THE EFFICACY OF ACUPUNCTURE COMBINED WITH CHIROPRACTIC MANIPULATIVE THERAPY IN THE MANAGEMENT OF MIGRAINES

By

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I, Adam Yorke Brodrick Cullinan do declare that this dissertation is representative of my own work.

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Dedication

This is dedicated to my family, who has always unconditionally supported me in my endeavours.

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ABSTRACT

The aim of this investigation was to determine the relative effect of two treatments for migraine headache. It was hypothesised that by combining chiropractic adjustments with acupuncture, there would be a greater effect as opposed to using chiropractic adjustments only.

Thirty subjects diagnosed as having migraine headaches were randomly divided into two treatment groups. Each group consisted of 15 subjects, between the ages of 20 and 59, selected from the general population. The first group received chiropractic adjustment with acupuncture, whilst the second group received chiropractic adjustment only.

The research project was carried out where both groups received 10 treatments over a period of four weeks. After a follow-up period of eight weeks, the patients were reassessed. Subjective and objective measurements of the cervical spine using the Cervical Range of Motion (CROM) goniometer and completion of Canadian Memorial Chiropractic College (CMCC) neck disability index and McGill Short Form questionnaire were performed before the first, fifth and 10^{th} treatment and at the last follow-up assessment. Headaches were recorded in a headache diary at intervals of four weeks over a period of twelve weeks.

Following this, the data was then analysed statistically using a 95% confidence level. Intra-group comparisons were done using the

Wilcoxon signed rank test. Inter-group comparisons were done using the Mann-Whitney U-test.

Inter-group comparisons indicated that neither group improved statistically significantly more than the other. ($p>0.05$).
Intra-group results indicated that the adjustment group improved statistically significantly in terms of frequency, duration, and intensity and also with regard to the CMCC and the McGill Short Form questionnaires ($p<0.05$).
Intra-group results for the adjustment and acupuncture group indicated statistically significant findings for only headache intensity and the McGill short form questionnaires ($p<0.05$).
There were no statistically significant changes with regards to the CROM readings for both Inter and Intra-group analyses for either of the treatment groups.

From these results, it would seem that the adjustment group performed better than the adjustment and acupuncture group in terms of subjective findings. However, the inter-group analysis indicated this was not the case and it therefore could not be inferred that the adjustment group responded more favourably than the adjustment with acupuncture group in the treatment of migraine headaches.
It is suggested that further studies with a larger sample size are needed together with a placebo and/or control group to clearly evaluate the use of combined adjustment with acupuncture. It was also suggested that any future studies study the effects of combined adjustment with acupuncture on specific types of migraine. With regard to acupuncture treatment, it is recommended that different points be tried for migraine

headache and furthermore different points for different symptom pictures of migraine be used.

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DEFINITION OF TERMS

Manipulation

Passive manoeuvre in which specifically directed manual forces are applied to vertebral and extra-vertebral articulations of the body, with the object of restoring mobility to restricted areas.

1. Long lever manipulation – High-velocity force exerted on a point of the body some distance from the area where it is expected to have its beneficial effect.
2. Short-lever manipulation – High-velocity thrust directed specifically at an isolated joint. (Gatterman 1990: 410.)

Adjustment

Specific Form of direct articular manipulation utilising either long or short leverage techniques with specific contacts characterised by a dynamic thrust of controlled velocity, amplitude, and direction. (Gatterman 1990: 405.)

Fixation

For the purposes of this study the following definitions as listed by Gatterman 1990: 408) will apply.

1. Absence of motion of a joint in a position of motion, usually at the extremity of such motion.

2. [Dynamic fault] State whereby a vertebra or pelvic bone has become temporarily immobilised in a position that it may normally occupy during any phase of physiological spinal movement.

3. Immobilisation of a vertebra in a position of movement when the spine is at rest, or when the spine is in movement.

Acupuncture.

The Chinese practise of insertion of needles into specific exterior body locations to relieve pain, to induce surgical anaesthesia and for therapeutic purposes. (Dorlands Illustrated Medical Dictionary 1988.)

CHAPTER 1

Migraines have been shown to have a fairly high incidence (Lipton and Stewart 1994). In studies using International Headache Society diagnostic criteria revealed that 15% to 18% of women and six percent of men suffer from migraines.

Roux (1984), in a descriptive study of 100 patients presenting with headache (49 tension headache sufferers and 20 migraine sufferers), found that 80 percent of patients with migraine are more likely to interrupt their work as opposed to 50 percent of patients with tension headaches.

Iversin et al. (1990), in a descriptive study of 81 patients diagnosed as having migraine, tension headache or both, found that the majority of patients with migraine classify the intensity of their headache as moderate or severe, in contrast to patients with tension headaches who classify the intensity as mild or moderate. Not a single patient with tension headaches reported the headache as usually or always severe.

Dahlof and Dimenas (1995), in a controlled study involving 138 migraine patients, found that migraineurs felt more emotional stress as well as greater discontentment, decreased vitality and suffered more from loss of sleep than the control group, even between attacks.

It is this headache-related disability which is the major determinant of the economic impact of the illness (Stewart and Lipton 1994). Migraine

taxes the economy, not only in direct costs (i.e. medical) but also in indirect costs such as in loss of working days.

Past research into chiropractic treatment indicates that chiropractic care can play an important role in the treatment of migraine (Vernon 1995). Parker et al. (1978), in a controlled study involving spinal adjustment and mobilisation, demonstrated in 85 migraineurs, a 28% success rate initially and 19% success rate at a two year follow up. Stodolny and Chmielewski (1989), spinally adjusted 31 migraineurs in an uncontrolled study and demonstrated a 75% degree of success. Using spinal adjustments, Tuchin (1997), in a clinical trial involving 32 people, demonstrated a significant improvement in those people suffering from migraine with aura.

Vernon (1988) proposes his Vertebrogenic Theory of migraine aetiology where migraines are precipitated due to vertebral and muscular dysfunction in the cervico-thoracic spine, which results in facilitation of the autonomic nervous system. This is in turn causes the migraine cascade of symptomatology (for example: headache, nausea, photophobia, and aura). Furthermore he proposes three categories of migraineurs with regard to the Vertebrogenic Model. The first category of migraineurs would be those for whom the Vertebrogenic Model applies. The second category of migraineurs would be those with whom the Vertebrogenic cause was secondary yet compounding to the primary cause of their migraines. The third category of migraineurs would be those with whom the Vertebrogenic Model plays no part at all. This author thus predicts Chiropractic care would: be highly successful for the first category; be of some relief for the second and of no help to

the third. Vernon (1995), suggests in a later review of the literature, that research should be moving to designs where the object is to find the best method or combinations of methods of improving the quality of care and magnitude of benefit to headache sufferers.

Studies involving the treatment of migraine with acupuncture revealed positive findings. Batra (1986) demonstrated in his uncontrolled study of twenty migraineurs, who had not responded to conventional therapy, excellent results in 30% of the cases, effective in 35% of the cases, slight effectiveness in 25% of the cases and ineffectiveness in only 10% of the cases.

Vincent (1989), in a randomised controlled trial of 30 chronic migraineurs comparing true and sham acupuncture, demonstrated a 43% reduction in pain scores and 38% reduction in medication for the acupuncture group. Baischer (1995), in a study to determine the long-term effects of acupuncture over a three-year period, demonstrated the following results: Data showed an improvement greater than 33% for 69% of the patients at post-treatment and 58% of the patients at a three year follow up, while during treatment, drug intake was reduced to 50% for the acupuncture group.

The aim of this study was to evaluate the relative effect of chiropractic spinal adjustment in conjunction with acupuncture, as opposed to the spinal adjustment only in terms of subjective and objective findings, in the treatment of migraineurs.

There were three objectives in this study.

The first objective was to determine the effect of the combination of chiropractic spinal adjustment and acupuncture, as opposed to spinal adjustment alone in the treatment of migraine, in terms of subjective findings.

The second objective was to determine the effect of the combination of chiropractic spinal adjustment and acupuncture, as opposed to spinal adjustment alone in the treatment of migraine, in terms of objective findings.

Lastly, the third objective was to integrate the data from objectives one and two in order to determine the relative effectiveness of the two treatment approaches for migraine headaches.

Given both the disabling effect and the economic implications of migraines on the migraineur and society, a cost-effective treatment is necessary. Whereas chiropractic manipulation can benefit some migraineurs, it will not benefit all (Vernon 1995: 316). Vernon (1995) writes that uncontrolled studies with regard to chiropractic manipulation on migraine headache when taken together indicate a seventy five to ninety percent success rate with reduction of migraine. Perhaps combining it with a method (acupuncture) that is relatively cheap, safe and has no side effects (Murray 1995), more beneficial results could be obtained.

CHAPTER 2

2.0 Literature Review

2.1 Introduction

Migraine was the first headache syndrome to be differentiated, most likely because of its severe pain and vomiting. Descriptions of migraines have been found in writings 3000 years ago. However it was Aretaeus of Cappadocia who is generally regarded, as being the first to recognise migraine as a distinct type of headache because of the clear description he gave of the disorder. It was later that Galen gave it the name *hemicrania*, which the Romans translated into Latin as *hemicranium*. This was later corrupted into low Latin as *hemigranium*. It is the French translation of this *migraine* that is used today. Raskin (1990: 35)

2.2 Classification of Migraine Type Headache

2.2.1 Classifications of Migraine

The Headache Classification Committee of the International Headache Society (1988) lists five categories of migraine. These are:

1. Migraine without aura. (Also known as common migraine)

2. Migraine with aura. (Also known as classic migraine)

3. Opthalmoplegic migraine.

4. Retinal Migraine.

5. Childhood periodic syndromes that may be precursors to or associated with migraine.

This study concerned only with the first two categories, that is migraine without aura and migraine with aura.

2.2.1.1 Migraine without Aura

Migraine without aura, also known as common migraine, was defined by the Headache Classification Committee of the International Headache Society (1988) as "Idiopathic recurring, headache disorder manifesting in attacks lasting 4 to 72 hours. Typical characteristics of the headache are unilateral location, pulsating quality, moderate, or severe intensity, aggravation by routine physical activity and association with nausea, photo and phonophobia."

2.2.1.2 Migraine with Aura

Migraine with aura, also known as classic migraine, was defined by the Headache Classification Committee of the International Headache Society (1988) as, "Idiopathic recurring disorder manifesting with attacks of neurological symptoms unequivocally localisable to the cerebral cortex or brain stem, usually gradually developed over 5 – 20 minutes and usually lasting less than 60 minutes. Headache nausea

and/or photophobia usually follow the neurological aura symptoms directly or after a free interval of less than one hour. The headache lasts 4 – 72 hours, but may be completely absent."

This definition encompasses six migraine with aura subtypes as listed by the Headache Classification Committee of the International Headache Society (1988).

These are the following.

1. Migraine with typical aura

The Headache Classification Committee of the International Headache Society (1988) describes this as follows," Migraine with an aura consisting of homonymous visual disturbances, hemisensory symptoms, hemiparesis or dysphasia or combinations thereof. Gradual development, duration of one hour and complete reversibility characterise the aura which is associated with headache."

2. Migraine with prolonged aura

The Headache Classification Committee of the International Headache Society (1988) describes this as follows," Migraine with one or more aura symptoms lasting more than 60 minutes and less than a week. Neuroimaging is normal."

3. Familial hemiplegic migraine

The Headache Classification Committee of the International Headache Society (1988) describes this as follows," Migraine with aura including

hemiparesis and where at least one first degree relative [i.e. immediate family] has identical attacks."

4. Basilar Migraine

The Headache Classification Committee of the International Headache Society (1988) describes this as follows," Migraine with aura symptoms clearly originating from the brain stem or from both occipital lobes."

5. Migraine aura without headache

The Headache Classification Committee of the International Headache Society (1988) describes this as follows," Migrainous aura unaccompanied by headache."

