THE ASSOCIATION BETWEEN MYOFASCIAL TRIGGER-POINTS IN THE MASSETER MUSCLE GROUP AND EPISODIC TENSION - TYPE HEADACHES, IN THE WATERBERG DISTRICT.

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DECLARATION

I, Wilna-mari van Staden declare that this research report is my own work. It is being submitted for the degree of Master of Science in Physiotherapy in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.

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18 day of September 2012

Dedicated to my loving and supportive husband Jaco

And our baby daughter, Lune born on 18/02/2011.

ABSTRACT

Headache is a common complaint in society and is related to personal, biomechanical and socioeconomic circumstances. In current literature trigger-points (TrPs) in the majority of the muscles of the face and neck contributing to tension-type headache (TTH) have been evaluated, except the TrPs of the masseter muscles. The aim of this study is to determine the association between myofascial (TrPs) in the masseter muscle group and episodic tension-type headache (ETTH). Fourteen subjects with ETTH were matched with same sex and same age subjects not suffering from headache acting as the control group. The diagnostic criteria as described by Simons and Travel (1999) were used in the objective tests to diagnose the TrPs in the masseter muscles. Subjective tests included a disability questionnaire, National stress awareness day stress questionnaire, (NSAD stress questionnaire), a precipitating and aggravating factors questionnaire. Active TrPs were found in 92.86% of ETTH group and 7.14% had latent TrPs. Within the control group 7.14% had active TrPs, 14.29% latent TrPs and 78.37% had no TrPs. Differences in the presence of masseter TrPs between the ETTH and control group were significant with p-value <0.001. All the questions asked in the headache disability questionnaire evaluating headache frequency, intensity and severity were significant with p-value<0.005. The NSAD stress questionnaire revealed statistical significant values for questions pertaining to muscular aches and pains and subjectively subjects claimed that they felt tension at work. The precipitating questionnaire showed that physical activity, stress / tension and reading were significant precipitating factors for developing a tension-type headache. The aggravating questionnaire only showed light as an aggravating factor. Stress and tension had 100% “yes” answers in the ETTH group. Weather as an aggravating factor had 100% “no” answers from the control group. Physical activity, driving and noise had relative high percentages of “yes” answers from the ETTH group and higher probability scores for being an aggravating factor when comparing the ETTH and control group, but were not found to be statistically significant. Myofascial TrPs in the masseter muscle group contribute to the origin and or maintenance of ETTH.

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List of abbreviations:

Episodic tension-type headache – ETTH

Chronic Tension-type headache – CTTH

Trigger points – TrPs

Active trigger points – AtrPs

Latent trigger points - LtrPs

Temperomandibular joint –TMJ

Temperomandibular disorder - TMD

International Headache Society – ICS

International Classification of Headache syndromes – ICH

List of definitions

Primary headache:

Migraine with and without an aura:

Migraine without aura: Recurrent headache disorder manifesting in attacks lasting 4-72 hours. Typical Characteristics of the headache are unilateral location, pulsating quality, moderate or severe intensity, aggravating by routine physical activity and association with nausea and / or photophobia and phonophobia, (International Headache Society, 2004).

Migraine with aura: Recurrent disorder manifesting in attacks of reversible focal neurological symptoms that usually develop gradually over 5-20 minutes and lasts for less than 60 minutes. Headache with features of migraine without aura usually follows the aura symptoms. Less commonly, headache lacks migrainous features or is completely absent, (International Headache Society, 2004).

Typical aura with migraine headache: Typical aura consisting of visual and/or sensory and / or speech symptoms. Gradual development, duration no longer than one hour, a mix of positive and negative features and complete reversibility characterise the aura which is associated with a headache fulfilling criteria, (International Headache Society, 2004).

Tension type headache:

Episodic Tension-type headache: Frequent episodes of headache lasting minutes to days. The pain is typically bilateral, pressing or tightening in quality and of mild to moderate intensity, and it does not worsen with routine physical activity. There is no nausea but photophobia or phonophobia may be present. At least 10 episodes occurring on ≥ one but < 15 days per month for at least 3 months, (International Headache Society, 2004).

Chronic Tension-type headache: The disorder evolving from episodic tension-type headache, with daily or very frequent episodes of headache lasting minutes to days. The pain is typically bilateral, pressing or tightening in quality and of mild to moderate intensity and it does not worsen with routine physical activity. There may be mild nausea, photophobia or phonophobia. Headache occurring on ≥15 days per month on average for >three months, (International Headache Society, 2004).

Cluster headache: Attacks of severe, strictly unilateral pain which is orbital, supraorbital, temporal or in any combination of these sites, lasting 15-180 minutes and occurring from once every other day to 8 times a day. The attacks are associated with one or more of the following, all of which are ipsilateral: conjunctival injection, lacrimation, nasal congestion, rhinorrhoea, forehead and facial sweating, miosis, ptosis, eyelid oedema. Most patients are restless or agitated during an attack, (International Headache Society, 2004).

Hemicranias continua: Persistent strictly unilateral headache responsive to Indomethacin, (International Headache Society, 2004).

Secondary headache: Another disorder known to be able to cause headache has been demonstrated, headache occurs in close temporal relation to the other disorder and / or there is other evidence of a causal relationship, headache is greatly reduced or resolves within three months (this may be shorter for some disorders) after successful treatment or spontaneous remission of the causative disorder, (International Headache Society, 2004).

Cervicogenic headache: Pain referred from a source in the neck and perceived in one or more regions of the head and / or face, Clinical, laboratory and or imaging evidence of a disorder or lesion within the cervical spine or soft tissues of the neck known to be, or generally accepted as a valid cause of headache. Evidence that the pain can be attributed to the neck disorder or lesion based on the demonstration of clinical signs that implicate a

source of pain in the neck or abolition of the headache following diagnostic blockade of a cervical structure or its nerve supply using placebo- or other adequate controls. The pain resolves within three months after successful treatment of the causative disorder or lesion, (International Headache Society, 2004).

Headache due to tumour or metastatic disease: Diffuse non-pulsating headache with either nausea or vomiting, or worsened by physical activity and or manoeuvres known to increase intracranial pressure and occurring in attack-like episodes. And also space-occupying intracranial tumour demonstrated by CT or MRI, (International Headache Society, 2004).

Hormone induced headache: Regular use of exogenous hormones, typically for contraception or hormone replacement therapy, can be associated with increase in frequency or new development of headache. Headache develops or markedly worsens within three months of commencing exogenous hormones; headache resolves or reverts to its previous pattern within three months after total discontinuation of exogenous hormones, (International Headache Society, 2004).

Trauma related headache e.g. Whiplash: Headache develops within seven days after whiplash injury, associated at the time of injury with neck pain. The clinical manifestations include symptoms and signs that relate to the neck, as well as somatic extra cervical, neurosensory, behavioural, cognitive and affective disorders whose appearance and modes of expression and evolution can vary widely over time, (International Headache Society, 2004).

Group I temperomandibular joint dysfunction: Muscle Disorders including myofascial pain and or myofascial pain with limited mouth opening (Look, et al. 2010).

Group II temperomandibular joint dysfunction: Disc Displacements including (IIa) disc displacement with reduction; (IIb) disc displacement without reduction with limited

mouth opening; (IIc) disc displacement without reduction and without limited mouth opening (Look, et al. 2010).

Group III temperomandibular joint dysfunction: Arthralgia, Arthritis, Arthrosis: (IIIa) arthralgia; (IIIb) osteoarthritis; (IIIc) osteoarthrosis, noted with audible clicking and grinding. (Look, et al. 2010)

Myofascial trigger point: (Simons and Travel, 1999).

- **(Clinical definition of a central trigger point.):** a hyperirritable spot in skeletal muscle that is associated with a hypersensitive palpable nodule in a taut band. The spot is painful on compression and can give rise to characteristic referred pain, referred tenderness, motor dysfunction, and autonomic phenomena. Types of myofascial trigger points include: active, associated, attachment, central, latent and satellite trigger point.
- **(Etiological definition):** a cluster of electrically active loci each of which is associated with a contraction knot and a dysfunctional motor endplate in skeletal muscle.

Active myofascial trigger point: a myofascial trigger point that causes a clinical pain complaint. It is always tender, prevents full lengthening of the muscle, weakness 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 patients pain tolerance, produces referred motor phenomena, generally in its pain reference zone, and causes tenderness in the pain reference zone.

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 point and always has a taut band that increases muscle tension and restricts range of motion.

Bruxism: Clenching of the teeth, resulting in rubbing, gritting or grinding together of the teeth, usually during sleep (Ramirez, et al. 2004).

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CHAPTER 1

1.0 INTRODUCTION

The background for this particular study will be explained including problem statements, the main aims, objectives and the significance of the study.

1.1 Background

Headache as stated by the International Classification of Headache Society (ICH) is defined as pain located above the orbitomeatal line. (ICH, 2004). Headache can generally be described as a pain felt in the head arising from any cause (Anderson, 1998). Headache is a common complaint in society and is related to personal, biomechanical and socioeconomic circumstances (Jull and Sterling, 2008). Headache has been called “the most common complaint of civilized man”, affecting approximately two-thirds of the world population (Bruckner and Khan, 2000). The World health organisation (WHO) ranked headache as number 19 among all diseases causing disability. (ICH, 2004). Tension-type headaches (TTH) account for nearly 90% of all headaches. (Rasmussen, et al., 1991). The ICH states the lifetime prevalence in the general population ranges from 30 -78% in various studies. (ICH, 2004). Approximately 3% of the population have chronic tension-type headaches (CTTH)

Tension-type headache is considered to be the prototype of headache with myofascial tissues playing an important role in the genesis of TTH, (Jensen and Olesen, 1996). The role of myofacial tissues in the genesis of TTH can be further explained by Gerwin (2005) and Jensen (2005) that have claimed that pain from the pericranial head; neck and shoulder muscles might be referred to the head, and be experienced as headache. Simons and Travell (1999) also described the referred pain patterns from different myofascial trigger-points (TrPs) in head and neck muscles, which produced pain features that are usually found in subjects presenting with TTH.

In clinical practice it is common for physiotherapists to treat the posterior compartment of the neck, which includes the deep and superficial neck extensor muscles, the zygapophysial joints, ligaments and other connective tissues, when treating pathology of the cervical spine and myofacial tissues that may refer pain to the head causing headaches. (Biondi 2000). Treatment of the anterior compartment of the neck for headaches usually only include the treatment of the sternocleidomastoid muscle as it is known that active trigger-points (ATrPs), in this muscle refers pain to the lateral aspect of the head and face. As no literature includes the association of the master muscle TrPs in the genesis of headaches, it is frequently not included in the management of headaches, but more specifically TTH.

As physiotherapists are encouraged to use treatment regimes that are evidence based it is only with severe temperomandibular joint (TMJ) dysfunction characterised by an audible clicking and grinding, that clinicians generally treat more specifically into the TMJ and the muscles of mastication (Grant and Niere, 2000, as quoted by Niere and Quin, 2007). Previous studies focussing on the contributing factors for ETTH included the evaluation of TrPs in the temporalis muscles, sternocleidomastoid muscles, deep occipital muscles, superior trapezius and levator scapula muscles as well as digastric and medial and lateral pterigoid muscles (Fernandez-de-las-Peñas, et al., 2007; 2006a, b; Simons and Travell., 1999; Atkinson and Vossler, 1982). Yet no studies exist to include the masseter muscle's trigger-points contribution in the genesis of TTH.

