
 - Substance abuse or withdrawal
 - Non-cephalic infection
 - Metabolic disorders
 - Disorders of the cranium, neck, eyes, nose, sinuses, teeth, mouth or other facial or cranial structures?
2. Are you currently receiving any form of treatment other than analgesic medication for your headaches?

DURBAN UNIVERSITY OF TECHNOLOGY
CHIROPRACTIC DAY CLINIC
CASE HISTORY

Patient: _____ Date: _____

File # : _____ Age: _____

Sex : _____ Occupation: _____

Intern : _____ Signature _____

FOR CLINICIANS 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: _____

Conditions met in Visit No:	Signed into PTT:	Date:
-----------------------------	------------------	-------

Case Summary signed off:	Date:
--------------------------	-------

Intern's Case History:

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

3. **Present Illness:**

	Complaint 1	Complaint 2
▶ Location		
▶ Onset : Initial:		
Recent:		
▶ Cause:		
▶ Duration		
▶ Frequency		
▶ Pain (Character)		
▶ Progression		
▶ Aggravating Factors		
▶ Relieving Factors		
▶ Associated S & S		
▶ Previous Occurrences		
▶ Past Treatment		
▶ Outcome:		

4. **Other Complaints:**

5. **Past Medical History:**

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

6. Current health status and life-style:

- ▶ Allergies
- ▶ Immunizations
- ▶ Screening Tests incl. xrays

- ▶ 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

Durban Institute of Technology
PHYSICAL EXAMINATION: SENIOR

Patient Name : _____ File no : _____ Date : _____
Student : _____ Signature : _____

VITALS:

Pulse rate:		Respiratory rate:	
Blood pressure:	R	L	Medication if hypertensive:
Temperature:		Height:	
Weight:	Any recent change? Y / N	If Yes: How much gain/loss	Over what period

GENERAL EXAMINATION:

General Impression	
Skin	
Jaundice	
Pallor	
Clubbing	
Cyanosis (Central/Peripheral)	
Oedema	
Lymph nodes	Head and neck
	Axillary
	Epitrochlear
	Inguinal
Pulses	
Urinalysis	

SYSTEM SPECIFIC EXAMINATION:

CARDIOVASCULAR EXAMINATION

RESPIRATORY EXAMINATION

ABDOMINAL EXAMINATION

NEUROLOGICAL EXAMINATION

COMMENTS

NEUROLOGICAL EXAMINATION: See Regionals

DURBAN INSTITUTE OF TECHNOLOGY
REGIONAL EXAMINATION - CERVICAL SPINE

Patient: _____ File No: _____

Date: _____ Student: _____

Clinician: _____ Sign: _____

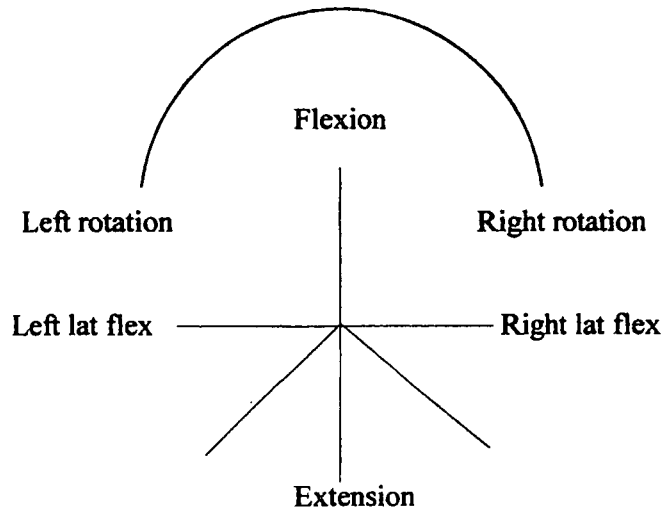
OBSERVATION:

- Posture
- Swellings
- Scars, discolouration
- Hair line
- Body and soft tissue contours

- Shoulder position
 - Left :
 - Right :
- Shoulder dominance (hand):
- Facial expression:

RANGE OF MOTION:

- Extension (70°):
- L/R Rotation (70°):
- L/R Lat flex (45°):
- Flexion (45°):



PALPATION:

- Lymph nodes
- Thyroid Gland
- Trachea

ORTHOPAEDIC EXAMINATION:

Tendermess		Right	Left
Trigger Points:	SCM		
	Scaleni		
	Post Cervicals		
	Trapezius		
	Lev scapular		

	Right	Left		Right	Left
Doorbell sign			Cervical compression		
Kemp's test			Lateral compression		
Cervical distraction			Adson's test		
Halstead's test			Costoclavicular test		
Hyper-abduction test			Eden's test		
Shoulder abduction test			Shoulder compression test		
Dizziness rotation test			Lhermitte's sign		
Brachial plexus test					

NEUROLOGICAL EXAMINATION:

Dermatomes	Left	Right	Myotomes	Left	Right	Reflexes	Left	Right
C2			C1			C5		
C3			C2			C6		
C4			C3			C7		
C5			C4					
C6			C5					
C7			C6					
C8			C7					
T1			C8					
			T1					
Cerebellar tests:		Left		Right				
Disdiadochokinesis								

VASCULAR:	Left	Right		Left	Right
Blood pressure			Subclavian arts.		
Carotid arts.			Wallenberg's test		

MOTION PALPATION & JOINT PLAY:

Left: Motion Palpation:
 Joint Play:
 Right: Motion Palpation:
 Joint Play:

Upper Thoracics:
 Motion Palpation:
 Joint Play:

BASIC EXAM: SHOULDER:

Case History:

BASIC EXAM: THORACIC SPINE:

Case History:

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

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

APPENDIX H

Myofascial Diagnostic Scale

TRIGGER POINT SIGNS.