6. Migraine with acute onset aura

The Headache Classification Committee of the International Headache Society (1988) describes this as follows," Migraine with aura developing fully in less than 5 minutes."

2.3 Prevalence

Stewart et al. (1994), in a review of population studies that used the diagnostic criteria of the International Headache Society, concluded that prevalence of migraine among men is approximately 6% and 15% to 17% among women. Prevalence appeared to vary with age, increasing up to about 40 years and then decreasing for both men and women. The ratio of women to men also appeared to vary with age.

The ratio increased (i.e. higher for women) from about menarche to about 42 years of age and then declined thereafter.

2.4 Effects of Migraine on General Wellbeing

In a prospective random sample of 1007 young adults (Breslau and Davis 1993), the association between migraine and psychiatric disorder, physical complaints, indicators of functional impairment and the use of mental health services were examined.

In this study a history of migraine was associated with increased lifetime rates of major depression, anxiety disorders, illicit drug use disorders, nicotine dependency and suicide attempts. Furthermore subjects with a history of migraine compared to non-migraineurs had more signs of physical symptoms, were more likely to report for job absenteeism, were more likely to assess their general health as," poor to fair" and to use mental health facilities. (Breslau and Davis 1993.)

In a survey done on 845 patients using the Short Form 36 health questionnaire (Osterhaus et al. 1994), the authors concluded that migraineurs suffered a unique quality of life burden. It was found that migraineurs reported substantially diminished physical functioning, general health and emotional well being compared to the general population of the United States of America, with no reported conditions.

Compared to other chronic conditions, migraine appeared comparable to conditions that might otherwise be considered more debilitating than migraine. Migraineurs were shown to be similar to osteoarthritis

sufferers and diabetes in physical functioning, whilst scales measuring well being (mental health, social functioning) were significantly lower for migraine than for the aforementioned. Furthermore, migraineurs scored the lowest (i.e. faired worse) with regard to the degree to which bodily pain affected their normal daily routine. (Osterhaus et al. 1994.)

2.5 Implications for Society

In a random sample of 13343 people interviewed during a one-year study in order to assess the impact of headaches on work time and work effectiveness, migraines emerged as the worst culprit (Schwartz et al. 1997).

The study was done by telephonic interview. If the interviewee was a headache sufferer, the information obtained was that of frequency, severity, location, duration, disability, quality and associated symptoms. The headaches were then classified according to the criteria of Headache Classification Committee of the International Headache Society (1988).

Of the above respondents 9.4% reported missing work more than rarely because of headaches in general. Thirty one percent reported that their effective work level was reduced more than rarely by headaches. Furthermore, 9.2% reported that their level was reduced more than 50% by headaches during work.

By including actual workdays lost and reduced effectiveness at work, it was computed that an equivalent of 4.2 days per year, per person, were lost because of headaches. With regards to the subjects questioned this amounted 9922 lost workdays per year. Of these workdays lost 57% were lost due to migraine whilst 43% were due to tension headaches and other types of headaches that could not be classified.

Decreased work effectiveness was calculated as reduced effectiveness workday equivalents (REWE) using four components. These were: reported number of headaches per year; proportion of headaches that cause a decreased work level; the average proportion reduction in work level and average duration of headaches. Of the 23287 computed annual REWE's, 64% were due to tension type headaches and 36% were due to migraine headaches.

This demonstrates that migraineurs were most likely to report actual workdays lost while tension type headache sufferers were more likely to report reduced effectiveness. The authors conclude, "Migraine is a serious 'disease' that has significant impact on work, both on absenteeism and effectiveness while at work."

2.6 Onset and Course of Migraine Headache

Migraines without aura and migraines with aura differ in their nature of attack. Migraines with aura specifically have a prodromal period (a phase, which precedes and can extend into the headache period)

where an aura is experienced. Although migraines without aura can have a prodromal period, this is not characteristic. (Theisler 1990: 7.)

The migraine without aura attack is typically characterised by headache, gastrointestinal symptoms and other autonomic symptoms such as mild dizziness, vertigo and syncopal attacks. The prodromal period, when it does occur, can have warning symptoms such as "neck stiffness, shoulder tightness, uneasiness, drowsiness, a feeling of inability to wake up completely, yawning, changes in appetite, irritability, anxiety, a feeling of being run down, depression, elation or mood swings." (Theisler 1990: 7.)

As mentioned previously, this period does not always occur with migraine without aura, but when it does, it can last from a few hours to a few days. The migraine headache itself is usually severe and incapacitating. (Theisler 1990: 7.)

The prodromal period for migraines with aura can involve visual, sensory or motor phenomena. Visual phenomena include aura, whilst sensory phenomena include numbness and tingling and motor phenomena can include hemiparesis and dysphasia. Typically the migraine with aura is preceded by aura which is pathognomonic to it. During the headache phase these neurological symptoms can continue and sometimes outlast the actual head pain. (Theisler 1990: 8.)

2.7 Models of Explanation of Migraine Headache

There are two main theories to explain the mechanism of migraine headache (Appenzeller 1991:763). These are the Vascular Theory of Migraine and the Neurogenic Theory of Migraine.

Vernon (1988) proposes another model, the Vertebrogenic Theory of Migraine. This serves to explain the role chiropractic could play in migraine therapy. He later adapted it in 1995 to call it the Model of Cervicogenic Headache Pathogenesis (Vernon 1995: 307).

These theories will be briefly discussed below. This will serve as an outline to the current knowledge. An in-depth discussion will not be entered into as it is beyond the scope of this paper.

2.7.1 The Vascular Theory of Migraine

The vascular theory of migraine holds that migraines are due the vasoconstriction and vasodilatation of the cerebro-vasculature. (Diamond 1991:546.)

The model is divided into four consecutive events. These are firstly initial cerebral vasoconstriction (it is at this stage that the sufferer experiences aura or warnings of impending migraine). Secondly extra-cranial and intra-cranial vasodilatation occurs. This is considered the cause of pain in migraine. Thirdly there is concomitant sterile inflammation that increases the pain and prolongs the attack. Fourthly, secondary muscle contraction occurs. (Diamond 1991:546.)

Using the above as a framework the vascular model is further explained. (Theisler 1990: 37.)

Vasoconstriction Phase:

Initially it is hypothesised that various trigger factors, whether they be stress, caffeine or tyramine-rich foods, cause the release of epinephrine and norepinephrine which lead to the start of a migraine attack.

The above hormones lead to increased platelet aggregation which in turn cause the release of pain sensitising agents such as bradykinin, histamine, serotonin, substance P amongst others.

The release of serotonin increases the cerebral serotonin concentration. Serotonin is a potent vasoconstrictor that causes reactive cerebral vasoconstriction. It this cerebral vasoconstriction which is thought to be the cause of the pre-headache symptoms of the migraine with aura.

Vasodilatation Phase: Due to the vasoconstriction, cerebral acidosis occurs leading later to reactive cerebral vasodilatation. At the time this extra cerebral vasodilatation occurs, the actual headache is felt.

Sterile Inflammation: The release of the pain sensitising agents mentioned earlier account for the sterile inflammation that sensitises the arteries to vasodilatation, which prolongs the attack.

Theisler (1990: 44) further outlines the criticisms of the vascular model. The criticisms focus on two areas of the vascular model, the Ischaemic Phase and the Vasodilatatory Phase.

On the Ischaemic Phase:

- Most of the criticism is levelled at presumption that cortical ischaemia is the cause of migraine symptoms. Electroencephalographic studies have failed to prove a cortical ischaemic basis for migraine with aura. Symptoms that are manifested cannot be linked to the occlusion of the larger cerebral vessels as correlated with the simultaneous performance of arteriographic studies. Furthermore neurological symptoms that occur prior to onset of head pain extend well beyond the scope of the extracranial vasculature.

- With regard to the concept of cerebral ischaemia being responsible for pre-headache symptoms, the decrease in cerebral blood flow that does take place is insufficient to produce ischaemic symptoms. Furthermore bilateral decreases in cerebral blood flow have been recorded when the headache symptoms were distinctly unilateral.

- Cortical ischaemia should produce symptoms consistent with an upper motor neurone lesion (i.e. spastic paralysis), while the opposite occurs (i.e. flaccid paralysis).

- Decreased cerebral blood flow is known to continue long after the neurological symptoms have abated and the site of the headache

has no consistent relationship to the site of the decreased blood flow.

- Finally with regard to reduced cerebral blood flow the assumption that ischaemia causes cerebral acidosis has not been proven, in fact no reduction in cerebral pH has been shown.

On the Vasodilatatory Phase:

- In terms of cerebral vasodilatation no consistent evidence has been found to prove its connection with the actual headache. The increase in cerebral blood has shown to be minimal and, in areas where it is measurable, it does not tend correspond to the actual head pain. Migraine headache has been recorded not only when cerebral blood flow is normal but also when there is a measured decrease in the cerebral blood flow.

- Lastly extracranial arterial occlusion induced by a pressure cuff fails to relieve the headache. This is inconsistent with theory of extra-cerebral vasodilatation as a cause of pain.

In conclusion, in migraine with aura, vasoconstriction is unrelated to the neurological signs and symptoms, while for migraine in general, no vascular changes are associated with the head pain. (Nelson 1994.)

2.7.2 The Neurogenic Theory of Migraine

The trigeminal nerve is central to the neurogenic model and is the most important component in the pathogenesis of migraine. (Buzzi et al. 1995.)

The trigeminal nerve is the largest of the cranial nerves. It is the principle general sensory nerve to the head, more specifically the face and also the motor nerve to the muscles of mastication. (Moore 1992: 822.)

In addition to the innervation of the more commonly known structures, there is a component of the trigeminal nerve that innervates the vasculature of the head. This innervation which is primarily by the ipsilateral trigeminal nerve, is both motor and nociceptive. Thus the head vasculature is pain sensitive and therefore it is accepted that it must play a role in the head pain. The trigeminal nerve sends branches to the following vasculature: the middle meningeal and superficial and superficial branches of the external carotid artery, dural arteries, and the superior sagittal sinus. It also supplies large vessels of the brain, which include the superior cerebellar, rostral basilar, middle cerebellar and parts of the circle of Willis. (Darby and Cramer 1994: 65-66.)

This system of innervation of the cerebral vasculature and the meninges is also known as the trigeminal vascular system (TVS). The TVS is a network of fibres existing in the blood vessels and the meninges, that can be activated by chemical or receptor mediated processes. The relevance of this, is that blood vessels are considered to be the portal of entry to the brain while the meninges are considered to be the protective capsule of the brain. As a result, any primary disturbances in the brain (i.e. events occurring in the circulation or in the vessel wall), can influence the TVS fibres. (Buzzi et al. 1995.)

Animal studies regarding the trigeminal nerve have shown the following. Firstly that it provides the only known pain sensitive

innervation to the cranial vasculature. Secondly, trigeminal ganglion stimulation increases both bulk extra-cerebral and regional blood flow, specifically in the frontal and parietal area. Thirdly, trigeminal ganglion stimulation has been shown in rats to increase both vascular permeability and mast cell degranulation in the dura thus causing neurogenic inflammation in the area. Fourthly, trigeminal ganglion stimulation causes the release of calcitonin gene related peptide (CGRP) and substance P (SP), both markers of trigeminal ganglion activity. The last point is important in that human studies have shown that during migraine with or without aura there is marked increase in levels of CGRP and SP indicating activation of the trigeminal ganglion. (Edvinsson and Goadsby 1994.)

The Neurogenic model holds that any stimulus that depolarises the trigeminal sensory system activates the trigeminal vascular system (TVS) which causes changes in cephalic circulation and intra and extra-vascular tissues receiving its innervation. (Buzzi et al. 1995.)

The TVS is thought be part of a mechanism that alerts and protects the brain. Headache is a consequence of this mechanism when a real or threatened injury is perceived to the brain. The pain experienced in migraine is thought to be due to a combination of several factors. These being neurogenic inflammation of the dura mater and the cerebral vasculature combined with vasodilatation and increased permeability of the cerebral vasculature resulting in tissue oedema. The autonomic response that accompanies the headache is thought to be due to the attachment of TVS fibres to the autonomic centre of the brain. (Buzzi et al. 1995.)