1.2 Problem statement

The theory that TrPs in the masseter muscle plays a role in the pain and symptoms individuals suffering from ETTH experience cannot be supported or negated. From an anatomical point of view, as well as from a biomechanical understanding, it becomes evident that the masseter and temporalis muscles act as synergists. They play a central part in mastication and tension when looking at jaw clenching. The TrPs in the temporalis muscle has been found to be a contributing factor in the pain perceived by ETTH sufferers (Fernandez-de-las-Peñas, et al., 2007; Lipchik, 1996). The fact that

temporalis and masseter muscles share the same nerve supply also supports the reasoning to investigate the TrPs in the masseter muscle and their association with the pain perceived in ETTH sufferers. To date there is no published evidence that has included the TrPs in the masseter muscle as a contributing factor in the pain perceived by individuals suffering from ETTH.

1.3 Aim of the study

The aim is to determine the association between myofascial TrPs in the masseter muscle group and ETTH.

1.4 Study objectives

The objectives of the study are to:

1. Determine the proportion of ATrPs in the masseter muscle in patients suffering from ETTH.
2. Determine if the myofascial TrPs in the masseter muscle contribute to the pain perceived by individuals suffering from ETTH, and
3. Determine other factors that may contribute to ETTH.

1.5 Significance of the study

This study may add to the current evidence that myofascial TrPs in the masseter muscles are a contributing factor in ETTH. The study will increase awareness amongst physiotherapists treating individuals suffering from ETTH. It may indicate that the muscles of mastication, temporalis and also masseter, contribute to the presentation and pain experienced in ETTH. The treatment of these muscles would therefore then need to be incorporated into a holistic treatment approach that is evidence based.

CHAPTER 2

2.0 LITERATURE REVIEW

In this chapter the literature pertaining to the study will be discussed. Relevant studies that have served to classify and identify different types of headaches, trigger-points and study instrumentations as well as the relevant questionnaires will be discussed. The relationship of the TMJ with the cervical spine and the myofascial trigger-point will also be reviewed including methodological considerations.

PubMed, EBSCO Host, Medline and PEDRO were used as search engine in this study, Key words included, tension-type headache, masseter muscle, trigger-points and myofacial tissues.

2.1 Classification of headaches

The revised International Classification of Headache syndrome, by ICS classifies headaches into either primary or secondary headache disorders (Gobel, 2001). Headache, as a primary disorder, includes migraine with and without aura, tension-type headache, cluster headaches and hemicrania continua. Headache as a secondary disorder is known as a symptom arising from another recognizable cause (Jull and Sterling, 2008). The most prevalent headache in the category of secondary headache disorders is cervicogenic headache. Other secondary headaches include headache due to tumour and metastatic disease, hormone induced headache and headache following trauma to the cervical spine e.g. whiplash disorders (Gobel, 2001).

Tension-type headache is classified as a primary headache and is defined as pain arising from the head, face, the cervical spine and other cervical structures that include muscles, ligaments, fascia, disc, vascular and neural structures as well as zygapophysial joints (Jull and Sterling, 2008; Maitland, 2001; Gobel, 2001). Previous terms used to describe TTH as cited in the ICS, - include: “tension headache, muscle contraction headache, psychomyogenic headache, stress headache, ordinary headache, essential headache, idiopathic headache and psychogenic headache”

(Gobel, 2001).

The ICS further defines an ETTH as frequent episodes of headaches lasting minutes to days. The pain is typically bilateral, pressing or tightening in quality and of mild to moderate intensity, and it does not worsen with routine physical activity. There is no nausea but photophobia or phonophobia may be present. Individuals suffering from ETTH, experience at least 10 episodes per month occurring on ≥1 but < 15 days, for at least three months, ≥ 12 and < 180 days per year and the headache lasts from 30 minutes to seven days (Gobel, 2001).

2.1.1 Differential diagnosis

Episodic tension-type headache often coexist with migraine without aura. Coexisting TTH in migraineurs should preferably be identified by a diagnostic headache diary (Gobel, 2001) or a headache questionnaire (Niere and Quin, 2007). It is important to differentiate between these two primary headaches types as treatment of migraine differs considerably from that of tension-type headache. Correct diagnosis aids in the selection of the right treatment and prevention from “medication overuse” in headache sufferers (Gobel, 2001).

2.2 Anatomical and biomechanical considerations

Myofascial tissues and myofascial tissue disorders play an important role in primary type headaches, especially TTH (Jensen and Olesen, 1996). Previous studies have linked myofascial tissue disorders in having a direct interrelationship to the genesis of tension type headache, and even mechanical neck pain. (Fernandez-de-las-Peñas, et al., 2007; 2006a, b; Simons, et al., 1999). Myofascial tissues are described by Hertling and Kessler (2006) as those tissues that are either musculoskeletal or connective tissue in makeup and origin. The authors are in agreement that the interrelationship between these tissues and the mechanical dysfunction that can be directly linked to their aberrant function, demands the closest attention.

The referred pain patterns from different myofascial TrPs in the head and neck muscles give rise to headache symptoms that patients complain of when seeking medical treatment. These myofascial TrPs may mimic the signs and symptoms found in both primary and secondary types of headache. (Fernandez-de-las-Peñas, et al., 2007; 2006a, b; Simons, et al., 1999).

Tension-type headaches may be caused by muscle tension around the head and neck. One of the theories claims that the main cause of TTH is teeth clenching, causing a chronic contraction of the temporalis muscle (Rasmussen, et al., 1991). Ramirez, Sandoval and Ballesteros (2004) also found bruxism to play a meaningful role in craniofacial referred symptoms such as TTH. Ramirez, et al., (2004) stated that non-functional clenching and grinding of the teeth (bruxism) can exceed the structural and physiological tolerance of muscles, teeth and the TMJ, sensitizing the neurons of the spinal nucleus of the trigeminal nerve in the brain stem. The sub nucleus caudalis in the brain stem receives these craniofacial nociceptive afferent signals. Convergence of these afferent nerves toward the trigeminal spinal nucleus, the thalamus and the cortex can confuse the brain in the localization of the specific source of the peripheral pain (Ramirez, et al., 2004).

Although the pathogenesis of tension-type headaches are poorly understood, it has been demonstrated that the most prominent clinical finding is an increase in tenderness to palpation of the pericranial tissue. (Fernández De las Peñas, et al. 2010). A decrease in pressure pain thresholds in CTTH but not in ETTH has been viewed, yet pressure pain sensitivity is consistent in ETTH. (Fernández De las Peñas, et al. 2010)

Sensitization of the pericranial myofacial tender tissue sensitised due to noxious stimuli, stimulate afferent neurons at the level of the spinal dorsal and or the trigeminal nucleus. (Fernández De las Peñas, et al. 2010).

Holmes and Zimmerman (1983) are of the same opinion but also emphasised the

psychophysiological theory and feel that emotional tension leads to physical involuntary tension-relieving mechanisms such as the above mentioned bruxism and jaw-clenching and this leads to muscle fatigue and subsequent spasm. They concluded in their study on TMJ dysfunction and headaches that muscle spasm particularly of the medial and lateral pterigoid muscles, the temporalis and the masseter caused TTH. Yet they never tested the muscles individually for their contribution to the TTH perceived. Both authors refer to jaw-clenching as a factor in the genesis of TTH. Rasmussen, et al. (1991) refers specifically to jaw-clenching where the muscles in itself undergoes physical tension, muscle fatigue and spasm, but, the authors Holmes and Zimmerman (1983) using the psychophysiological theory, is of the opinion that when an individual is under emotional stress, the individual will use an emotional tension-relieving mechanism like teeth clenching as a coping strategy. Yet this same emotional tension relieving mechanisms will cause physical tension within the muscle and pathology.

The masseter and temporalis muscles are collectively known as the muscles of mastication. Anatomically, they have the same nerve supply via the trigeminal nerve, specifically the anterior trunk of the mandibular nerve CN V3. These muscles also share the same arterial blood supply via the maxillary artery. Biomechanically, they act as synergists in temporomandibular occlusal activities (Moore and Dalley, 2006).

The muscles of mastication (temporal, masseter, medial and lateral pterigoid muscles) develop from the mesoderm of the embryonic first pharyngeal (mandibular) arch. These four muscles are all innervated by the nerve of that arch, the motor root of the mandibular nerve (CN V3). These muscles act as the prime movers of the TMJ (Moore and Dalley, 2006). The masseter muscle specific function is mandibular elevation and mandibular protrusion. As these muscles are anatomically linked it once again emphasizes the need to include the masseter muscle in a similar study as that done for the temporalis, medial and lateral pterigoid muscles in the ETTH population.

The temperomandibular joint is a modified hinged type of synovial joint. The articular surfaces are formed by the condyle of the mandible and the articular tubercle of the temporal bone and the mandibular fossa. The TMJ joint capsule is arranged loosely with the disc dividing the joint into two separate joint spaces. Each joint has its own synovial lining, predisposing the joint to synovial joint pathology. With the TMJ continuously in motion with eating, chewing and talking excessive stress is placed on the joint by increasing the joint compression as with clenching and this also adds to the formation of pathology. Look, John and Tai (2010) described three different groups of temporomandibular joint dysfunction. The TMJ complex does not function in isolation, and pathology within the joint will affect structures away from the TMJ joints for example the cervical spine..

2.3 Relationship of the TMJ complex with the cervical spine

The cervical spine and the TMJ are closely connected with musculature connecting the mandible to the cranium, the hyoid bone and the clavicle (Moore and Dalley, 2006; Norkin and Levangie, 1992). The cervical spine is, in essence, interposed between the proximal and distal attachments of some of the muscles and influences the position of the mandible. The posture of the head can also affect the resting position of the mandible where a forward shift of the cranium will decrease the space in the TMJ. Many of the symptoms of the TMJ dysfunction are similar to symptoms of cervical spine problems. Many patients with TMJ dysfunction have concurrent cervical spine problems. In a study by Fernandez-de-las-Peñas, et al., (2006a) examining TrPs in the sub occipital muscles and forward head posture in TTH, it was stated that hyperextension of the neck or increased cervical lordosis is a common consequence of forward head posture. Their study concluded that the craniovertebral angle was smaller in (CTTH) subjects than in controls. They also concluded that the degree of the forward head posture correlated positively with the headache frequency. Pathology of the cervical spine can alter the biomechanics of the TMJ as a result of the change in the cranio-vertebral angle and hence can be a precipitating factor of TTH. (Fernandez-de-las-Peñas, et al., 2006a). One has to note that this study was conducted CTTH

sufferers and not ETTH sufferers. The study also had a relatively small sample size of only 20 CTTH subjects, nine men and eleven women.

Atkinson, et al., (1982) found in their study on the evaluation of facial, head, neck and TMJ pain patients that subjects with medial pterygoid muscle tenderness also had masseter and hyoid muscle tenderness. Masseter muscle tenderness was strongly related to sternocleidomastoid and mylohyoid muscle tenderness in the neck area. This study was conducted on 12 non-randomly selected subjects with a history of TMJ pain dysfunction syndrome and not specifically in TTH sufferers.