1. Soft tissue tenderness
Grade:
 - 0 No tenderness 0
 - i Tenderness to palpation without grimace 1
 - ii Tenderness to palpation with grimace or flinch 2
 - iii Tenderness with withdrawal (+ve jump sign) 3
 - iv Withdrawal (+ve jump sign) to non noxious stimuli 4
(i.e. Superficial palpation, gentle percussion).
 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 out of 17 _____

APPENDIX H- MYOFASCIAL DIAGNOSTIC SCALE (Page 1)

Date : _____
 Visit number : _____
 Participant name : _____
 File number : _____

TRAPEZIUS				SUBOCCIPITAL			
UPPER							
TP1		TP2		TP1		TP2	
R	L	R	L	R	L	R	L
0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4
4	4	4	4	4	4	4	4
4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5
TOTAL OUT OF 17							

APPENDIX H- MYOFASCIAL DIAGNOSTIC SCALE (Page 2)

Date : _____
 Visit number : _____
 Participant name : _____
 File number : _____

STERNOCLEIDOMASTOID

		CLAVICULAR				STERNAL			
UPPER		MIDLEVEL		UPPER		MIDLEVEL		LOWER	
R	L	R	L	R	L	R	L	R	L
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4
4	4	4	4	4	4	4	4	4	4
4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5
TOTAL OUT OF 17									

APPENDIX H- MYOFASCIAL DIAGNOSTIC SCALE (Page 3)

Date : _____
 Visit number : _____
 Participant name : _____
 File number : _____

TEMPORALIS											
TP1		TP2		TP3		TP4					
R	L	R	L	R	L	R	L	R	L	R	L
0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4	4	4
4	4	4	4	4	4	4	4	4	4	4	4
4	4	4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5	5	5
TOTAL OUT OF 17											

APPENDIX I- Headache Diary

Name: _____

Please complete the following questions every day for the next 14 days.

Day _____ Date _____

- The graphs below show one full day from 6am to 6am the next day. Each block represents half an hour, if you get a headache make a mark in the time slot in which you get the headache.

DAY

6am	6:30	7am	7:30	8am	8:30	9am	9:30	10am	10:30	11am	11:30	12am	12.30

1pm	1:30	2pm	2:30	3pm	3:30	4pm	4:30	5pm	5:30

NIGHT

6pm	6:30	7pm	7:30	8pm	8:30	9pm	9:30	10pm	10:30	11pm	11:30	12am	12.30

1am	1:30	2am	2:30	3am	3:30	4am	4:30	5am	5:30

2. Numerical Pain Rating Scale

Please rate your pain from 0-10 on this scale, using zero as no pain at all and ten being the worst pain ever.

0 1 2 3 4 5 6 7 8 9 10

APPENDIX J (Page 1)

Date : _____
 Visit number : _____
 Participant name : _____
 File number : _____

TRAPEZIUS			SUBOCCIPITAL		
UPPER					
TP1		TP2			
R	L	R	L	R	L

STERNOCLEIDOMASTOID					
CLAVICULAR			STERNAL		
UPPER		MIDLEVEL	UPPER		LOWER
R	L	R	L	R	L

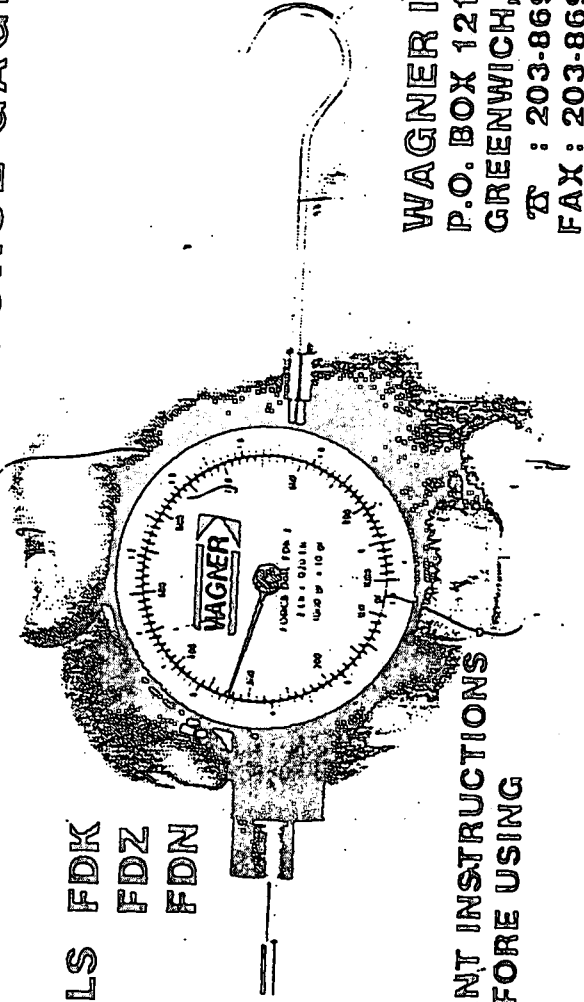
FORCE DIAL CERTIFICATE OF CALIBRATION

WAGNER INSTRUMENTS certifies that all FORCE DIALS are calibrated at the factory to meet the specified accuracy of $\pm 1\%$ of full scale, advertised in our current catalog.

QUALITY CONTROL DIRECTOR

FORCE DIAL™ PUSH - PULL FORCE GAGE

**MODELS FDK
FDZ
FDN**



**IMPORTANT INSTRUCTIONS
READ BEFORE USING**

**WAGNER INSTRUMENTS
P.O. BOX 1217
GREENWICH, CT 06836 U.S.A.
☎ : 203-869-9681
FAX : 203-869-9871**

The relationship between Myofascial trigger points of the pericranial musculature and Episodic tension-type headache.

Objective: To determine the relationship between Myofascial Pain Syndrome (MPS) of the pericranial musculature and the clinical presentation of the episodic tension-type headache (ETTH).

