THE RELATIVE EFFECTIVENESS OF ADJUSTMENTS AND TRACTION IN THE TREATMENT OF TENSION-TYPE HEADACHES

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by

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I, Robert David Donkin, do hereby declare that this dissertation is representative of my own work, both in concept and execution, except where otherwise indicated in the text.

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DEDICATIONS

First and foremost, to the Lord Jesus Christ for giving me a destiny and an abundant life through His sacrifice on the cross.

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ABSTRACT

Headaches are very common in today's society and of all presenting types of headaches, tension - type headaches are the most common. At a neurologic outpatient clinic 40% of 1152 of all patients referred had tension-type headache (Lance et al. 1965). The purpose of this study was to determine if manual traction is an effective adjunct to the chiropractic treatment (the adjustment) of tension - type headaches, and to determine if the adjustment alone or the adjustment and manual traction have an effect on tension - type headaches. It was hypothesised that the combination of manual traction and adjustments would be more effective than adjustments alone. The study was a randomised, uncontrolled clinical trial conducted at the Technikon Natal Chiropractic Day Clinic. Thirty patients, presenting with tension - type headaches, were selected for the study and randomly allocated to two groups of fifteen each. Patients in Group A received adjustments and Group B received adjustments and manual traction as treatment. The subjective findings of the patients were recorded by means of the Short - form McGill Pain Questionnaire, the CMCC Neck Disability Index, the Numerical Pain Rating Scale 101 and the Headache Diary. The first three questionnaire were completed by the patients at the beginning of the first, fifth, final and follow up consultations. The Headache Diary, on the other hand, was completed on a daily basis by the patients for the period of the study. Objective findings consisted of the six cervical ranges of motion obtained by means of the Cervical Range of Motion Instrument (CROM).

These measurements were taken at the beginning of the first, fifth, final and follow up consultations. The subjective and objective data was analyzed using two - tailed non - parametric testing. The Wilcoxon Signed - Ranks Test was used for intra - group analysis while the Mann - Whitney U Test was used for inter - group analysis. A 95% level of confidence was used in both tests. The mean values, standard deviation and standard error were also used to strengthen or oppose the results obtained from the non - parametric testing. The results of the study showed that both groups improved with regard to subjective findings. There was a statistically significant decrease in headache intensity, frequency and duration in Group A from the first to the final and follow up consultations. In Group B, there was a statistically significant decrease in headache intensity from the first to the final and follow up consultations. Inter - group analysis of the subjective data demonstrated a statistically significant difference between the groups where Group A showed a greater improvement in headache intensity and frequency than in Group B. Statistical analysis of the objective data yielded non - significant data except for right lateral flexion which increased significantly in Group A from the first to the final consultation. It is evident from the results obtained that chiropractic treatment of tension - type headache improves the symptoms with regards to subjective findings.

Contrary to the proposed hypothesis however, manual traction does not enhance the effect of the adjustment, but Group B (the manual traction and adjustment group) in fact showed a smaller improvement than did the adjustment only group of Group A.

TABLE OF CONTENTS PAGE

Appendices

LIST OF TABLES, FIGURES AND PLATES PAGE

DEFINITIONS

Adjustment - The chiropractic adjustment is a specific form of direct articular manipulation using either long or short leverage techniques with specific contacts and is characterized by a dynamic thrust of controlled velocity, amplitude, and direction.

Chiropractic - Chiropractic is a discipline of the scientific healing arts concerned with the pathogenesis, diagnosis, therapeutics, and prophylaxis of functional disturbances, pathomechanical states, pain syndromes, and neurophysiological effects related to the statics and dynamics of the locomotor system, especially of the spine and pelvis.

Fixation (dynamic fault) - The state whereby articulation has become temporarily immobilised in a position that it may normally occupy during any phase of physiological movement. The immobilisation of an articulation in a position of movement when the joint is at rest, or in a position of rest when the joint is in movement.

Joint dysfunction - Joint mechanics showing area disturbances of function without structural change; subtle joint dysfunctions affecting quality and range of joint motion. They are diagnosed with the aid of motion palpation, and stress and motion radiography investigation.

Manipulation - Spinal manipulative therapy broadly defined includes all procedures where the hands are used to mobilize, adjust, manipulate, apply traction, massage, stimulate, or otherwise influence the spine and paraspinal tissues with the aim of influencing the patient's health.

Motion palpation - Palpatory diagnosis of passive and active segmental joint range of motion.

Manual traction - Traction applied by the physician without the aid of any mechanical device.

Objective findings - Findings obtained from the Cervical Range of Motion Metre (CROM).

Subjective findings - Findings obtained from the Short - form McGill Pain Questionnaire, Numerical Pain Rating Scale 101, CMCC Neck Disability Index and the Headache Diary.

Subluxation - a motion segment, in which alignment, movement, integrity, and/or physiological function are altered although contact between surfaces remain intact.

Tension - type headache - A bilateral headache of occipitonuchal location, and the pain intensity varying throughout the day. The headache has a heavy, pressing and tight quality with associated tight muscles of the neck and scalp.

Traction - The art of drawing or exerting a pulling force.

Vertebral motion segment - Two adjacent vertebral bodies and the disc between them, the two posterior joints and the ligamentous structures binding the two vertebrae to one another.

CHAPTER 1 : INTRODUCTION

1. Background to the problem

Headache has been referred to as the most common medical complaint of civilised man (Dalessio 1987:3). Headaches not only affect the well-being of people but have a deleterious effect on productivity and profitability in business. In the United States, the Nuprin pain report showed that 156 million work days are lost each year as a result of headaches and the loss in productivity is estimated at $25 billion (Sternbach 1986).

In the United States, headaches lead to more than 18 million visits to physicians a year (Sternbach 1986). Of the people presenting with the complaint of headache at a physician's office, 80% are diagnosed with muscle contraction (tension - type) headache (Diamond 1987:172).

A tension - type headache, as defined by Raskin (1988:215), is a head pain which is bilateral, commonly occipitonuchal; with a tendency to wax and wane throughout the day; of a heavy, pressing and tight quality, and associated with contracted muscles of the neck and scalp.

The patient with a headache will first seek relief with over - the - counter analgesics before approaching a physician for treatment and advice (Diamond 1987:173). A wide variety of treatment is offered by different practitioners often focusing on their field of expertise. Medical practitioners will often prescribe analgesics, anti-depressants, anti-inflammatories and ergotamine derivatives as the initial approach to headache (Raskin 1988:223, Diamond and Dalessio 1992:131-135). Psychotherapists institute relaxation and biofeedback techniques, which are reported to provide relief by relaxing the tight muscles of the headache sufferer (Raskin 1988:221).

Manual therapy for headaches, which includes massage of the neck muscles (Penter 1995) and stimulation of skin over this area (Diamond and Dalessio 1992:136), is also indicated when the cervical spine is involved. Injection of tender points in the surrounding muscles, known as active trigger points, may also be effective in managing the person's headache (Travell and Simons 1983:202). Chiropractors recommend manipulation and manual therapy for the treatment of tension - type headaches (Gatterman 1990 : 252-253).

In a comparative study of amitriptyline and spinal manipulation, manipulation was found to be an effective treatment for tension - type headaches without the side effects of the amitriptyline (Boline 1995).

Fitz - Ritson (1984), in his own investigations, found that traction, in conjunction with isokinetic exercises and manipulation, has a positive effect on tension - type headaches and has pointed to its use in the management of headaches. Traction is widely used in various ways in orthopaedic practice, but its use in the past has been restricted to attempt to restore presumed shifts of disc material to its "proper place" (Grieve 1988:567).

Grieve (1989:567) states that when the sole basis for using traction is the notion of mechanically repositioning the disc or "shifting it off the nerve root", the therapist is denied a much wider range of application of this useful treatment method. If traction is conceived as a flexible and freely adaptable method of mobilisation, its field of usefulness is considerably widened (Grieve 1998:567).

Betge and So (1985) found that traction separates vertebral motor units, anteflexes the alignment of vertebral segments and decreases the lordotic curve of the cervical spine. According to Betge and So (1985) spinal manipulation increases these effects of traction.

2. Statement of the problem

The purpose of this study was to determine the relative efficacy of adjustments compared to adjustments and manual traction in the treatment of tension - type headaches, with reference to the patient's perception of the treatment and objective findings. Group A was treated with adjustments to the cervical and upper thoracic spine. Group B was treated with adjustments to the cervical and the upper thoracic spine and manual traction was applied after the adjustments. The patient's perception of the treatment was measured using the Short-form McGill Pain Questionnaire (Melzack 1987), the Numerical Pain Rating Scale 101 (NRS 101) (Jensen et al. 1986), the CMCC Neck Disability Index (Vernon and Mior 1991) and a Headache Diary (Andrasik and Burke 1987 : 353-356). The former three questionnaires were completed four times through the two month period of treatment and assessment while the headache diary was completed on a daily basis over the two month period. The objective findings were obtained using the goniometer (Youdas et al. 1991) to measure the cervical spine range of motion of each patient at various intervals through the treatment period and at the follow - up consultation.

3. Need for a solution to the problem

The magnitude of the problem of tension - type headaches in society today, is only noted when studies such as the Nuprin pain report (Sternbach 1986) bring the problem to the fore. The problem is not only at a business and production level, but the problem also affects individuals in their personal lives (Sternbach 1986).

The wide variety of treatments used to treat tension - type headache seems to point to the need for a more effective standard method of treatment of tension - type headache. The more effective treatment should ideally reduce the cost of treatment; decrease the number of visits necessary to the physician's office; and prolong the symptom - free period the patient experiences. The extent of the side effects of the treatment and the possibility of dependency on the treatment also play a role in selecting the most appropriate and effective treatment.

Boline (1995), in a randomised controlled trial showed that spinal manipulative therapy is an effective treatment for tension - type headaches. In this trial, spinal manipulation in comparison to the group treated with amitriptyline, had fewer side effects and a sustained therapeutic benefit after the treatment period not experienced by the group treated with amitriptyline (Boline 1995).

Treatment of headaches by chiropractors has been aimed at motion and alignment abnormalities in the spinal segments of the cervical and thoracic spine (Ng 1980, Vernon 1992). Manipulation is used to correct these abnormalities. Traction also has an effect on these spinal segments (Betge and So 1995) and Fitz - Ritson (1984) reported that traction can be used in treating chronic headaches. This report by Fitz-Ritson on the use of traction in headaches was only a case study presentation. A study of a larger group of patients with one particular headache type has not yet been completed. This study sets out to determine if manual traction can enhance the effect of manipulation on tension - type headaches, thereby providing a more effective treatment option for the chiropractor's use.

CHAPTER 2 : LITERATURE REVIEW

1. Introduction

The subject of headache is a complex and common one, especially considering the proposed mechanisms and management of headache. Headache is a very common problem and the treatment of tension - type headaches has many different approaches, with varied success rates. It is important to investigate the efficacy of the treatment approaches to determine their usefulness, and this study attempts to investigate a chiropractic approach to tension - type headaches. In this review, the magnitude of the problem will be examined, as well as the related cervical spine anatomy, the possible mechanisms of headache and clinical considerations and treatment in the management of tension - type headache.

2. Incidence and Prevalence

Headache is known as the most common medical complaint in society (Dalessio 1987:3) and has a prevalence of 66% to 83% of the population in developed countries (Martin 1993:22). Headache is also the ninth most common cause of patient visits to physicians (Wyngaardin and Smith 1985:2129), but only 10-15% of headache sufferers consult physicians (Martin 1993:22). Of the people consulting physicians, 80% present with tension - type headaches (Diamond 1987:172).

3. Anatomy

During this literature review only relevant anatomy related to the study will be briefly discussed. The focus will be on the vertebral motion segment which is affected by manipulation and traction (Betge and So 1981; Fitz-Ritson 1984). The vertebral motion segment consists of the intervertebral disc, posterior spinal articulations, spinal ligaments, intersegmental spinal muscles and contents of the spinal canal and the intervertebral foramina (Gatterman 1990:13). The main focus will be on the intervertebral disc, the posterior spinal articulations and related ligaments.

3.1 The intervertebral disc

The intervertebral disc is a fibrocartilaginous structure that joins adjacent vertebra together to form an articulation. The disc is made up of an outer annulus fibrosus and a central nucleus pulposus. The annulus fibrosus, which is the fibrocartilaginous portion of the disc, is made up of concentric lamellae between adjacent vertebrae. It is reinforced anteriorly and posteriorly by fibres from the anterior and posterior longitudinal ligaments. On its outer edge, the annulus fibrosus blends with periosteum and attaches to the bone of the vertebra. The nucleus pulposus lies slightly anterior to the centre of the disc. It is made up of water and salt in a proteoglycan gel, as well as a lattice of collagen fibres. (Bland 1994:51-61.)

There is no disc between C0-C1 and C1-C2 and as a result these levels are said to be atypical vertebral motion segments (Gatterman 1990:13).

3.2 Posterior spinal articulations

The posterior spinal articulations are also known as zygapophyseal joints, posterior joints, joints of the vertebral arches, facet joints and apophyseal joints. These posterior spinal articulations are paired diarthrodial (freely movable) joints and are located between the superior and inferior facets of adjacent vertebra from C2-C3 and C7-T1.(Bland 1994:51-61.) The occipitoatlantal articulation (C0-C1) is not a typical spinal articulation because the paired occipital condyles of the occiput articulate with the upper articular facets of C1. The C1 - C2 segment has an atypical structure because the body of the atlas is replaced anteriorly by the odontoid peg of the axis.(Gatterman 1990:13.)

The fibrous capsule of the zygapophyseal joints is lax to allow movement and is also richly innervated with proprioceptive and pain receptors. The joints are covered by hyaline cartilage, lined with synovial membrane and almost all of these joints have a fibrofatty, fibrocartilaginous meniscus within each joint. The superior facets of the joint surfaces face forward and downward at 45 degrees, while the inferior facet joint surfaces face backward and upward at the same angle.

The surfaces of the facets do not fit perfectly together and thus allow the complex movements at these joints during lateral flexion and rotation of the neck. (Bland 1994:51-61.)

3.4 Spinal ligaments

These ligaments provide postural support between vertebra, restrict motion within physiological limits and are designed to resist tensile forces applied to the spine in various directions. Mechanically, the ligaments deform as a result of separation between vertebra such as in traction. The spinal ligaments are divided into long spinal ligaments and short intersegmental ligaments. The long spinal ligaments include the anterior and posterior longitudinal ligaments and the supraspinous ligaments, while the intersegmental ligaments include the ligamentum flava, the interspinous, intertransverse, and capsular ligaments. There are also regional accessory ligaments such as the ligamentum nuchae, the accessory ligament between the axis and atlas, the transverse ligament of the atlas, the cruciform ligament of atlas, and the apical and alar ligaments of the dens of the axis.(Gatterman 1990:207-210.)

3.5 Intersegmental muscles

Briefly, the intersegmental muscles extend between adjacent segments and are thought to act as postural muscles. They include the deep transversospinal muscles of the multifidus, rotatores, interspinal and intertransversarii. (Gatterman 1990:17-18.)

3.6 Intervertebral foramina and spinal canal

The intervertebral foramen is a canal formed by the pedicles of adjacent vertebra, the intervertebral disc, the posterior joints and the ligamentum flava. It allows segmental spinal nerves to leave the spinal canal and blood vessels and nerves to supply the contents of the vertebral canal. The spinal canal, made up of the vertebral bodies and vertebral arches, protects the spinal cord, the meninges and associated vessels.(Gatterman 1990:18.)

4. Subluxation, Subluxation Complex and Subluxation Syndrome

To understand the subluxation syndrome and how it relates to tension - type headache, it is necessary to understand what is meant by "subluxation". A subluxation is defined as "a motion segment, in which alignment, movement, integrity, and/or physiological function are altered although contact between joint surfaces remains intact" (Gatterman 1995:11). In the studies of Ng (1980) and Vernon (1992) both static and motion abnormalities were noted in the cervical spines of headache sufferers which may be equated with this definition of subluxation.