It was for this reason that any subject with cervical spine pathology was excluded from this study.

2.4 Myofascial pain syndromes- the myofascial trigger-point

Simons, et al., (1999) define myofascial TrPs, both clinically and aetiologically, as a hyper-irritable spots in skeletal muscle that is associated with a hypersensitive palpable nodule in a taut band of myofascial tissue. The myofascial TrPs are painful on compression, palpation and/or stretch, and can give rise to the typical referred pain pattern, referred tenderness, motor dysfunction and autonomic phenomena (Simons, et al., 1999). When these signs are found to be positive in the respective myofascial tissue, it is classified as AtrPs.

The active trigger-point is further described as a cluster of electrically active loci each of which is associated with a contraction knot and a dysfunctional motor endplate in skeletal muscle (Simons, et al., 1999).

Further classification of myofascial trigger-points describes latent trigger-points (LtrPs) as myofascial trigger-points that is only painful on palpation, and may not be an

immediate source of pain, but may produce other muscle dysfunctions such as fatigue and restricted joint range of motion (Simons, et al., 1999).

Trigger-points, active and latent, may refer pain, alter sensation, can cause autonomic phenomena, change joint biomechanics, affect joint and muscle range of motion, overload joints and cause muscle weakness and later muscle dysfunction (Simons, et al., 1999).

Myofascial pain syndrome is defined as the sensory, motor and autonomic symptoms caused by myofascial trigger-points. Myofascial pain syndromes are also described as a regional pain syndrome of any soft tissue origin. The most common element in myofascial pain syndromes is the myofascial trigger-point, and the specific muscle or muscle group that causes the symptoms should be identified (Simons, et al., 1999).

Studies done by Fernandez-de-las-Peñas, et al., (2007; 2006a,b); Miguel, et al., (2001); Simons, et al., (1999.) and Atkinson, et al., (1982), have shown that myofascial TrPs in the muscles of the face and neck are the direct cause of the individual's headache episodes. This has been found to be true for patients suffering from primary and secondary headache syndromes. Bernhardt, et al., (2005), stated that palpation of the sensitive masticatory muscles showed a significant relation to the occurrence of frequent headache, especially TTH. These studies have tested temporalis, superior trapezius, sub-occipitales, levator scapulae, sternocleidomastoid and the extra ocular muscles. Although there is abundant evidence to show that myofascial TrPs in these muscles contribute to the headache symptoms, there is currently no published evidence indicating that myofascial TrPs in the masseter muscle contribute to headache symptoms as well.

According to Simons, et al., (1999), the diagnosis of myofascial pain due to TrPs depends on, at the very least the presence of:

1. the regional or local pain situated in any structure of the body, typically with a

deep aching quality,

2. the presence of a focally tender spot in a taut band of skeletal muscle (the trigger point) usually but not invariably, distant from or outside of the clinical pain site,
3. The application of 2-4kg/cm² of pressure on the trigger point that reproduces the clinical pain complaint within 10 seconds.
4. Lastly Simons, et al., (1999) added the diminished range of motion of the involved muscle due to pain.

It is for this reason that a hand-held digital pressure algometer with a round tip of 1 cm² was used in this study. This is the same algometer that Ylinen, et al., (2007) used in his study, conducted on the repeatability of pressure algometry on the neck muscles, when he stated that palpation by an experienced practitioner may be a sufficiently reliable method for screening painful areas and may reveal the site of pain. Ylinen, et al., (2007), does not state what he classifies as an "experienced practitioner", but Fernandez-de-las-Peñas, et al., (2007; 2006a, b) mentions the use of an assessor who had more than 4 years' experience in TrPs diagnosis. The pressure tip was placed against the trigger-point of the masseter muscle for 10 seconds, in accordance with the criteria set out by Simons, et al, (1999).

Trigger-points produce dysfunction, because they increase muscle tension, and they often produce pain (Simons, et al., 1999). Trigger-points in the masseter muscles most likely cause severely restricted jaw opening as TrPs cause muscle tension. Myofascial TrPs, with myofascial pain and limitation in range of motion on mouth opening, are signs and symptoms of grade one myofascial TMJ dysfunction. The limitation in mouth opening is described by Look, et al., (2010) as mouth opening of less than 40mm or the ability to position three (index, middle and ring) fingers vertically aligned between the upper and lower central incisors up to the first distal interphalyngeal folds.

Simons, et al., (1999) explains that the referred pain from TrPs in the masseter muscle may project to the eyebrow, maxilla, mandible anteriorly and to the upper or lower molar

teeth. The deep layers of the masseter muscle may refer pain deep into the ear and the region of the TMJ. Simons, et al., (1999) were the only authors to acknowledge that pain caused by the masseter TrPs is often a component of TTH and may be seen with cervicogenic headache as well. It is noted that they did not specifically test the ETTH and cervicogenic headache population but found in individuals that had positive TrPs in the masseter muscle that some also suffered from these headaches.

The section below reviews methods that were employed in this study.

2.5 Methodological considerations

Fernandez-de-las-Peñas, et al., (2007, 2006a, b) paired subjects in their study testing the sub-occipital muscles in ETTH, with healthy individuals of the same-age and sex, as a basis for comparison. The reason for pairing subjects on same-age basis would limit age related pathology bias. Sex related pairing would limit the female / male discrepancy in ETTH epidemiology findings, as females are generally more prone to TTH, than their male counterparts (Rasmussen, et al., 2001).

All of the studies conducted by Fernandez-de-las-Peñas, et al., (2007, 2006a, b) only tested eleven symptomatic individuals comparing them with eleven same-sex and same-age non-symptomatic individuals. This is a relatively small sample size but, considering that 3% of the total world population can be diagnosed with ETTH and that cervical spine pathology should be ruled out, eleven test subjects with a standard deviation of 10% the power calculation of 95% still makes the study clinically relevant.

Rasmussen, et al., (2001) stated that TTH were more common in the less educated and lower income groups in the United States of America. In the 2006 study on the presence of TrPs in the sub-occipital muscles in ETTH individuals, Fernandez-de-las-

Peñas, et al., (2006a; b) found no significant differences based on gender or age between the study groups. They did however find that in the ETTH group sixty present (60%) of the subjects had positive AtrPs and forty percent (40%) had LtrPs. They also concluded that twenty percent (20%) of the control group, not suffering from ETTH, had LtrPs.

Ylinen, J. et al. (2007) stated that a hand-held digital pressure algometer is sufficient and reliable method for screening painful areas and may reveal the site of pain. Ylinen, J. et al. (2007) used a hand held digital pressure Algometer (Force Five, Wagner Instruments, Box 1217, Greenwich, CT 06836) with a round tip of 1 cm^2 in their study on the repeatability and reliability of the use of the pressure algometer on the neck muscles. The same pressure Algometer was used on each trigger point of the masseter muscles for the objective evaluation of active and latent trigger points.

Headache in itself is a wide category of pain disorders, debilitating in its effect. With this in mind it is not surprising that psychological risk factors contribute to the disability and debilitating effect of headaches. Nicholson, et al., (2007) have used the bio psychosocial framework and viewed what factors influence headache by considering the role psychological (cognitive and affective) factors have in the development, course and consequences of headache. They concluded that neural circuits, responsible for cognitive-affective phenomena, are highly interconnected with the circuitry responsible for headache pain. They reviewed the influence that cognition and negative affect (depression, anxiety and anger) had on the development of headaches and the frequency and perception of headaches. The authors concluded that headaches are influenced by not only the medical contributing factors but also the psychological factors and thus by managing the patient suffering from headaches in the bio-psychosocial framework, more effective treatment can be given. Nicholson, et al., (2007).

Spierings, et al., (2001) utilised a precipitating and aggravating factors questionnaire

based on the IHS criteria to determine whether there were headache precipitating and aggravating factors that differentiate TTH from migraine. In their study they interviewed 38 subjects with migraine and 17 with TTH. The questionnaire enquired about the following aggravating and precipitating factors namely: physical activity, straining, bending over, stress/tension, coughing/sneezing, fatigue, reading, driving, lack of sleep, specific food or drinks, alcohol, not eating on time, smoke, smell, light, noise, menstruation for the female subjects and weather. They concluded that weather; smell smoke and light were the significant ($p \leq 0.05$) precipitating factors that differentiated migraine from TTH, and light, noise, smell, physical activity, straining and bending over were the significant aggravating factors in TTH.

The questionnaire was not validated as a questionnaire set, but rather formed as a list from the ICH diagnostic criteria. The same questionnaire was used in this study to meet the objectives set out for this study and to evaluate other factors contributing to ETTH.

Niere, et al., (2007) however developed a headache specific disability questionnaire for patients attending physiotherapy. The results of this study lead to this validated and internally consistent nine point questionnaire for patients presenting with headache, to evaluate the impact or the disability their headaches caused on their activities of daily living. This tool was developed to be used as an outcome measure for treating physiotherapists treating headache patients. However the study by Niere, et al., (2007) has to date not been tested for the responsiveness and test-retest reliability of the nine point questionnaire. The exact questionnaire was used in this study as an outcome measure to evaluate factors such as headache frequency, intensity and duration as well as limitations in work and social life amongst all the participants.

Lastly the National Stress Awareness Day (NSAD) stress questionnaire was also employed as developed by the International Stress Management Association (ISMA). The questionnaire consists of 25 questions pertaining to individual stressors as no

individual's stress pattern is ever the same. This questionnaire was specifically utilised to evaluate the emotional stress as a possible factor in TTH sufferers.

The literature reviewed pertaining to the ETTH and myofascial trigger-points the face and neck were mainly conducted by Fernandez-de-las-Peñas, et al. (2007, 2006a, b). These studies had similar aims and objectives and employed a subjective four week headache diary. With the development of the Specific Headache Disability questionnaire by Niere, et al. (2007) more direct information can be derived from the tension-type headache population.

The methodology used in this study is supported by the current literature. Although this is the first study of its kind to utilise the aggravating and precipitating factors questionnaire, the NSAD stress questionnaire as well as the headache disability questionnaire to answer to the objectives of the study.

The following chapter will discuss the methodology of this study.

Chapter 3

3.0 METHODOLOGY

This chapter will focus on the methodology used in this research study, the study design employed, subject recruitment, setting and sample selection as well as the inclusion and exclusion criteria. These factors will be discussed together with the statistical analysis and ethical considerations. The pilot study and the main study methods will be presented separately.

3.1. Pilot study

3.1.1. Introduction

A pilot study was conducted prior to the main study with the following aims and objectives:

The aim of the pilot study was to establish the testing procedure and evaluation process that would be used in the main study.

The objectives were to set a:

1. Systematic approach to the evaluation process that will be used in the main study.
2. To enable the researcher to become confident in the handling and utilisation of the testing equipment.
3. To establish the correct administration of the questionnaires
4. To ensure that the questionnaires used would be understood by the participants of the study.

3.1.2. Methodology

The five participants who had similar characteristics (inclusion criteria) as the ones to be

used in the main study were diagnosed and invited by the medical practitioner or physiotherapist to take part in the study were selected as the pilot group. An information session was scheduled with the participants where the test procedure and the questionnaires were explained. Informed written consent was obtained and the test procedure was conducted.