Design: This study was a quantitative, pilot non-intervention clinical assessment.

Sample group: N=40 and no grouping was required.

Results: The results showed that there was no correlation between the clinical presentation of ETTH and that of MPS, in terms of subjective and objective findings.

Key words: Episodic tension-type headache (ETTH), Myofascial Pain Syndrome (MPS), pericranial musculature.

INTRODUCTION

The episodic tension-type headache (ETTH) is a very prevalent headache disorder for which no single cause has been identified (Schwartz *et al.*, 1998). Current knowledge suggests the headache may be of muscular origin (Millea and Brodie, 2002). It should be noted that it is a multifactorial disorder, with a number of concurrent pathophysiological mechanisms (Jensen 1999). Some of the classical clinical manifestations of the ETTH include a sustained and persistent headache with pain that is bilateral in 90% of cases and is described as a constricting, tight, squeezing pain (Jamison, 1991).

In contrast, Myofascial Pain Syndrome (MPS) is described as a muscular disorder resulting in autonomic, sensory and motor symptoms from myofascial trigger points. Active myofascial trigger points (MTrPs) produce a local twitch response when palpated and are painful when pressure is applied to the area (Travell *et al.*, 1999). Pain due to active MTrPs may be referred locally, or to a

distant site, and the individual is often unaware of their presence (Baldry, 1998).

Referred pain from the upper Trapezius, Suboccipital, Sternocleidomastoid (SCM) and Temporalis muscles is spread collectively over the region of the head and neck. MPS of the upper Trapezius muscle produces a typical tension-type headache picture when its referral pattern overlaps with referral patterns from other muscles, namely the Sternocleidomastoid and the Suboccipital muscles (Travell *et al.*, 1999).

A clinical overlap between ETTH and MPS of the pericranial musculature exists. Pain is experienced over the region of the occiput and spreads to the parietal, frontal and facial areas in the case of an ETTH (Diamond, 1992). Similarly the suboccipital muscles produce a referred pain pattern that radiates from the occiput towards the region of the orbit (Travell *et al.*, 1999).

Pain produced by active MTrPs has, in the past, been somewhat overlooked as a significant cause of pain. It is poorly recognised and often mismanaged (Baldry, 1998). In the majority of cases head and neck pain, has been found to be of myofascial origin and is, more often than not, related to trigger points (Murphy, 1989).

This study was conducted at the Chiropractic Day Clinic. Forty participants, suffering ETTH, were drawn from the province of Kwa-Zulu Natal. The clinical assessment included a case history and physical and cervical examinations. Algometer and Myofascial Diagnostic Scale readings provided the objective measurements and the subjective data were gained through the use of a headache diary and the Numerical Pain Rating Scale. The participants were requested to complete a Headache Diary over a period of 14 days. Following this, they returned to the Chiropractic Day Clinic for a second consultation. Data was collected at both consultations and the participants were offered one free treatment.

Data were entered into a MS Excel spreadsheet and imported into SPSS version 13.0 (SPSS Inc., Chicago, Illinois, U.S.A.) for analysis. A p value of <0.05 was considered statistically significant.

METHODS:

DESIGN

The design was a quantitative, pilot, non-intervention clinical assessment study of forty participants.

SAMPLE GROUP

The sample consisted of forty volunteers residing in the province of Kwa-Zulu Natal suffering from ETTH.

INCLUSION CRITERIA

- Participants had to be between the ages of 18 and 45 years, to minimize the coexistence of other disorders such as those associated with degenerative and chronic conditions (Travell *et al.*, 1999).
- Participants had to fulfill the diagnostic criteria for ETTH specified by the International Headache Society (1988).
 - A) At least ten previous headache episodes fulfilling criteria B-D listed below. Number of days with such headache fewer than a hundred and eighty a year (fewer than fifteen a month).
 - B) Headache lasting from thirty minutes to days.
 - C) At least two of the following characteristics:

1. Pressing/tightening (non-pulsating) quality.
2. Mild or moderate intensity (may inhibit, but does not prohibit activity.)
3. Bilateral location.
4. No aggravation by walking stairs or similar routine physical activity.

D) Both of the following:

1. No nausea or vomiting (anorexia may occur).
2. Photophobia and phonophobia are absent, or one but not the other is present.

E) At least one of the following:

1. History and physical or neurological examinations do not suggest one of the following:
 - a) Trauma.
 - b) Vascular disorders.
 - c) Non-vascular intracranial disorders.
 - d) Substances or their withdrawal.
 - e) Non-cephalic infection.
 - f) Metabolic disorders.
 - g) Disorders of the cranium, neck, eyes, nose, sinuses, teeth, mouth or other facial or cranial structures.
2. History and/or physical and/or neurological examinations do suggest such a disorder, but it is ruled out by appropriate investigation.

EXCLUSION CRITERIA

Patients were excluded from the study for the following reasons:

- A disorder mentioned in E (1) above was present.
- Participants that failed to sign the informed consent form.
- If they received any form of therapy during the course of the research period (medicinal therapy was permitted with the requirement that a note of it was made in the Headache Diary and the type of medication and frequency of intake was consistent with their past therapy).
- If they suffered from any other type of headache, e.g. migraine headache, during the research period.

SUBJECTIVE MEASUREMENT

▫ Headache Diary

A Headache Diary was completed over a period of two weeks. This included details of headache frequency, intensity and duration. The 24 hours of each day were divided into a day and night category and the patient was requested to cross each half hour for the period of time they were experiencing a headache. The Headache Diary was collected at the second consultation, 14 days after the initial consultation. The number of headaches per half hour per day and per night was then calculated.

Use of a Headache Diary has been found to give a qualitatively and quantitatively more precise diagnosis (Rasmussen *et al.*, 1992). A Headache Diary was used effectively by de Busser (2001) to compare the effectiveness of chiropractic manipulation with and/or without soft tissue treatment in the management of tension-type headaches in children.