2.7.3 The Vertebrogenic Theory of Migraine

Vernon, in 1988 first outlined a model for vertebrogenic migraine. This model, in brief concerns the role that vertebrogenic dysfunction could play in the triggering and pathogenesis of migraine. Vertebral dysfunction meant cervical fixations, especially C1, C2 and C3 and upper thoracic fixations (T1 – T4).

Vernon (1995: 308), revises this model to that of cervicogenic headache. Cervicogenic headache meaning its origin lies within the cervical spine. Vernon by association includes migraines in the term cervicogenic headache.

Vernon (1995: 308), proposes in the mechanism of migraines of cervical origin, that the trigeminal-cervical-nucleus plays an important role.

The trigemino-cervical nucleus is an amalgamation of the caudal end of the trigeminal nucleus and the rostral ends of the dorsal horns of the three upper cervical spinal nerves. These two structures are anatomically, histologically and functionally the same. Thus, the central nervous system has no way of differentiating whether the source of pain is from the cervical spinal nerves or from the trigeminal system. (Nelson 1994.)

The trigeminal nerve itself consists of three branches, the ophthalmic, maxillary and the mandibular. All three of the branches extend as far the upper third of the cervical segment. However, the ophthalmic branch extends as far as the fourth cervical segment. This branch is responsible for the nociception of the areas where the pain of migraine

headaches are felt, thus allowing it to be affected by the middle as well as the upper cervical segments. (Theisler 1990: 54.)

Vernon (1995: 309), explains that the trigemino-cervical nucleus by virtue of its intimate relationship with the trigeminal nerve and cervical afferent nerves, is sensitive to nociceptive inputs. These can strengthen or facilitate other normally quiescent sensory input that converges on this area causing excitation and hyperfacilitation to arise here.

This hyperfacilitation of the trigeminal-cervical nucleus may explain the formation of the headache and of deep tissue pain and hyperalgesia of the surrounding cutaneous areas. The hyperalgesia and deep tissue pain can be explained by the hypersensitivity of the dorsal horns of cervical nerves. This can also explain the poor localisation and the pain referral because of the general convergence sensory input into one area, that being the trigeminal-cervical nucleus. With regards to the headache, the model at this point ties in with the neurogenic model in so far as the trigeminal nerve becomes involved with the pathogenesis of migraine. (Vernon 1995: 309.)

Vernon (1995: 316), recognises that this model will not apply to all migraineurs, but qualifies it by proposing three hypothetical categories of migraine sufferers with regard to model.

- The first category consists of those migraine sufferers for whom the cervicogenic component is etiological. These are likely to derive benefit from spinal manipulative therapy.

- The second category consists of those migraine sufferers for whom the cervicogenic component is secondary and synergistic. Vernon (1995: 316), believes that this group will derive benefit from spinal manipulative therapy in conjunction with other therapies.

- The third category consists of those migraine sufferers for whom the cervicogenic component is negligible. These people are unlikely to benefit from spinal manipulative therapy.

2.8 Proposed Mechanism of Manipulation.

Vernon (1992), demonstrated in 28 common migraine sufferers and 19 tension headache sufferers, that there was a high prevalence of cervical dysfunction in both groups. Ninety seven percent of all the subjects exhibited on dynamic x-ray studies, at least one significant abnormality of segmental mobility from C0 to C7, while 43% exhibited abnormalities at four or more segments. There was segmental hypo-mobility at C0-C1 for 90% of the subjects in flexion and 70% of subjects in extension. Lastly, on motion palpation, 84% of all subjects were found to have at least two major fixations from C0 to C2. Although not a controlled study, the strength of the results gives a good indication of cervical dysfunction in sufferers of common migraines. Nevertheless further investigation involving controlled trials needs to be done in order to conclusively demonstrate cervical dysfunction in migraineurs.

Vernon (1995: 312), summarises that afferent pain from dysfunctional cervical joints serves to trigger hyper-facilitation of the trigemino - cervical nucleus as discussed in 2.7.3.

Vernon (1995: 316), proposes that manipulation of dysfunctional cervical joints will decrease the facilitation of afferent nerves to the trigemino-cervical nucleus. This is thought to be brought about via the following mechanism whereby manipulation of a joint causes the sudden stretching of structures in and around the joint (e.g. capsule and ligaments), resulting in rapid firing of joint mechanoreceptors which cause reflex relaxation of the surrounding muscle as well as a pain inhibition (Brodeur 1995).

2.9 Proposed Mechanisms of Acupuncture

Acupuncture has been used on the one hand for acute analgesia (as in surgical analgesia) and also for more chronic analgesia. The acute analgesia is usually short lasting and stops after the acupuncture stimulation stops, while chronic analgesia has been documented to last for years. (Klide 1989.)

Most investigations on acupuncture analgesia study the acute production of analgesia and not long-term analgesia. It may or may not be due to the same mechanisms. However, what is most apparent is that part of the neurological descending system of the body is responsible and that neurotransmitters are involved. The most studied and most likely of these neurotransmitters are enkephalins, serotonin, acetylcholine and norepinephrine. (Klide 1989.)

Klide (1989) hypothesises that with chronic analgesia, "training" of the autonomic system occurs. In other words repeated activation of physiological systems that inhibit the transmission of pain, by means of

multiple acupuncture treatments, trains these systems to continually be active. Thus the period of pain relief is maintained long after the last treatment. This is however hypothetical and research needs to be done firstly, to show that pain modulating systems can be "trained" and secondly, the period of treatment and frequency of treatment needed in order to achieve the required long term analgesia.

It has been suggested that when analgesia occurs as a result of prolonged stimulation, the endogenous mechanism responsible for it is opioid peptide mediated, however when it is in response to a brief stimulation, it is due to a non-opioid little known mechanism (Baldry 1989: 80.)

Murray (1995), in a review of acupuncture literature, writes that initially endorphins and endogenous opiates were believed to underlie acupuncture's analgesia. This was underscored by the drug Naloxone's tendency to reverse acupuncture' analgesia. However Naloxone did not always inhibit analgesia caused by acupuncture. This is now leading to research where the interaction of endorphins with neurotransmitters such as substance P and serotonin is being investigated.

2.10 Discussion of Proposed Treatment for Migraine Type Headache

2.10.1 Chiropractic Treatment

The first attempt to measure the improvement of migraines due to adjustment was done by Wight (1978) who performed a retrospective

analysis on 87 of his migraine patients. The group consisting of 57 women and 30 men was divided into 34 sufferers of "common migraine" and 53 sufferers of "classical migraine". In the "common" migraine group 85% of the women and 50% of the men achieved what Wight (1978) calls a "greatly improved" level. Vernon (1995) puts this level to be at 85%. In the "classical" migraine group, 75% of the men and 78% of the women also achieved this "greatly improved" level. On average the overall improvement for both categories of migraine and both categories of sex was reported at 74.7%.

This trial lacked the proper controls to be taken seriously, yet as Vernon (1995) states, "it served a useful function as the first attempt to quantify the levels of improvement possible with this challenging condition in a typical clinical setting."

Parker et al. (1978) were the first to research the effectiveness of manipulation in a controlled trial. In a sixth month trial, volunteers suffering from migraine were randomly allocated to three treatment groups. One group received cervical manipulation performed by a physiotherapist, the other by a chiropractor, while the control group was given mobilisation. For the entire treatment, migraine symptoms were significantly reduced in all three groups. Parker et al. (1978) found that there was a 28% overall improvement in frequency of attacks which reduced a further 19% up to the follow up period. No difference was found between the three groups with respect to the reduction of frequency, duration and induced disability of migraine attacks. However, chiropractic patients did report the greatest reduction in severity of attacks. (Parker et al. 1978.)

Parker et al. (1980) questions whether mobilisation or manipulation of the cervical spine is an effective treatment of migraine. The authors maintain that some evidence suggested that placebo influences made a slight contribution to the improvement, with sex, social class, and subject's optimism being weakly associated with the initial improvement.

What the authors propose is that improvement levels reflected spontaneous decrease in migraine symptoms. In other words, it has been observed that the natural history of migraine may include periods of time when it would appear that a cure has occurred with the patient. This cure is temporary, and normally the migraines resume their usual occurrences.

Stoldolny and Chmielwski (1989), in study of 31 migraine sufferers, showed a decrease in frequency of migraines. The subjects were diagnosed has having "cervicogenic migraine". Although diagnosis was not made according to the criteria of the Headache Classification Committee of the International Headache Society (1988), the diagnosis appears to fit in with the criteria for common migraine. Subjects were first assessed for degree of cervical rotation and cervical dysfunction. This was found to be at the levels C0/C1 for all the subjects and C7/T1 for 75% of the subjects. The subjects were given cervical manipulations at the areas of cervical dysfunction in three treatments over a period of three weeks. After one week, 75% of subjects reported complete relief of headaches. Other findings included increased cervical range at previously dysfunctional levels and in most subjects reduced levels of dizziness.

Vernon (1995), points out that Stoldolny and Chmielwski's (1989) study was not a controlled trial and that no statistical analysis was done on frequency, duration and intensity of the headaches. Furthermore the study was done over a short period, with no follow up period to assess the long-term affect of the treatment.

Vernon (1995), does make the point however that the results are consistent with other uncontrolled studies that when taken together indicate (75% - 90%) of success with reduction of headache after spinal manipulation.

Coulter et al. (1996:26-27), in contrast to this, in a literature review of recent migraine studies regarding manipulation, summarised that the literature is too limited to support or refute the use of cervical spine manipulation for patients suffering from migraine headaches.

A clinical trial on the efficacy of spinal manipulative therapy for migraine with aura showed significant benefits (Tuchin 1997). This trial was of six months duration where 32 volunteers between the ages of 23 and 60 were used. The trial was divided up into three stages: A two month pre-treatment period, a two month treatment period and a two month post-treatment period. The volunteers were given spinal manipulative therapy for the treatment period of 2 months. They were required during the trial to complete headache diaries noting the frequency, severity and duration as well as medication taken. The end result was, that the patients showed a statistically significant decrease ($p<0.05$) in migraine frequency and duration in the long term (i.e. extending into the two month post-treatment period) when compared to the initial baseline levels.

Although not a controlled trial, this study does indicate that manipulation can play an important role in the treatment of migraine and that a proper controlled study is necessitated.

2.10.2 Acupuncture Treatment

In a study involving 20 patients suffering from migraine, Batra (1986), suggests that acupuncture be tried for migraineurs who were resistant to conventional forms of treatment for migraine. For this study 15 females and five males within a migraine frequency of two to six per month were selected for the trial. The patients had proved resistant to conventional treatment. For the study a regular schedule of 10 treatments was given. Results, which were divided into frequency, duration and intensity of migraine, were analysed three months after the last treatment. Patient assessment revealed that 30% of the patients showed marked improvement (greater than 90%), while 35% of the patients improved by 75%. Furthermore, 25% showed mild improvement (25% - 50%) and only 10% showed no improvement. With regards to drug intake 45% of patients stopped or reduced their intake of painkillers.

Although Batra's (1986) study is a clinical study that shows good results, it is weakened by it's sample size, by the fact that it is non-randomised and has no control group.

Vincent (1989) conducted a single, blinded, randomised controlled trial, comparing true and sham acupuncture on 30 patients suffering from chronic migraine. A four-week baseline period was followed up by a six-week treatment period and an initial six week follow up period.

Thereafter follow-ups were carried out at four months and at one-year post-treatment. Throughout the study diary measures of headache quality and medication intake were recorded. Furthermore, measures of headache quality, general anxiety and pain behaviour were included. True acupuncture was statistically more effective in the treatment of migraine than the control procedure. Subjects in the acupuncture group reduced their pain scores by 43% and their medication scores by 38%. These scores were maintained over a four month and one year post treatment period.