The subluxation complex refers to a theoretical model of subluxation and the pathological changes associated with it. These changes can occur in nerves, muscles, ligaments, vascular components and connective tissue levels (Gatterman 1995:11). While palpatory and nerve block findings suggest the involvement of the upper cervical facet joints in some forms of headache, the exact pathology which occurs in these joints has not yet been clearly established (Bogduk 1992).

The subluxation syndrome encompasses all the clinical manifestations of subluxation. The American Chiropractic Association on technique-adopted terminology defines the subluxation syndrome as "an aggregate of signs and symptoms that relate to pathophysiology or dysfunction of spinal and pelvic motion segments or to peripheral joints" (Leach 1994:20). The subluxation syndrome of headaches from the cervical spine includes the symptoms and signs of the presenting headache and the associated neck stiffness and pain experienced with this type of headache.

5. Mechanism and pathophysiology of headache

5.1 Muscular factors

According to Jensen and Rasmussen (1996), 87% of the chronic and 66% of the episodic tension - type headache have a muscular disorder. Edmeads (1988), in his article on the cervical spine and headache, also mentions the possibility that through aponeurotic and fascial connections, the neck muscles may produce a "myogenic head pain". Diamond (1987:173) goes further to indicate that sustained muscle contraction is a cause of muscle contraction headache. Travell and Simons (1983:238) were of this opinion, stating that "muscle contraction" headache was as a result of referred pain from either the trapezius or sternocleidomastoid muscles.

However, an EMG study by Martin and Mathews (1978) did not support the theory that muscle tension was the primary cause of chronic tension headaches. Ziegler (1985:315) suggests that muscle involvement in headache may be a response to pain rather than a cause of the pain. More studies are needed in this area for clarification of the pathogenic importance of muscular disorders in headaches (Jensen and Rasmussen 1996).

5.2 Vascular factors

There is controversy between researchers regarding the role that vascular factors play in causing tension - type headaches. Onel (1961) studied blood flow in muscles to determine whether local tissue ischaemia was the cause of tension - type headache. He found however, that capillary blood flow in the splenius capitis muscle increased rather than decreased in headache sufferers. This fact reduces the likelihood of ischaemia being the causative mechanism. Langemark et al. (1990) however, noted that blood flow in the temporal muscle was not increased in tension - type headache patients when compared to control subjects.

A study using amyl nitrate on subjects with tension - type headaches found that their headaches were aggravated on administration of this vasodilator in 43% of the cases (Martin and Mathews 1978).

Kabe et al. (1991), after studying thermography in tension - type headache patients, found that two groups in the study could be identified. One group with headaches of less than six months

duration showed higher temperatures in the painful area, the other group with headaches of more than two years duration showed a lower temperature in the painful area. Kabe et al. (1991) hypothesised that the difference was due to vasodilatory mechanisms in the early tension - type headache and that sympathetic regulation changed after a longer history and hence lowered the temperature over the painful area.

5.3 Psychological factors

Magni (1987) hypothesised that elevations in psychological symptoms found in patients with recurrent headaches, not caused by organic lesions, predisposed these patients to having headaches. Another theory relates these psychological symptoms and the tension - type headache to an underlying depression in these patients (DaFonseca 1963). A more recent study by Holroyd et al. (1993) indicates that psychological symptoms were present only when the patient was experiencing pain at the time of the evaluation. Furthermore, they stated that previous studies were incorrect in associating psychological disturbances with recurrent headache (Holroyd et al. 1993).

5.4 Cervical spine

The role of the cervical spine in headaches remains controversial and confusing (Vernon 1989). Boake (1972) was of the opinion that 70% of headaches he saw had a cervical origin, often as a result of apophyseal joint "locking". Vernon et al.(1992) in their study, also placed emphasis on the role of dysfunction of the cervical spine in muscle contraction and migraine headaches. This dysfunction was noted in a decreased segmental mobility on x - ray and in the motion palpation findings of the examiners (Vernon 1992). But Edmeads (1988), while admitting that disease processes in the cervical region were capable of producing headache, stated that the role of dysfunction, such as hypomobility of joints in causing headache, was obscure. Lewit (1971) contended that the posterior arch of the atlas was an important structure in the pathogenesis of headache, possibly due to the fact that the ventral ramus of the first cervical (suboccipital) nerve is located in this area (Warwick and Williams 1973).

Kerr (1961) suggested that there was a basis for spread of pain from the cervical spine to areas of the head supplied by the trigeminal nerve. According to Bogduk (1992), the anatomical basis for headache originating from the cervical spine relates to convergence within the trigeminocervical nucleus. The nociceptive neurons in this nucleus receive input from both trigeminal and cervical areas. The central connections of these neurons are poorly organised and as a result information received may be interpreted as arising from either trigeminal or cervical regions or both. Thus, nociceptive input from the cervical nerves C1-3 may be interpreted by the brain as arising from the trigeminal region, in other words from the head (a headache). Significantly, the cervical nerves C1-3 supply the muscle, joints and ligaments of the upper three cervical segments as well as the dura mater of the spinal cord and the posterior cranial and vertebral arteries. This does not support the theory that headaches may originate from the lower cervical spine (Bogduk 1992).

There are varying opinions as to whether radiologically assessable changes can be seen on cervical x - ray in tension - type headache patients. The presence of radiologically assessable changes in the cervical spine in headache sufferers as found by Ng (1980). The study showed that C1 and C3 in the symptomatic group (with occipital headache) had a significantly greater lateral inclination on anterior - posterior x - rays, than those in the control group (Ng 1980). Vernon (1992) found that 77% of all his subjects exhibited a marked reduction, absence or reversal of the normal cervical lordosis. In contrast to these studies, Wober Bingol et al. (1992) found that tension headache (tension - type headache) patients had pathological findings on x - ray less often than normal subjects. They therefore excluded the possible relationship between radiologically assessable changes of the cervical spine and tension headache (Wober Bingol 1992).

5.5 Central nervous system involvement

Some recent thinking in headache research points to a disturbance in the central pain pathways in tension - type headache patients (Shoenen et al. 1991, Langemark et al. 1993). Langemark et al. (1993), when investigating the nociceptive reflex threshold, found that these central disturbances affecting the threshold may be significant in the mechanism of chronic tension - type headache.

A study showing a decrease in pain pressure thresholds in chronic tension - type headache sufferers appears to support this thinking (Shoenen et al. 1991). As a result of this disruption of central pain pathways, tension - type headache patients have an increased sensitivity to nociceptive (pain) input (Langemark et al. 1993)

5.6 Myofascial - supraspinal - vascular model (MSV model)

A model involving vascular, myofascial and supraspinal inputs has been proposed by Olesen (1991). In this MSV model, tension - type headache presents as a result of largely myofascial nociceptive input with varying amounts of vascular input and supraspinal facilitation. Migraine headache, according to this model, has a strong vascular input with a moderate myofascial input and a small input supraspinally. Supraspinal input is thought to be relatively more important in tension - type headache than in migraine headache.

It appears that as yet a complete and definitive mechanism of all tension - type headache has not yet been established. Headache pain is as a result of multiple causes (Ziegler 1985:315).

6. Clinical considerations and differential diagnosis

6.1 Definition of tension - type headaches

The definition of tension - type headache used in this study is: a bilateral headache of occipitonuchal location, and the pain intensity varying throughout the day. The headache has a heavy, pressing and tight quality with associated tight muscles of the neck and scalp. (Raskin 1989:215,219.)

Diamond (1987:172) defines a muscle contraction (tension - type) headache slightly differently, defining it as a steady non - pulsatile ache which may be unilateral or bilateral and may occur over the frontal, temporal, occipital or parietal regions. The pain may also be a dull pressure, like a band around the head, or be more generalised over the head or predominantly nuchal (Cull and Will 1993:851).

6.2 Differential diagnosis

6.2.1. Cervicogenic headache

The possible diagnosis of cervicogenic headache was excluded when screening patients for this study.

The International Headache Society criteria for cervicogenic headache includes:

A. Pain localised to the neck and occipital region. May project to the forehead, orbital region, temples, vertex or ears.

B. Pain is precipitated or aggravated by special neck movements or sustained neck posture.

C. At least one of the following:

1.resistance to or limitation of passive neck movements.

2.changes in neck muscle contour, texture, tone or response to active and passive stretching and contraction.

3.abnormal tenderness of neck muscles

D. Radiological examination reveals at least one of the following:

1.movement abnormalities in flexion or extension

2.abnormal posture

3.fractures, congenital abnormalities, bone tumours, rheumatoid arthritis or other distinct pathology (not spondylosis or osteochondrosis). (International Headache Society 1988.)

Sjaastad (1983:7-8) describes a cervicogenic headache as unilateral, localised to the temporal, frontal, occiput, and ocular areas and sometimes the face. The headache does not alternate from side to side, but when severe it may be felt on both sides of the head. The associated ipsilateral phenomena presenting with the headache include : slight lacrimation, runny nose, tinnitus, conjunctival infection, erythema in the frontal and temporal region, and sometimes ipsilateral blurring and reduced vision. The headache can be precipitated by either neck movements, coughing, sneezing or evacuating the bowels. The patients with these headaches complain of neck stiffness and painful neck movements even in headache free periods. (Sjaastad 1983:7-8)

6.2.2. Migraine headache

Dalessio (1987:5) divides migraine into classic migraine and common migraine. The classic migraine describes head pain of a few hours to days presenting at times with photophobia, nausea and vomiting, constipation, diarrhoea, weight gain and fluid retention. These symptoms may be followed by diuresis, scotoma or field defects, paresthesias or defects in motility, vertigo and high blood pressure. A painless sensory aura precedes the headache and consists of visual disturbances and neurological symptoms. A common migraine has the same headache description but preceding features to the episode. (Dalessio 1987:5.)

The International Headache Society (IHS)(1988) defines the common migraine as a migraine without aura. The migraine without aura is

an "idiopathic, recurring headache manifesting in attacks lasting 4 - 72 hours. Typical characteristics of headache are unilateral location, pulsating quality, moderate or severe intensity, aggravation by routine physical activity, and association with nausea, photo- and phonophobia."(IHS 1988.)

The classic migraine is also renamed by the IHS. The "migraine with aura" is an idiopathic, recurring headache with attacks of neurological symptoms lasting 5 - 20 minutes. These symptoms are usually followed by a headache, nausea and/or photophobia. The headache may be completely absent but usually lasts 4 - 72 hours.(IHS 1988.)

6.2.3. Mixed headache

A mixed headache consists of symptoms of both tension - type headache and migraine headache in varying degrees (Dalessio 1987:9).

Dalessio (1987:9) describes three types:

1. A headache of migraine quality and has minor muscular involvement and which occurs over many years.
2. A headache which is mainly tension - type headache in character and has an intermittent throbbing pain, nausea and photophobia accompanying it.
3. An episodic migraine headache progresses into a daily tension - type headache. (Dalessio 1987:9.)

The International Headache Society (1988) states that the patient presenting with both migraine and tension -type headache should receive the diagnosis for both conditions rather than using a separate diagnosis such as "combined headache". The combined headache referred to can be equated with mixed headache described above.

For the purpose of this study, if the primary presenting headache was of the migraine type, the patient was excluded. However, if the primary presenting headache was a tension - type headache and occasional (a maximum of one per month) migraine headache, the patient was not excluded from the study as the migraine symptoms were not deemed to significantly affect the outcome of the study.

6.3 Warning signs

When evaluating a headache patient, it is important to identify ominous signs or "red flags" in the history and examination. These include:

1. A headache which is subacute and progressive.
2. New onset of headache in adult life especially over 40 years of age.
3. Onset of headache with exercise or intercourse.
4. Significant change in established headache pattern.
5. Nocturnal occurrence of headache or morning awakening.
6. Associated nausea and vomiting not explained by migraine or systemic illness.
7. Precipitation or worsening of headache with changing of posture.
8. Confusion and change in cognitive abilities.
9. Seizures.
10. Weakness.
11. Any abnormal neurological sign.
12. Personality changes.
13. Signs of raised intracranial pressure : transient visual obscurations, diplopia, intracranial noises, papilloedema.
14. Resistance of headache to analgesics.
15. Decreased level of consciousness, lethargy or excessive sleepiness.
16. Fever associated with the headache.
17. Meningeal signs (resistance to passive flexion of the neck) (Dodick 1997).

7. Indications and contra - indications

7.1 Manual traction

The indications for traction include:

1. Degenerative disc disease with or without nerve root entrapment.
2. A prolapsed disc.
3. Facet osteoarthritis and capsulitis (Kekosz 1986).
4. Facet syndrome.
5. Muscular spasm (Gatterman 1990:369-370).
6. Chronic headache (Fitz - Ritson 1984).

According to Kekosz (1986), the contra - indications of traction of the lumbar and cervical spine are :

1. Inadequate investigation (clinical, radiographic and laboratory).
2. Acute traumatic lesions.
3. Spinal malignancy (primary or metastatic).
4. Cerebrovascular insufficiency.
5. Temporomandibular joint syndrome.
6. Uncontrolled hypertension.
7. Severe cardiovascular disease.

8. Rheumatoid arthritis.
9. Spondylitis.
10. Osteoporosis.
11. Spinal infection, including osteomyelitis and discitis.
12. Large central disc and spinal cord compression.
13. Aortic aneurysm.
14. Ileofemoral incompetency.
15. Appreciable involuntary head or neck movements (e.g. Parkinsonism).
16. Uncooperative patient.

Grieve (1982) also includes developmental stenosis and cervical myelopathy as contra - indications to cervical traction.

7.2 Manipulation

The primary indication for manipulation is joint fixation or blockage, which is described as a reversible mechanical derangement of the facet joint, causing a limitation in normal movement (Gatterman 1990:50-51).

Contra - indications to manipulation, according to Gatterman (1990:55-69) are as follows:

1. Vertebral artery syndrome.
2. Aneurysm of any major blood vessel.
3. Tumours of the spine, either primary or secondary.
4. Bone infections such as osteomyelitis and tuberculosis affecting the spine.
5. Traumatic injuries such as fracture, articular. dislocation and severe ligamentous strain or instability.
6. Spinal haematomas as a result of anti - coagulant therapy.
7. Acute inflammatory phases of ankylosing spondylitis in the inflammatory stage, rheumatoid arthritis affecting the cervical spine, psoriatic arthritis, Reiter's syndrome and osteoarthritis.
8. Cauda equina syndrome.
9. Cervical disc lesions, myelopathy or cervical radiculopathy.

8. Treatment protocols and their effectiveness

"The first step to treatment is to identify the causal factors" (Wyngaardin and Smith 1985:2132).

8.1. Pharmacological

Lance and Curran (1964), in a study involving 280 chronic tension headache sufferers, found that the anti - depressants, amitriptyline and imipramine, as well as the tranquillising agents, chlordiazepoxide and diazepam, improved the headache symptoms of the patients. 65% of the study showed a 50% improvement and 25% reported to be headache free (Lance and Curran 1964). A dosage of 50 - 100 mg of amitriptyline per day is recommended (Raskin 1988:222). Propanolol is reported to be effective for tension - type headaches but not as effective as amitriptyline (Raskin 1988:223). Ketoprofen was also found to be effective and well - tolerated in a study on the treatment of mild to severe episodic tension - type headaches (Dohlof and Jacobs 1996). Aspirin may be used for individual headaches (Wyngaardin and Smith 1985:2132) and is often combined with a mild sedative for effective relief (Ziegler 1985:318).

8.2. Biofeedback

" EMG biofeedback training involves providing patients with continuous information pertaining to the state of tension of one or more muscles with a view to helping them control tension " (Martin 1993:71).

EMG biofeedback has been shown to be more effective than no treatment in the treatment of tension - type headaches (Haynes et al. 1975). Martin (1993:73) also found this therapy to produce better results than just placebo effect. But the benefit seems to be short-lived with little long - term benefit (Chapman 1986; Raskin 1988:221-222).