3.1.3. Results and Recommendations for the main study

The test procedure proved to work well and no changes were made. The identifying of the trigger-points as a three when active, two for latent-trigger points and one for no trigger-points proved functional and was kept standard for the main study. The results of the questionnaires were kept concealed until the data analysis of the main study commenced, as the pilot study was conducted with the aim of testing the procedures and concealing data formed part of the procedure of the main study. The results of the pilot study were not evaluated and did not form part of the main study results. There were no complaints or misunderstandings pertaining to the questions asked in the questionnaires.

With the pilot study it became evident that more regular and frequent information sessions were to be given to smaller groups of testing individuals as they were tested over an eight month period. It was not ethically sound to delay testing and subsequent treatment until all participants could be tested on the same day or time. It also proved to be easier for the researcher to travel to nearby towns for testing to be conducted, than to ask all the participants to travel to the researcher's rooms. This however did not interfere with the selection, grouping, the testing procedure or the completing of questionnaires. Two individuals never returned their completed questionnaires and failed to forward them via email or fax after telephone follow-up.

Recommendations for the main study were that all the participants had to hand in their completed documents on the day of testing. Participants were informed and tested on

the day they presented themselves to the practice after being diagnosed according to the inclusion criteria by a general practitioner or physiotherapist.

3.2 Main study

3.2.1 Study design

The study was conducted as an observational, cross sectional, descriptive study with a control group matched for sex and age.

3.2.2 Participants

3.2.2.1 Participant recruitment and setting.

All individuals residing in the Waterberg district of the Limpopo province, suffering from ETTH were invited to participate in the study, by means of room-notices for the participating doctors and physiotherapists, as well as individual visits to all the referring medical practitioners and physiotherapists in the Waterberg district. Individuals were selected as they presented themselves to the medical practitioner and/or physiotherapists for diagnosis according to the guidelines of the International Classification of headache Society. A medical practitioner and/or a physiotherapist is the first contact that patients suffering from headaches have and therefore a diagnosis from either a medical practitioner or a physiotherapist is sufficient due to their respective medical expertise. In South Africa, both medical practitioners and physiotherapists enjoy first line practitioner status (as confirmed by the Health Professional Council of South Africa), allowing both disciplines to diagnose, treat and refer patients when necessary. Neurological expertise, as provided by a neurologist consultation, does not exist in the rural and semi-urban Limpopo area in which this study was conducted.

Pairing with non-symptomatic individuals was done on a same sex, and same age basis, these individuals acted as the control group.

3.2.2.2 Sample Selection

A sample of convenience was used in this observational, cross sectional study. A sample of convenience refers to the study setting. The sample selection was done in the Waterberg district in order to limit travel expenses and time spent by the participants. The Waterberg district is a rural and semi-urban area.

3.2.2.3 Sample Size

An expected rate of positive TrPs in symptomatic individuals was calculated at 60% and 20% for asymptomatic individuals, with a standard deviation of 10% prior to the commencement of the study. The power calculation of 95%, suggested that for the viability and clinical relevance of this study, 11 symptomatic individuals, paired with 11 non-symptomatic individuals should have been tested for the objective tests of the study. This in in accordance with similar studies conducted by Fernandez-de-las-Peñas, et al. (2007; 2006a, b.) on the tension-type headache population. Non-symptomatic individuals refer to individuals not suffering from primary headaches meeting the inclusion criteria or cervicogenic headache as cervical spine pathology was an exclusion criteria set out for the purpose of this study. By extending an open invitation to all individuals suffering from ETTH to participate in the study, the researcher hoped to increase the sample size to be more representative of the ETTH population. The sample size was calculated for the objective testing of the study and not specifically for the questionnaires used as these had experimental value to investigate other biopsycosocial factors that may contribute to the TTH in this particular study sample.

3.2.3. Inclusion Criteria

The following inclusion criteria were used to select participants as they volunteered to be part of the study. The inclusion criteria used were in line with the international classification of headaches:

- Individuals between the ages of 18 – 60.

- Individuals suffering from ETTH diagnosed by the medical practitioners or physiotherapists.
- Episodic tension-type headache is a headache mild to moderate in nature.
- Usually bilateral, but may be unilateral.
- Pressing or tightening in nature.
- The TTH is not associated with nausea but phonophobia and photophobia may be present.
- The headache does not increase with routine physical activity.
- Patients suffering from at least 10 episodes per month with the headache ranging ≥ 1 and < 15 days per month,
- Headache for at least 3 months or ≥ twelve and < hundred and eighty days per year.
- The headaches usually lasting thirty minutes to 7 days were included.
- The final inclusion criterion for this study was the inclusion of group 1 TMJ dysfunction.

3.2.4 Exclusion Criteria

Participants were excluded if:

- individuals suffered from severe acute migraine attacks,
- Individuals had physiotherapy treatment in the month prior to testing.
- individuals had pathology including:
    - Osteo-arthritis of the cervical spine,
    - Rheumatoid-arthritis, especially in the cervical spine,
    - Known and diagnosed tumours or metastatic disease in the head and neck area.
    - Other exclusion criteria were history of trauma in the head and neck in the past three months, including whiplash.

- Group 2 and 3, TMJ disorders – audible clicking of the jaw on talking and eating, disc displacements with or without reduction, arthralgia, osteo-arthritis of the TMJ and osteo-arthrosis.

3.3 Ethical considerations

Ethical clearance was sought and received from the Human Research Ethics committee of the University of the Witwatersrand before the study was conducted. Clearance certificate number M10439. (Annexure i)

An information sheet was handed out to each individual stating the reasons and purpose of the study (Annexure ii).

A signed informed consent form was mandatory for each individual prior to the commencement of the testing procedure (Annexure iii).

Specific information regarding the purpose of the study and the diagnosing criteria was given to the medical practitioners and physiotherapists referring individuals for this study (Annexure iv).

The researcher kept the identifiable data concealed throughout the study until the time of the data capturing.

3.4 Instrumentation and Outcome Measures

A headache-specific disability questionnaire for individuals suffering from headaches was used. This questionnaire was given to each participant in order to determine the pain severity, headache frequency and intensity, and the reduction of activity and the inability to perform daily activities. The researcher was blinded to the results of the headache questionnaires until the data were used in the data analysis phase of the study.

The NSAD stress questionnaire and “precipitating and aggravating factors” questionnaires were used. The researcher was blinded to the results of the

questionnaires and the data was only used in the data analysis phase of the study.

A hand-held digital pressure algometer (Force Five, Wagner Instruments, Box 1217, Greenwich, CT 06836) with a round tip of 1 cm^2 was used on each trigger point of the masseter muscles for the objective evaluation of active and latent trigger points.

3.5 Procedure protocol

The researcher arranged meetings with all referring practitioners in the Waterberg district to explain the study and the purpose for their referral. The researcher arranged information sessions with all the subjects as they presented themselves for the purpose of this study. The information sessions were prior to testing. Each participant received an information document that explained the reasons for doing the study as well as informing the participants of the possible discomfort that might be experienced during the examination phase of the study. Participants were asked to insert the completed and signed documents into the envelopes provided before testing, thus concealing the information of the subjective questionnaires from the researcher.

The researcher handed out and collected the headache questionnaire, stress- and precipitating-and- aggravating factors questionnaires and the signed written consent forms in the information sessions.

As part of the information session participants were asked to refrain from taking any pain and anti-inflammatory medication during the 24 hours preceding evaluation. Participants entered the evaluation area, stated his/her name to the researcher, and proceeded to lie in the supine position on a therapeutic plinth. His/her head was placed on a pillow to maintain the neutral cervical spine position.

An objective clinical evaluation process was used to determine the presence of myofascial trigger-points in the masseter muscle in patients and controls. The researcher palpated the masseter muscle for a taut palpable band within the muscle fibres, bilaterally, and utilised a hand-held digital pressure Algometer with a round tip of 1 cm². Compression pressure, measuring between 2-4 kg/cm^2, at the round tip was gradually increased perpendicularly on the muscle. The compression started at 2kg/cm² and gradually increased to 4kg/cm² until the onset of the patients' exact headache symptoms they complain of. This pressure was held on the trigger points in the masseter muscle for 10 seconds on the left and right masseter muscle respectively. The researcher recorded the pain sensation experienced by the subject as either an active- (AtrPs =3) or latent trigger-point (LtrPs=2), or no trigger-point (NtrPs =1).

Trigger-points were classified as active, only if it was the familiar headache-type pain the individual usually experienced, and was located in the area of recurrent headache distribution. The familiar headache included the pressing or tightening feeling, bilateral or in some individuals unilateral (symmetrical to the trigger-point testing side). And the distribution area was located in the majority of the subjects as an arc of pain that extends across the temple and over the eyebrow, in the temporal, frontal, retro-orbital areas. Only in five subjects was trigger-point referral mentioned to refer to the molar teeth, this is consistent with the "distinctly different referred pain patterns" as stated and described by Simons and Travell. (1999). The trigger-points were classified as latent if tender but not giving the familiar distribution of pain the individual experienced when having their usual headache. No trigger-point was recorded if there was no palpable tender taut band found in the location of trigger-points in the masseter muscle.

3.6 Data analysis

The SPSS statistical package version 2.8 was used to analyse data collected from the objective evaluation process. The Fisher exact tests were used to analyse data collected from the objective evaluation process to compare the proportion of either active or latent TrPs between the two study groups. The active and latent trigger-points

in the ETTH and control groups were calculated to determine if trigger-points were also active in non-symptomatic individuals.

The two sample t-test was used to analyse the differences in the Headache disability questionnaire for the clinical variables relating to headaches (headache intensity, frequency and/or duration) between the ETTH and control groups.

A multiple logistic regression analysis was used to evaluate other factors possibly contributing to the ETTH. The NSAD stress questionnaire, an aggravating and precipitating factor questionnaire were analysed.

A p-value of 0.05 was set for statistical significance.

The following chapter will present the results of the study.

Chapter 4

4.0 RESULTS

In this chapter results will be presented.

4.1 Demographic data of the participants

A total of 14 ETTH participants, 10 women and four men, aged 18- 60 years old, and 14 healthy volunteers, 10 women and four men were studied. Episodic tension-type headache participants were headache free on the days of evaluation. The demographic and clinical data of each group are given in the tables below.

Table 4.1: Demographic data of the ETTH and control groups. (n=28)

	ETTH n = 14	CONTROL n = 14
Gender (male/female)	4/10	4/10
Age (years)	33 ± 15	34 ± 14

Table 4.2: Clinical data of the ETTH and control groups. (n=28)

	ETTH n = 14	CONTROL n = 14	p-value
Headache intensity (VAS)	8.2 ± 1.2	4.6 ± 2.2	0.01
Headache Severity	6.4 ± 2.3	3.6 ± 2.6	0.04
Headache Frequency (days/month need to lie down)	4-6 ± 1.7	0-1 ± 0.6	0.01

There were no differences between the study groups regarding age and gender as the study group was matched with the control group. The headache intensity as measured on the visual analogue scale (VAS) was higher in the ETTH group than in the control group. (p=0.01). Headache severity was higher in the ETTH group than in the control

group. (p=0.04). The ETTH group had more frequent headaches than the control group. (p=0.01).