Ernst and White (1997) include Vincent's (1989) research amongst other reviewed research that they term "rigorous". Indeed, it's strength lies in the fact that it is a single blinded randomised controlled trial. What lends it further weight is that a four week baseline period was carried out first allowing a more accurate comparison between post-treatment period and baseline values. Unfortunately one is not made aware of whether the migraine diagnosis was made according to the criteria for migraine as defined by Headache Classification Committee of the International Headache Society (1988), causing it to weaken the study.

Baischer (1995), in an uncontrolled study on 26 migraineurs, showed benefits of acupuncture treatment for the majority of the group. The 26 patients selected for the trial suffered from chronic migraine according to the criteria as defined by the Headache Classification Committee of the International Headache Society (1988) criteria. The patients documented frequency, duration and intensity of attacks as well as analgesic intake in a headache diary, which was kept for a five-week

period before treatment (pre-treatment), immediately after the treatment (post-treatment) and three years later (follow-up).

Statistically, the decrease of frequency was the main reason for improvement. Duration and intensity did not change significantly at post treatment or follow up. Thus the data demonstrated a greater than 50% improvement for 14 patients (53.8%) at post treatment and for 13 patients (50%) at follow up.

The number of analgesics taken for relief of migraine headache decreased from 19.5 (pre-treatment) to 9.4 (post treatment). (Values were taken as mean values per patient)

Subjectively, 80.8% of patients judged the extent of improvement greater than 33% at the end of post treatment evaluation phase. Three years later 65.4% of patients still estimated the reduction in migraine symptoms at greater than a third.

Although potentially a strong study in that the migraineurs conform to the criteria as defined by the Headache Classification Committee of the International Headache Society (1988) and that there is a long pre-treatment period to accurately document migraine occurrence, the study is weakened by it's sample size, by the fact that it is non-randomised and has no control group.

2.11 Summary

The impact migraine has on the individual (Breslau and Davis 1993) and society has been shown (Schwartz et al. 1997). Even though it is experienced by many people its patho-mechanics are still contentious (Theisler 1990: 1). This ultimately has an effect on what treatments can be offered to patients. Coulter et al. (1996: 26-27), in a review of the current literature, feel manipulation has not been conclusively demonstrated to show significant changes in migraine sufferers. Vernon (1995) is more positive and writes that uncontrolled studies with regard to chiropractic manipulation when taken together indicate (75% - 90%) of success with reduction of headache.

With regard to acupuncture and its effect on migraineurs, studies by Baischer (1995) and Vincent (1989) have shown significant benefits for migraine sufferers.

As much as the aforementioned studies have shown benefits, there still remains a serious need for rigorous clinically controlled trials for both chiropractic manipulation of migraineurs and acupuncture for migraine, to accurately measure effects of these treatment modalities on migraines. Nevertheless, evaluation of the combination of the two modalities can still be of use in the search for effective treatment of migraines.

Chapter 3

3.0 Materials and Methods

3.1 Introduction

This chapter covers how the study was conducted. This includes the study design, the subjects (patients) used, the interventions (treatments) they received as well as data collected from them and the statistical procedures this data was subjected to.

3.2 Study Design

This study was designed to be an uncontrolled, unblinded, randomised, comparative pilot study.

3.2.1 Object of the Study

The object of the study was to determine the relative effect of each treatment protocol in terms of objective and subjective measurements. The study attempted to identify whether the combination of chiropractic manipulative therapy and acupuncture treatment had a relatively greater effect in the treatment of migraine type headaches than chiropractic manipulative therapy on it's own.

3.2.2 Selection of subjects

Patients were notified of the research via advertising. Case histories on prospective patients were taken to determine whether they were sufferers of migraine type headaches. If they fitted the criteria they were included in the study.

The patient had to fulfil the diagnostic requirements for a migraine without aura and migraine with aura. (Headache Classification Committee of the International Headache Society 1988.)

Each patient was to have been suffering from migraines at least once a month for the last twelve months. (Dahlof and Dimenas 1995.)

No patients were to have any contra-indications to adjustments (Gatterman 1990: 67-68) and acupuncture (Baldry 1989: 29).

Contra-indications were assessed by means of the following methods. Radiographs of the cervical spine, a case history, physical examination, regional orthopaedic and neurological screening of the cervical spine and thoracic spine, as per Technikon Natal Chiropractic Day Clinic.

The patients were assessed for any warning signs and symptoms with respect to their headaches indicative of life threatening pathologies (Andrasik 1992: 345). If found, these subjects were excluded from the study.
Patients were to be between the ages of 18 and 60.

3.2.3 Allocation of subjects

After the patients had signed the informed consent form (Addendum H), they were then randomly divided into Group A (adjustment and acupuncture) and Group B (adjustment). Randomisation was done by the flipping of a coin, where "heads" stood for Group B and "tails" Group A. When a patient was designated into a group via this method,

it automatically followed that the next patient be placed in the alternate group. This was done to ensure an even spread of patients in both groups.

3.3 Interventions

After being accepted into the study, the patients were treated as follows:

Both Groups were given ten treatments over period of four weeks. Although Vernon (1995) recommended 9 – 12 treatments over two months (this dosage being based on "consensus" from previous studies), this author decided on the four week treatment period due to time constraints.

The chiropractic group:

Patients in this group were adjusted for fixation's in the cervical and upper thoracic (T1 - T4) area. (Vernon 1992.)

The chiropractic with acupuncture group:

This group was given chiropractic treatment as described above, followed by acupuncture treatment.

The acupuncture points as per Beijing College of Traditional Chinese Medicine et al. (1980: 336 - 337) that were used were the following:

Taiyang
Gall Bladder 8
San Jang 5
Gall Bladder 41
Liver2
Gall Bladder 34

The acupuncture points were localised in the following manner. A measurement was taken from the distance between the two creases of the inter-phalangeal joints of the index finger. This represented the acupuncture measurement of 1aum. (Chaitow 1983: 21.)
This measurement was translated onto a plastic ruler using a felt tipped pen. This ruler was then used to measure out the acupuncture points specifically for each patient.

The needles were inserted into each of the above points. There was no stimulation of the needles. The needles used were the standard, 2.5-cm, stainless steel, disposable acupuncture needles. Each acupuncture treatment lasted 20 minutes. (Baldry 1989: 198.)

3.4 Methods of measurement

Subjective and objective measurements were taken to measure any changes related to the treatment, with regard to the migraineurs.

The subjective measurements used were the McGill Short Form Questionnaire, the CMCC Questionnaire and the headache diary.

The McGill Short Form Questionnaire and the CMCC Questionnaire were completed by the patients at the initial consultation (reading 1), middle consultation (reading 2), last consultation (reading 3) and at the follow up consultation (reading 4). This was done before actual treatment proceeded. For the entire study, the middle consultation stood for the fifth consultation, the last consultation stood for the tenth consultation.

The headache diary was filled in over a period of twelve weeks and completed every time the patient experienced a migraine. The headache diary was then divided into 3 periods of 4 weeks each (i.e. period 1, period 2 and period 3). A baseline measurement was taken at the first consultation with regards to headache frequency, average duration and average intensity for the four weeks period preceding this consultation.

The CROM apparatus was used as a form of objective measurement. Using the CROM apparatus at the first (reading 1), middle (reading 2), last (reading 3) and follow up (reading 4) consultations, range of motion measurements were recorded. This was done before actual treatment proceeded.

Subjective measurements

3.4.1 CMCC Neck Disability Index (Addendum D) (Vernon and Mior 1991)

This questionnaire indicated how the day to day life of the patient is affected by neck pain experienced. Ten questions were required to be answered by the patient. These questions were scored from a minimum of zero to a maximum of five. The result obtained was represented as a percentage disability and was calculated by scoring the questionnaire out of 50.

3.4.2 McGill Short-Form Pain Questionnaire (Addendum E) (Melzack 1987)

This questionnaire was intended to interpret the sensory dimension of the pain experienced by the patient (Melzack and Katz 1992:

162). The McGill Short Form correlated very highly with the sensory, affective and total indices of the McGill Long Form Questionnaire and was designed to free the patient from filling out lengthy questionnaires. (Melzack and Katz 1992: 163.)

The questionnaire consisted of 15 words used to describe pain. Each word was ranked on an intensity scale of: 0 = none; 1 = mild; 2 = moderate; 3 = severe. The total score was reflected as a percentage of the maximum of 45.

3.4.3 Headache Diary (Addendum G)

Andrasik (1992: 353) maintains that subjective ratings of head pain (i.e. of frequency, intensity and duration) have become the "gold standard". The headache diary adapted from Andrasik (1992: 354) was used to measure these parameters.

1) The headache frequency pertains to the number of discreet migraines over a specified interval. These were divided into 3 periods of 4 weeks each per patient.

2) The duration pertains to the length of time in hours between the headache onset and offset. Duration was calculated by averaging the number of migraine hours per four-week period per patient.

3) The peak intensity pertains to the highest intensity value out of 100 for a given migraine period. This was calculated by averaging the peak intensity of migraines experienced per four-week period per patient.

Objective measurements

3.4.4 Cervical Spine Range of Motion (Addendum F)

The CROM was used in order to measure the cervical range of motion. Performance Attainments Associates (St Paul, MN) produced the CROM. Flexion, extension, left/right rotation, and left/right lateral flexion were measured in degrees according to the protocol laid out in the manufacturer's procedure manual.

A study comparing the CROM device to two other cervical range of motion techniques (i.e. universal goniometer and visual estimation) found that the C.R.O.M. device to have the greatest reliability. (Youdas et al. 1991.)

Furthermore, it showed good inter and intra tester reliability when two physical therapists took repeated measurements on the same patient. During the procedure, no aggravation of the patient's condition was found. (Youdas et al. 1991.)

3.5 Statistical Analysis

The statistical package Statgraghics Plus Version 6, supplied by Manugistics Incorporated, was used for data entry and analysis.

3.5.1 Treatment of the Data

1. The scores from the two questionnaires (McGill Short Form and CMCC) were represented as percentages.
2. The scores for the headache diary were represented as frequency, duration in hours and intensity out of 100.

3. The scores from the CROM for all planes of movement were represented as degrees.
4. The data then underwent statistical analysis, which was carried out by this author.

3.5.2 Methods of Data Analysis

The sample size of the group was small (15 per group), therefore non-parametric tests such as the Mann-Whitney Unpaired Test and the Wilcoxon's Signed Rank test were used for data analysis.

3.5.3 Procedure 1

Inter-Group Comparisons

Forty-four Mann-Whitney U tests were used to compare groups 1 and 2. The two groups were treated as being independent of one another (unpaired). The purpose was to find out whether there is any significant difference between the two groups at a 95% confidence interval with $\alpha/2 = 0.025$ level of significance using a two tailed test with respect to McGill, C.M.C.C., forward flexion, extension, left lateral flexion, right lateral flexion, right rotation, left rotation, frequency of migraine, intensity of migraine, and duration of migraine.

Comparisons were done with regard to intervals where the measurements were taken (i.e. reading 1, reading 2, reading 3 and reading 4). For headache diary, comparisons were done with regard to the baseline measurement, period 1, period 2 and period 3.

3.5.4 Hypothesis Testing and Decision Rule

The Null Hypothesis H_0 states that there is no significant difference between the two groups with respect to the variable of interest. The

alternative Hypothesis H_1 states that there is a significant difference between the two groups.

H_0: $\mu_1 = \mu_2$

H_1: μ_1 and μ_2 are significantly different from each other.

3.5.5 Decision Rule

For a two tailed test,

Reject H_0 if $P \leq \alpha/2 = 0.025$

Accept H_0 if $P \geq \alpha/2 = 0.025$

P is the observed significance level of the test.