▫ Numerical Pain Rating Scale (NRS)

The NRS formed part of the Headache Diary and was filled in daily, for a period of 14 days. Patients were asked to rate their headaches on a scale of

zero to 10, zero representing an absence of pain and 10 representing pain at its worst. An average of their pain was taken at 24 hours.

The NRS is effective in assessing pain intensity, as interpreted by the patient. Recording subjective data with the NRS 101 is reported to be a valid and reliable method when relating to the patient's level of pain (Jenson *et al.*, 1986).

OBJECTIVE MEASUREMENT

❖ Myofascial trigger point (MTrP) location

MTrP location was determined with the aid of the Trigger point manual by Travell *et al.* (1999) thus the following specific trigger point locations for the pericranial muscles were used:

The upper Trapezius

- The first trigger point (TrP1) is located in the middle of the upper portion of the Trapezius muscle, at its anterior border.
- The second trigger point (TrP2) is lateral and caudal to the first.

The Sternocleidomastoid muscle

This muscle is divided into two divisions, the sternal and clavicular divisions.

- The sternal division may contain trigger points in the upper, midfibre and lower fibre regions.
- The clavicular may contain MTrPs in the upper and midfibre regions. This division sits posterior and deep to the sternal portion of the muscle.

The Temporalis muscle

There are four sites at which one may locate MTrPs in the Temporalis muscle.

- Three of the MTrPs occur commonly at the musculotendinous junction, just above the zygomatic arch.
- The fourth MTrP is located at the mid fibre region of the posterior portion of the muscle and can be located in the area just behind the ear.

The Suboccipital muscles (Recti Capitis Posteriores Major and Minor and Obliqui Inferior and Superior)

- MTrPs in the Suboccipital muscles are found deep in the region of the occiput.

❖ **Myofascial Diagnostic Scale (MDS)**

The MDS was used to determine if MTrPs were active or latent and the extent to which the patient was suffering from pain due to MTrPs. The total score was 17; a score below 9 was considered a latent trigger point, while a score above 9 was an active MTrP. Measurements were taken at each MTrP and repeated at the second consultation.

The MDS has been found to give consistent readings and is the most appropriate tool for this purpose (Chettiar, 2001).

❖ **Algometer**

The algometer was used to determine the pressure threshold measurement. Initially, the MTrPs of each muscle were located through palpation. Following this, the footplate of the algometer was placed over the MTrP and a pressure was applied at approximately 1kg per centimetre squared per second, in the direction of the painful MTrP.

When the patients first felt pain they were requested to say "yes". At that point the algometer was removed and a reading in kg/cm squared was taken.

Readings were taken for each MTrP and were repeated at the second consultation.

The force dial algometer, manufactured by Wagner Instruments with an 11kg pressure range, was used for this study. Their address is P.O. Box 1217, Greenwich CT 06836, U.S.A.

This tool has been proven as an effective tool in diagnosing, assessing and managing MTrPs (Fischer, 1987).

STATISTICAL ANALYSIS

Data were entered into a MS Excel spreadsheet and imported into SPSS version 13.0 (SPSS Inc., Chicago, Illinois, U.S.A.) for analysis. A p value of <0.05 was considered statistically significant.

Since most of the data were highly skewed, non-parametric statistics were used to summarize the data (reported as medians and ranges) and to perform statistical hypothesis tests. Paired quantitative data were compared with the Wilcoxon signed ranks test; independent quantitative data with the Mann-Whitney test. Spearman's rank correlation was used to assess relationships between two quantitative variables, with scatter plots to graphically display any trends reported.

DEMOGRAPHICS

The sample consisted of forty participants (10 males and 30 females), as represented in Figure 1. The ages ranged from 19 to 45, with a mean age of 27.7 (SD 6.8) years.

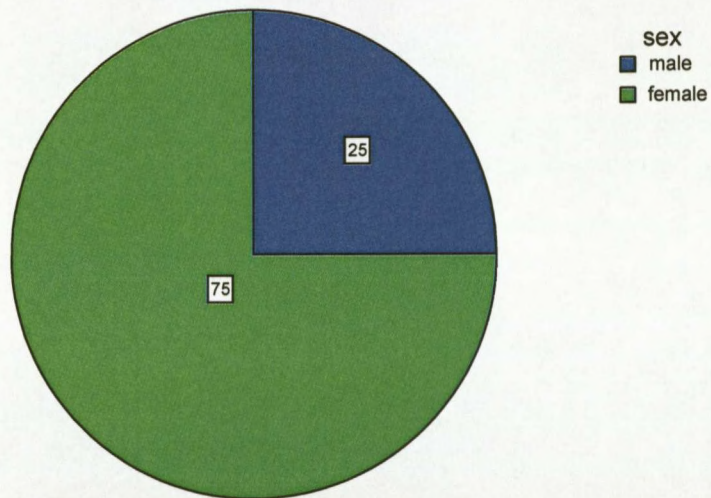


Figure 1: Female and male distribution of subjects

RESULTS

Objective 1:

To determine the nature, i.e. frequency, duration and intensity, of the ETTH.

1.1 Frequency and duration of ETTH

Headache episodes were converted to hours of headache over a 24-hour period. The distribution of this variable was highly positively skewed as seen in Figure 2.