4.2 Objective test

The figure below demonstrates the differences in percentage of active and latent or no trigger-points between the ETTH and control groups.

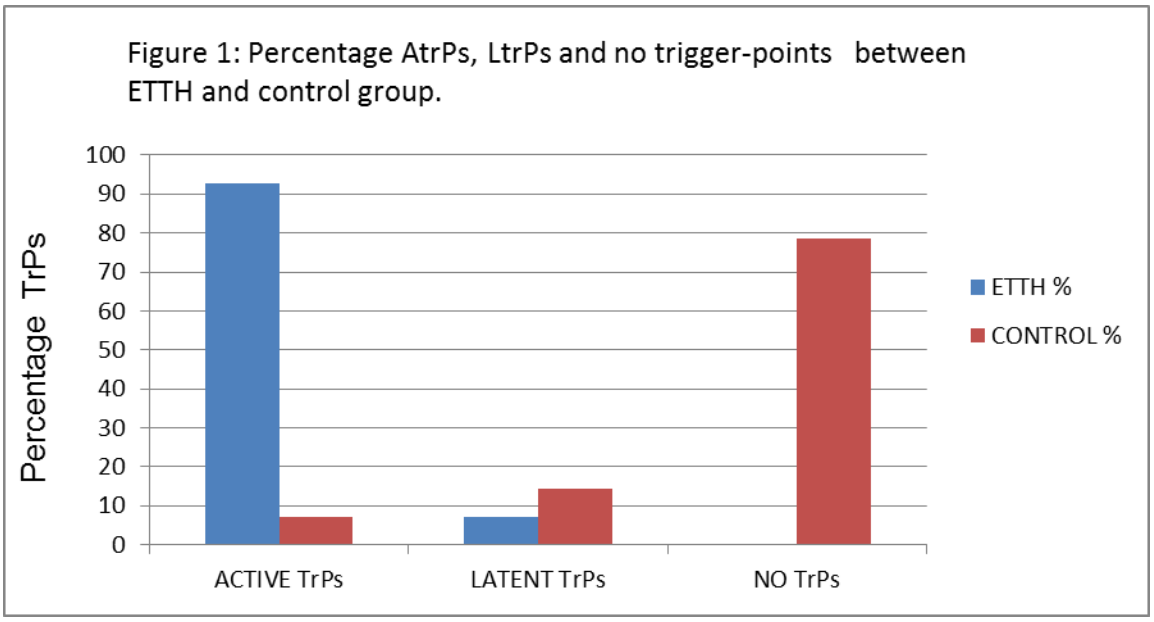

Figure 4.1: Percentage of Active TrPs, Latent TrPs and no TrPs in ETTH and control groups.

All the participants were tested for active, latent and or no TrPs. All the ETTH subjects showed TrPs in the masseter muscles. Active trigger-points were found in 92.86% (13) of the ETTH group, whereas the remaining 7.14% (one) subject had LtrPs. In the control group 7.14% (one) subject had an AtrPs in the masseter muscle group, 14.29% (two) subjects showed LtrPs and 78.57% (eleven) had no trigger-points present. Differences in the presence of trigger-points in the masseter muscle group between both groups were significant for active trigger-points with a p-value of 0.001.

4.3 The Headache Disability questionnaire

Thirteen of the ETTH subject returned their questionnaires as one participant failed to hand the completed questionnaires in at the time of testing. Despite many attempts of the researcher to contact the subjects for the missing data via telephone, internet, and social networks, the data were calculated on the 13 ETTH and 14 control subjects.

All nine questions pertaining to headache and its related disability showed statistical significance with a p-value = 0.05 or less. The following table illustrates the questions asked and the results as received by using the two-sample t-test

Table 4.3: Headache Disability Questionnaire: (n=27)

				TWO SAMPLE t-TEST
	HEADACHE DISABILITY QUESTIONNAIRE	ETTH MEAN (SD) 95% CI n=13	CONTROL MEAN (SD) 95% CI n=14	p-VALUE
1	How would you rate the usual pain of your headache on a scale from 0-10?	8.15 (±1.21) (7.42; 8.89)	4.64 (±2.21) (3.37; 5.92)	0.01
2	When you have headaches, how often is the pain severe?	6.38 (±2.18) (5.01; 7.70)	3.62 (±2.59) (2.15; 5.14)	0.01
3	On how many days in the last month did you actually lie down for an hour or more because of your headaches?	2 (±1.73) (0.95; 3.05)	0.21 (±0.59) (-0.12; 0.55)	0.01
4	when you have a headache, how ofen do you miss work or school for all or part of the day?	1.23 (±1.59) (0.27; 2.19)	0.29 (±0.61) (-0.07; .064)	0.05
5	When you have a headache while you work (or school), how much is your ability to work reduced?	5 (±2.67) (3.38; 6.62)	2.07 (±2.46) (0.65; 3.49)	0.01
6	How many days in the last month have you been kept form performing housework or chores for at least half of the day because of your headache?	1.75 (±1.76) (0.63; 2.87)	0.21 (±0.43) (-0.03; 0.46)	0.001
7	When you have a headache, how much is you ability to perform housework or chores reduced?	5.25 (±3.22) (3.20; 7.3)	2.29 (±2.2) (1.02; 3.56)	0.01
8	How many days in the last month have you been kept from non-work activities (family, social or recreational) because of your headache?	2.46 (±2.33) (1.05; 3.9)	0.43 (±0.85) (-0.06; 0.92)	0.01
9	When you have a headache, how much is your ability to engage in non-work activities (family, social or recreational) reduced?	4.54 (±2.3) (3.15; 5.93)	1.64 (±2.13) (0.41; 2.88)	0.001

Headache intensity, severity, and frequency were all greater for the ETTH group when compared with the control group. ($p \leq 0.05$). Factors pertaining to work, leasure activities and activities of daily living were all found to be more affected for the ETTH group.($p<0.05$). Even amongst the control group answers pertaining to headache disability were answered. The control group does not suffer from pirmary headaches nor secondary headaches due to pathology of the cervical spine. This however does not limit the control groups' individual and personal interpretation of any other type of headache they may experience from time to time or even their perception of what a headache would be like or limit them to do, if they were to suffer from headaches. All participants were headache free on the day of testing.

4.4 The NSAD Stress questionnaire

The table below refers to the NSAD stress questionnaire and presents the percentages of positive and negative answers between the ETTH and control group for those questions with a $p \leq 0.05$. The NSAD stress questionnaire presented 25 questions to determine if any of these stressors were present in the ETTH group when comparing them to the control group, and the results for the remainder of the 25 questions with $p>0.05$ can be seen in appendix vi b.

Table 4.4: NSAD stress questionnaire: (n=27)

Q	NSAD STRESS QUESTIONNAIRE		ETTH n = 13	CONTROL n = 14	p-value
6	I feel that there are too many deadlines in my work/life that are difficult to meet.	**YES**	7 (53.85%)	2 (14.29%)	0.04
		NO	6 (46.15%)	12 (85.71%)	
22	Increase in muscular aches and pains especially in the neck, head, lower back, shoulders.	**YES**	13 (100%)	10 (71.43%)	0.05
		NO	0 (0%)	4 (28.57%)	

Question six presented equal number of ETTH participants stating yes and no, but there were a higher percentage of participants stating yes in the ETTH group compared to the control group (p=0.04). Question 22: showed that 100% of the ETTH participants answered “Yes” to the question, and although a high percentage of the control group also shared the same opinion, 28.57% did however say no (p=0.05). Question 21 (annexure vi b) pertaining to specifically grinding of teeth, (bruxism) as was previously seen in the literature, did in this small sample size not show to be of statistical significance (p=0.09) although 9 (69.23%) of ETTH participants answered yes compared to the 5 (35.71%) control group participants answering yes.

4.5 Precipitating factors

The table below shows the results of the precipitating factors questionnaire between the ETTH and the control group.

Table 4.5: Precipitating factors: (n=27)

	QUESTIONS:	ANSWER	ETTH n=13	CONTROL n=14	p-VALUE
1	Physical activity	YES	6 (46.15%)	1 (7.14%)	0.04
		NO	7 (53.85%)	13 (92.86%)	
2	Straining	YES	7 (53.85%)	6 (42.86%)	0.57
		NO	6 (46.15%)	8 (57.14%)	
3	Bending over	YES	5 (38.46%)	4 (28.57%)	0.59
		NO	8 (61.54%)	10 (71.43%)	
4	Stress / Tension	YES	13 (100%)	8 (57.14%)	0.05
		NO	0 (0%)	6 (42.86%)	
5	Coughing / Sneezing	YES	4 (30.77%)	2 (14.29%)	0.31
		NO	9 (63.23%)	12 (85.71%)	
6	Fatigue	YES	6 (46.15%)	5 (35.71%)	0.58
		NO	7 (53.85%)	9 (64.29%)	
7	Reading	YES	10 (76.92%)	5 (35.71%)	0.04
		NO	3 (23.08%)	9 (64.29%)	
8	Driving	YES	12 (92.31%)	8 (57.14%)	0.06
		NO	1 (7.69%)	6 (42.86%)	
9	Lack of sleep	YES	9 (69.23%)	8 (57.14%)	0.52
		NO	4 (30.77%)	6 (42.86%)	
10	Specific food/ drink	YES	3 (23.08%)	3 (21.43%)	0.92
		NO	10 (76.92%)	11 (78.57%)	
11	Alchohol	YES	3 (23.08%)	0 (0%)	0.1
		NO	10 (76.92%)	14 (100%)	
12	Not eating on time	YES	6 (46.15%)	5 (35.71%)	0.58
		NO	7 (53.85%)	9 (64.29)	
13	Smoke	YES	4 (30.77%)	3 (21.43%)	0.58
		NO	9 (69.23%)	11 (78.57%)	
14	Smell	YES	2 (15.38%)	3 (21.43%)	0.69
		NO	11 (84.62%)	11 (78.57%)	
15	Light	YES	7 (53.85%)	3 (21.43%)	0.09
		NO	6 (46.15%)	11 (78.57%)	
16	Noise	YES	8 (61.54%)	6 (42.86%)	0.34
		NO	5 (35.46%)	8 (57.14%)	
17	Menstruation	YES	1 (11.11%)	3 (30%)	0.33
		NO	8 (88.89%)	7 (70%)	
18	Weather	YES	2 (15.38%)	0 (0%)	NS
		NO	11 (84.62%)	14 (100%)	

Physical activity (Q1 p=0.04), stress / tension (Q4 p=0.05) and reading (Q7 p=0.04) were the factors with statistical significance in the precipitating questionnaire. Stress / tension were the only factor having a 100% positive answer in the ETTH group. A large percentage of ETTH participants n=12(92.31%) answered yes to driving (Q8) being a precipitating factor but was not statistically significant with a p-value of 0.06.

4.6 Aggravating factors

The same questions as in the precipitating questionnaires were offered to the subjects with the instruction to only mark the factors that aggravates an already existing headache. The table below presents the results obtained.