3.5.6 Procedure 2

Intra-Group Comparisons

For CMCC, McGill Short Form and CROM, Wilcoxon's signed rank Tests were used within each group to find out whether there is any significant improvement between readings 1and 2, 1 and 3, 1 and 4, 2 and 3, 2 and 4, and 3 and 4. With regards to the headache diary, for frequency, duration and intensity, Wilcoxon's Signed Rank Tests were used within each group to find out whether there is any significant improvement between baseline and period 1, baseline and period 2, baseline and period 3, period's 1 and 2, period's 1 and 3, and period's 2 and 3. With respect to all measurements, statistically significant findings were based on a 95% confidence level and the above decision rule.

3.5.7 Hypothesis Testing and Decision Rule

The null hypothesis H_0 states that there is no significant improvement between consultations within group1 with respect to the variable of interest. The alternative hypothesis H_1 states the contrary to the null hypothesis.

H_0: There is no significant improvement.

H_1: There is a significant improvement.

$\alpha = 0.025$ = level of significance of test.

3.5.8 Decision Rule

For a two tailed test,

Reject H_0 if $P \leq \alpha/2 = 0.025$

Accept H_1 if $P > \alpha/2 = 0.025$

P is the observed significance level of the test.

3.5.9 Procedure Three

Summary statistics (median, mean, standard error, and standard deviation) were obtained.

3.5.10 Procedure Four

Power analysis results of each test were given below the relevant table. These were then used in the discussion to determine the power of each test and the chance of Type II error.

3.5.11 Procedure Five

Barcharts were constructed to present major findings of the study as a visual summary of results obtained from Mann-Whitney and Wilcoxon's Signed Rank Tests. Barcharts were made using the package EXCEL.

CHAPTER 4

4.1. Introduction:

The null hypothesis (H_0) states that there is no significant difference between the two groups with respect to the variable of interest. The alternative hypothesis (H_1) states that there is a significant difference between the two groups. In other words:

H_0: $\mu_1 = \mu_2$

H_1: μ_1 and μ_2 are significantly different to each other

$\alpha = 0.05$ = level of significance of test.

The decision rule works as follows:

Reject H_0 if $P \leq \alpha/2 = 0.025$

Accept H_0 if $P > \alpha/2 = 0.025$

P is the observed significance level of the test.

The data was assessed in a two tailed format using the Mann Whitney U Test for inter-group analysis and the Wilcoxon Signed Rank Test for intra-group analysis.

4.1.2 Abbreviations:

Group A: Acupuncture and Adjustment Group

Group B: Adjustment Group

S.E: Standard Error

S.D: Standard Deviation

M: Migraine without Aura

MA: Migraine with Aura

4.2 Age and Sex Percentages:

Age:

AGE:	GROUP A:	GROUP B:	TOTAL:
20 – 29	53.3%	33%	43.3%
30 – 39	6.6%	6.6%	6.6%
40 – 49	33.3%	26%	30%
50 – 59	6.6%	33.3%	20%

Sex:

SEX:	GROUP A:	GROUP B:	TOTAL
MALE	7%	20%	13%
FEMALE	93%	80%	87%

4.3 Migraine with Aura versus Migraine without Aura Percentages

	GROUP A:	GROUP B:	TOTAL
M	86.6%	86.6%	86.6%
MA	13.3%	13.3%	13.3%

4.4 Inter-Group Comparison using Mann Whitney U Test with regard to Objective Findings:

4.4.1. Reading One:

		GROUP A READING 1				GROUP B READING 1			
GONIO METER	Median	Mean	S.E.	S.D	P-Value	Median	Mean	S.E.	S.D.
FLEX	61	64.1	2.7	10.3	0.0907	70	71	3.5	13.5
EXT	54	54.8	3.2	12.4	0.4415	60	60.5	3.7	14.4
(L)LAT FLEX	45	45.9	3.2	5.7	0.9008	48	46.5	3.1	11.9
(R)LAT FLEX	44	43.6	1.8	6.9	0.9502	41	44.5	3.1	12.1
(R) ROT	53	57.3	3.1	12.0	0.7241	60	58.3	3.3	12.9
(L) ROT	60	58.9	2.8	10.7	0.5599	61	60.933	4.9362	19.1
POWER			Flexion		0.3188				
			Extension		0.1931				
			(R)Lat Flexion		0.0558				
			(L)Lat Flexion		0.0547				
			(R)Rotation		0.0547				
			(L)Rotation		0.0617				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus the null hypothesis is accepted.

4.4.2. Reading Two:

		GROUP A READING 2				GROUP B READING 2			
GONIO METER	Median	Mean	S.E.	S.D	P-Value	Median	Mean	S.E.	S.D.
FLEX	70	67	3.5	13.2	0.7397	66	69	2.6	10.1
EXT	56	53.9	3.22	12.6	0.1132	61	59.9	3.2	11.5
(L)LAT FLEX	46	44.5	2.16	8.2	0.6318	40	44.4	3.8	14.7
(R)LAT FLEX	40	41	1.21	4.7	0.5319	40	40.6	3.4	13.2
(R) ROT	62	60.1	2.8	10.9	0.9834	61	61.4	2.9	11.4
(L) ROT	60	62.3	2.8	9.7	0.5599	61	58.1	2.9	11.4
POWER			Flexion		0.0712				
			Extension		0.2501				
			(R)Lat Flexion		0.0511				
			(L)Lat Flexion		0.05				
			(R)Rotation		0.0599				
			(L)Rotation		0.1742				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.4.3 Reading Three:

		GROUP A READING 3				GROUP B READING 3			
GONIO METER	Median	Mean	S.E.	S.D	P-Value	Median	Mean	S.E.	S.D.
FLEX	70	65.7	3.4	12.9	0.1575	75	71.1	2.8	10.6
EXT	59	54.9	2.9	11.5	0.6918	56	57.7	3.9	15.4
(L)LAT FLEX	43	43.1	2.3	8.8	0.2188	50	48.3	2.7	10.6
(R)LAT FLEX	42	41.5	1.9	7.7	0.8514	40	44.9	3.3	12.4
(R) ROT	60	59.8	2.5	9.6	0.8677	62	60.3	3.5	13.6
(L) ROT	61	61.3	2.9	15.7	0.5885	59	58.7	4.1	10.3

POWER		
	Flexion	0.2169
	Extension	0.0812
	(R)Lat Flexion	0.1317
	(L)Lat Flexion	0.2819
	(R)Rotation	0.0513
	(L)Rotation	0.0779

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.4.4 Reading Four:

		GROUP A READING 4				GROUP B READING 4			
GONIO METER	Median	Mean	S.E.	S.D	P-Value	Median	Mean	S.E.	S.D.
FLEX	69	68.3	3.2	12.6	0.9834	65	69.3	2.6	9.9
EXT	52	54.5	2.1	8.1	0.1132	64	61.7	3.4	13.3
(L)LAT FLEX	45	46.5	2.6	10.0	0.2619	50	47.2	2.3	9.0
(R)LAT FLEX	42	41.6	2.0	7.8	0.4543	43	44.8	2.7	10.3
(R) ROT	62	64.5	1.9	7.5	0.9667	63	64.9	3.3	12.9
(L) ROT	60	63.5	2.7	10.3	0.3699	60	61.3	2.9	11.2
POWER			Flexion		0.0556				
			Extension		0.3939				
			(R)Lat Flexion		0.1449				
			(L)Lat Flexion		0.0539				
			(R)Rotation		0.051				
			(L)Rotation		0.0811				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.5 Inter-Group Comparison using Mann Whitney U Test with regard to Subjective Findings:

4.5.1 Inter-Group Comparison using Mann Whitney U Test with regard to the headache diary:

4.5.1.1 Baseline reading:

		GROUP A Baseline				GROUP B Baseline			
DIARY	Median	Mean	S.E.	S.D.	P-Value	Median	Mean	S.E.	S.D.
FREQ	1	1.8	0.4	1.4	0.3384	2	1.9	0.3	1.0
INT	90	88.7	2.6	9.9	0.5691	90	90.7	2.7	10.3
DUR	24	30.1	6.1	23.7	0.2787	36	37.5	5.9	23.1
POWER			Frequency		0.0548				
			Intensity		0.0791				
			Duration		0.127				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.5.1.2 Period One:

		GROUP A Period 1				GROUP B Period 1			
DIARY	Median	Mean	S.E.	S.D.	P-Value	Median	Mean	S.E.	S.D.
FREQ	2	1.9	0.3	1.1	0.3439	2	1.5	0.3	1.1
INT	80	68.9	7.3	28.1	0.3604	65	57.8	8.7	33.8
DUR	41	49.5	12.8	49.5	0.7871	34	47.2	11.9	46.4
POWER			Frequency		0.1533				
			Intensity		0.1494				
			Duration		0.0517				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.5.1.3 Period Two:

		GROUP A Period 2				GROUP B Period 2			
DIARY	Median	Mean	S.E.	S.D.	P-Value	Median	Mean	S.E.	S.D.
FREQ	1	1.6	0.5	1.8	0.3217	1	0.8	0.2	0.8
INT	53.3	42.5	9.9	38.3	0.9144	50	45.2	10.6	31.2
DUR	6	31.6	11.9	46.1	0.9316	7.	26.5	11.2	46.4
POWER			Frequency		0.3076				
			Intensity		0.0543				
			Duration		0.1368				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.5.1.4 Period Three:

		GROUP A Period 3				GROUP B Period 3			
DIARY	Median	Mean	S.E.	S.D.	P-Value	Median	Mean	S.E.	S.D.
FREQ	1	1.3	0.3	1.0	0.2281	1	0.8	0.2	0.9
INT	70	61.6	9.4	36.5	0.1073	50	37.7	9.8	38.0
DUR	19.5	39.5	12.8	49.4	0.0722	6	14.2	5.3	20.6
POWER			Frequency		0.1265				
			Intensity		0.3867				
			Duration		0.3984				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.5.2 Inter-Group Comparison using Mann Whitney U Test with regard to CMCC and McGill Short Form Questionnaires:

4.5.2.1 Reading One:

	GROUP A READING 1					GROUP B READING 1			
	Median	Mean	S.E.	S.D.	P-Value	Median	Mean	S.E.	S.D.
CMCC	10	12.5	2.7	8.4	0.2041	12	20.6	4.4	16.9
MCGIL	40	49.9	6.0	23.4	0.9834	44.4	46.5	4.2	16.0
POWER			CMCC		0.3409				
			McGill		0.0708				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.5.2.2 Reading Two:

	GROUP A READING 2					GROUP B READING 2			
	Median	Mean	S.E.	S.D.	P-Value	Median	Mean	S.E.	S.D.
CMCC	12	20.6	40.4	13.1	0.5047	8	9.3	1.8	7.2
MCGIL	24.4	27.3	6.3	24.2	0.4649	13.3	21.4	22.5	22.5
POWER			CMCC		0.7988				
			McGill		0.0981				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.5.2.3 Reading Three:

	GROUP A READING 3					GROUP B READING 3			
	Median	Mean	S.E.	S.D.	P-Value	Median	Mean	S.E.	S.D.
CMCC	8.8	11.7	3.1	12.1	0.8019	8.8	14.9	4.5	17.6
MCGIL	8.8	21.9	6.9	26.7	0.5971	20	24.4	5.9	23.1
POWER			CMCC		0.0828				
			McGill		0.0573				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.5.2.4 Reading Four:

	GROUP A READING 4					GROUP B READING 4			
	Median	Mean	S.E.	S.D.	P-Value	Median	Mean	S.E.	S.D.
CMCC	8	10.8	3.4	13.2	0.7533	8	11.4	4.1	15.8
MCGIL	26.6	34.0	7.5	29.0	0.03721	17.7	27.9	7.4	28.6
POWER			CMCC		0.0512				
			McGill		0.0835				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.6 Intra-Group Comparisons:

4.6.1 Intra-Group Comparisons of Group A using Wilcoxon Signed Rank Test

4.6.1.1 Intra-Group Comparisons using Wilcoxon Signed Rank Test with Regard to Objective Data:

4.6.1.1.1 Reading One versus Reading Two:

		GROUP A READING 1				GROUP A READING 2			
GONIO METER	Median	Mean	S.E.	S.D	P-Value	Median	Mean	S.E.	S.D.
FLEX	61	64.1	2.7	10.3	0.6055	70	67	3.5	13.2
EXT	54	54.8	3.2	12.4	0.6055	56	53.9	3.22	12.6
(L)LAT FLEX	45	45.9	3.2	5.7	1	46	44.5	2.16	8.2
(R)LAT FLEX	44	43.6	1.8	6.9	0.0613	40	41	1.21	4.7
(R) ROT	53	57.3	3.1	12.0	0.3016	62	60.1	2.8	10.9
(L) ROT	60	58.933	2.7662	10.7	0.5791	60	62.3	2.8	9.7
POWER			Flexion		0.0949				
			Extension		0.0538				
			(R)Lat Flexion		0.0786				
			(L)Lat Flexion		0.2024				
			(R)Rotation		0.0949				
			(L)Rotation		0.1342				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.6.1.1.2 Reading One versus Reading Three:

		GROUP A READING 1				GROUP A READING 3			
GONIO METER	Median	Mean	S.E.	S.D	P-Value	Median	Mean	S.E.	S.D.
FLEX	61	64.1	2.7	10.3	0.1814	70	65.7	3.4	12.9
EXT	54	54.8	3.2	12.4	0.7892	59	54.9	2.9	11.5
(L)LAT FLEX	45	45.9	3.2	5.7	0.1814	43	43.1	2.3	8.8
(R)LAT FLEX	44	43.6	1.8	6.9	0.4226	42	41.5	1.9	7.7
(R) ROT	53	57.3	3.1	12.0	0.7892	60	59.8	2.5	9.6
(L) ROT	60	58.933	2.7662	10.7	0.3864	61	61.3	2.9	15.7
POWER			Flexion		0.0637				
			Extension		0.0501				
			(R)Lat Flexion		0.1129				
			(L)Lat Flexion		0.1592				
			(R)Rotation		0.0824				
			(L)Rotation		0.0725				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.6.1.1.3 Reading One versus Reading Four:

		GROUP A READING 1				GROUP A READING 4			
GONIO METER	Median	Mean	S.E.	S.D	P-Value	Median	Mean	S.E.	S.D.
FLEX	61	64.1	2.7	10.3	0.1213	69	68.3	3.2	12.6
EXT	54	54.8	3.2	12.4	0.3016	52	54.5	2.1	8.1
(L)LAT FLEX	45	45.9	3.2	5.7	1	45	46.5	2.6	10.0
(R)LAT FLEX	44	43.6	1.8	6.9	0.4226	42	41.6	2.0	7.8
(R) ROT	53	57.3	3.1	12.0	0.0613	62	64.5	1.9	7.5
(L) ROT	60	58.933	2.7662	10.7	0.0613	60	63.5	2.7	10.3
POWER			Flexion		0.1515				
			Extension		0.0506				
			(R)Lat Flexion		0.1060				
			(L)Lat Flexion		0.0538				
			(R)Rotation		0.4635				
			(L)Rotation		0.2031				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.6.1.1.4 Reading Two versus Reading Three:

		GROUP A READING 2				GROUP A READING 3			
GONIO METER	Median	Mean	S.E.	S.D	P-Value	Median	Mean	S.E.	S.D.
FLEX	70	67	3.5	13.2	0.7892	70	65.7	3.4	12.9
EXT	56	53.9	3.22	12.6	1	59	54.9	2.9	11.5
(L)LAT FLEX	46	44.5	2.16	8.2	0.7728	43	43.1	2.3	8.8
(R)LAT FLEX	40	41	1.21	4.7	0.2672	42	41.5	1.9	7.7
(R) ROT	62	60.1	2.8	10.9	0.7728	60	59.8	2.5	9.6
(L) ROT	60	62.3	2.8	9.7	0.7728	61	61.3	2.9	15.7
POWER			Flexion		0.0572				
			Extension		0.055				
			(R)Lat Flexion		0.0543				
			(L)Lat Flexion		0.070				
			(R)Rotation		0.0506				
			(L)Rotation		0.0541				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.6.1.1.5 Reading Two versus Reading Four:

		GROUP A READING 2				GROUP A READING 4			
GONIO METER	Median	Mean	S.E.	S.D	P-Value	Median	Mean	S.E.	S.D.
FLEX	70	67	3.5	13.2	0.3016	69	68.3	3.2	12.6
EXT	56	53.9	3.22	12.6	0.7892	52	54.5	2.1	8.1
(L)LAT FLEX	46	44.5	2.16	8.2	0.6055	45	46.5	2.6	10.0
(R)LAT FLEX	40	41	1.21	4.7	1	42	41.6	2.0	7.8
(R) ROT	62	60.1	2.8	10.9	0.1489	62	64.5	1.9	7.5
(L) ROT	60	62.3	2.8	9.7	0.7892	60	63.5	2.7	10.3
POWER			Flexion		0.0574				
			Extension		0.0523				
			(R)Lat Flexion		0.0561				
			(L)Lat Flexion		0.0855				
			(R)Rotation		0.2251				
			(L)Rotation		0.0605				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.5.1.1.6 Reading Three versus Reading Four:

		GROUP A READING 3				GROUP A READING 4			
GONIO METER	Median	Mean	S.E.	S.D	P-Value	Median	Mean	S.E.	S.D.
FLEX	70	65.7	3.4	12.9	0.2672	69	68.3	3.2	12.6
EXT	59	54.9	2.9	11.5	0.7892	52	54.5	2.1	8.1
(L)LAT FLEX	43	43.1	2.3	8.8	0.4226	45	46.5	2.6	10.0
(R)LAT FLEX	42	41.5	1.9	7.7	1	42	41.6	2.0	7.8
(R) ROT	60	59.8	2.5	9.6	0.6055	62	64.5	1.9	7.5
(L) ROT	61	61.3	2.9	15.7	0.4226	60	63.5	2.7	10.3

POWER		
	Flexion	0.0809
	Extension	0.0512
	(R)Lat Flexion	0.0501
	(L)Lat Flexion	0.1517
	(R)Rotation	0.2916
	(L)Rotation	0.0698

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.5.1.2. Intra-Group Comparisons using Wilcoxon Signed Rank Test with regard to Subjective Data:

4.6.1.2.1 Intra-Group Comparisons using Wilcoxon Signed Rank Test with regard to the Headache Diary:

4.6.1.2.1.1 Baseline Reading versus Period One:

		GROUP A Baseline				GROUP A Period 1			
DIARY	Median	Mean	S.E.	S.D.	P-Value	Median	Mean	S.E.	S.D.
FREQ	1	1.8	0.4	1.4	1	2	1.9	0.3	1.1
INT	90	88.7	2.6	9.9	0.0960	80	68.9	7.3	28.1
DUR	24	30.1	6.1	23.7	0.789	41	49.5	12.8	49.5
POWER			Frequency		0.0546				
			Intensity		0.6791				
			Duration		0.2438				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.6.1.2.1.2 Baseline Reading versus Period Two:

		GROUP A Baseline				GROUP A Period 2			
DIARY	Median	Mean	S.E.	S.D.	P-Value	Median	Mean	S.E.	S.D.
FREQ	1	1.8	0.4	1.4	0.1489	1	1.6	0.5	1.8
INT	90	88.7	2.6	9.9	**0.0032**	53.3	42.5	9.9	38.3
DUR	24	30.1	6.1	23.7	0.3016	6	31.6	11.9	46.1
POWER			Frequency		0.0612				
			Intensity		0.9856				
			Duration		0.0511				

The p value for intensity is significant. Thus, the null hypothesis is rejected. H_1, which states there is a significant difference between the two readings, is accepted.

4.6.1.2.1.3 Baseline Reading versus Period Three:

		GROUP A Baseline				GROUP A Period 3			
DIARY	Median	Mean	S.E.	S.D.	P-Value	Median	Mean	S.E.	S.D.
FREQ	1	1.8	0.4	1.4	0.2888	1	1.3	0.3	1.0
INT	90	88.7	2.6	9.9	0.1489	70	61.6	9.4	36.5
DUR	24	30.1	6.1	23.7	1	19.5	39.5	12.8	49.4
POWER			Frequency		0.1824				
			Intensity		0.7424				
			Duration		0.0919				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.6.1.2.1.4 Period One versus Period Two:

		GROUP A Period 1				GROUP A Period 2			
DIARY	Median	Mean	S.E.	S.D.	P-Value	Median	Mean	S.E.	S.D.
FREQ	2	1.9	0.3	1.1	0.0704	1	1.6	0.5	1.8
INT	80	68.9	7.3	28.1	0.0960	53.3	42.5	9.9	38.3
DUR	41	49.5	12.8	49.5	1.8706	6	31.6	11.9	46.1
POWER			Frequency		0.0793				
			Intensity		0.5384				
			Duration		0.1598				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.6.1.2.1.5 Period One versus Period Three:

		GROUP A Period 1				GROUP A Period 3			
DIARY	Median	Mean	S.E.	S.D.	P-Value	Median	Mean	S.E.	S.D.
FREQ	2	1.9	0.3	1.1	0.1489	1	1.3	0.3	1.0
INT	80	68.9	7.3	28.1	0.7892	70	61.6	9.4	36.5
DUR	41	49.5	12.8	49.5	0.8017	19.5	39.5	12.8	49.4
POWER			Frequency		0.3162				
			Intensity		0.0874				
			Duration		0.0804				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.6.1.2.1.6 Period Two versus Period Three:

		GROUP A Period 2				GROUP A Period 3			
DIARY	Median	Mean	S.E.	S.D.	P-Value	Median	Mean	S.E.	S.D.
FREQ	1	1.6	0.5	1.8	0.7518	1	1.3	0.3	1.0
INT	53.3	42.5	9.9	38.3	0.3864	70	61.6	9.4	36.5
DUR	6	31.6	11.9	46.1	0.2672	19.5	39.5	12.8	49.4
POWER			Frequency		0.083				
			Intensity		0.2613				
			Duration		0.0702				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.6.1.2.2 Intra-Group Comparisons using Wilcoxon Signed Rank Test with regard to CMCC and McGill Short Form Questionnaire:

4.6.1.2.2.1 Reading One versus Reading Two:

	GROUP A READING 1					GROUP A READING 2			
	Median	Mean	S.E.	S.D.	P-Value	Median	Mean	S.E.	S.D.
CMCC	10	12.5	2.7	8.4	0.7892	12	20.6	40.4	13.1
MCGIL	40	49.9	6.0	23.4	**0.0161**	24.4	27.3	6.3	24.2
POWER			CMCC		0.4813				
			McGill		0.7073				

The McGill short form readings between readings one and two are significant. Thus, the null hypothesis is rejected in this case. H_1, which states there is a significant difference between the two values, is accepted.

4.6.1.2.2.2 Reading One versus Reading Three:

	GROUP A READING 1					GROUP A READING 3			
	Median	Mean	S.E.	S.D.	P-Value	Median	Mean	S.E.	S.D.
CMCC	10	12.5	2.7	8.4	0.0301	8.8	11.7	3.1	12.1
MCGIL	40	49.9	6.0	23.4	**0.0163**	8.8	21.9	6.9	26.7
POWER			CMCC		0.0542				
			McGill		0.8385				

The p value for the McGill short form is significant. Thus, the null hypothesis is rejected. H_1, which states there is a significant difference between the two readings, is accepted.

4.6.1.2.2.3 Reading One versus Reading Four:

	GROUP A READING 1					GROUP A READING 4			
	Median	Mean	S.E.	S.D.	P-Value	Median	Mean	S.E.	S.D.
CMCC	10	12.5	2.7	8.4	0.5464	8	10.8	3.4	13.2
MCGIL	40	49.9	6.0	23.4	**0.0032**	26.6	34.0	7.5	29.0
POWER			CMCC		0.0669				
			McGill		0.3469				

The p value for the McGill short was significant. Thus, the null hypothesis is rejected. H_1, which states there is a significant difference between the two values, is accepted.