8.3. Relaxation Training

Relaxation training is usually in the form of progressive relaxation or autogenic training. Relaxation training has been found to be as effective as EMG biofeedback in the treatment of headaches and significantly superior to placebo controls (Martin 1993:81). Cott et al. (1992) conducted a long - term study comparing autogenic relaxation training; EMG biofeedback and relaxation training combined; and thermal biofeedback and relaxation training combined in the treatment of chronic idiopathic headache. Their findings showed that the combination of EMG biofeedback and relaxation therapy provided significantly more improvement than the other treatments (Cott et al. 1992).

8.4. Manipulative Therapy

There have been various studies on the treatment of headache with manipulation, but only a few have been randomised controlled studies. In the RAND report, cervical spine manipulation and mobilisation was reported to provide short - term relief for some tension - type headache sufferers and other nonmigranous headache sufferers (Coulter et al. 1996).

The randomised controlled study by Boline et al. (1995) on chronic tension - type headache revealed significant results. 126 subjects took part and were randomised into two groups. The first group was treated with chiropractic manipulation and the second with amitriptyline. Both groups were treated for six weeks. At the end of the treatment period, both groups had improved and there was no difference in improvement between the groups. However, four weeks later, an assessment was conducted revealing that the amitriptyline group had returned to close to baseline levels, while the manipulation group still showed a statistically significant level of improvement.(Boline 1995.)

Vernon (1982) conducted a prospective and retrospective uncontrolled study involving 33 tension - type headache subjects. Following nine manipulations, the average headache frequency dropped from 13 to 3 per month, the average severity from 3,5 to 1,5 (out of a score of 5) and the duration decreased by 10 hours - from 12 to 2 hours. 94% of the subjects reported complete relief following the treatment.(Vernon 1982.)

In one of the earlier studies, Hoyt et al. (1979) monitored 22 subjects complaining of a dull, non - throbbing bilateral headache. The subjects - through randomisation - either received palpation and manipulation, palpation only, or rest in the supine position. Only the manipulation group showed a reduction in headache severity (an average of 50% reduction) five minutes after one treatment. This study showed that even one manipulation had an effect on headache severity. The study however, did not have any pre-, post-treatment, or long - term measurements to strengthen the findings.(Hoyt 1979.)

Droz and Crot (1985) reported on 332 patients with occipital headaches. In this review, occipital headaches were taken to be a subgroup of tension - type headaches. An average of nine manipulation treatments were administered to these patients. Following treatment, 80% were pain-free or almost pain-free, 10% had a decrease in symptoms, 5% had little or no relief, and 5% were worse following treatment.(Droz and Crot 1985.)

Relief from other headaches following manipulative therapy has also been reported. Jensen (1990) compared manipulative therapy to cold packs when treating 19 post - traumatic headache subjects. The subjects were treated twice a week for one week. The assessment was done two weeks after treatment. The manipulation group showed a 57% reduction in pain intensity and a 64% reduction in analgesic use. A five week follow-up did not however render statistical difference between the two groups.(Jensen 1990.)

Mennell (1990), in his article on joint dysfunction of the cervical spine, reported on 23 patients who complained of headaches. After receiving manipulation, 5 patients reported no symptoms of headache, 6 reported a marked improvement and 7 a moderate improvement of their symptoms. 2 patients reported no change in their symptoms following manipulation.(Mennell 1990.)

More recently, spinal manipulation was found to be effective in treating the newly classified cervicogenic headaches (Nilsson et al. 1997). The study was a prospective controlled trial with a blinded observer. 53 suitable headache sufferers completed the

study, with 28 receiving cervical manipulation and the other 25 receiving low level laser and deep friction massage in the lower cervical and upper thoracic regions. Both groups were treated twice a week for a period of three weeks. The subjects were required to complete a headache diary for a period of five weeks. The use of analgesics decreased by 36% in the manipulation group, while in the soft - tissue group there was no change. The number of headache hours decreased by 69% in the manipulation group and by 37% in the soft - tissue group. Headache intensity decreased by 36% in the manipulation group and 17% in the soft - tissue group. The significant improvement of the manipulation group over the soft - tissue group was seen as significant to the researchers in the study.(Nilsson et al.1997.)

8.5. Traction

"Traction is a technique in which a force is applied to a part of the body to stretch soft tissues, to separate joint surfaces or bony structures." (Fitz - Ritson 1984)

The use of traction in any form for the treatment of headache has not been studied in any randomised controlled trials. It has, however, been a recommended adjunct to various forms of treatment. Boake (1972), in his treatment of headaches, recommends that gentle traction of the cervical spine be used as a pre - manipulative procedure to relieve muscle spasm. Following manipulation, Boake (1972) again recommends traction to be applied to the neck either manually or mechanically. Lance (1982) identified cervical traction or manipulation as useful in treating headaches, if there was evidence of degeneration of the cervical disc which may be contributory to the presenting headache.

Fitz - Ritson (1984) presented three case studies of patients with chronic headaches where cervical spinal traction was the main treatment of choice. The traction was mechanically administered and an average of ten treatments were given. Isokinetic exercises and chiropractic manipulation were added to the treatment protocol later in the treatment. All of the patients had significant relief from their headaches following the treatment.

The rationale of using traction was based on the understanding that the traction was affecting the upper cervical segments.(Fitz-Ritson 1984.) These segments have been identified by Bogduk (1992) as capable of producing headache pain. Particularly the zygapophyseal joints of the upper three vertebra are involved in this mechanism (Bogduk 1992). Betge and So (1981) found that traction has a definite effect on the cervical spine. The effects include separation of the vertebral motor units, anteflexion of the alignment of vertebral segments and a reduction in the physiological lordotic curve (Betge and So 1981). Fitz - Ritson (1984) was of the opinion that combined with chiropractic manipulation, this effect would be enhanced and thereby further reduce the headache symptoms.

It is on this premise that this study is based; to determine if manipulation has an effect on headache and whether manipulation and traction combined also have an effect. The question of whether manual traction and manipulation have a greater effect than just manipulation was also addressed in this study.

8.6. Massage

Penter (1995) found that massage has an effect in reducing headache symptoms of chronic tension - type headache sufferers. Nilsson (1997) also found that deep friction massage and low level laser decreased the duration of cervicogenic headaches per day by 37% and the intensity by 17%. Gatterman (1990:250) points to massage as one of the options in treating muscle contraction (tension - type) headaches.

9. Conclusion

Greater awareness of how common the tension - type headache is has encouraged more research and attention to the subject. After a review of the literature, it is clear that still more research is necessary to increase the understanding and management of this condition. This study seeks to in some way clarify the effects of spinal manipulation and traction in the management of tension - type headaches.

CHAPTER 3 : MATERIALS AND METHODS

1. INTRODUCTION

The object of this study was to determine if manual traction is an effective adjunct to the chiropractic adjustment in the treatment of tension - type headaches. If so, it will enhance the chiropractor's ability to deal with the condition. Furthermore, the object was to determine if manual traction and adjustments are more effective than adjustments alone in the treatment of tension - type headaches.

2. STUDY DESIGN AND PROTOCOL

This study was a randomised, uncontrolled clinical trial with the purpose of determining the possible effect of each treatment protocol. Patients in treatment group A received adjustments, and in group B, adjustments and manual traction were administered. Firstly, intra - group change was considered for the two groups. Secondly, inter - group difference between the groups was analyzed to determine which of the treatment protocols were, if at all, more effective. The more effective protocol would then be the treatment of choice for treating tension - type headaches.

Patients were recruited by advertisements on local radio and advertisements placed at libraries, shopping centres and at the Technikon Natal. These adverts indicated that research on tension - type headaches was being conducted and that free treatment would be offered to those participating in the research programme. Interested persons contacted the Technikon Chiropractic Clinic whereupon the nature of the study was explained. Following the explanation, an initial consultation was arranged for willing and suitable subjects.

2.1 Inclusion and exclusion criteria

A sample size of thirty patients was randomly divided into the two groups. Each subject underwent a thorough case history, physical examination and cervical spine regional examination, prior to treatment, to determine if they complied with the following criteria:

a. Patients who presented with tension - type headaches as defined by Raskin (1988:215).

b. Patients younger than 14 years of age or older than 65 years of age were excluded from the study. Patients older than 65 years of age were excluded because Phase 3 degeneration (Kirkaldy - Willis, 1992:111) is usually present in their lumbar and cervical spines. Patients with Phase 3 degeneration were thus excluded from the study.

c. Patients presenting with hard neurological signs were excluded from the study.

d. Patients presenting with any illness that may affect, perpetuate or cause their headache, were excluded from the study. For example, influenza, sinusitis (Crompton and McHardy 1993 : 354), raised intracranial pressure, meningitis, elevated blood pressure (Cull and Will 1993 : 846,849).

e. Patients who exhibited any contra-indications to traction and/or manipulation were excluded from the study (Kekosz et al. 1986, Gatterman 1990 : 55-68).

f. Patients taking analgesics and/or receiving other manual therapy to the cervical and thoracic spine were excluded from the study.

g. Patients were required to be without any treatment for one week before the treatment commenced.

2.2 Allocation of patients

The thirty patients were randomly allocated to two groups of fifteen each. The randomisation was done by placing thirty pieces of paper, numbered from one to thirty, in a hat. The hat was then agitated to ensure the pieces of paper were well mixed. The first number drawn was allocated to the first patient, the second number to the second patient and so forth, until each patient had a number allocated to him/her. Numbers 1-15 were assigned to treatment group A, and numbers 16-30 were assigned to treatment group B.

On the first consultation, the patients were screened and examined by the examiner to determine if they presented with tension-type headache, or whether with any condition that would prevent them from participating in the study. The screening and examination included a case history (Appendix 2), physical examination (Appendix 3) and cervical regional examination (Appendix 4). During the cervical regional examination, zygapophyseal joints with restricted motion were located in the cervical and thoracic spine by means of motion palpation (Schafer and Faye 1989:100-109).

If deemed clinically necessary, the patients underwent radiological examination of the cervical spine to rule out any pathology that would exclude them from the study.

Patients meeting the above - mentioned criteria were required to complete an informed consent form before treatment was administered. The patients were assigned to either group A (adjustments only) or group B (adjustments and manual traction) by the method previously described.

2.3 Interventions

All patient in groups A and B received adjustments (diversified technique) (Szaraz 1984) to the levels of joint fixation. The adjustments were administered by the examiner or the supervising clinician at the Technikon Natal Day Clinic. The adjustments used were occiput rotation (mastoid contact) (Szaraz 1984:2.7), occiput lateral flexion (mastoid contact) (Szaraz 1984:2.9), rotatory cervical (index contact) (Szaraz 1984:2.19), supine lateral break (Szaraz 1984:2.20), thumb move (Szaraz 1984:4.1), combination (Szaraz 1984:4.2), hypothenar lateral spinous (Szaraz:6.1), crossed bilateral (Szaraz 1984:6.4), and/or anterior thoracic (Szaraz 1984:6.8). Rotation of the cervical spine beyond 45 degrees was not used in these adjustments. Selection of the technique(s) used was based on the level to be treated, direction of the fixation , patient build and comfort.

The patients in group B received manual traction following the adjustment. The manual traction was administered by the examiner with the patient supine and the neck flexed 20-30 degrees. The researcher stood at the head of the table and grasped the head of the patient with one hand placed at the base of the occiput and the other placed around the mandible of the patient. Cephalad traction was applied by the researcher to within the patient's tolerance. For the purpose of this study, the patient's tolerance precedes any pain or discomfort during the traction or if the patient began to slide on the table. The traction was intermittent in nature, with a 10 second traction period followed by a 10 second rest period. This procedure was repeated twenty times at each consultation.

Each patient was treated over a period of four weeks and received a maximum of nine treatments within this period. If the patient was asymptomatic before the ninth treatment, the treatments were discontinued. If the patient again became symptomatic within the four week period, treatment was continued until the ninth treatment, the end of the four week period, or until the patient was again asymptomatic within the four weeks.

In review of the literature on cervical traction, a standard method was not found. Zylbergold (1985) found that intermittent traction was the most effective method. Supine traction is recommended rather than seated traction by Grieve (1982:573). Pio et al. (1995) found that the greatest posterior vertebral body

separation was obtained by traction when the neck was placed in slight flexion (25° - 45°). The traction in this study was a combination of the most effective techniques of traction based on previous research and was used, as there was no obvious standard for such traction.

If the patient became and remained asymptomatic through the four weeks, continued assessment of the patient occurred in the third and fourth weeks. The measurements obtained during the continued assessment were aligned with the fifth and final treatment assessments of the other patients needing treatment during the third and fourth weeks.

3. MEASUREMENTS AND OBSERVATIONS

The primary data was obtained directly from the patients using the following communication and observation methods. Subjective findings were obtained with the Short-form McGill Pain Questionnaire (Appendix 5) , the CMCC Neck Disability Index (Appendix 6), the Numerical Pain Rating Scale 101 (Appendix 7) and the Headache Diary (Appendix 8).

The first three questionnaires were completed at the beginning of the first, fifth and final treatments and the follow - up consultation. The patient was carefully instructed by the examiner on how to complete the questionnaires, following which, the patient completed the questionnaires on his/her own. The headache diary was completed on a daily basis during the treatment and assessment periods.

3.1 Subjective Measurement

3.1.1. Short-form McGill Pain Questionnaire

The Short-form McGill Pain Questionnaire (Melzack 1987) is a subjective questionnaire used to provide information on the sensory, affective and overall intensity of the pain. The Short-form McGill Pain Questionnaire correlates highly with other recognised questionnaires and is sensitive for traditional clinical therapies (Melzack 1987). The questionnaire is divided into two sections, one assessing the sensory perception of pain (questions 1-11) and the other the affective dimension of pain (question 12-15). For the purpose of this study, only questions 1-11 were used. A minimum score of zero is allocated for no pain, and a maximum of three for the most severe pain for each question. Each question must be answered by the patient. The data was collected and recorded. The sum of the completed sections is divided by the highest possible score to arrive at a percentage.

3.1.2. CMCC Neck Disability Index

CMCC Neck Disability Index (Vernon and Mior 1991) assessed the disability experienced by the patient. This index has been found to have a high degree of test - retest reliability and internal consistency, an acceptable level of validity, as well as showing sensitivity to severity variation (Vernon and Mior 1991). The areas of disability assessed included pain intensity, personal care, lifting, reading, headaches, concentration, work, driving, sleeping and recreation. Each section was completed by the patient by marking one block in each section which most appropriately describes their disability. Scores from zero to five were allocated in each section where zero indicated no disability and five maximum disability. The total of the whole questionnaire was divided by the highest possible total of fifty to arrive at a percentage disability.

3.1.3. Numerical Rating Scale

Numerical Rating Scale 101 (NRS 101) (Jensen et al. 1986) determined the pain intensity the patient experienced during the study. This questionnaire was used because it is easy to administer and score, has a high relative rate of correct scoring, and also has a large choice of response categories (101) (Jensen et al. 1986). The questionnaire consists of two lines which each indicate a scale of 0-100 depicting the intensity of the pain. On the first line the patient is required to indicate a number between 0 and 100 that best describes the pain experienced when it is at its worst. On the second line the patient is required to indicate the number between 0 and 100 that best describes the pain experienced when it is at its least. The data was collected and recorded. The average pain intensity was calculated by adding the values representing the patient's least and worst intensity of pain and dividing the total by two.

3.1.4. Headache Dairy

The Headache Diary (Andrasik and Burke 1987 :353-356) recorded the duration, intensity and frequency of the patient's headache. The Headache Diary was socially validated in a study by Blanchard et al. (1981). The Headache Diary consisted of a grid with intensity of the headache on the y-axis and the time of the day on the x-axis, starting at six o'clock in the morning and ending at six o'clock the following morning.