Table 4.6: Aggravating factors between ETTH and Control group. (n=27)

	QUESTIONS:	ANSWER	ETTH n=13	CONTROL n=14	p-VALUE
1	Physical activity	YES	9 (69.23%)	5 (35.71%)	0.09
		NO	4 (30.77%)	9 (64.29%)	
2	Straining	YES	9 (69.23%)	7 (50%)	0.31
		NO	4 (30.77%)	7 (50%)	
3	Bending over	YES	6 (46.1515)	6 (42.86%)	0.86
		NO	7 (53.85%)	8 (57.14%)	
4	Stress / Tension	YES	13 (100%)	10 (71.43%)	0.06
		NO	0 (0%)	4 (27.57%)	
5	Coughing / Sneezing	YES	8 (61.54%)	4 (28.57%)	0.09
		NO	5 (38.46%)	10 (71.43%)	
6	Fatigue	YES	9 (69.23%)	6 (42.86%)	0.17
		NO	4 (30.77%)	8 (57.14%)	
7	Reading	YES	9 (69.23%)	5 (35.71%)	0.09
		NO	4 (30.77%)	9 (64.29%)	
8	Driving	YES	11 (84.62%)	7 (50%)	0.07
		NO	2 (15.38%)	7 (50%)	
9	Lack of sleep	YES	9 (69.23%)	6 (42.86%)	0.17
		NO	4 (30.77%)	8 (57.14%)	
10	Specific food/ drink	YES	2 (15.38%)	3 (21.43%)	0.69
		NO	11 (84.62%)	11 (78.57%)	
11	Alchohol	YES	3 (23.08%)	5 (35.71%)	0.48
		NO	10 (76.92%)	9 (64.269%)	
12	Not eating on time	YES	3 (23.085)	3 (21.43%)	0.92
		NO	10 (76.92%)	11 (78.57%)	
13	Smoke	YES	4 (30.77%)	5 (35.71%)	0.79
		NO	9 (69.23%)	9 (64.29%)	
14	Smell	YES	1 (7.69%)	3 (21.43%)	0.33
		NO	12 (92.31%)	11 (78.57%)	
15	Light	YES	8 (61.54%)	3 (21.43%)	0.04
		NO	5 (38.46%)	11 (78.57%)	
16	Noise	YES	10 (76.92%)	8 (57.14%)	0.28
		NO	3 (23.08%)	6 (42.86%)	
17	Menstruation	YES	1 (11.11%)	3 (30%)	0.33
		NO	8 (88.89%)	7 (70%)	
18	Weather	YES	2 (15.38%)	0 (100%)	NS
		NO	11 (84.62%)	14 (100%)	

Interesting is that even the control group that does not suffer from headaches in general, answered yes to the posing factors. They may believe that these factors will influence them once they have a headache. The only factor with statistical significance was that of light (Q15) with a p-value of 0.04. The factors pertaining to alcohol (Q11) and specific food (Q10), smoke (Q13), smell (Q14) and menstruation (Q17) had a much higher confirmative percentage from the control group than that of the ETTH group. This confirms that the control group do not suffer from ETTH as these factors are not associated according the classification of headaches as set out by the ICS.

Stress and tension (Q4) had 100% confirmative answers in the ETTH group, indicating that they feel that stress and tension is an aggravating factor for their headache.

Weather (Q18) had a 100% negative response from the control group as they do not experience changes in weather or particular weather to play any part in aggravating their particular headache. Physical activity (Q1) (p=0.09), reading (Q7) (p=0.09), driving (Q8) (p=0.07) and noise (Q16) (p=0.28) had relative high percentages of yes answers form the ETTH but were not found to be statistically significant.

The following chapter will discuss the results presented.

Chapter 5

5.0 DISCUSSION

In this chapter the results will be discussed.

5.1 Demographic data of the participants

The study examined a total of 28 subjects, 14 ETTH subjects, ten woman and four men and 14 control subjects, ten woman and four men. The mean age for the groups was 33 and 34 respectively. The demographic relationship of woman vs. men is supported in the literature were it has been stated that women are more prone to TTH than their male counterparts (Rasmussen, et al., 2001). The demographic data is in accordance with studies conducted by Fernandez-de-las-Peñas, et al., (2006b) where 20 subjects, five men and 15 women were tested, as well as Fernandez-de-las-Peñas, et al., (2006a) also 20 subjects of which nine men and 11 women were tested.

5.2 Objective tests

All subjects presenting with ETTH in this study had muscle TrPs in the masseter muscles, either active or latent as for one subject. The referred pain evoked by an active masseter TrPs reproduced the usual headache in 92.86% (13) of them, where 7,14% (one) subject had an LtrPs in the masseter muscle. Within the control group 7,14% (one) subject had an AtrP in the masseter muscle, 14.29% (two) showed LtrPs and the remaining 78.57% (11) had no TrPs present in the masseter muscles. The results are in agreement with Fernandez-de-las-Peñas, et al., (2007, 2006a,b), who also observed active and latent trigger-points in the TTH group and some LtrPs and majority of no trigger-points in healthy subjects,

These findings especially with the high percentage of 92.86% of active TrPs in the ETTH group and 92.86% of no TrPs in the control group support the hypothesis that TrPs in the masseter muscles play an important role in the genesis of ETTH.

Brendsten (2000), reported that both peripheral mechanisms, that is the myofascial tenderness of the masticatory musculature and the central mechanisms, the sensitization of supraspinal neurons and decreased anti-nociceptive activity the supraspinal structures, might be involved in the pathogenesis of TTH. Nociceptive inputs from the TrPs in the masticatory muscles, and in this case the masseter muscle specifically, may produce a continuous afferent bombardment to the trigeminal nerve nucleus caudalis. This repeated nociceptive activation of the nucleus caudalis could produce central sensitization and later cause ETTH to become chronic. Fernandez-des-las-Peñas, et al., (2006a) is also of the same opinion and state that, if there were a lesser degree of central sensitization in ETTH because of the intermittent nature of the TTH, one would expect fewer ATrPs and more LtrPs in the ETTH subjects. However, Oliveira-Campelo, et al., (2010) found that even LtrPs disturb normal motor recruitment and movement efficiency and sensitization mechanisms. Active and latent TrPs have been proven to both have algogenic substances and chemical mediators such as bradykinin, substance P, or serotonin. Active trigger-points have higher concentrations of these chemical than latent trigger-points (Oliveira-Campelo, et al., 2010). As seen in the results both AtrPs and LtrPs were found in the ETTH subjects but higher percentages of AtrPs suggest the masseter muscle plays an important role in the genesis of ETTH. .

5.3 The Headache disability questionnaire

The headache intensity, frequency and total disability profile were significant for the ETTH group. There are no other studies that have introduced this headache disability questionnaire in the ETTH population, and therefore no correlation can be drawn from the literature. Fernandez-des-la-Peñas, et al., (2006a) did report in their study that headache intensity and frequency were related to TrPs activity in CTTH but not in ETTH. It is clear from the data obtained that even in the subjects suffering from ETTH and not CTTH yet, the headache frequency is severe. The ETTH cause them to lie down between 4-6 days per month. This is on average a full week of inactivity. The time lost can have severe economic implications for both the employer and employee.

Headache intensity was calculated at an average of 8.2 vs. the control group 4.6 on the numeric pain scale presented. It is clear that even though these subjects are diagnosed as suffering from ETTH, their headache is debilitating in its effect and disables the subjects although not chronic in nature yet.

5.4 The NSAD stress questionnaire

The greater differences between the ETTH and control group found in the NSAD stress questionnaire were the factors pertaining to the feeling that they had too many deadlines in their work, and muscular aches and pain. Muscular aches and pains, or tension in the myofascial component of the head and neck area, have been proven in previous literature to be a co-morbid factor in the genesis and maintenance of ETTH (Fernandez-des-las-Peñas, et al., 2007, 2006a,b; Ramirez, et al., 2005; Maitland, 2001; Simons, et al., 1999 and Rasmussen, 1991).

Specific feelings of too many deadlines is the first to be reported on as this is the first time, to the researcher's knowledge, that the NSAD stress questionnaire was employed in this type of study. Torelli, et al., (2008) in their paper on the Human Psyche and TTH, state that with further evaluation of these individuals suffering from TTH (ETTH and CTTH) it will be clear that life situations justify the appearance of their headache disorder. They state that frequently TTH seems to spring from an inadequate relationship between the sufferer's personality profile and events in their lives. Torelli, et al., (2008) reported a linear relationship between patients' personal abilities and the requirements of their surrounding environments. Sometimes, the authors note, these requirements are too much for the patients to cope with or the patients are unable to confront them properly, and thus ETTH may represent a clear signal that something is not right in the lives of those who suffer from it.

Grinding of the teeth or bruxism as some authors prefer to use, was not found to be a statistically significant factor. Rasmussen, et al., (1991) and Ramirez, et al., (2005) found in their respective studies that bruxism was a factor contributing to TTH.

5.5 Precipitating factors

Physical activity, stress / tension and reading were the factors found to have statistical significant differences between the ETTH and control group as a precipitating factor. It has to be noted that these questionnaires were handed only to the 28 participating subjects. The study samples were calculated for the objective tests of this study, and the questionnaires handed merely served an experimental value. The results should be interpreted with caution. Interesting to note that in a study by Spierings, et al., (2001) on the aggravating and precipitating factors of migraine versus TTH, these exact factors had statistical significance in the TTH group as well. Physical activity is not listed in the International headache classification as a factor of TTH.

5.6 Aggravating factors

Light was the only aggravating factor to have had statistical significance. The trigeminal nerve that gives branches to the masseter muscle also gives a large branch to the ophthalmic nerve. The ophthalmic nerve arises from the trigeminal ganglion as a wholly sensory nerve and supplies the area of skin derived from the embryonic frontonasal prominence. It would be interesting to see what future research yields in the sensory inputs of all the senses and nerve stimulation for afferent input into the trigeminal nucleus (Moore and Dalley, 2006).

Active myofascial TrPs in the masseter muscles were more common in ETTH subjects than in healthy controls. The high level of specificity and sensitivity yielded this study clinically relevant. Parameters including headache frequency, intensity and disability proved to be disabling to the ETTH subjects. Stress and tension, reading, physical activity as well as muscle aches and pains in the neck and shoulders were the clinical significant precipitating and aggravating factors in the ETTH subjects, and form a basis for better understanding in our bio psychosocial model when evaluating and treating patients. These findings were in accordance with the findings of Spierings et al., (2001).

The major findings, study limitations and recommendations from the whole study are highlighted in the next chapter (6).

Chapter 6

6.0 CONCLUSION

Headache is a common complaint in society and is related to personal and socio-economic circumstances. Headache is debilitating in its effect.

The aim of this study was to determine the association between myofascial TrPs in the masseter muscle group and ETTH. The following objectives were set in the study:

1. Determine the proportion of ATrPs in the masseter muscle in patients suffering from ETTH.
2. Determine if the myofascial TrPs in the masseter muscle contribute to the pain perceived by individuals suffering from ETTH, and
3. Determine other factors that may contribute to ETTH.