4.6.1.2.2.4 Reading Two versus Reading Three:

	GROUP A READING 2					GROUP A READING 3			
	Median	Mean	S.E.	S.D.	P-Value	Median	Mean	S.E.	S.D.
CMCC	12	20.6	40.4	13.1	0.7728	8.8	11.7	3.1	12.1
MCGIL	24.4	27.3	6.3	24.2	0.7892	8.8	21.9	6.9	26.7
POWER			CMCC		0.4547				
			McGill		0.0835				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.6.1.2.2.5 Reading Two versus Reading Four:

	GROUP A READING 2					GROUP A READING 4			
	Median	Mean	S.E.	S.D.	P-Value	Median	Mean	S.E.	S.D.
CMCC	12	20.6	40.4	13.1	1	8	10.8	3.4	13.2
MCGIL	24.4	27.3	6.3	24.2	1	26.6	34.0	7.5	29.0
POWER			CMCC		0.4972				
			McGill		0.0975				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.6.1.2.2.6 Reading Three versus Reading Four:

	GROUP A READING 3					GROUP A READING 4			
	Median	Mean	S.E.	S.D.	P-Value	Median	Mean	S.E.	S.D.
CMCC	8.8	11.7	3.1	12.1	0.2672	8	10.8	3.4	13.2
MCGIL	8.8	21.9	6.9	26.7	0.7892	26.6	34.0	7.5	29.0
POWER			CMCC		0.0537				
			McGill		0.2002				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.6.2 Intra-Group Comparisons of Group B using Wilcoxon Signed Rank Test

4.6.2.1 Intra-Group Comparisons using Wilcoxon Signed Rank Test with regard to Objective Data:

4.6.2.1.1 Reading One versus Reading Two:

		GROUP B READING 1				GROUP B READING 2			
GONIO METER	Median	Mean	S.E.	S.D	P-Value	Median	Mean	S.E.	S.D.
FLEX	70	71	3.5	13.5	0.1814	66	69	2.6	10.1
EXT	60	60.5	3.7	14.4	0.7892	61	59.9	3.2	11.5
(L)LAT FLEX	48	46.5	3.1	11.9	0.7892	40	44.4	3.8	14.7
(R)LAT FLEX	41	44.5	3.1	12.1	0.4226	40	40.6	3.4	13.2
(R) ROT	60	58.3	3.3	12.9	1	61	61.4	2.9	11.4
(L) ROT	61	60.9	4.9	19.1	0.06055	61	58.1	2.9	11.4
POWER			Flexion		0.0705				
			Extension		0.0515				
			(R)Lat Flexion		0.68				
			(L)Lat Flexion		0.1228				
			(R)Rotation		0.099				
			(L)Rotation		0.0731				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.6.2.1.2 Reading One versus Reading Three:

		GROUP B READING 1				GROUP B READING 3			
GONIO METER	Median	Mean	S.E.	S.D	P-Value	Median	Mean	S.E.	S.D.
FLEX	70	71	3.5	13.5	0.7892	75	71.1	2.8	10.6
EXT	60	60.5	3.7	14.4	0.4226	56	57.7	3.9	15.4
(L)LAT FLEX	48	46.5	3.1	11.9	0.3016	50	48.3	2.7	10.6
(R)LAT FLEX	41	44.5	3.1	12.1	1	40	44.9	3.3	12.4
(R) ROT	60	58.3	3.3	12.9	0.5791	62	60.3	3.5	13.6
(L) ROT	61	60.9	4.9	19.1	1	59	58.7	4.1	10.3
POWER			Flexion		0.05				
			Extension		0.0761				
			(R)Lat Flexion		0.0508				
			(L)Lat Flexion		0.0688				
			(R)Rotation		0.0667				
			(L)Rotation		0.0517				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.6.2.1.3 Reading One versus Reading Four:

		GROUP B READING 1				GROUP B READING 4			
GONIO METER	Median	Mean	S.E.	S.D	P-Value	Median	Mean	S.E.	S.D.
FLEX	70	71	3.5	13.5	0.4226	65	69.3	2.6	9.9
EXT	60	60.5	3.7	14.4	0.5791	64	61.7	3.4	13.3
(L)LAT FLEX	48	46.5	3.1	11.9	1	50	47.2	2.3	9.0
(R)LAT FLEX	41	44.5	3.1	12.1	0.5791	43	44.8	2.7	10.3
(R) ROT	60	58.3	3.3	12.9	0.1213	63	64.9	3.3	12.9
(L) ROT	61	60.9	4.9	19.1	0.5791	60	61.3	2.9	11.2
POWER			Flexion		0.0649				
			Extension		0.0554				
			(R)Lat Flexion		0.0505				
			(L)Lat Flexion		0.0532				
			(R)Rotation		0.2623				
			(L)Rotation		0.0504				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.6.2.1.4 Reading Two versus Reading Three:

		GROUP B READING 2				GROUP B READING 3			
GONIO METER	Median	Mean	S.E.	S.D	P-Value	Median	Mean	S.E.	S.D.
FLEX	66	69	2.6	10.1	1	75	71.1	2.8	10.6
EXT	61	59.9	3.2	11.5	0.6055	56	57.7	3.9	15.4
(L)LAT FLEX	40	44.4	3.8	14.7	0.1213	50	48.3	2.7	10.6
(R)LAT FLEX	40	40.6	3.4	13.2	0.7892	40	44.9	3.3	12.4
(R) ROT	61	61.4	2.9	11.4	0.7892	62	60.3	3.5	13.6
(L) ROT	61	58.1	2.9	11.4	0.7892	59	58.7	4.1	10.3
POWER			Flexion		0.0806				
			Extension		0.069				
			(R)Lat Flexion		0.1202				
			(L)Lat Flexion		0.1373				
			(R)Rotation		0.0556				
			(L)Rotation		0.0522				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.6.2.1.5 Reading Two versus Reading Four:

		GROUP B READING 2				GROUP B READING 4			
GONIO METER	Median	Mean	S.E.	S.D	P-Value	Median	Mean	S.E.	S.D.
FLEX	66	69	2.6	10.1	0.3016	65	69.3	2.6	9.9
EXT	61	59.9	3.2	11.5	0.2886	64	61.7	3.4	13.3
(L)LAT FLEX	40	44.4	3.8	14.7	0.6055	50	47.2	2.3	9.0
(R)LAT FLEX	40	40.6	3.4	13.2	0.3016	43	44.8	2.7	10.3
(R) ROT	61	61.4	2.9	11.4	0.2672	63	64.9	3.3	12.9
(L) ROT	61	58.1	2.9	11.4	0.1814	60	61.3	2.9	11.2
POWER			Flexion		0.0507				
			Extension		0.0654				
			(R)Lat Flexion		0.1475				
			(L)Lat Flexion		0.0855				
			(R)Rotation		0.1131				
			(L)Rotation		0.1111				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.6.2.1.6. Reading Three versus Reading Four:

		GROUP B READING 3				GROUP B READING 4			
GONIO METER	Median	Mean	S.E.	S.D	P-Value	Median	Mean	S.E.	S.D.
FLEX	75	71.1	2.8	10.6	0.4226	65	69.3	2.6	9.9
EXT	56	57.7	3.9	15.4	0.6055	64	61.7	3.4	13.3
(L)LAT FLEX	50	48.3	2.7	10.6	0.5163	50	47.2	2.3	9.0
(R)LAT FLEX	40	44.9	3.3	12.4	0.4226	43	44.8	2.7	10.3
(R) ROT	62	60.3	3.5	13.6	0.5791	63	64.9	3.3	12.9
(L) ROT	59	58.7	4.1	10.3	0.6055	60	61.3	2.9	11.2
POWER			Flexion		0.0728				
			Extension		0.1088				
			(R)Lat Flexion		0.0501				
			(L)Lat Flexion		0.0591				
			(R)Rotation		0.1436				
			(L)Rotation		0.0939				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.6.2.2. Intra-Group Comparisons using Wilcoxon Signed Rank Test with regard to Subjective Data:

4.6.2.2.1 Intra-Group Comparisons using Wilcoxon Signed Rank Test with regard to the Headache Diary:

4.6.2.2.1.1 Baseline Reading versus Period One:

		GROUP B Baseline				GROUP B Period One			
DIARY	Median	Mean	S.E.	S.D.	P-Value	Median	Mean	S.E.	S.D.
FREQ	2	1.9	0.3	1.0	0.5049	2	1.5	0.3	1.1
INT	90	90.7	2.7	10.3	**0.0008**	65	57.8	8.7	33.8
DUR	36	37.5	5.9	23.1	0.6055	34	47.2	11.9	46.4
POWER			Frequency		0.1637				
			Intensity		0.9236				
			Duration		0.1002				

The intensity p value is significant. Thus, for the aforementioned value, the null hypothesis is rejected. H_1, which states there is a significant difference between the two readings, is accepted.

4.6.2.2.1.2 Baseline Reading versus Period Two:

		GROUP B Baseline				GROUP B Period 2			
DIARY	Median	Mean	S.E.	S.D.	P-Value	Median	Mean	S.E.	S.D.
FREQ	2	1.9	0.3	1.0	**0.0014**	1	0.8	0.2	0.8
INT	90	90.7	2.7	10.3	**0.0055**	50	45.2	10.6	31.2
DUR	36	37.5	5.9	23.1	0.0613	7.	26.5	11.2	46.4
POWER			Frequency		0.8934				
			Intensity		0.9978				
			Duration		0.1154				

The frequency and intensity p values are significant. Thus, for the aforementioned values, the null hypothesis is rejected. H_1, which states there is a significant difference between the readings, is accepted.

4.6.2.2.1.3 Baseline versus Period Three:

		GROUP B Baseline				GROUP B Period 3			
DIARY	Median	Mean	S.E.	S.D.	P-Value	Median	Mean	S.E.	S.D.
FREQ	2	1.9	0.3	1.0	**0.0158**	1	0.8	0.2225	0.9
INT	90	90.7	2.7	10.3	**0.0005**	50	37.6666	9.8181	38.0
DUR	36	37.5	5.9	23.1	0.1213	6	14.2	5.3293	20.6
POWER			Frequency		0.8635				
			Intensity		0.9968				
			Duration		0.8034				

The frequency and intensity p values are significant. Thus, for the aforementioned values, the null hypothesis is rejected. H_1, which states there is a significant difference between the readings, is accepted.

4.6.2.2.1.4 Period One versus Period Two:

		GROUP B Period 1				GROUP B Period 2			
DIARY	Median	Mean	S.E.	S.D.	P-Value	Median	Mean	S.E.	S.D.
FREQ	2	1.5	0.3	1.1	0.0268	1	0.8	0.2	0.8
INT	65	57.8	8.7	33.8	1	50	45.2	10.6	31.2
DUR	34	47.2	11.9	46.4	0.1213	7.	26.5	11.2	46.4
POWER			Frequency		0.4756				
			Intensity		0.1681				
			Duration		0.2091				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.6.2.2.1.5 Period One versus Period Three:

		GROUP B Period 1				GROUP B Period 3			
DIARY	Median	Mean	S.E.	S.D.	P-Value	Median	Mean	S.E.	S.D.
FREQ	2	1.5	0.3	1.1	0.1138	1	0.8	0.2225	0.9
INT	65	57.8	8.7	33.8	0.1814	50	37.6666	9.8181	38.0
DUR	34	47.2	11.9	46.4	**0.0161**	6	14.2	5.3293	20.6
POWER			Frequency		0.4434				
			Intensity		0.3059				
			Duration		0.6648				

The p value is significant for the duration of migraines. Thus, the null hypothesis is rejected. H_1, which states there is a significant difference between the two values, is accepted.