A separate grid was used for each day and sixty grids were completed by each patient. The patient was required to draw a line on the grid each day depicting the intensity, duration and frequency of the headache each day. The data from the Headache Diary was recorded each day by the patient from the first treatment up until the follow-up consultation. Patients were instructed to record daily the time of the onset, the intensity and the duration of the headache in the headache diary. The interpretation of the Headache Diary was based on recent studies by Nilsson et al. (1997) and Boline et al. (1995).

3.2 Objective Measurements

3.2.1. Cervical Range of Motion Instrument

A goniometer was used to obtain objective data regarding the patient's cervical range of motion. The CROM (Cervical Range of Motion Instrument) (Youdas et al. 1991) manufactured by Performance Attainment Associates (3600 Labore Road, Suite 6, St. Paul, Minnesota 55110-4144, USA) was used to assess six ranges of motion of the cervical spine. The CROM has been found to have a good to high intra - examiner reliability by Youdas et al. (1991). The six ranges of motion were cervical extension, flexion, right rotation, left rotation, left lateral flexion and right lateral flexion.

The CROM measurements were obtained as follows. At the beginning of the first, fifth and final treatments and the follow - up consultations, the cervical ranges of motion were measured. At the beginning of each range of motion, the subject was instructed to sit erect in a straight-back chair with the sacrum against the back of the chair, the thoracic spine away from the back of the chair, arms hanging at sides and feet flat on the floor. The subject was then instructed to position the CROM instrument as if putting on a pair of glasses. The velcro was then fastened firmly around the subject's head.

The subject was instructed to fully flex the neck and a reading was obtained from the sagittal plane meter. The subject was then instructed to extend the neck and a reading was taken from the sagittal plane meter. The subject was then asked to focus on a point on the wall straight ahead with the head in the neutral position to eliminate rotation while measuring lateral flexion. The subject was instructed to laterally flex the head to the left keeping the shoulders level. Shoulder elevation was monitored and checked by the researcher by placing the hand on the right shoulder. Any head motion outside the coronal plane was corrected manually by the researcher. A reading was obtained from the lateral flexion meter. From the neutral position, the subject was instructed to laterally flex to the right in the same manner as for left lateral flexion.

For rotation, the magnetic yoke was placed on the subject's shoulders with the arrow pointing north. The lateral flexion and sagittal plane meters read zero to ensure that the rotation meter was level. As the subject looked straight ahead, the rotation meter was turned so that one of the pointers pointed to zero. The subject was instructed to focus on a horizontal line on the wall to ensure the head was not tipped while the head was rotated to the left. The right shoulder was lightly stabilized by the researcher's hand to eliminate shoulder rotation. A reading was obtained and recorded from the rotation meter. From the neutral position, the subject was instructed to rotate the head to the right with the same procedure used for left rotation, with the left shoulder lightly stabilised by the researcher's hand.

The secondary data included journal articles, published reports and books containing relevant information.

4. STATISTICAL ANALYSIS

4.1 Introduction

Statistical analysis of the following data was collated:

1. The six ranges of motion recorded from the goniometer.
2. The Short-form McGill Pain Questionnaire.
3. The CMCC Neck Disability Index.
4. The Numerical Rating Scale 101.
5. The Headache Diary.

4.2 Objective Findings

Objective findings were obtained using the goniometer. During each consultation, before the treatment was administered, six range of motion readings were recorded. Each range of motion was compared separately. The data from the goniometer was obtained from the first, fifth, final and follow - up consultations. The data from the first treatment was compared with the data from the fifth and final treatments and the follow - up consultation, using the Wilcoxon Signed - Ranks Test and mean values. The data from the fifth treatment was compared to the final treatment. The data from the final treatment were also compared with the data from the follow - up consultation using the Wilcoxon Signed - Ranks Test. The Mann - Whitney U Test and mean value analysis were used for inter - group analysis between group A and group B, using the data from the first, fifth, final treatments and follow - up consultation.

4.3 Subjective Findings

The Short-form McGill Pain Questionnaire, the CMCC Neck Disability Index, the NRS 101 and the Headache Diary were used to obtain subjective measurements of the patient's pain. These questionnaires, excluding the Headache Diary, were completed by the patient at the beginning of the first, fifth, final treatments and the follow - up consultation. The Wilcoxon Signed - Ranks Test and mean values were used for intra - group analysis comparing the data from the first, fifth and final treatments and follow - up consultation. The data from the first treatment was compared to the data from the fifth and final treatments and the follow - up consultation. The data from the fifth treatment was compared to the data from the final treatment. The data from the final treatment was compared to the data from the final consultation. The Mann - Whitney U Test and mean value analysis were used for inter - group analysis between group A and group B using the data from the first, fifth and final treatments and the follow - up consultation.

The Headache Diary was used to determine if any change in headache intensity, duration and frequency occurred during the two month period of treatment and assessment. The percentage change in headache intensity was obtained by calculating the mean maximum headache intensity per episode per week.

The mean intensity of week 1 was compared to the mean of week 2, week 3, week 5 and week 8 respectively. The mean headache intensity of week 3 was compared with the mean headache intensity in week 5. The mean headache intensity from week 5 was compared with the mean headache intensity in week 8. The Wilcoxon Signed - Ranks Test and mean value analysis were used at these intervals for intra group analysis. The Mann - Whitney U Test and mean value analysis for inter - group analysis used week 1, week 3, week 5 and week 8 of groups A and B.

The percentage change in the mean number of headache hours each week was used to determine if any change in headache duration had occurred during the treatment and assessment periods. Headache frequency was analyzed using the percentage change in frequency per week. The same comparison intervals used for headache intensity were used for headache duration and frequency .

The comparison between week 1 and week 2 was used to determine if there was any initial change in intensity of the headache following the commencement of treatment. Week 3 of the Headache Diary was chosen for comparison because it most closely represented the treatment 5 which was used for analysis in the other questionnaires and the goniometer.

Similarly, week 5 was analyzed because the final treatment was used for subjective and objective measurements. Week 8 was used to determine the headache intensity at the follow - up consultation.

The computer software STATGRAPHICS VERSION 6, manufactured by MANUGISTICS INC. was used to statistically analyze the data using the Wilcoxon Signed - Ranks Test for intra-group analysis and the Mann-Whitney U Test for inter-group analysis.

4.4 Statistical Tests

The sample size per group was small as each group had 15 subjects. There was also a lack of precision in the measurements used in the study. As a result, non-parametric tests were used to do statistical data analysis. Parametric tests such as the two-tailed Sample unpaired and paired t-tests were not used. Instead, non-parametric tests such as the Mann-Whitney U Test and Wilcoxon Signed - Ranks Test were used for data analysis. The statistical tests were applied to the data by a statistician and the examiner.

The Wilcoxon Signed - Ranks Test was applied to the data to determine any statistical difference, within the groups, between the first treatment, the fifth and final treatments and follow-up consultation using the previously described method. A 95% confidence level was used in this test. The Wilcoxon Signed - Ranks Test was used to attempt to solve subproblem 1 and 2.

Subproblem 1 is to determine the efficacy of adjustments (Group A) in the treatment of tension - type headaches with reference to subjective and objective findings. The null hypothesis stated that there was no statistically significant difference in the condition between the first, fifth, final treatments and follow - up consultation in group A. The alternative hypothesis stated that there was a statistically significant difference in the condition between the first, fifth and final treatments and the follow - up consultation in group A.

Subproblem 2 is to determine the effectiveness of adjustments and manual traction (group B) in the treatment of tension - type headaches with reference to subjective and objective findings.

The null hypothesis stated that there was no statistically significant difference in the condition between the first, fifth and final treatments and follow - up consultation in group B. The alternative hypothesis stated that there was a statistically significant difference in the condition between the first, fifth and final treatments and the follow - up consultation in group B.

The Mann - Whitney U Test was used to determine if the was a statistically significant difference between the groups A and B. A 95% confidence level was used for this test (alpha value of 0.05). A two-tailed test was used where the null hypothesis was rejected if $p > 0.025$ (alpha divided by two) and accepted if $p < 0.025$ (alpha divided by two). This test was used for subproblem 3. Subproblem 3 is to determine the relative efficacy of adjustments compared to adjustments and manual traction in the treatment of tension - type headaches with reference to subjective and objective findings. The null hypothesis stated that there was no statistically significant difference between the two groups. The alternative hypothesis was that there was a statistically significant difference between group A and group B.

4.5 Summary and Descriptive Statistics

Standard deviation was used to determine the distribution of the values of a group of data around the mean value of the data. Standard error was also used to determine the reliability of the results obtained. Mean values were used for comparison within the groups and between the groups. The percentage difference in the mean values of treatment 1 and the final treatment would determine the percentage improvement within each group.

Diagrammatic representation of the relevant data was displayed by means of bar graphs, pie charts and tables. At least four bar graphs, with standard error bars, were used. Tables were used for comparison of p - values and mean values during intra - group and inter - group analysis. For inter - group analysis, standard deviation and standard error was also included in these tables.

CHAPTER 4 : RESULTS

4.1 Introduction

In this chapter, the criteria governing data admissibility will be outlined and the data from the study will be presented in tabulated form. Firstly, demographic data from the study will be presented, followed by the data from intra - group analysis and the data from the inter - group analysis. Each table from the intra - group and inter - group data will contain the p - value obtained from either the Wilcoxon Signed - Ranks test or the Mann - Whitney U Test , the mean value, the standard deviation and the standard error. The discussion of the data will be not be covered in this chapter but will be the focus of chapter 5.

4.2 Criteria governing admissibility of data

Only information obtained from the case history, physical examination, questionnaires and CROM will be used in the data for this study. The pain questionnaires were completed under the supervision of the researcher and the CROM readings were taken by the researcher only.

Thirty-four subjects began the study and 4 were excluded due to non-compliance. As a result 15 subjects completed the study in Group A and 15 subjects completed the study in Group B. One patient from Group B became asymptomatic and re-entered the study after becoming symptomatic once again within four weeks.

For the following data, a two-tailed test was performed; where the null hypothesis is accepted when $p < 0.025$ and rejected when $p > 0.025$.

ABBREVIATIONS USED IN TABLES

1. INT - headache intensity from headache diary
2. FREQ - headache frequency from headache diary
3. DURA - headache duration from headache diary
4. S.D - standard deviation
5. S.E. - standard error
6. Lat fl - lateral flexion
7. Rot - rotation
8. pts - patients
9. pt - patient

4.3 Demographic Data

DEMOGRAPHIC DATA TABLE

	GROUP A	GROUP B
Age range (mean age)	20-62 (38.9)	23-58 (34.2)
Male : Female	4 : 11	6 : 9
Pain description	Dull/ache - 6 Pressure - 1 tight - 3 throbbing - 1 other - 4	Dull - 8 Pressure - 3 tight - 2 throbbing - 2 other - 1
Mean duration of headaches	9.2yrs	9.5yrs
levels of fixation	C0 (9 pts) C1 (10 pts) C2 (13 pts) C3 (8 pts) C4 (9 pts) C5 (3 pts) C6 (2 pts) C7 (2 pts) T1 (0) T2 (4 pts) T3 (6 pts) T4 (3 pts) T5 (1 pts) T6 (4 pts)	C0 (9 pts) C1 (14 pts) C2 (12 pts) C3 (7 pts) C4 (5 pts) C5 (6 pts) C6 (4 pts) C7 (1 pt) T1 (1 pt) T2 (1 pt) T3 (4 pts) T4 (0) T5 (2 pts) T6 (1 pt)

4.4 Intra - Group Data

4.4.1 Subjective data

TABLE 1 : Statistical results of the subjective findings from headache diary comparing week 1 and week 2 in Group A

	WEEK 1				WEEK 2		
	MEAN	S.D.	S.E.	P-VALUE	MEAN	S.D.	S.E.
INT	4.54	1.28	0.33	0.1213	3.79	2.46	0.64
FREQ	5.20	2.40	0.62	0.0257	3.20	2.65	0.68
DURA	67.87	45.59	12	0.1213	49.43	53.22	13.7

TABLE 2 : Statistical results of the subjective findings from headache diary comparing week 1 and week 2 in Group B

	WEEK 1				WEEK 2		
	MEAN	S.D.	S.E	P-VALUE	MEAN	S.D.	S.E.
INT	4.89	2.14	0.55	0.7892	4.87	2.08	0.54
FREQ	5.33	2.92	0.75	0.7237	5.27	3.03	0.78
DURA	54.6	36.44	9.41	0.0388	50.23	42.69	11.0

TABLE 3 : Statistical results of the subjective findings comparing consultation 1 and 5 in Group A

	CONSULTATION 1				CONSULTATION 5		
	MEAN	S.D.	S.E	P-VALUE	MEAN	S.D.	S.E
NRS101	40.3	21.0	5.4	0.0162	19.33	19.0	4.9
McGILL	24.17	18.3	4.7	0.0005	6.22	8.6	2.2
CMCC	32.00	12.8	3.3	0.0614	18.53	11.6	3.0
DIARY (INT)	4.54	1.3	0.3	0.5465	3.23	1.9	0.5
DIARY (FREQ)	5.20	2.4	0.6	0.0055	2.80	2.7	0.7
DIARY (DURA)	67.87	45.6	12	0.0389	34.23	42.7	11

TABLE 4 : Statistical results of the subjective findings comparing consultation 1 and 5 in Group B

	CONSULTATION 1				CONSULTATION 5		
	MEAN	S.D.	S.E	P-VALUE	MEAN	S.D.	S.E
NRS101	45.00	17.3	4.6	0.5791	33.23	26.0	6.7
McGILL	33.16	29.9	7.7	0.4227	25.43	27.0	6.9
CMCC	30.67	14.0	3.6	0.1814	24.13	16.7	4.3
DIARY-(INT)	4.89	2.1	0.6	0.4227	5.00	2.2	0.5
DIARY-(FREQ)	5.33	2.9	0.8	1	5.67	4.1	1.0
DIARY-(DURA)	54.60	36.4	9.4	0.2673	47.88	39.8	10.

TABLE 5 : Statistical results of the subjective findings comparing consultation 1 and final in Group A

	CONSULTATION 1				FINAL		
	MEAN	S.D.	S.E	P-VALUE	MEAN	S.D.	S.E
NRS101	40.30	21.0	5.4	0.0098	14.67	14.0	3.6
McGILL	24.17	18.3	4.7	0.0098	6.55	9.0	2.3
CMCC	32.00	12.8	3.3	0.0388	14.26	8.9	2.3
DIARY-(INT)	4.54	1.3	0.3	0.0019	1.81	1.9	0.5
DIARY-(FREQ)	5.20	2.4	0.6	0.0015	2.20	2.9	0.8
DIARY-(DURA)	67.87	45.6	12	0.0098	30.43	46.1	12

TABLE 6 : Statistical results of the subjective findings comparing consultation 1 and final in Group B

	CONSULTATION 1				FINAL		
	MEAN	S.D.	S.E.	P-VALUE	MEAN	S.D.	S.E
NRS101	45.00	17.3	4.7	0.0098	23.86	21.8	5.6
McGILL	33.16	29.6	7.7	0.0162	13.69	20.8	5.4
CMCC	30.67	14.0	3.6	0.0033	19.73	15.2	3.9
DIARY-(INT)	4.87	2.1	0.6	0.5791	3.88	2.6	0.7
DIARY-(FREQ)	5.33	2.9	0.8	0.3428	4.40	3.2	0.8
DIARY-(DURA)	54.60	36.4	9.4	0.1814	45.03	41.5	10.