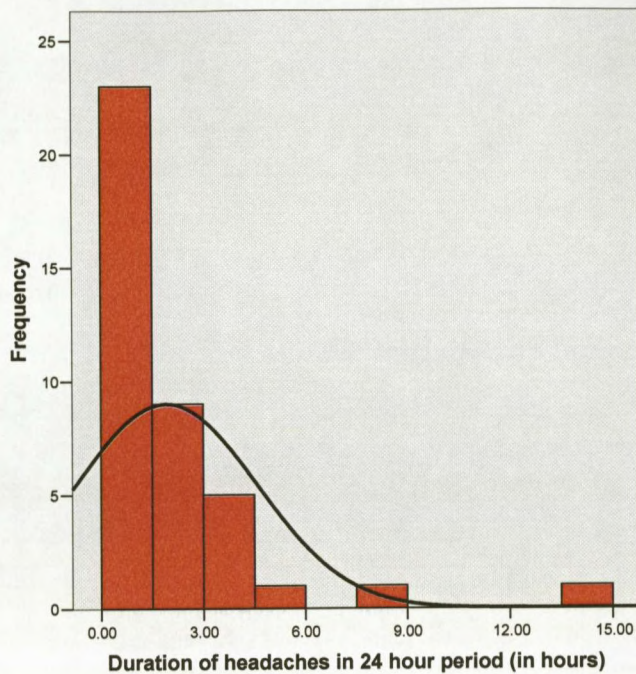


Figure 2 Histogram of duration of headaches in a 24-hour period.

Table 1 shows that the shortest duration of a headache episode was 0.11 hours and the longest was 14.32 hours, while the median duration was 0.77 hours. It was determined that 50% of the sample experienced less than one hour of headache over a 24-hour period and 25% of the sample experienced over 2.5 hours in a 24-hour period.

Table 1 Descriptive statistics for duration of headaches in 24-hour period (in hours)

N	Valid	40
	Missing	0
Median		0.77
Minimum		0.11
Maximum		14.32
Percentiles	25	0.45
	50	0.77
	75	2.6

The Wilcoxon signed ranks test was used to compare day time and night time headache episodes, and the test statistics followed in Table 3. The comparison of medians between day and night is shown in Table 2.

Table 2 Wilcoxon signed ranks test for comparison of headache episodes between day and night time

		N	Mean Rank	Sum of Ranks
Mean episodes of night-time headaches	Negative Ranks	32(a)	23	689
	Positive Ranks	8(b)	16.4	131
Mean episodes of day-time headaches	Ties	0(c)		
	Total	40		

a) Mean episodes of night-time headaches < Mean episodes of day-time headaches

b) Mean episodes of night-time headaches > Mean episodes of day-time headaches

c) Mean episodes of night-time headaches = Mean episodes of day-time headaches

Table 3 Test statistics

	Mean episodes of night-time headaches - Mean episodes of day-time headaches
Z	-3.752(a)
Asymp. Sig. (2-tailed)	<0.001

a) Based on positive ranks.

The median number of half-hour headache episodes during the day-time over the two-week period was 1.29 (range 0.7 to 21.4), while the median episodes of night time headaches was 0.64 (range 0 to 7.3). There was a significant difference ($p < 0.001$), with daytime headaches being more frequent than night time headaches.

1.2 Intensity of ETTH

Headache pain using the NRS scale was averaged over the two-week period. The distribution of pain was relatively Gaussian as illustrated by Figure 3 below.

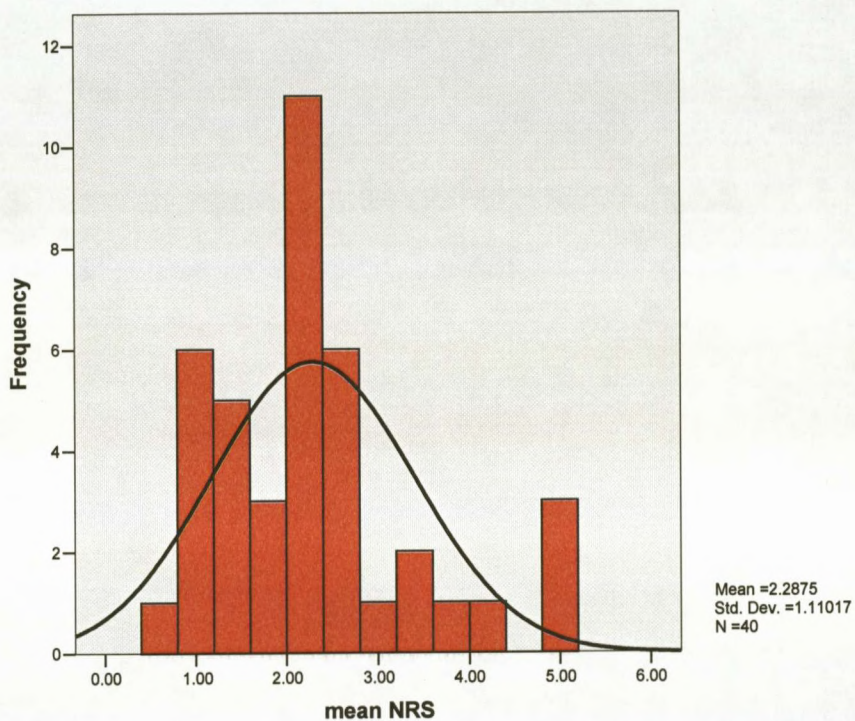


Figure 3 Histogram of the distribution of NRS pain scores in the sample

The mean and standard deviation were used to summarise these values. Mean NRS score over a 24-hour period was 2.3 (SD 1.1), with a range of 0.7 to 5.1. See Table 4.

Table 4 Descriptive statistics for mean NRS score over 24 hours

N	Valid	40
	Missing	0
Mean		2.3
Std. Deviation		1.11
Minimum		0.71
Maximum		5.07

Objective 2:

To determine the nature i.e. type, number and severity, of the MTrPs in the upper Trapezius, Temporalis, Suboccipital and Sternocleidomastoid musculature.

2.1 Myofascial Diagnostic Scale (MDS) (severity/muscle tenderness)

MDS scores were averaged over the two time-points and presented as median values for the sample. MTrP number one, located in the right upper Trapezius muscle, had the highest median (median = 10.25). The second highest was the uppermost MTrP in the clavicular portion of the right Sternocleidomastoid (SCM) muscle (median = 9.75), followed by the second MTrP in the upper Trapezius bilaterally, as well as the upper MTrP in the left clavicular portion of the SCM (median = 9.25). See Figure 4.