92, 86% of the ETTH group had AtrPs in the masseter muscles compared to the 7.14% of the control group having AtrPs. In the ETTH group 7.14% subjects had LtrPs compared to the 14.29% of LtrPs in the control group. No ETTH subject had no-trigger points present but 78.57% of the control group subjects displayed not having any TrPs present. The ETTH group did not only have high percentages of AtrPs, but the pain experienced with the testing of the TrPs were in the exact pain distribution area, and of the same nature and quality of the headaches they suffer from.

The results of this study clearly indicate that the TrPs in the masseter muscle group is associated with ETTH.

Even in this study where only ETTH has been studied, it is clear from the disability questionnaire that these subjects as disabled because of their headache. Their social participation, activities of daily living and economic contributions are severely affected by the headache intensities, frequencies and severities they suffer from. Other factors found to be contributing factors in the ETTH group included physical activity, stress/tension and reading as precipitating factors, light the only aggravating factor.

Feelings pertaining to having too many deadlines in their work, and muscular aches and pains especially in the neck and shoulders were significant factors found to contribute to the clinical picture of ETTH.

This study presents more evidence about the TrPs of the anterior face which can be added to future treatment plans to enable the physiotherapist to better understand and treat the ETTH condition.

With this study, it can now be said that all the muscles of the face and neck have been tested for their trigger-point contribution to TTH. This study adds to the international scope of knowledge.

6.1 Study limitations

- Study limitations include; the use of a small selective sample size that was based in the Waterberg district, a rural/sub-urban district in the Limpopo province of South Africa. The sample size was calculated for the objective testing of the study in accordance with the relevant literature, but the sample size was not representative for the subjective questionnaires handed to each candidate.

- Only ETTH were evaluated and the results cannot be interposed in other headache disorders. It would be clinically valuable to extend the same study to the chronic tension-type headache population, as well as other primary and secondary headache diagnosis populations.

- Trigger point palpations were done by the same researcher for all the study participants.

- Extra oral palpation was used in this study. In similar future studies intra oral palpation for the deep trigger points of the masseter muscle should also be

included.

6.2 Recommendations for future studies

- Masseter muscle TrPs contribute to the origin and or maintenance of the ETTH, but a better understanding and more in depth knowledge of the role of these muscles, and their nociceptive pathways in ETTH needs further research

- It is recommended that larger population bases are evaluated in future to be more representative of the whole population of South Africa.

- The same study should be extended to the CTTH population.

- That more extensive research will be conducted using the aggravating and precipitating factors questionnaire, the NSAD stress questionnaire and the headache disability questionnaire as the bio-psychosocial model should be employed when dealing with tension-type headache patients. This study showed in experimental value that other factors including stress and disability factors contribute to the clinical picture of ETTH.

Chapter 7

7.1 References

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7.2 Appendices

Annexure i: Ethical clearance certificate.

Annexure ii: Information document to participants.

Annexure iii: Informed consent forms to participants.

Annexure iv: Information document to referring practitioners.

Annexure v: Headache disability questionnaire.

Annexure vi a: NSAD Stress questionnaire.

Annexure vi b: NSAD Stress questionnaire results.

Annexure vii: Precipitating factors for tension-type headache questionnaire

Annexure viii: Aggravating factors for tension-type headache questionnaire.

Annexure 1: Ethical clearance certificate

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG
Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Mrs Wilna-Mari van Staden

CLEARANCE CERTIFICATE	**M10439**
PROJECT	The Association between Myofascial Trigger-Points in the Masseter Muscle Group and Episodic Tension-Type Headaches
INVESTIGATORS	Mrs Wilna-Mari van Staden.
DEPARTMENT	Department of Physiotherapy
DATE CONSIDERED	30/04/2010
DECISION OF THE COMMITTEE*	Approved unconditionally

Unless otherwise specified this ethical clearance is valid for 5 years and may be renewed upon application.

DATE 25/05/2010 **CHAIRPERSON** .....
(Professor PE Cleaton-Jones)

*Guidelines for written 'informed consent' attached where applicable
cc: Supervisor : DM Moraka

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10004, 10th Floor, Senate House, University.
I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to a completion of a yearly progress report.**

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES...

Annexure 2: Information sheet to participants:

INFORMATION DOCUMENT

The association between myofascial trigger-points in the masseter muscle group and episodic tension- type headaches.

Dear participant;

My name is Wilna-mari van Staden. I am a post graduate student at the University of the Witwatersrand. I am conducting research on myofascial trigger-points “knots” in the masseter muscles in episodic tension- type headache. Research is just the process in which we learn the answer to a specific question. In this study we want to determine if active myofascial trigger-points in the masseter muscles (chewing muscles) in the face are associated factors in the pain individuals suffering from tension-type headaches feel. This is not a routine evaluation and the information gained through my evaluation and palpation techniques will be helpful to answer the question that the research study has asked.

I would like to invite you to take part in the research study. The study will be evaluating the presence of active myofacial trigger- points in the muscles that we use to eat with in individuals suffering from tension-type headaches, and compare the presence of these active myofacial trigger-points to individuals not suffering from headaches. As part of the research study you will be thoroughly evaluated by a registered physiotherapist or medical practitioner and the muscles in your face will be touched and moved from the outside of your mouth. You will be asked to fill in questionnaires pertaining to your headache. This will be done on the same day of your evaluation and the procedure will not take more than an hour of your time.

There is no financial implication for you or the therapist in this research study. In the event that active myofacial trigger-points in the muscles of mastication are found to play an active role in your tension-type headache the physiotherapist will advise you on a treatment session to follow free of charge.

Reimbursement for your participation in this study will be considered in the event of travel expenses alone. Catering on the day of testing will be provided as a token of my appreciation for your time and efforts to participate in this study.

Please note that as the medical practitioner or the physiotherapist will evaluate you prior to this study your diagnosis will be made known and available to the research assistant and me. You will have to sign the “consent form” provided giving the medical

practitioner and the physiotherapist, the research assistant and myself permission to use your information and medical diagnosis for the purpose of the study.

After the evaluation process individuals might experience some discomfort and tenderness in the muscles of the face. These symptoms should not be present for more than 24 hours.

Presently there exists few research studies on these muscles as a contributing factor in headaches yet this has been seen and treated in clinical practice. The benefit of contributing your time and effort to this study will enable us to scientifically document our findings and thus aid in the future treatment of this debilitating condition. As a participant you will be given information on the study while involved in the project and after the results are available.

Participation is voluntary and you may refuse to participate at any stage during the study. Refusal to participate will not bear any penalty or loss of benefits to which you the participant is otherwise entitled.

For further information or reporting of study related adverse events; please do not hesitate to contact me:

Wilna-mari van Staden

Email: wilna.mari@gmail.com,

Tel: 014 755 3617

Cell: 084 713 2311

Fax: 086 565 7381

Or REC administrator and chair – for reporting of complaints or problems.

Anisa Keshav

Email: anisa.keshav@wits.ac.za

Tel: 011 717 1234

Fax: 011 339 5708

Annexure iii: Informed consent form:

Consent form:

This document should be read in conjunction with the Information document titled

“The association between myofascial trigger-points in the masseter muscle group and episodic tension- type headaches”.

I..... (Full name), in my capacity as:

The study participant: (18 years or over) do hereby give my consent to participate in the above mentioned study.

I give Wilna-mari van Staden consent to perform palpation techniques to the muscles of my face, and to apply pressure by means of a digital hand-held algometer. I have read and understand all the terms in the information document and all my questions were answered to my satisfaction.

I understand that I may feel discomfort during the testing procedure and that I should refrain from taking any pain or anti-inflammatory medication prior to the testing procedure.

In the event where I use pain or anti-inflammatory medication for a severe tension-type headache in the 24hours preceding the test procedure, I understand that I should inform the research assistant as this information is important.

I understand that I can withdraw from the study at any time without giving any reasons to the researcher.

I understand and give consent that in the event of the University of the Witwatersrand Ethical Committee's need to investigate the research my and cohort identification may become evident.

Date:.....Time:.....

Place:.....

Participant:.....

Annexure iv: Information sheet to referring practitioners:

INFORMATION DOCUMENT

The association between myofascial trigger-points in the masseter muscle group and episodic tension- type headaches.

Dear colleague;

My name is Wilna-mari van Staden, I am a post graduate student at the University of the Witwatersrand. I am conducting research on myofascial trigger-points in the masseter muscle, in episodic tension- type headache. In this study, the researcher wants to determine if active myofascial trigger-points in the masseter muscle are an associated factor in the pain individuals suffering from tension-type headaches feel. This is not a routine evaluation, and the information gained through my evaluation and palpation techniques will be helpful to answer the question that the research study has asked and hopefully contribute to future treatment protocols of tension-type headaches.

I would like to invite you to take part in the study. The study will be evaluating the presence of active myofacial trigger- points in the masseter muscles in individuals suffering from tension-type headaches, and compare the presence of these active myofacial trigger-points to individuals not suffering from headaches.

As part of the research study, I would like to ask you to evaluate the patients that suffer from episodic tension-type headache, and refer your patients to participate in this study. Evaluation will be according to the International Headache Society's criteria:

- Individuals between the ages of 18 – 60.
- Frequent episodes of headaches that can last 30 minutes to 7 days.
- At least 10 episodes per month (≥1 but <15 days)

- for at least three months or ≥12 and <180 days per year,
- The pain is typically bilateral, pressing or tightening in quality, mild to moderate intensity, but may be experienced unilateral.
- The headache does not worsen with routine physical activity.
- No nausea, but photophobia or phonophobia may be present.

Exclusion Criteria for this study:

- Individuals suffering from severe acute migraine attacks.
- Individuals who have had physiotherapy treatment in the month prior to testing.
- Individuals who have pathology including:
- Osteo-arthritis of the cervical spine,
- Rheumatoid-arthritis, especially in the cervical spine,
- Known and diagnosed tumours or metastatic disease in the head and neck area,
- Trauma in the head and neck in the past three months, including whiplash.
- Severe temporomandibular joint disorders – i.e. audible clicking of the jaw on talking and eating.

All the participants will be asked to fill in questionnaires relating to their headache, as well as sign written informed consent. Each participant will be paired with a participant not suffering from headaches, on a same age and same sex basis. Confidentiality will be maintained through-out the study and each participant will be allocated a number to conceal their identity.

The procedure will not take more than an hour of their time. There is no financial implication to you or the patient, in this research study. In the event that active myofacial trigger-points in the muscles of mastication are found to play an active role in their tension-type headache, a treatment session will be scheduled free of charge to the participant.

Please be advised that participants will be asked to refrain from any pain or anti-inflammatory medication 24hours preceding the testing procedure. In the event of a severe headache attach where the participant uses medication, they should be advised not to conceal this information, and still take part in the study if they so wish. After the evaluation process individuals may experience some discomfort and tenderness in the muscles of the face. These symptoms should not be present for more than 24 hours and home advice regarding the use heat, stretches and prescribed medication will be given to each participant to minimize the possible effects of the evaluation process.

Presently there exists few research studies on these muscles as a contributing factor in headaches, yet this has been seen and treated in clinical practice. The benefit of contributing your time and effort to this study will enable us to scientifically document our findings and thus aid in the future treatment of this debilitating condition.

Take note that as a participant you will be given information on the study while involved in the project and after the results are available.

Participation is voluntary and you may refuse to participate at any stage during the study. Refusal to participate will not bear any penalty or loss of benefits to which the participant is otherwise entitled.