TABLE 7 : Statistical results of the subjective findings comparing consultation 1 and the follow up in Group A

	CONSULTATION 1				FOLLOW UP		
	MEAN	S.D.	S.E	P-VALUE	MEAN	S.D.	S.E
NRS101	40.39	21.0	5.4	0.01615	10.30	14.4	3.7
McGILL	24.17	18.3	4.7	0.0005	4.02	7.2	1.9
CMCC	32.00	12.8	3.3	0.0098	11.86	8.7	2.2
DIARY-(INT)	4.54	1.3	0.3	0.0433	2.57	2.9	0.8
DIARY-(FREQ)	5.20	2.4	0.6	0.0003	2.07	2.3	0.6
DIARY-(DURA)	67.87	45.6	11	0.0003	29.73	40.6	10

TABLE 8 : Statistical results of the subjective findings comparing consultation 1 and the follow up in Group B

	CONSULTATION 1				FOLLOW UP		
	MEAN	S.D.	S.E.	P-VALUE	MEAN	S.D.	S.E
NRS101	45.00	17.3	4.7	0.0098	23.86	21.8	5.6
McGILL	33.16	29.6	7.7	0.0162	13.69	20.8	5.6
CMCC	30.67	14.0	3.6	0.0033	19.73	15.2	3.9
DIARY-(INT)	4.87	2.1	0.6	0.5791	3.88	2.6	0.6
DIARY-(FREQ)	5.33	2.9	0.8	0.3428	4.40	3.2	0.8
DIARY-(DURA)	54.6	36.4	9.4	0.1814	45.03	41.5	10

TABLE 9 : Statistical results of the subjective findings comparing consultation 5 and final in Group A

	CONSULTATION 5				FINAL		
	MEAN	S.D.	S.E.	P-VALUE	MEAN	S.D.	S.E
NRS101	19.33	19.1	4.9	0.7518	14.67	14.0	3.6
McGILL	6.22	8.6	2.2	1	6.55	9.0	2.3
CMCC	18.53	11.6	3.0	0.3865	14.26	8.9	2.3
DIARY-(INT)	3.23	1.9	0.5	0.0433	1.81	1.9	0.4
DIARY-(FREQ)	2.80	2.8	0.7	0.5465	2.20	2.9	0.8
DIARY-(DURA)	34.23	42.7	11.0	0.2673	30.43	46.1	12

TABLE 10 : Statistical results of the subjective findings comparing consultation 5 and final in Group B

	CONSULTATION 5				FINAL		
	MEAN	S.D.	S.E.	P-VALUE	MEAN	S.D.	S.E
NRS101	33.23	26.0	6.7	1	34.06	25.6	6.6
McGILL	25.43	27.0	7.0	0.5790	19.80	21.7	5.6
CMCC	24.13	16.7	4.3	0.3865	20.93	15.6	4.0
DIARY-(INT)	5.00	2.2	0.6	1	4.08	2.0	0.5
DIARY-(FREQ)	5.67	4.1	1.1	0.5465	4.73	2.8	0.7
DIARY-(DURA)	47.88	39.8	10.3	1	48.5	39.5	10

TABLE 11 : Statistical results of the subjective findings comparing final and follow up consultations in Group A

	FINAL				FOLLOW UP		
	MEAN	S.D.	S.E.	P-VALUE	MEAN	S.D.	S.E
NRS101	14.67	14.0	3.6	0.5465	10.30	14.4	3.7
McGILL	6.55	9.0	2.3	0.5050	4.02	7.2	1.9
CMCC	14.26	8.9	2.3	0.5791	11.86	8.7	2.2
DIARY-(INT)	1.81	1.9	0.5	0.7518	2.57	2.9	0.8
DIARY-(FREQ)	2.20	2.9	0.8	1	2.07	2.3	0.6
DIARY-(DURA)	30.43	46.1	11.9	0.7518	29.73	40.6	10

TABLE 12 : Statistical results of the subjective findings comparing final and follow up consultations in Group B

	FINAL				FOLLOW UP		
	MEAN	S.D.	S.E.	P-VALUE	MEAN	S.D.	S.E
NRS101	34.06	25.6	6.6	0.2673	23.86	21.8	5.6
McGILL	19.80	21.7	5.6	0.3865	13.69	22.8	5.4
CMCC	20.93	15.6	4.0	0.5465	19.73	15.2	3.9
DIARY-(INT)	4.08	2.0	0.5	0.7893	3.88	2.6	0.7
DIARY-(FREQ)	4.73	2.8	0.7	0.5465	4.4	3.2	0.8
DIARY-(DURA)	48.5	39.5	10.1	0.4227	45.03	41.5	11

4.4.2 Objective data

TABLE 13 : Statistical results of the goniometric measurements comparing consultation 1 and 5 in Group A

	CONSULTATION 1				CONSULTATION 5		
GONIOMETER	MEAN	S.D.	S.E.	P-VALUE	MEAN	S.D.	S.E
Flexion	62.1	14.3	3.7	0.613	68	13.5	3.5
Extension	55.9	8.0	2.0	0.423	58.3	9.9	2.5
(R)Lat Fl	36.5	9.1	2.4	0.149	38.7	8.0	2.0
(L)Lat Fl	36.1	10.5	2.7	0.149	40.3	9.6	2.5
(R) Rot	59.5	10.0	2.6	1	60.8	6.54	1.7
(L) Rot	58.3	11.5	3.0	0.752	59.2	10.0	2.6

TABLE 14 : Statistical results of the goniometric measurements comparing consultation 1 and 5 in Group B

	CONSULTATION 1				CONSULTATION 5		
GONIOMETER	MEAN	S.D.	S.E.	P-VALUE	MEAN	S.D.	S.E
Flexion	62.2	16.4	4.2	1	63.5	13.5	3.5
Extension	63.2	12.9	3.3	0.061	58.7	12.0	3.1
(R)Lat Fl	41.9	7.5	1.9	1	42.9	6.9	1.8
(L)Lat Fl	44.3	7.0	1.8	0.343	41.8	4.63	1.2
(R) Rot	63.7	13.0	3.4	1	63.5	8.4	2.2
(L) Rot	63.1	11.8	3.0	1	64.4	9.2	2.4

TABLE 15 : Statistical results of the goniometric measurements comparing consultation 1 and final in Group A

	CONSULTATION 1				FINAL		
GONIOMETER	MEAN	S.D.	S.E.	P-VALUE	MEAN	S.D.	S.E
Flexion	62.1	14.4	3.7	0.606	63.9	9.4	2.4
Extension	55.9	8.0	2.1	0.579	58.7	7.6	2.0
(R)Lat Fl	36.5	9.1	2.4	0.149	40.9	9.2	2.4
(L)Lat Fl	36.1	10.5	2.7	0.301	41.4	10.5	2.7
(R) Rot	59.5	10.0	2.6	0.579	62	5.9	1.5
(L) Rot	59.5	10.0	2.6	0.546	63.3	8.2	2.1

TABLE 16 : Statistical results of the goniometric measurements comparing consultation 1 and final in Group B

	CONSULTATION 1				FINAL		
GONIOMETER	MEAN	S.D.	S.E.	P-VALUE	MEAN	S.D.	S.E
Flexion	62.2	16.4	4.2	0.789	64.4	13.7	3.6
Extension	63.2	12.9	3.3	0.061	58.3	10.6	2.8
(R)Lat Fl	41.9	7.5	1.9	0.789	43.7	7.5	1.9
(L)Lat Fl	44.3	7.0	1.8	0.773	44.3	7.3	1.9
(R) Rot	63.7	13.0	3.4	0.591	63.9	9.2	2.4
(L) Rot	63.1	11.8	3.0	0.773	64.3	11.5	3.0

TABLE 17 : Statistical results of the goniometric measurements comparing consultation 1 and follow up in Group A

	CONSULTATION 1				FOLLOW UP		
GONIOMETER	MEAN	S.D.	S.E.	P-VALUE	MEAN	S.D.	S.E
Flexion	62.1	14.4	3.7	0.789	66.3	12.4	3.2
Extension	55.9	8.0	2.1	0.386	59.6	10.0	2.6
(R)Lat Fl	36.5	9.1	2.4	0.006	41.5	8.1	2.1
(L)Lat Fl	36.1	10.5	2.7	0.061	42.9	9.9	2.5
(R) Rot	59.5	10.0	2.6	0.267	63.5	6.7	1.7
(L) Rot	58.3	11.5	3.0	0.267	63.9	8.0	2.1

TABLE 18 : Statistical results of the goniometric measurements comparing consultation 1 and follow up in Group B

	CONSULTATION 1				FOLLOW UP		
GONIOMETER	MEAN	S.D.	S.E.	P-VALUE	MEAN	S.D.	S.E
Flexion	62.2	16.4	4.2	0.423	67.1	10.9	2.8
Extension	63.2	12.9	3.3	0.061	60.7	10.5	2.7
(R)Lat Fl	41.9	7.5	1.9	0.267	44.3	7.7	2.0
(L)Lat Fl	44.3	7.0	1.8	1	43.6	6.2	1.6
(R) Rot	63.4	13.0	3.4	1	63.8	11.5	3.0
(L) Rot	63.1	11.8	3.0	1	64.9	9.3	2.4

TABLE 19 : Statistical results of the goniometric measurements comparing consultation 5 and final in Group A

	CONSULTATION 5				FINAL		
GONIOMETER	MEAN	S.D.	S.E.	P-VALUE	MEAN	S.D.	S.E
Flexion	68	13.5	3.5	0.228	63.9	9.4	2.4
Extension	58.3	9.9	2.5	0.752	58.7	7.6	2.0
(R)Lat Fl	38.7	8.0	2.1	0.267	40.9	9.2	2.4
(L)Lat Fl	40.3	9.6	2.5	0.579	41.4	10.5	2.7
(R) Rot	60.8	6.5	1.7	1	62	5.9	1.5
(L) Rot	59.2	10.0	2.6	0.546	63.3	8.2	2.1

TABLE 20: Statistical results of the goniometric measurements comparing consultation 5 and final in Group B

	CONSULTATION 5				FINAL		
GONIOMETER	MEAN	S.D.	S.E.	P-VALUE	MEAN	S.D.	S.E
Flexion	63.5	13.4	3.5	0.579	64.3	13.7	3.6
Extension	58.7	12.0	3.1	0.773	58.3	10.7	2.8
(R)Lat Fl	42.9	6.9	1.8	0.148	43.7	7.5	1.9
(L)Lat Fl	41.8	4.6	1.2	0.227	44.3	7.3	1.9
(R) Rot	63.5	8.4	2.2	0.579	63.9	9.2	2.4
(L) Rot	64.4	9.2	2.4	1	64.3	11.5	3.0

TABLE 21 : Statistical results of the goniometric measurements comparing final and follow up consultations in Group A

	FINAL				FOLLOW UP		
GONIOMETER	MEAN	S.D.	S.E.	P-VALUE	MEAN	S.D.	S.E
Flexion	63.9	9.4	2.4	1	66.3	12.4	3.2
Extension	58.7	7.6	2.0	0.386	59.6	10.0	2.6
(R)Lat Fl	40.9	9.2	2.4	0.773	41.5	8.1	2.1
(L)Lat Fl	41.4	10.5	2.7	0.752	42.9	9.9	2.5
(R) Rot	62	5.9	1.5	0.121	63.5	6.7	1.7
(L) Rot	63.3	8.2	2.1	1	63.9	8.0	2.1

TABLE 22 : Statistical results of the goniometric measurements comparing final and follow up consultations in Group B

	FINAL				FOLLOW UP		
GONIOMETER	MEAN	S.D.	S.E.	P-VALUE	MEAN	S.D.	S.E
Flexion	64.3	13.8	3.6	0.267	67.1	10.9	2.8
Extension	58.3	10.7	2.8	0.027	60.7	10.5	2.7
(R)Lat Fl	43.7	7.5	1.9	1	44.3	7.7	2.0
(L)Lat Fl	44.3	7.3	1.9	1	43.6	6.2	1.6
(R) Rot	63.9	9.2	2.4	0.773	63.8	11.5	3.0
(L) Rot	64.3	11.5	3.0	1	64.9	9.3	2.4

4.5 Inter - group Data

4.5.1. Subjective data

TABLE 23 : Statistical results of the subjective findings comparing consultation 1 of both Group A and B

	GROUP A CONSULTATION 1				GROUP B CONSULTATION 1		
	MEAN	S.D.	S.E.	P-VALUE	MEAN	S.D.	S.E
NRS 101	40.30	21.0	5.4	0.8680	45.00	17.3	4.6
McGILL	24.17	18.3	4.7	0.6187	33.16	29.6	7.7
CMCC	32.00	12.8	3.3	0.6161	30.67	14.0	3.6
DIARY-(INT)	4.54	1.3	0.3	1	4.89	2.1	0.6
DIARY-(FREQ)	5.20	2.4	0.6	0.9324	5.33	2.9	0.8
DIARY-(DURA)	67.87	45.6	11.8	0.5475	54.60	36.4	9.4

TABLE 24 : Statistical results of the subjective findings comparing consultation 5 of both Group A and B

	GROUP A CONSULTATION 5				GROUP B CONSULTATION 5		
	MEAN	S.D.	S.E.	P-VALUE	MEAN	S.D.	S.E
NRS 101	19.33	19.1	4.9	0.1369	33.23	26.0	6.7
McGILL	6.22	8.6	2.2	0.0456	25.4	27.0	7.0
CMCC	18.53	11.6	3.0	0.2797	24.13	16.7	4.3
DIARY-(INT)	3.23	1.9	0.5	0.0506	5.00	2.2	0.6
DIARY-(FREQ)	2.80	2.8	0.7	0.0344	5.67	4.1	1.1
DIARY-(DURA)	34.23	42.7	11.0	0.1910	47.88	39.8	10

TABLE 25 : Statistical results of the subjective findings comparing final consultations of both Group A and B

	GROUP A FINAL CONS				GROUP B FINAL CONS		
	MEAN	S.D.	S.E.	P-VALUE	MEAN	S.D.	S.E
NRS 101	14.67	14.0	3.6	0.0428	34.06	25.6	6.6
McGILL	6.55	9.0	2.3	0.0822	19.81	21.7	5.6
CMCC	14.26	8.9	2.3	0.2192	20.93	15.6	4.0
DIARY-(INT)	1.81	1.9	0.5	0.0050	4.08	2.0	0.5
DIARY-(FREQ)	2.20	2.9	0.8	0.0186	4.73	2.8	0.7
DIARY-(DURA)	30.43	46.1	11.9	0.0785	48.5	39.5	10

TABLE 26 : Statistical results of subjective findings comparing follow up consultations of both Group A and B

	GROUP A FOLLOW UP				GROUP B FOLLOW UP		
	MEAN	S.D.	S.E.	P-VALUE	MEAN	S.D.	S.E
NRS 101	10.30	14.4	3.7	0.0529	23.86	21.8	5.6
McGILL	4.02	7.2	1.9	0.1098	13.69	20.8	5.4
CMCC	11.86	8.7	2.2	0.1896	19.73	15.2	3.9
DIARY-(INT)	2.57	2.9	0.8	0.1297	3.88	2.6	0.7
DIARY-(FREQ)	2.07	2.3	0.6	0.0386	4.40	3.2	0.8
DIARY-(DURA)	29.73	40.6	10.5	0.2563	45.03	41.5	11

4.5.2 Objective data

TABLE 27 : Statistical results of the goniometric measurements comparing consultation 1 of both Group A and B

	GROUP A CONSULTATION 1				GROUP B CONSULTATION 1		
GONIOMETER	MEAN	S.D.	S.E.	P-VALUE	MEAN	S.D.	S.E
Flexion	62.1	14.4	3.7	0.983	62.2	16.4	4.2
Extension	55.9	8.0	2.1	0.058	63.2	12.9	3.3
(R)Lat fl	36.5	9.1	2.4	0.108	41.8	7.46	1.9
(L)Lat fl	36.1	10.5	2.7	0.017	44.3	7.0	1.8
(R) Rot	59.5	10.0	2.6	0.675	63.7	13.0	3.4
(L) Rot	58.3	11.5	3.0	0.261	63.1	11.8	3.0

TABLE 28 : Statistical results of the goniometric measurements comparing consultation 5 in both Group A and B