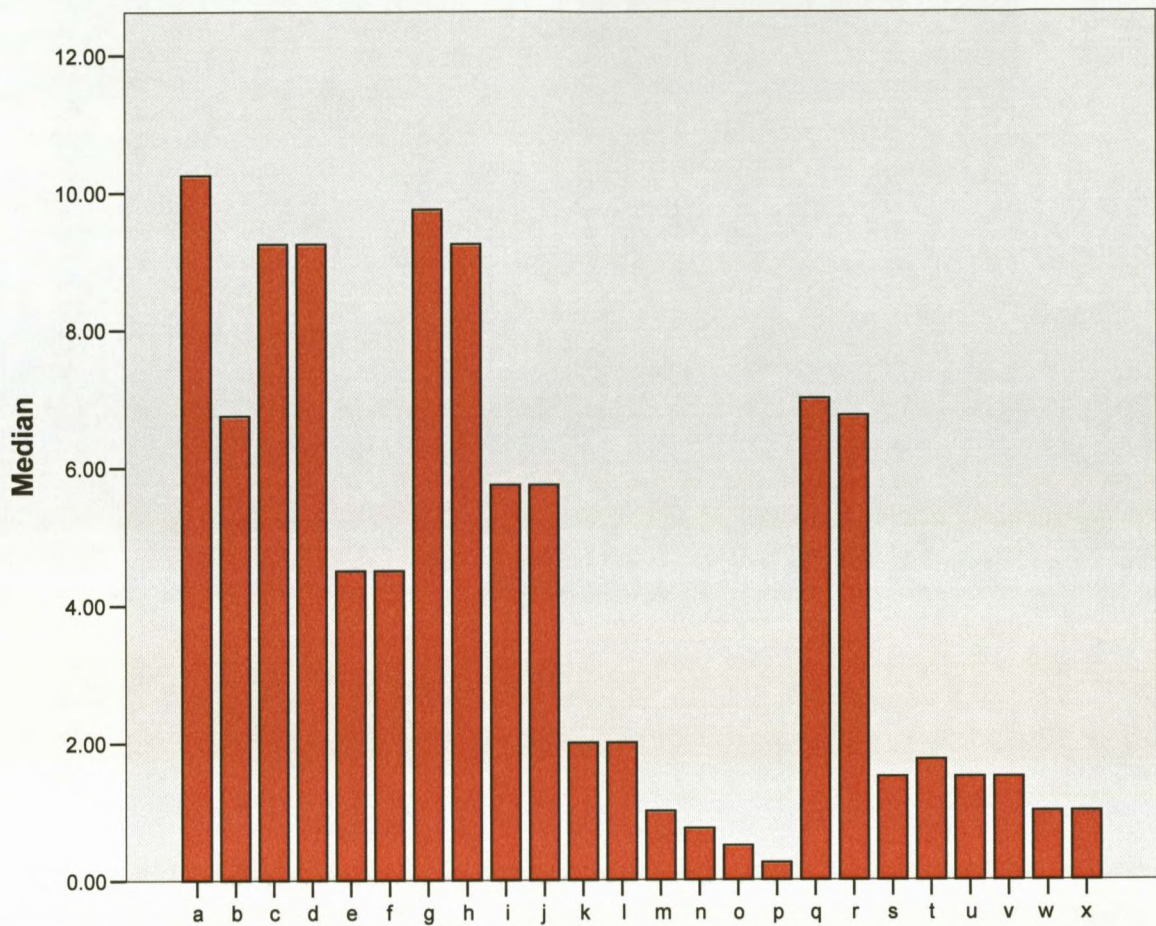


Figure 4 Median MDS scores for all muscles

Key

a) Right upper Trapezius MTrP number one	m) Right SCM midlevel MTrP
b) Left upper Trapezius MTrP number one	n) Left SCM midlevel MTrP
c) Right upper Trapezius MTrP number two	o) Right SCM lower MTrP
d) Left upper Trapezius MTrP number two	p) Left SCM lower MTrP
e) Right Suboccipital MTrP	q) Right Temporalis MTrP number one
f) Left Suboccipital MTrP	r) Left Temporalis MTrP number one
g) Right Sternocleidomastoid (SCM) upper clavicular MTrP	s) Right Temporalis MTrP number two
h) Left SCM upper clavicular MTrP	t) Left Temporalis MTrP number two
i) Right SCM clavicular midlevel MTrP	u) Right Temporalis MTrP number three
j) Left SCM clavicular midlevel MTrP	v) Left Temporalis MTrP number three
k) Right SCM upper sternal MTrP	w) Right Temporalis MTrP number four
l) Left SCM upper sternal MTrP	x) Left Temporalis MTrP number four

2.2 Algometer readings (severity/muscle tenderness)

Algometer scores were averaged over the two time-points and presented as median values for the sample in Figure 5. The scores were lowest in the clavicular portions of the SCM muscles and highest in the Temporalis and upper Trapezius muscles.