Reimbursement for your participation in this study will be considered in the event where you (the physiotherapist) will be asked to treat the participant for masseter trigger-points in the event where the participant and I failed to schedule a treatment session.

For further information or reporting of study related adverse events; please do not hesitate to contact me:

Wilna-mari van Staden

Email: wilna.mari@gmail.com,

Tel: 014 755 3617

Cell: 084 713 2311

Fax: 086 565 7381

Or REC administrator and chair – for reporting of complaints or problems.

Anisa Keshav

Email: anisa.keshav@wits.ac.za

Tel: 011 717 1234

Fax: 011 339 5708

Annexure v: Headache disability questionnaire:

Annexure v

HEADACHE DISABILITY QUESTIONNAIRE

Name:..... Date:...../...../..... Score / 90

Please read each question and circle the response that best applies to you

1. How would you rate the usual pain of your headache on a scale from 0 to 10?

0 NO PAIN	1	2	3	4	5	6	7	8	9	10	WORST PAIN

2. When you have headaches, how often is the pain severe?

NEVER 0	1-9% 1	10-19% 2	20-29% 3	30-39% 4	40-49% 5	50-59% 6	60-69% 7	70-79% 8	80-89% 9	90-100% 10	ALWAYS

3. On how many days in the last month did you actually lie down for an hour or more because of your headaches?

NONE 0	1-3 1	4-6 2	7-9 3	10-12 4	13-15 5	16-18 6	19-21 7	22-24 8	25-27 9	28-31 10	EVERY DAY

4. When you have a headache, how often do you miss work or school for all or part of the day?

NEVER 0	1-9% 1	10-19% 2	20-29% 3	30-39% 4	40-49% 5	50-59% 6	60-69% 7	70-79% 8	80-89% 9	90-100% 10	ALWAYS

5. When you have a headache while you work (or school), how much is your ability to work reduced?

NOT 0 REDUCED	1-9% 1	10-19% 2	20-29% 3	30-39% 4	40-49% 5	50-59% 6	60-69% 7	70-79% 8	80-89% 9	90-100% 10	UNABLE TO WORK

6. How many days in the last month have you been kept from performing housework or chores for at least half of the day because of your headaches?

NONE 0	1-3 1	4-6 2	7-9 3	10-12 4	13-15 5	16-18 6	19-21 7	22-24 8	25-27 9	28-31 10	EVERY DAY

7. When you have a headache, how much is your ability to perform housework or chores reduced?

NOT 0 REDUCED	1-9% 1	10-19% 2	20-29% 3	30-39% 4	40-49% 5	50-59% 6	60-69% 7	70-79% 8	80-89% 9	90-100% 10	UNABLE TO PERFORM

8. How many days in the last month have you been kept from non-work activities (family, social or recreational) because of your headaches?

NONE 0	1-3 1	4-6 2	7-9 3	10-12 4	13-15 5	16-18 6	19-21 7	22-24 8	25-27 9	28-31 10	EVERY DAY

9. When you have a headache, how much is your ability to engage in non-work activities (family, social or recreational) reduced?

NOT 0 REDUCED	1-9% 1	10-19% 2	20-29% 3	30-39% 4	40-49% 5	50-59% 6	60-69% 7	70-79% 8	80-89% 9	90-100% 10	UNABLE TO PERFORM

Annexure vi: NSAD stress questionnaire:

NSAD STRESS QUESTIONNAIRE:

Answer all the questions but just tick one box that applies to you, either yes or no. Answer yes, even if only part of a question applies to you. Take your time, but please be completely honest with your answers:

	Questions:	yes	No
1	I frequently bring work home at night		
2	Not enough hours in the day to do all the things that I must do		
3	I deny or ignore problems in the hope that they will go away		
4	I do the jobs myself to ensure they are done properly		
5	I underestimate how long it takes to do things		
6	I feel that there are too many deadlines in my work / life that are difficult to meet		
7	My self-confidence / self-esteem is lower than I would like it to be		
8	I frequently have guilty feelings if I relax and do nothing		
9	I find myself thinking about problems even when I am supposed to be relaxing		
10	I feel fatigued or tired even when I wake after an adequate sleep		
11	I often nod or finish other peoples sentences for them when they speak slowly		
12	I have a tendency to eat, talk, walk and drive quickly		
13	My appetite has changed, have either a desire to binge or have a loss of appetite / may skip meals		

14	I feel irritated or angry if the car or traffic in front seems to be going too slowly/ I become very frustrated at having to wait in a queue		
15	If something or someone really annoys me I will bottle up my feelings		
16	When I play sport or games, I really try to win whoever I play		
17	I experience mood swings, difficulty making decisions, concentration and memory is impaired		
18	I find fault and criticize others rather than praising, even if it is deserved		
19	I seem to be listening even though I am preoccupied with my own thoughts		
20	My sex drive is lower, can experience changes to menstrual cycle		
21	I find myself grinding my teeth		
22	Increase in muscular aches and pains especially in the neck, head, lower back, shoulders		
23	I am unable to perform tasks as well as I used to, my judgment is clouded or not as good as it was		
24	I find I have a greater dependency on alcohol, caffeine, nicotine or drugs		
25	I find that I don’t have time for many interests / hobbies outside of work		

Annexure vi b: NSAD stress questionnaire results.

	NSAD STRESS QUESTIONNAIRE.				
			ETTH n = 13	**CONTROL n = 14**	**p-value**
1	I frequently bring work home at night.	**YES**	6 (46.15%)	7 (50%)	0.84
		NO	7 (53.85%)	7 (50%)	
2	Not enough hours in the day to do all the things that I must do.	**YES**	12 (92.13%)	10 (71.43%)	0.19
		NO	1 (7.69%)	4 (27.57%)	
3	I deny or ignore problems in the hope that they will go away.	**YES**	6 (46.15%)	5 (35.71%)	0.58
		NO	7 (53.85%)	9 (64.29%)	
4	I do the jobs myself to ensure they are done properly.	**YES**	12 (92.31%)	13 (92.86%)	0.96
		NO	1 (7.69%)	1 (7.14%)	
5	I underestimate how long it takes to do things.	**YES**	7 (53.85%)	7 (50%)	0.84
		NO	6 (46.15%)	7 (50%)	
6	I feel that there are too many deadlines in my work/life that are difficult to meet.	**YES**	7 (53.85%)	2 (14.29%)	0.04
		NO	6 (46.15%)	12 (85.71%)	
7	My self-confidence / self-esteem is lower than I would like it to be.	**YES**	8 (61.54%)	7 (50%)	0.55
		NO	5 (38.46%)	7 (50%)	
8	I frequently have guilty feelings if I relax and do nothing.	**YES**	9 (69.23%)	7 (50%)	0.31
		NO	4 (30.77%)	7 (50%)	
9	I find myself thinking about problems even when I am supposed to be relaxing	**YES**	9 (69.23%)	10 (71.43%)	0.9
		NO	4 (30.77%)	4 (28.57%)	
10	I feel fatigued or tired even when I wake after an adequate sleep.	**YES**	9 (69.23%)	9 (64.29%)	0.79
		NO	4 (30.77%)	5 (35.71%)	
11	I often nod or finish other people's sentences for them when they speak slowly.	**YES**	7 (53.85%)	8 (57.14%)	0.86
		NO	6 (46.15%)	6 (42.86%)	
12	I have a tendency to eat, talk, walk and drive quickly.	**YES**	11 (84.62%)	13 (92.86%)	0.51
		NO	2 (15.38%)	1 (7.14%)	
13	My appetite has changed, has either a desire to binge or have a loss of appetite / may skip meals.	**YES**	8 (61.54%)	9 (64.29%)	0.88
		NO	5 (38.46%)	5 (35.71%)	
14	I feel irritated or angry if the car or traffic in front seems to be going too slowly / I become very frustrated at having to wait in a queue.	**YES**	10 (76.92%)	11 (78.57%)	0.92
		NO	3 (23.08%)	3 (21.43%)	
15	If something or someone really annoys me I will bottle up my feelings.	**YES**	10 (76.92%)	10 (71.43%)	0.75
		NO	3 (23.08%)	4 (28.57%)	
16	When I play sport or games, I really try to win whoever I play.	**YES**	7 (53.85%)	8 (57.14%)	0.86
		NO	6 (46.15%)	6 (42.86%)	

17	I experience mood swings, difficulty making decisions, concentration and memory is impaired.	**YES**	8 (61.54%)	6 (42.86%)	0.34
		NO	5 (38.46%)	8 (57.14%)	
18	I find fault and criticize others rather than praising, even if it is deserved.	**YES**	5 (38.46%)	6 (46.86%)	0.82
		NO	8 (61.54%)	8 (57.14%)	
19	I seem to be listening even though I am preoccupied with my own thoughts.	**YES**	8 (61.54%)	13 (92.86%)	0.08
		NO	5 (35.46%)	1 (7.14%)	
20	My sex drive is lower, can experience changes to menstrual cycle.	**YES**	6 (46.15%)	6 (42.86%)	0.86
		NO	7 (53.85%)	8 (57.14%)	
21	I find myself grinding my teeth.	**YES**	9 (69.23%)	5 (35.71%)	0.09
		NO	4 (30.77%)	9 (64.29%)	
22	Increase in muscular aches and pains especially in the neck, head, lower back, shoulders.	**YES**	13 (100%)	10 (71.43%)	0.05
		NO	0 (0%)	4 (28.57%)	
23	I am unable to perform tasks as well as I used to, my judgment is clouded or not as good as it was.	**YES**	6 (46.15%)	2 (14.29%)	0.83
		NO	7 (53.85%)	12 (85.71%)	
24	I find I have a greater dependence on alcohol, caffeine, nicotine or drugs.	**YES**	3 (23.08%)	2 (14.29%)	0.56
		NO	10 (76.92%)	12 (85.71%)	
25	I find that I don't have time for many interests / hobbies outside of work.	**YES**	8 (61.54%)	8 (57.14%)	0.82
		NO	5 (38.46%)	6 (42.86%)	

Annexure vii: Precipitating factors questionnaire:

Precipitating factors for tension-type headache questionnaire:

Please indicate which of the following statements have you found **to bring on your headache?**

		Yes	No
1	Physical activity		
2	Straining		
3	Bending over		
4	Stress / tension		
5	Coughing / sneezing		
6	Fatigue		
7	Reading		
8	Driving		
9	Lack of sleep		
10	Specific foods / drink		
11	Alcohol		
12	Not eating on time		
13	Smoke		
14	Smell		
15	Light		
16	Noise		
17	Menstruation *		
18	Weather		

* Woman only

Annexure viii: Aggravating factors questionnaire:

Aggravating factors for tension-type headache questionnaire:

Please indicate which of the following statements have you found **to worsen your headache?**

		Yes	No
1	Physical activity		
2	Straining		
3	Bending over		
4	Stress / tension		
5	Coughing / sneezing		
6	Fatigue		
7	Reading		
8	Driving		
9	Lack of sleep		
10	Specific foods / drink		
11	Alcohol		
12	Not eating on time		
13	Smoke		
14	Smell		
15	Light		
16	Noise		
17	Menstruation *		
18	Weather		

* Woman only