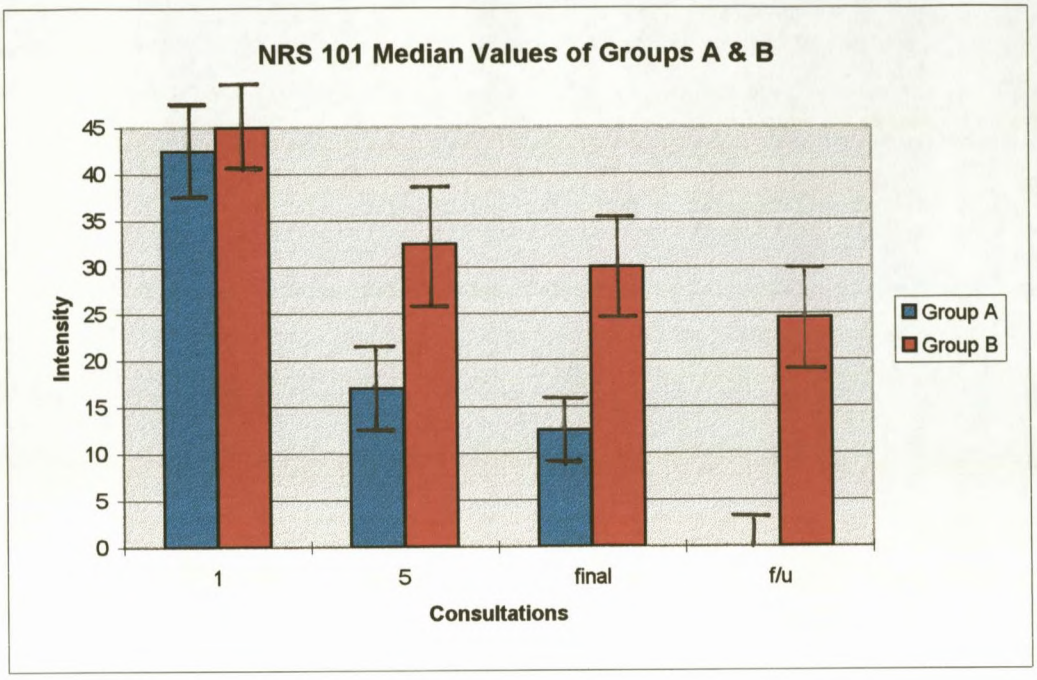
	GROUP A CONSULTATION 5				GROUP B CONSULTATION 5		
GONIOMETER	MEAN	S.D.	S.E.	P-VALUE	MEAN	S.D.	S.E
Flexion	68.0	13.5	3.5	0.276	63.5	13.5	3.5
Extension	58.3	9.9	2.5	0.950	58.7	12.0	3.1
(R)Lat fl	38.7	8.0	2.1	0.098	41.8	4.6	1.2
(L)Lat fl	40.3	9.6	2.5	0.369	63.5	8.4	2.2
(R) Rot	60.8	6.54	1.69	0.403	63.4	8.4	2.2
(L) Rot	59.2	10.0	2.6	0.190	64.4	9.2	2.4

TABLE 29 : Statistical results of the goniometric measurements comparing the final consultation of both Group A and B

	GROUP A FINAL CONS				GROUP B FINAL CONS		
GONIOMETER	MEAN	S.D.	S.E.	P-VALUE	MEAN	S.D.	S.E
Flexion	63.9	9.4	2.4	0.692	64.4	13.7	3.6
Extension	58.7	7.6	2.0	0.787	58.3	10.7	2.8
(R)Lat fl	40.9	9.2	2.4	0.349	34.7	7.5	1.94
(L)Lat fl	41.4	10.5	2.7	0.370	44.3	7.3	1.9
(R) Rot	62	5.9	1.5	0.379	63.9	9.2	2.4
(L) Rot	63.3	8.2	2.1	0.677	64.3	11.5	3.0

TABLE 30 : Statistical results of the goniometric measurements comparing follow up consultations of both Group A and B

	GROUP A FOLLOW UP				GROUP B FOLLOW UP		
GONIOMETER	MEAN	S.D.	S.E.	P-VALUE	MEAN	S.D.	S.E
Flexion	66.3	12.4	3.2	0.819	67.1	10.9	2.8
Extension	59.6	10.0	2.6	0.950	60.7	10.5	2.7
(R)Lat fl	41.5	8.1	2.1	0.349	44.3	7.7	2.0
(L)Lat fl	42.9	9.9	2.5	0.950	43.6	6.2	1.6
(R) Rot	63.5	6.7	1.7	0.723	63.8	11.5	3.0
(L) Rot	63.9	8.0	2.1	0.752	64.9	9.3	2.4


NRS 101 Median Values of Groups A & B
Intensity
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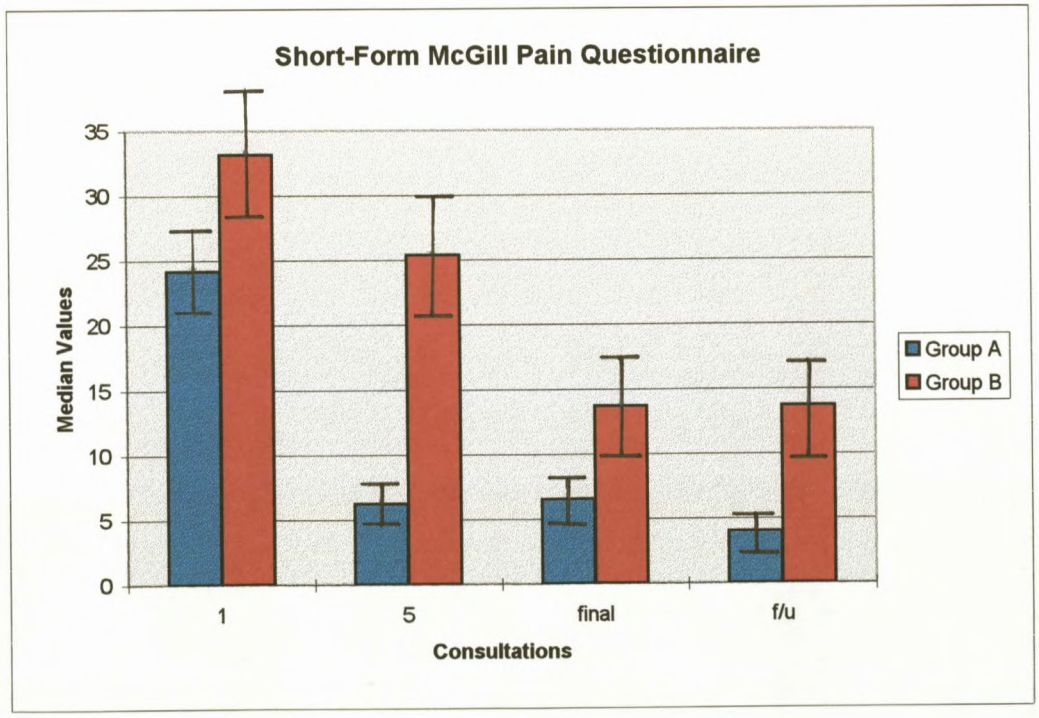
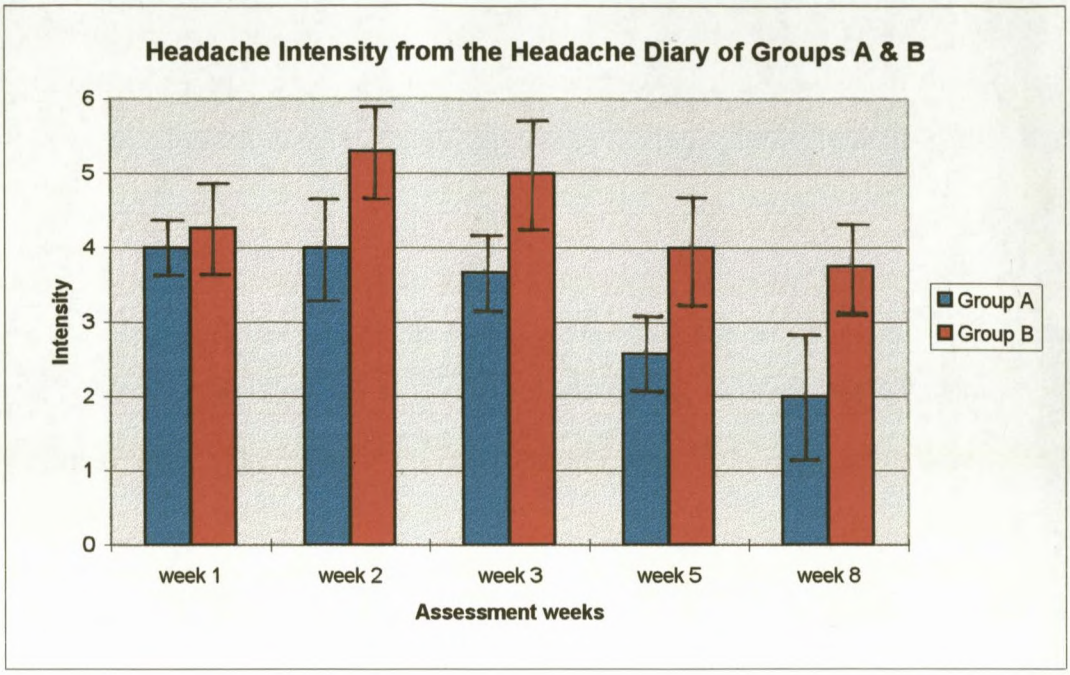
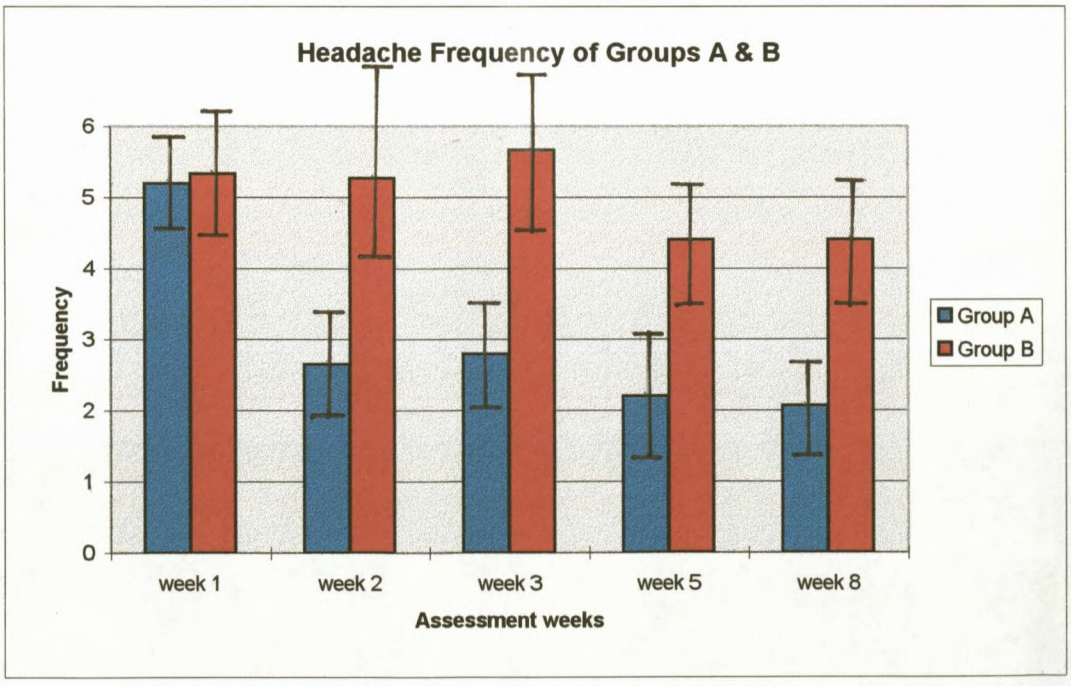
40
35
30
25
20
15
10
5
0
1
5
final
f/u
Consultations
Group A
Group B


Short-Form McGill Pain Questionnaire
Median Values
35
30
25
20
15
10
5
0
1
5
final
f/u
Consultations
Group A
Group B


Headache Intensity from the Headache Diary of Groups A & B
Intensity
0
1
2
3
4
5
6
week 1
week 2
week 3
week 5
week 8
Assessment weeks
Group A
Group B


Headache Frequency of Groups A & B
Frequency
0
1
2
3
4
5
6
week 1
week 2
week 3
week 5
week 8
Assessment weeks
Group A
Group B

CHAPTER 5 : DISCUSSION

5.1 INTRODUCTION

This chapter focuses on three main areas of analysis. Firstly, analysis of the demographic data; secondly, analysis of the subjective data; and thirdly, the analysis of the objective data. Analysis of the subjective and objective data will include both the intra - group and inter - group analysis, while the problems encountered in the research and data collection will also be discussed. Finally, the results of this study will be compared to research done in the past to determine if the study compares favourably or not with the current trends in headache research.

5.2 Demographic data

The age ranges of Group A and Group B compare favourably, although Group A has a marginally wider age range of 20-62 compared to 23-58 for Group B. This consistency between the age range of the groups is confirmed by the mean average age which is only 4.7 years higher in Group A (38.9) than in Group B (34.2). The groups are similar and comparable with regards to age, and this will therefore strengthen the statistical results obtained from the study.

The male to female ratio of the groups shows that 73.3% of Group A were female whereas 60% of Group B were female. The small male to female ratio in Group A as compared to Group B may affect the inter - group analysis to some degree. Both these ratios however, are in line with the thinking that tension - type headaches are more prevalent in females. However, Group A perhaps has too many female patients to be representative of the population of tension - type headache sufferers.

The pain description of the two groups showed that the description of a "dull, aching" or a "dull ache" were the most common ways of describing the headache pain in this study. The words "tight" or "pressure" were also commonly used by the patients to describe their headaches. This assists in confirming the diagnosis of tension - type headache as described by Raskin (1988:215) and the IHS Classification (1988).

At the beginning of the study, the headaches experienced by Group A and Group B were of similar duration. Group A showed a slightly wider range of headache duration than Group B. This should not affect the analysis between the groups because the difference is slight and the mean duration of the headache in the two groups is almost identical at 9.2 years for Group A and 9.5 years for Group B.

The most common levels of fixation palpated in the spine of the patients were C1/C2 and C2/C3. In Group A, 87% of the patients had fixations at C2 and 67% had fixations at the C1 level. In Group B, C1/C2 was fixated in 93% of the patients and C2/C3 in 80% of the patients. Bogduk (1992) identified dysfunction of the first three cervical facet joints as a possible cause of headache. The findings of this study correlate well with this possible mechanism. It must be noted however, that the examiner in this study was aware of the possible relationship between the upper cervical segments and headache and this may have biased the results of the most common levels of fixation found. It is not known whether these results would be different had the examiner not known of this possible relationship. This is a possible source of blinding in this area for future studies. The examiner involved should not know the nature of the study and the patients presenting complaint. Such a study would be useful to determine whether the results regarding levels of fixation in this study and other studies are valid.

5.3 Subjective data

5.3.1 Intra - group analysis

5.3.1.1 Subproblem 1

Comparing week 1 to week 2 of the Headache Diary in Group A with regards to headache intensity, frequency and duration, the p - values were greater than 0.025, indicating that the null hypothesis of subproblem 1 should be accepted. The mean values of the data appear to indicate a slight improvement in the intensity and a greater improvement in the frequency and duration of the headache. The large standard deviation of the headache duration data may have affected the mean value's representation of the data.

The analysis of the data from Group A of consultation 1 and consultation 5 indicate that the null hypothesis is accepted (p - value < 0.025) with regards to the CMCC Disability Index and the intensity and the duration of the headache recorded in the Headache Diary. However, the null hypothesis is rejected and the alternative hypothesis accepted when analyzing the data from the NRS 101, McGill Pain Questionnaire and the headache frequency from the Headache Diary. The mean values of the NRS 101, McGill Pain Questionnaire and headache frequency confirm the improvement detected in the statistical analysis. The standard deviation for this data also indicates that these mean values are representative of the group of data. The intensity of the headache experienced at the fifth consultation was considerably less than that at the first consultation, but the average mean headache intensity recorded over week 3 in the Headache Diary (during which the fifth consultation was usually recorded), did not change significantly between the two consultations.