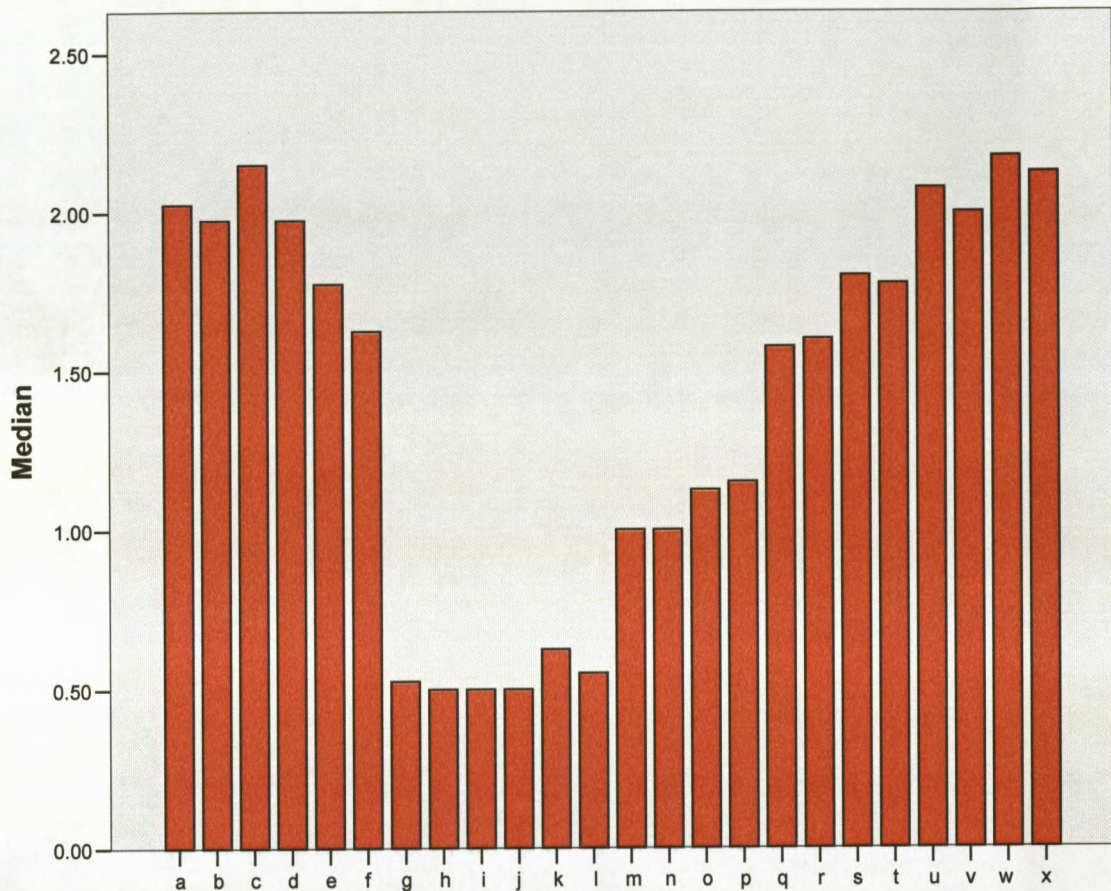


Figure 5 Median algometer scores for all muscles

Key

a) Right upper Trapezius MTrP number one	m) Right SCM midlevel MTrP
b) Left upper Trapezius MTrP number one	n) Left SCM midlevel MTrP
c) Right upper Trapezius MTrP number two	o) Right SCM lower MTrP
d) Left upper Trapezius MTrP number two	p) Left SCM lower MTrP
e) Right Suboccipital MTrP	q) Right Temporalis MTrP number one
f) Left Suboccipital MTrP	r) Left Temporalis MTrP number one
g) Right Sternocleidomastoid (SCM) upper clavicular MTrP	s) Right Temporalis MTrP number two
h) Left SCM upper clavicular MTrP	t) Left Temporalis MTrP number two
i) Right SCM clavicular midlevel MTrP	u) Right Temporalis MTrP number three
j) Left SCM clavicular midlevel MTrP	v) Left Temporalis MTrP number three
k) Right SCM upper sternal MTrP	w) Right Temporalis MTrP number four
l) Left SCM upper sternal MTrP	x) Left Temporalis MTrP number four

2.3 Active and latent MTrPs (type and number)

The median number of active trigger points per participant was 5.5 (range 0 – 14), while the median number of latent trigger points was 18.5 (range 10-24) as seen in Table 5 The average ratio of active to latent trigger points was 1:3.36.

Table 5 Descriptive statistics for number of active and latent trigger points

		Number of active trigger points	Number of latent trigger points
N		40	40
Median		5.50	18.50
Minimum		0	10
Maximum		14	24
Percentiles	25	2.00	16.00
	50	5.50	18.50
	75	8.00	22.00

The research problem:

To determine if a correlation exists between the clinical presentation of ETTH and MTrPs in the upper Trapezius, Temporalis, Suboccipital and Sternocleidomastoid musculature, in terms of the subjective and objective findings.

1.0 Correlation between MTrPs and ETTH

1.1 Correlation between number of active trigger points and duration and frequency of headaches

No correlation between the number of active MTrPs and the frequency and severity of ETTH was found as shown in Table 6 ($\rho = 0.077$ and 0.242 , respectively).

Table 6 Spearman's rank correlation between number of active trigger points and duration and frequency of headaches

Spearman's rho		Number of active trigger points
Mean headache NRS score	Correlation Coefficient	0.24
	Sig. (2-tailed)	0.13
	N	40
Mean duration of headaches in 24-hour period (in hours)	Correlation Coefficient	0.08
	Sig. (2-tailed)	0.64
	N	40

1.2 Correlation between number of latent trigger points and duration and severity of headaches

No correlation was found between the number of latent trigger points and the frequency and severity of headaches. The signs of the correlation coefficients were simply reversed when the number of latent trigger points was correlated against the pain and duration of headaches (see Table 7).

Table 7 Spearman's rank correlation between number of latent trigger points and duration and severity of headaches

		Number of latent trigger points
Mean headache NRS score	Correlation Coefficient	-0.24
	Sig. (2-tailed)	0.13
	N	40
Mean duration of headaches in 24-hour period (in hours)	Correlation Coefficient	-0.08
	Sig. (2-tailed)	0.64
	N	40

1.3 Correlation between severity and tenderness of trigger points and duration and severity of headaches

Table 8 Spearman's rank correlation between severity and tenderness of trigger points and duration and severity of headaches

Spearman's rho		Mean headache NRS score	Mean duration of headaches in 24-hour period (in hours)
Total MDS score	Correlation Coefficient	0.25	0.18
	Sig. (2-tailed)	0.11	0.26
	N	40	40
Total algometer score	Correlation Coefficient	-0.025	0.04
	Sig. (2-tailed)	0.88	0.82
	N	40	40

In Table 8 ETTH severity (NRS score) was not correlated with the MDS ($\rho = 0.254$, $p=0.113$) or algometer score ($\rho = -0.025$, $p=0.881$). The duration of the headache was not correlated with the MDS score ($\rho = 0.183$, $p = 0.258$), or with the algometer score ($\rho =0.037$, $p = 0.823$).

DISCUSSION

The higher percentage of females suffering ETTH that is evident in the present study is in keeping with previous studies (Janke *et al.*, 2004). This may be as a result of the fact that females are more likely to seek consultation than their male counterparts (Rasmussen, 1995). Headache episodes were found to be more common during the day-time which is in agreement with findings provided by Diamond (1987) and Raskin (1988).

The relatively high prevalence of active MTrPs documented in this sample is in keeping with Jensen's (1999) study, in which participants suffering from ETTH, when compared to headache-free individuals, were found to have significantly higher levels of pericranial tenderness. It can be deduced through the present study, and those previous to it, that individuals suffering from ETTH have a greater degree of pericranial tenderness compared to headache-free persons.

Travell *et al.* (1999) name the upper Trapezius and SCM muscles MTrPs as those that are commonly found in individuals suffering ETTH. In the present study the upper Trapezius MTrPs and the uppermost MTrP in the clavicular division of the SCM were prevalent, and exhibited the lowest algometer scores. This finding further confirms the presence of MPS in persons suffering ETTH as given by Mennell (1992). The need for assessment of MPS in the treatment and management of these individuals is thus highlighted.

CONCLUSION

No correlation was found between the algometer and Myofascial Diagnostic Scale, collectively, and the Headache Diary. It can be concluded that there was no correlation between the clinical presentation of ETTH and that of MPS, in terms of subjective and objective findings. The results may have been influenced by an insufficient sample size and the lack of a control group that would represent a baseline of myofascial involvement in headache free individuals. The decision to exclude a control group was made upon findings by Mennell (1992) that identified an association between MPS and ETTH.

A study by Fernández de las Peñas *et al.* (2006) revealed similar results to that of the present study, with regard to the Suboccipital muscles in particular. Their study found that active MTrPs may contribute to the maintenance of the ETTH but the actual role they play requires further investigation, thus the same can be said for the upper Trapezius, Suboccipital, SCM and Temporalis muscles.

REFERENCES

Baldry, P., 1998. Acupuncture, trigger points and musculoskeletal pain. Churchill Livingstone, Edinburgh, Scotland.

Chettiar, A. 2001. The therapeutic efficacy of action potential therapy in the treatment of myofascial pain syndrome. M.Tech: Chiropractic dissertation, Technikon Natal, Durban, South Africa.

de Busser, N.L. 2001. The relative effectiveness of chiropractic manipulation in conjunction with soft tissue treatment, as compared with soft tissue treatment alone, in the management of tension-type headaches in children. M.Tech:Chiropractic Dissertation, Durban Institute of Technology, Durban, South Africa.

Diamond, S. 1987. Muscle contraction headache. In Dalessio, D.J. (ed.). Wolff's Headache and other Head Pain. 5th ed. Pp.171-189. New York: Oxford University Press. 434pp. ISBN 0-19-504356-1.

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

Fernandez de las Penas C, Alonso-Blanco C, Luz Cuadrado, M. 2006. Myofascial trigger points in the suboccipital muscles in episodic tension-type headache. Manual Therapy, 11(3): 225-230.

International Headache Society. 1988. Classification and diagnostic criteria for headache disorders, cranial neuralgias and facial pain. Cephalgia, 8 (suppl 7).

Jamison, J.R. 1991. Health Promotion for Chiropractic Practice. Gaithersburg, Maryland: Aspen Publishers. 255p. ISBN 0-8342-0178-X

Janke, E., Holroyd, K. and Romanek, K. 2004. Depression increases the onset of tension-type headache following laboratory stress. *Pain*, 3(3): 230-238.

Jensen, R. 1999. Pathophysiological mechanisms of tension-type headache: a review of epidemiological and experimental studies. *Cephalgia*, 19(6):602-621.

Mennell, J.M. 1992. *The Musculoskeletal System: Differential Diagnosis from Symptoms and Physical Signs*. Gaithersburg, Maryland: Aspen Publishers. 191pp. ISBN 0-8342-0255-7.

Millea, P., Brodie, J. 2002. Tension-Type Headache. *American Family Physician*. (Online). Available from: <http://www.aafp.org/afp/20020901/797.html> (Accessed 26 March 2006).

Murphy, G.J. 1989. Myofascial Trigger Points. *Journal of Clinical Orthodontics*, 23:627-631.

Raskin, N.H. 1988. *Headache*. 2nd ed. New York: Churchill Livingstone. 96pp. ISBN 0-443-08547-1.

Rasmussen, B. 1995. Epidemiology of headache. *Cephalgia*, 15:45-68.

Schwartz, B., Walter, F., Simon, D. and Lipton, R. 1998. Epidemiology of Tension-Type Headache. *Journal of American Medical Association*, 279(5):381-383.

Travell, J.G., Simons, D.G. and Simons, L.S. 1999. *Travell and Simons' Myofascial Pain and Dysfunction: The Trigger Point Manual: Volume 1, Upper half of body*. 2nd edition. Baltimore, Maryland: Williams and Wilkins. 2 vols. 1038pp. ISBN 0683-08367-8.