An improvement in the headache frequency is noted in week 3. The data from the Headache Diary regarding the duration of the headache displays a wide spread of values indicated by the standard deviation, which for the fifth consultation was larger than the mean itself. This may have affected the data analysis to some degree.

Analyzing the statistical results of Group A's consultation 1 and the final consultation revealed that p - values obtained are less than 0.025 except for the CMCC p - value. As a result, the null hypothesis is rejected and the alternative hypothesis is accepted for all the results except the CMCC index. The mean values confirm these results and the standard error indicates that there was good centralisation of the data around the mean values. The CMCC mean values indicate some improvement, but the spread of the data indicated by the standard deviation may have affected these results, thus yielding a non - significant result on analysis by the Wilcoxon Signed - Ranks Test.

On analysis of the data of Group A from consultation 1 and the follow up consultation, the p - values are less than 0.025 except for headache intensity from the Headache Diary. The null hypothesis is therefore accepted for the headache intensity data from the Headache Diary and rejected for the remaining data in this analysis. The mean values correlate well with these statistical results and indicate that there was a significant improvement in the subjective findings except for the headache intensity as obtained from the Headache Diary.

The difference in the data regarding the headache intensity obtained from the headache diary and the NRS 101 may seem to be contradictory, until it is noted that the data from the headache diary is the average headache intensity of a given week (for consultation 1 - week 1 and for the follow up consultation - week 8 of the headache diary) and not for the specific period of the consultation as reflected on the NRS 101. This variation may also be due to the method of data capture from the Headache Diary. For this data capture the mean daily headache intensity values were combined for a specific week to obtain a mean value. This method may have affected the results by eliminating the fluctuations in headache intensity noted in the headache diary.

The statistical results of the subjective findings comparing consultation 5 and the final consultation in Group A revealed that the p - values obtained were greater than 0.025 and thus the null hypothesis was accepted. The mean values in general showed a slight decrease from consultation 5 to the final consultation, but the data appears to be quite widely spread as demonstrated by the standard deviation and to some degree by the standard error, thus nullifying the decrease noted by the mean values.

The results obtained from the comparison between the final and follow up consultations showed that no significant difference existed between the two sets of data where the p - values were greater than 0.025. The mean values of the follow up consultation are marginally smaller than those obtained at the final consultation. This indicates that there was no significant change in the improvement experienced by the patients at the final consultation after four weeks.

5.3.1.2 Subproblem 2

When analyzing week 1 and week 2 of the Headache Diary to determine if there is any initial change in the headache intensity, frequency and duration, the p - values were greater than 0.025, indicating that there is no significant difference between the data of week 1 and week 2. The null hypothesis is therefore accepted and the alternative hypothesis rejected. The mean values also demonstrated that there was no significant difference between the data from the two weeks.

The comparison of the data from the first consultation and the fifth consultation of Group B indicate that there is no significant difference between the two sets of data with regards to the p - values and the mean values. All the p - values were greater than 0.025, indicating that the null hypothesis must be accepted and the alternative hypothesis rejected. Of interest is the large standard deviation obtained in the McGill Pain Questionnaire data for both consultation 1 and 5, which will affect the mean values' ability to represent the data correctly. However, the general trend of the data still indicates that there is no significant difference between the data obtained from consultation 1 and 5.

The p - values obtained from the comparison of the NRS 101, McGill Pain Questionnaire and the CMCC Neck Disability Index of consultation 1 and the final consultation were less than alpha = 0.025. For this set of data, the null hypothesis is rejected and the alternative hypothesis accepted. The mean values also indicate a difference in the data obtained from the two consultations, which represents an improvement in the headache experienced by the patients in Group B at the time of the final consultation.

The data from the headache diary indicating the frequency, average intensity and average duration from the first week and the fourth week are in contrast to the above - mentioned results, in that there is no significant difference between the two weeks indicated by the p - values being greater than alpha = 0.025. Although there is a slight difference in the mean values from the headache diary, these are not great enough to challenge the results already obtained.

When comparing the data from consultation 1 and the follow up consultation, the p - values obtained from the three questionnaires are less than alpha = 0.025 but the p - values obtained from the headache diary are greater than alpha = 0.025. Thus, for the questionnaires, the null hypothesis is rejected and the alternative hypothesis accepted. For the headache diary data, the null hypothesis is accepted, indicating that there is no significant difference between the two sets of data. The mean values obtained from the headache diary show some improvement in the average headache intensity, frequency and the average duration not indicated by the Wilcoxon Signed - Ranks Test. The mean values of the data obtained from the questionnaires confirm that there was an improvement of the headaches experienced and the standard error values are fairly small, showing that these mean values are representative of the sets of data.

The statistical results of the subjective findings comparing consultation 5 and the final consultation showed p - values of greater than alpha = 0.025 and the null hypothesis is therefore accepted. The mean values confirm these results with little difference between the values obtained from consultation 5 and the final consultation.

When comparing the results of the analysis of the final and follow up consultations, the p - values are all greater than alpha = 0.025, and therefore the null hypothesis is accepted and the alternative hypothesis rejected. The mean values of the NRS 101 and the McGill Pain Questionnaire however, show a decrease in the follow up consultation as compared to the final consultation. This result - which is contrary to the p - values - may have been affected by the relatively large spread of the data around the mean values indicated by both the standard deviation and standard error. The mean values of the remaining data confirm the results obtained by the Wilcoxon Signed Ranks Test.

5.3.2.Inter - group analysis

5.3.2.1 Subproblem 3

Analysis of the subjective data from consultation 1 of both Group A and Group B showed no difference between the sets of data. The p - values were greater than alpha = 0.025 and thus the null hypothesis was accepted and the alternative hypothesis rejected. The mean values of the data appear to confirm the notion that the two sets of data are similar. The standard deviation of Group B's McGill Pain Questionnaire is large, which indicates that the mean may not be totally representative of the data for that group. The other mean values on the other hand, appear to be representative of the data with smaller standard deviation and standard error values. These results show that before the treatment began the groups were similar and therefore the results obtained during the study can be critically analyzed as both groups started the study at similar levels.

The results of the fifth treatments of Group A and Group B were compared to determine if there was a significant difference between the groups at this stage of the treatment. The p - values were greater than alpha = 0.025 and therefore the null hypothesis was accepted, indicating that there was in fact no difference at this stage between the two groups. The mean values of Group A appear to be smaller than the same values for Group B; Group A has a greater centralisation of the data around these mean values than Group B. The p - values and mean values appear to provide two different results of the data and it is difficult to draw any firm conclusions from this analysis.

The comparison of the final consultations of Group A and B show no significant difference between the two sets of data indicated by the p - values of all the data, except one having a p - value that is greater than alpha = 0.025. For this data, the null hypothesis was accepted. The comparison of the average headache intensity in the two groups obtained by the headache diary had a p - value less than alpha = 0.025 and therefore for this data the null hypothesis was rejected and the alternative hypothesis accepted. The average headache intensity of week 4 in Group A was significantly less than the same of Group B; this is confirmed by the mean values. However, overall, no significant difference was noted between the two groups with regards to the final consultation.

The statistical analysis of the subjective findings comparing the follow up consultations of both groups revealed p - values of greater than alpha = 0.025, indicating that the null hypothesis should be accepted. The mean values of Group A again are marginally smaller than in Group B, particularly for the NRS 101 and the McGill Pain Questionnaire, although the wide spread of the data (shown by the standard deviation) may affect how the mean values represent the data.

5.4.Objective data

5.4.1. Intra - group analysis

5.4.1.1. Subproblem 1

The Cervical Range of Motion Instrument (CROM) was used to obtain the objective findings in this study. An analysis of Group A's objective findings of the first and fifth consultations yielded p - values greater than alpha = 0.025. The null hypothesis was therefore accepted. This states that there was no significant difference between the range of motion measurements at the first and fifth consultations. The mean values appear to confirm this finding.

The statistical results of the goniometric measurements comparing consultation 1 and the final consultation in Group A showed no statistically significant difference between the two groups. The p - values were greater than alpha = 0.025 and the mean values of the two groups were very similar.

The p - values obtained from the Wilcoxon Signed - Ranks Test, (in the comparison between the objective findings of consultation 1 and the follow-up consultation) were greater than alpha = 0.025, except the right lateral flexion analysis, which had a p - value of less than alpha = 0.025. For all the data (excluding right lateral flexion), the null hypothesis was accepted. The null hypothesis states that there was no difference between the two groups of data obtained from the first and follow-up consultations. For right lateral flexion, the null hypothesis was rejected and the alternative hypothesis accepted. The mean values of the right lateral flexion confirm that there was an increase in this range of motion by the follow-up consultation.

The statistical results of the goniometric measurements comparing the final and the follow-up consultations in Group A showed no significant difference between the two consultations. This was deduced by analyzing the p - values which were greater than alpha = 0.025, which indicates that the null hypothesis is accepted. The mean values appear to confirm these findings.

5.4.1.2. Subproblem 2

Comparing consultation 1 and 5 in Group B with regards to objective findings produced p - values which were greater than alpha = 0.025. Therefore, the null hypothesis was accepted. This states that there is no significant difference between the objective findings of consultation 1 and 5 in Group B.

The statistical results of the goniometric measurements comparing consultation 1 and the final consultation in Group B revealed no significant difference between the data obtained from consultation 1 and the final consultation. This can be deduced from the p - values which were greater than alpha = 0.025 and the mean values which are generally similar in both consultations.

For intra - group analysis, consultation 1 and the follow-up consultation were analyzed by the Wilcoxon Signed - Ranks Test. The p - values obtained were greater than alpha = 0.025, indicating that the null hypothesis should be accepted and the alternative hypothesis rejected. The mean values are representative of the data and also confirm the Wilcoxon Signed - Ranks Test results.

An analysis of consultation 5 and the final consultation of Group B for intra - group comparison showed no significant difference between these consultations. This is indicated by the p - values which were greater than alpha = 0.025 and the similar mean values obtained from both consultations. Therefore, the null hypothesis (which states that there was no significant difference between the two consultations) was accepted.

The final and the follow-up consultations of Group B were compared with regards to the objective findings to determine if there was any change in the cervical range of motion after the treatment was completed. Analysis by means of the Wilcoxon Signed - Ranks Test produced p - values greater than alpha = 0.025 and the null hypothesis was therefore accepted. The null hypothesis states that there was no difference in the cervical range of motion between the two consultations.

5.4.2 Inter - group analysis

5.4.2.1 Subproblem 3

Comparing the data obtained from the objective findings of Group A's first consultation and Group B's first consultation by means of the Mann - Whitney U Test produced p - values greater than alpha = 0.025 and therefore the null hypothesis was accepted. The null hypothesis states that there was no significant difference between the two groups. The mean values are also similar in terms of the cervical range of motion and this demonstrates that the groups had similar ranges of motion at the beginning of the study. This would assist in analysis of any change in the range of motion because at the onset, the groups were similar and any increase in range of motion would be indicative of the success of the treatment.

Analysis of the statistical results comparing consultation 5 of Group A and Group B with regards to the objective findings revealed p - values greater than alpha = 0.025. The null hypothesis (which states that there was no significant difference noted between the groups), was therefore accepted. Overall, the mean values of Group A were similar to the mean values of Group B, which confirms the findings of the Mann - Whitney U Test.

When comparing the final consultation of Group A and B with regards to the objective findings, the Mann - Whitney U Test produced p - values greater than alpha = 0.025 for all the ranges of motion. The mean values of the two groups were very similar, therefore enhancing the findings of the statistical analysis that the null hypothesis should be accepted and the alternative hypothesis rejected.

Lastly, the follow up consultations of the two groups were compared to determine if there was any difference in terms of the objective findings. The statistical analysis showed no significant difference between the two groups with p - values of greater than alpha = 0.025 and similar mean values in both groups.

5.5 Problems encountered with the subjective and objective data

The problems experienced with the subjective data occurred with the Headache Diary. Only twenty - two of the thirty patients completed their diaries as instructed. Most of the remaining patients forgot to complete some of the days between the final and follow up consultations. Most patients however, retrospectively remembered and recorded the headaches over these days. Some of the patients neglected to record their headache - free days and only noted the days when the headache was present. A small number of patients did not record the headaches throughout the day, but completed the whole day's recording at the end of the day.

No problems were experienced with the subjective questionnaires, but the comparison of these questionnaires with the Headache Diary often produced contradictory results. The problem appears to be the comparison of the average intensity of a whole week to the intensity of the headache at the time of the consultation. For example, week 1 of the Headache Diary was compared to consultation 1 although consultation 1 usually took place at the beginning of week 1. This resulted in the average intensity of the Headache Diary being affected by the treatment given, whereas the evaluation at consultation was not.

In the same way, the average intensity of weeks 3,5 and 8 are not directly comparable to consultation 5, the final and follow up consultations respectively. This data from the Headache Diary should possibly have been analyzed separately to draw perhaps more relevant conclusions as regards the data. The data collection from the Headache Diary was the most variable of all the data, due to patients' compliance with regards to completing the diary daily. This variable may have affected the strength of the results obtained in this study.

5.6 Comparison of results with past research

In this study, 83.3% of the patients showed some improvement in their headache and 16.6% showed no change following the treatment given. This compares well with the study by Mennell (1990), in which 18 out of 20 patients complaining of headaches had some relief from their symptoms. Droz and Crot (1985), in a study on occipital headaches, found that 5 to 10 manipulative treatments gave 76% of their patients relief; 13% were considered a "failure" with regards to the treatment.

In this current study, the mean average intensity of headache of Group A decreased by 63.5% and Group B by 47% by the final treatment. This compares favourably with a study of osteopathic manipulation on muscle contraction headache in which a 50% decrease in intensity was noted (Hoyt 1979). Boline (1995) found a 32% reduction in headache intensity in the manipulation group following treatment, while Nilsson et al.(1997) - in their study on cervicogenic headaches - noted a 36% decrease in headache intensity per episode in the manipulation group. Both groups in this current study appear to have experienced greater improvement than the studies of Boline (1995) and Nilsson et al. (1997).

In a study comparing manipulation and amitryptiline in the treatment of tension - type headaches, a 42% decrease in headache frequency was noted following four weeks of treatment (Boline 1995). Vernon (1982) also noted a decrease in the number of headaches per month following manipulative treatment - from 13 to 3 headaches per month. The current study's Group A shows a similar decrease in headache frequency from 5.2 headaches per week to 2.2 headaches. Group B does not show a statistically significant decrease in headache frequency, which contradicts the findings of past research on manipulative therapy and headaches (Vernon 1982, Boline 1995).

The duration of the headaches experienced in this study was affected by the treatment. In Group A, the mean number of headache hours decreased from 67.87 hours per week to 30.43 hours per week by the final treatment. Group B again showed minimal change in headache hours from 54.6 hours at consultation 1 to 45.3 hours per week at the final consultation. This group's results were contrary to the Vernon (1982) study, in which the headache duration decreased from 12 to 2 hours per headache episode. In the study on cervicogenic headaches by Nilsson et al. (1997), the number of headache hours per day decreased by 69%, which is similar to the results obtained in the current study in Group A but not in Group B.

CHAPTER 6 : CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

6.1.1. Conclusion from subjective findings

It is clear from the results that both groups improved with regard to most of the subjective findings. The subjective findings demonstrate a statistically significant decrease in headache intensity, frequency and duration in Group A and in headache intensity in Group B. Inter - group analysis demonstrated a statistically significant difference between the two groups at the final consultation, in which Group A had a greater improvement in the average intensity and frequency from the Headache Diary than Group B.

From these results, it is clear that Group A's treatment was more effective in treating tension - type headaches than Group B's treatment. Contrary to what was expected, manual traction did not improve the effect of the adjustment on tension - type headache. Some of the subjective findings even suggest that the combination of the manual traction and the adjustment produced a smaller effect on the headache symptoms than did the adjustment alone.

6.1.2. Conclusion from objective findings

From the objective findings obtained from the Cervical Range of Motion Instrument (CROM), no significant change in cervical range of motion in the intra - group analysis of both Group A and B was noted, except for right lateral flexion (which increased significantly in Group A from consultation 1 to the final consultation). From this data, it is evident that both forms of treatment did not significantly increase cervical range of motion within the groups as far as can be detected by the CROM.

Objective findings from the inter - group analysis showed that there was no statistically significant difference in cervical range of motion between the groups. These results were contrary to what was hypothesised at the beginning of the study. The hypothesis was that there would be a significant difference between the groups and that Group B would show a greater improvement than Group A. This hypothesis was therefore not substantiated by this study. It must be noted however, that these results relate only to this study and other studies would be needed to substantiate these findings.

The objective results of this study seem to indicate that there is no biomechanical basis for headache. The possibility remains, however, that biomechanical change may not have been detected by the methods used. Headaches may still originate from the upper cervical spine and manipulation may provide a facetal capsular stretch which affects nociceptive information from the region, thus providing relief from headache.

6.1.3 Final conclusion

In conclusion, it is evident from the data of this study that the chiropractic adjustment does subjectively improve the tension - type headache experienced by the patients in this study. The manual traction did not enhance the effect of the adjustment and appears to have limited value in the treatment of tension - type headaches.

6.2 Recommendations

The questionnaires used in this study, namely: the Short-form McGill Pain Questionnaire, the NRS 101 and the CMCC Neck Disability Index were easy to administer, easy for the patient to understand, and were useful in noting any changes in their headache. These questionnaires are recommended for future headache studies. The Headache Diary was more difficult to administer and a system of posting or delivery to the study centre on a weekly basis is recommended. This, so that the completion of the diary can be more carefully monitored during this period. The CROM proved to be easy to use but the significance of cervical range of motion in tension - type headache sufferers is unclear. Little significant data was obtained from the cervical range of motion and perhaps additional objective measurements would have been beneficial.

A pre - treatment assessment period of a minimum of two weeks is recommended. This should add to the strength of the statistical data obtained because there will be objective and subjective pre - treatment base line values available for comparison with the treatment and post - treatment values. Careful consideration should also be given to the use of medication by the patients. In this study, no medication was allowed to be consumed and this excluded patients who were not able to be without the pain relief afforded by their medication. If medication is allowed, the amount of medication used can be monitored in order to determine if the treatment has been successful in decreasing the headache. A small sample size was used in this study, but a larger sample size is advisable for future studies in order to enhance the strength of the statistical tests used. Future studies would also benefit from having a control group to monitor headache variability during the observation period of the study. This information could then be compared with the results obtained in the treatment group.

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APPENDIX 1

INFORMED CONSENT FORM

THE RELATIVE EFFECTIVENESS OF ADJUSTMENTS AND TRACTION IN THE TREATMENT OF TENSION - TYPE HEADACHES

Supervisor : Dr GF Parkin-Smith

Researcher : Rob Donkin

PLEASE CIRCLE THE APPROPRIATE ANSWER

1. Have you asked questions regarding the study? YES/NO

2. Have you received answers to your questions? YES/NO

3. Have you had an opportunity to discuss the study? YES/NO

4. Have you received enough information about the study? YES/NO

5. Do you understand the implications of your involvement in this study? YES/NO

6. Do you understand that you are free to withdraw from this study? YES/NO
   a. at any time
   b. without giving a reason for withdrawing.
   c. without affecting your future health care.

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

I,the undersigned,.....,have been explained the nature of this research project involving the treatment of tension - type headaches and therefore give my informed consent to be examined, treated and / or x-rayed at the Technikon Natal Chiropractic Day Clinic. I agree to comply with the instructions as stipulated by the intern to obtain successful completion of this research project.

Patient name:..... Signature:.....

Parent name:..... Signature:.....

Witness name:..... Signature:.....

Research intern:..... Signature:.....

APPENDIX 2

TECHNIKON NATAL CHIROPRACTIC DAY CLINIC
CASE HISTORY

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

FOR CLINICIAN'S USE ONLY
Initial visit clinician:_____Signature:_____

Case History:

Examination:
Previous: Current:

X-Ray Studies:
Previous: Current:

Clinical Path. lab:
Previous: Current:

Case Status:

PTT: Conditional: Signed Off: Final Sign out:

Recommendations:

Intern's Case History

1. Source of History:

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

3. Present Illness:

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

4. Other Complaints:

5. Past Medical History:

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

6. Current health status and life-style:

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

7. Immediate Family Medical History:

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

8. Psychosocial history:

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

9. Review of Systems:

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

APPENDIX 3

TECHNIKON NATAL

TECHNIKON NATAL CHIROPRACTIC DAY CLINIC

PHYSICAL EXAMINATION

Patient:_____File#: _____Date:_____
Clinician:_____Signature:_____
Intern:_____Signature:_____

1. VITALS

Pulse rate:
Respiratory rate:
Blood pressure: R L
Temperature:
Height:
Weight:

2. GENERAL EXAMINATION

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

Urinalysis:

3. CARDIOVASCULAR EXAMINATION

1) Is this patient in **Cardiac Failure** ?
2) Does this patient have signs of **Infective Endocarditis** ?
3) Does this patient have **Rheumatic Heart Disease ?**

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

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

Pulses:
- General Impression:
- Radio-femoral delay:
- Carotid:
- Radial:
- Dorsalis pedis:
- Posterior tibial:
- Popliteal:
- Femoral:

Percussion:
- borders of heart

Auscultation:
- heart valves (mitral, aortic, tricuspid, pulmonary)
- Murmurs (timing,systolic/diastolic, site, radiation, grade).

4. RESPIRATORY EXAMINATION

1) Is this patient in **Respiratory Distress** ?

Inspection
- Barrel chest:
- Pectus carinatum/cavinatum:
- Left precordial bulge:
- Symmetry of movement:
- Scars:

Palpation
- Tracheal symmetry:
- Tracheal tug:
- Thyroid Gland:
- Symmetry of movement (ant + post)
- Tactile fremitus:

Percussion
- Percussion note:
- Cardiac dullness:
- Liver dullness:

Auscultation
- Normal breath sounds bilat.:
- Adventitious sounds (crackles, wheezes, crepitations)
- Pleural frictional rub:
- Vocal resonance
  - Whispering pectoriloquy:
  - Bronchophony:
  - Egophony:

5. ABDOMINAL EXAMINATION

1) Is this patient in **Liver Failure** ?

Inspection
- Shape:
- Scars:
- Hernias:

Palpation
- Superficial:
- Deep = Organomegally:

- Masses (intra- or extramural)
- Aorta:

Percussion - Rebound tenderness:
- Ascites:
- Masses:

Auscultation - Bowel sounds:
- Arteries (aortic, renal, iliac, femoral, hepatic)

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

6. G.U.T EXAMINATION

External genitalia:
Hernias:
Masses:
Discharges:

7. NEUROLOGICAL EXAMINATION

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

Higher Mental Function
- Information and Vocabulary:
- Calculating ability:
- Abstract Thinking:

G.C.S.:
- Eyes:
- Motor:
- Verbal:

Evidence of head trauma:

Evidence of Meningism:
- Neck mobility and Brudzinski's sign:
- Kernigs sign:

Cranial Nerves:

I Any loss of smell/taste:
Nose examination:

II External examination of eye:
- Visual Acuity:
- Visual fields by confrontation:

- Pupillary light reflexes = Direct:
  = Consensual:
- Fundoscopy findings:

III Ocular Muscles:
Eye opening strength:

IV Inferior and Medial movement of eye:

V a. Sensory - Ophthalmic:
- Maxillary:
- Mandibular:

b. Motor - Masseter:
- Jaw lateral movement:

c. Reflexes - Corneal reflex
- Jaw jerk

VI Lateral movement of eyes

VII a. Motor - Raise eyebrows:
- Frown:
- Close eyes against resistance:
- Show teeth:
- Blow out cheeks:

b. Taste - Anterior two-thirds of tongue:

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

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

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

XII Inspection of tongue (deviation):

Motor System:

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

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

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

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

Sensory System:

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

b. Joint position sense
- Finger:
- Toe:

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

Cerebellar function:

Obvious signs of cerebellar dysfunction:
= Intention Tremor:
= Nystagmus:
= Truncal Ataxia:

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

8. SPINAL EXAMINATION:(See Regional examination)

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

9. BREAST EXAMINATION:

Summon female chaperon.

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

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

APPENDIX 4

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

Patient: _____ File: _____

Date: _____ Intern/Resident: _____

Clinician: _____ Sign: _____

OBSERVATION:

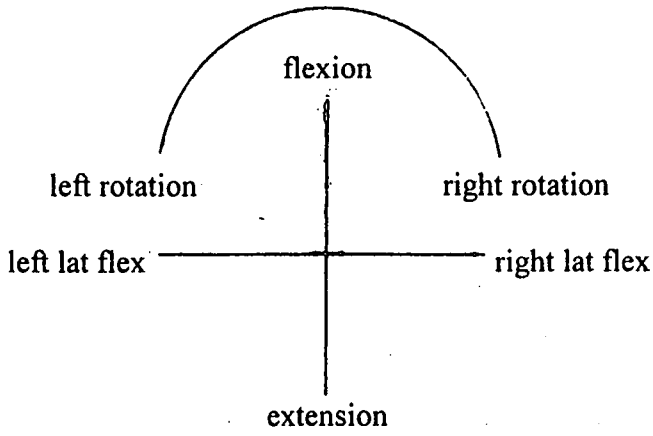
Posture
Swellings
Scars
Discolouration
Hair Line
Bony & Soft Tissue Contours

Shoulder position:
Left:
Right:
Muscle spasm
Facial expression

RANGE OF MOTION:

Flexion (45'):
L/R Rotation (70'):

Extension (70'):
L/R Lat Flex (45'):



PALPATION:

Lymph Nodes
Thyroid Gland

Trachea

ORTHOPAEDIC EXAMINATION:

Tenderness
Trigger Points: SCM, Scalenii, Post Cervicals, Trapezius, Lev Scap

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

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

Dizziness rotation test
Brachial plexus tension

Lhermitte's sign

NEUROLOGICAL EXAMINATION:

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

VASCULAR:

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

MOTION PALPATION & JOINT PLAY:

Left: Motion Palpation:
Joint Play:

Right: Motion palpation:
Joint Play:

Basic Exam: Shoulder:
Case History:

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

Upper T horacics:
Motion Palpation:
Joint Play:

Basic Exam: Thoracic Spine:
Case History:

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

SHORT-FORM McGILL PAIN QUESTIONNAIRE

RONALD MELZACK

PATIENT'S NAME: _____ DATE: _____

	NONE	MILD	MODERATE	SEVERE
THROBBING	0) _____	1) _____	2) _____	3) _____
SHOOTING	0) _____	1) _____	2) _____	3) _____
STABBING	0) _____	1) _____	2) _____	3) _____
SHARP	0) _____	1) _____	2) _____	3) _____
CRAMPING	0) _____	1) _____	2) _____	3) _____
GNAWING	0) _____	1) _____	2) _____	3) _____
HOT-BURNING	0) _____	1) _____	2) _____	3) _____
ACHING	0) _____	1) _____	2) _____	3) _____
HEAVY	0) _____	1) _____	2) _____	3) _____
TENDER	0) _____	1) _____	2) _____	3) _____
SPLITTING	0) _____	1) _____	2) _____	3) _____

APPENDIX 6

NUMERICAL RATING SCALE

Please indicate on the line below the number between 0 and 100 that best describes the pain of your major problem at this point, <u>when it is at its worst.</u> A zero (0) would mean "no pain at all" and one hundred (100) would mean "pain as bad as it could be." Please write only one number.

0 _____

Please indicate on the line below, the number between 0 and 100 that best describes the pain of your major problem at this point, <u>when it is at its least.</u> A zero (0) would mean "no pain at all" and one hundred (100) would mean "pain as bad as it could be." Please write only one number.

0 _____

APPENDIX 7

CMCC NECK DISABILITY INDEX

PATIENT NAME:_____ FILE #:_____ DATE:_____

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

Section 1 - Pain Intensity

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

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

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

Section 3 - Lifting

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

Section 4 - Reading

- ☐ I can read as much as I want to with no pain in my neck.
- ☐ I can read as much as I want to with slight pain in my neck.
- ☐ I can read as much as I want with moderate pain in my neck.
- ☐ I can't read as much as I want because of moderate pain in my neck.
- ☐ I can hardly read at all because of severe pain in my neck.
- ☐ I cannot read at all.

Section 5 - Headaches

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

Section 6 - Concentration

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

Section 7 - Work

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

Section 8 - Driving

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

Section 9 - Sleeping

- ☐ I have no trouble sleeping.
- ☐ My sleep is slightly disturbed (less than 1 hr. sleepless).
- ☐ My sleep is mildly disturbed (1-2 hrs. sleepless).
- ☐ My sleep is moderately disturbed (2-3 hrs. sleepless).
- ☐ My sleep is greatly disturbed (3-5 hrs. sleepless).
- ☐ My sleep is completely disturbed (5-7 hrs. sleepless).

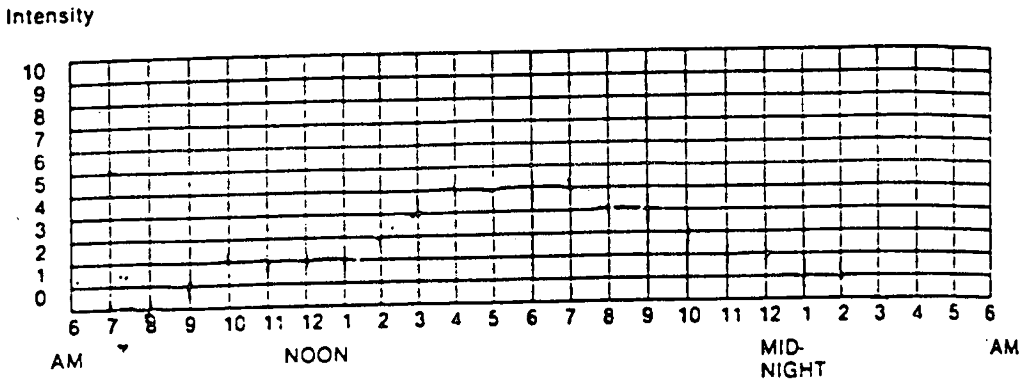
Section 10 - Recreation

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

APPENDIX 8

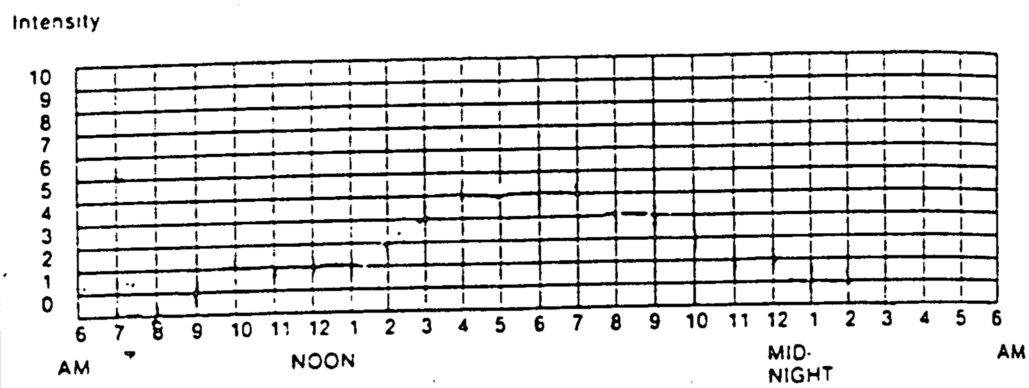
Name: ______________________

Date: ______________________



Name: ______________________

Date: ______________________



Name: ______________________

Date: ______________________