4.6.2.2.1.6 Period Two versus Period Three:

	GROUP B Period 2					GROUP B Period 3			
DIARY	Median	Mean	S.E.	S.D.	P-Value	Median	Mean	S.E.	S.D.
FREQ	1	0.8	0.2	0.8	0.7236	1	0.8	0.2	0.9
INT	50	45.2	10.6	31.2	1	50	37.7	9.8	38.0
DUR	7.	26.5	11.2	46.4	0.3427	6	14.2	5.3	20.6
POWER			Frequency		0.05				
			Intensity		0.0845				
			Duration		0.1357				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.6.2.2.2 Intra-Group Comparisons using Wilcoxon Signed Rank Test with regard to the CMCC and McGill Short Form Questionnaires:

4.6.2.2.2.1 Reading One versus Reading Two:

	GROUP B READING 1					GROUP B READING 2			
	Median	Mean	S.E.	S.D.	P-Value	Median	Mean	S.E.	S.D.
CMCC	12	20.6	4.4	16.9	**0.0008**	8	9.3	1.8	7.2
MCGIL	44.4	46.5	4.2	16.0	**0.016**	13.3	21.4	22.5	22.5
POWER			CMCC		0.6123				
			McGill		0.9226				

The C.M.C.C. and McGill short form p values are significant. Thus, for the aforementioned values, the null hypothesis is rejected. H_1, which states there is a significant difference between the readings, is accepted.

4.6.2.2.2.2 Reading One versus Reading Three:

	GROUP B READING 1					GROUP B READING 3			
	Median	Mean	S.E.	S.D.	P-Value	Median	Mean	S.E.	S.D.
CMCC	12	20.6	4.4	16.9	**0.0019**	8.8	14.9	4.5	17.6
MCGIL	44.4	46.5	4.2	16.0	**0.0161**	20	24.4	5.9	23.1
POWER			CMCC		0.1344				
			McGill		0.8333				

The C.M.C.C. and McGill short form p values are significant. Thus, for the aforementioned values, the null hypothesis is rejected. H_1, which states there is a significant difference between the readings, is accepted.

4.6.2.2.2.3 Reading One versus Reading Four:

	GROUP B READING 1					GROUP B READING 4			
	Median	Mean	S.E.	S.D.	P-Value	Median	Mean	S.E.	S.D.
CMCC	12	20.6	4.4	16.9	**0.0098**	8	11.3733	4.0797	15.8
MCGIL	44.4	46.5	4.2	16.0	0.1814	17.7	27.96	7.3942	28.6
POWER			CMCC		0.3098				
			McGill		0.5463				

The C.M.C.C. p value is significant. Thus, for the aforementioned value, the null hypothesis is rejected. H_1, which states there is a significant difference between the readings, is accepted.

4.6.2.2.2.4 Reading Two versus Reading Three:

	GROUP B READING 2					GROUP B READING 3			
	Median	Mean	S.E.	S.D.	P-Value	Median	Mean	S.E.	S.D.
CMCC	8	9.3	1.8	7.2	0.7728	8.8	14.9	4.5	17.6
MCGIL	13.3	21.4	22.5	22.5	0.2886	20	24.4	5.9	23.1
POWER			CMCC		0.1786				
			McGill		0.0627				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.6.2.2.2.5 Reading Two versus Reading Four:

	GROUP B READING 2					GROUP B READING 4			
	Median	Mean	S.E.	S.D.	P-Value	Median	Mean	S.E.	S.D.
CMCC	8	9.3	1.8	7.2	0.7728	8	11.3733	4.0797	15.8
MCGIL	13.3	21.4	22.5	22.5	0.5791	17.7	27.96	7.3942	28.6
POWER			CMCC		0.0696				
			McGill		0.0988				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

4.6.2.2.2.6 Reading Three versus Reading Four:

		GROUP B READING 3				GROUP B READING 4			
DIARY	Median	Mean	S.E.	S.D.	P-Value	Median	Mean	S.E.	S.D.
CMCC	8.8	14.9	4.5	17.6	1	8	11.4	4.1	15.8
MCGIL	20	24.4	5.9	23.1	0.5791	17.7	27.9	7.4	28.6
POWER			CMCC		0.0826				
			McGill		0.0632				

There are no significant values ($p>\alpha/2$) for the above comparisons. Thus, the null hypothesis is accepted.

Chapter 5

5.1 Introduction

This chapter involves the discussion of the statistical results obtained from the objective readings and the subjective readings.

This author first discusses the objective and subjective intra-group results to assess the effect of each treatment group in treating migraine headaches.

Secondly the objective and subjective inter-group results are discussed to assess whether there is statistically significant difference in the two treatment protocols.

5.2 Intra-Group Treatment Comparison

5.2.1 Objective Data

The objective data comprised of the goniometer readings, which were divided into flexion, extension, left lateral flexion, right lateral flexion, left rotation and right rotation.
The results for both treatment groups were not statistically significant for all six combinations of intra-group comparisons.

For above category, when one looks at the relevant powers of intra-group comparisons, one can see that the powers of the tests are overall very weak. This shows that the chance of missing possible

statistical significant results is high (i.e. a high probability of type 2 errors occurring).

5.2.2 Subjective Data

The subjective data comprises McGill Short Form Questionnaire results, the CMCC Questionnaire results and the headache diary results. The headache diary consists of frequency, intensity and duration categories.

5.2.2.1 McGill short form and C.M.C.C. questionnaires

CMCC Questionnaire:

The CMCC Questionnaire for Group A was not statistically significant for any of the intra-group comparisons.

The CMCC questionnaire for Group B showed statistically significant improvements (with median values indicating an improvement) with regard to 1 versus 2, 1 versus 3 and 1 versus 4 readings. This is in strong contrast to the intra-group findings of Group A.

When we look at the relevant power of the CMCC Questionnaire non-statistically significant intra-group comparisons for Groups A and B, we can see that the powers of the tests are overall very weak. This shows that the chance of missing possible statistical significant results is high (i.e. high probability of type 2 error occurring).

McGill Short Form Questionnaire:

The McGill Short Form Questionnaire was statistically significant (with median values indicating an improvement) for Group A for readings 1

versus 2, 1 versus 3 and 1 versus 4. This indicates that the patients certainly experienced an improvement in their quality of pain during the aforementioned intervals.

The McGill Short Form questionnaire for group B showed statistically significant results (with median values indicating an improvement) with regard to the readings 1 versus 2; and 1 versus 3 readings. In other words a statistically significant improvement in the quality of pain up until the final treatment but thereafter no statistically significant improvement.

For above category (i.e. McGill Short Form Questionnaire), when one looks at the relevant powers of the non-statistically significant intra-group comparisons for Groups A and B, one can see that the powers of the tests are overall very weak. This shows that the chance of missing possible statistically significant results is high (i.e. a high probability of type 2 errors occurring).

The statistically significant improvements for Group A are demonstrated in Figure One, which represents the medium values of the McGill Short Form Questionnaire and CMCC Questionnaire at the first, final and follow up consultations.

The statistically significant improvements for Group B are demonstrated in Figure Two, which represents the median values of the McGill Short Form Questionnaire and CMCC Questionnaire at the first, final and follow up consultations.

5.2.2.2 Headache diary

Group A:

For Group A, there were no statistically significant changes for the frequency and duration of the migraines. However between baseline and period 2 of the headache diary there was a statistically significant change with median values indicating a decrease in the intensity of the migraines. This is represented in Figure Three using the median as a measurement.

Although not statistically significant, there do seem to be some trends showing improvement in the median values for some of the comparisons of the categories:

Headache frequency median values show a decline between period 1 versus period 2; and period 1 versus period 3.

Headache intensity median values show a decline between baseline versus period 1, baseline versus period 3, period 1 versus period 2 and period 1 versus period 3.

Headache duration median values show a decline between baseline versus period 2, baseline versus period 3, period 1 versus period 2, period 1 versus period 3.

For all the above categories, when one looks at the relevant powers of the above mentioned intra-group comparisons, one can see that the powers of the tests are overall weak. This shows that the chance of missing possible statistically significant results is high (i.e. a high probability of type 2 errors occurring).

Group B:

For Group B there were statistically significant changes in the frequency, intensity and duration categories.

For frequency there were statistically significant changes (with median values indicating an improvement) for the baseline versus period 2, and baseline versus period 3 readings. This is an important indication as to the success of this group as frequency is ultimately the best indicator for success of the therapy. This is demonstrated in Figure Four.

With regard to other comparisons with headache frequency, there was an improvement (i.e. decrease) in the median values for period 1 versus period 2 and period 1 versus period 3, which could indicate a trend. This is reinforced by respective low powers indicating the high probability of a Type 2 error.

For headache intensity there were statistically significant changes (with median values indicating an improvement) between baseline versus period 1, baseline versus period 2 and baseline versus period 3 readings. These are represented in figure Five.

With regards to the other comparisons for headache intensity (except for period 2 versus period 3), the median values indicated a trend towards improvement, reinforced by low powers indicating the high probability of Type 2 errors.

For headache duration there was a statistically significant change, with median values indicating an improvement between period 1 versus period 3. This is represented in Figure Six.
Non-statistically significant comparisons for headache duration indicate an improvement in median values. With the exception of baseline versus period 3, all the other non-statistically significant comparisons for the headache duration have low powers. With regard to these ones, this shows that the chance of missing possible statistically significant results is high (i.e. a high probability of type 2 errors occurring).

5.3 Inter-Group Treatment Comparison

5.3.1 Objective Data

There were no statistically significant differences with regards to cervical range of motion changes between the two groups.
It is important to realise that none of the patients presented with decreased range of motion due to any diagnosable cervical facet dysfunction or cervical muscle spasm. The initial range of motion the patients presented with can be considered "normal" for their respective ages (Magee 1992: 27). Considering that there were no clinically recognisable patho-mechanics related to their cervical spines, it can be understood why there were no statistically significant differences both in the inter-group comparison and intra-group comparisons.

5.3.2 Subjective Data

There were no statistically significant differences with regards to the subjective measurements between the two groups. This applies to the

McGill Short Form Questionnaire, CMCC Questionnaire and the headache diary. Thus, overall, neither group performed statistically significantly better than the other.

When one looks at the relevant powers of the inter-group comparisons (subjective and objective findings), one can see that the powers of the tests are overall very weak. This shows that the chance of missing possible statistically significant results is high (i.e. a high probability of type 2 errors occurring).

5.4 Discussion

The first objective of the study was to look at performance of group A and group B in terms of subjective findings. Both group A and group B statistically significantly improved in the categories of subjective measurements. Group A only improved statistically significantly in the intensity and McGill Short Form categories for some of the comparisons. Group B improved statistically significantly in all the subjective categories for some of the comparisons.
In the light of these findings it is possible that there may have been a greater cervicogenic component to Group B's migraines than to that of Group A's. This is reinforced by the fact that only Group B showed any statistically significant improvement for the CMCC Questionnaire. The subjects in this group would have most likely fitted into Vernon's (1995: 316) first two categories of migraine sufferers that he proposes.

In terms of the second objective, which was to look at the performance of Group A and Group B in terms of objective findings, the results showed no statistically significant improvements or decline for any of the categories.

The third objective was to determine if there was a statistically significant difference when comparing the groups. The results showed no statistically significant differences in either objective or subjective findings.

However, by observing the results of the power analysis, it can be inferred that there is a high probability of false negatives (i.e. type 2 errors) occurring. Many of the non-statistically significant intra-group comparisons, particularly the headache diary for both Group A and Group B reflected an improvement. Furthermore, statistically significant differences may have existed between the groups that weren't detected in this small study. Although no real deductions can be made here, what can be inferred is that given a greater sample size, more statistically significant improvements within and between each group could have been detected.

5.5 Limitations of this study

5.5.1 Objective Measurements

With regard to objective measurements using the CROM, areas of potential error are examiner error and instrument error. Instrument error could occur due to the fact that degrees are incremented in twos allowing for inaccuracy of measurements.

5.5.2 Subjective Measurements

With regard to the McGill Short Form Questionnaire and the CMCC which were filled in at the consultations, the unconscious desire to please the examiner by recording lower scores to indicate an improvement, could have been present.

With regard to the headache diary there may have been the problem of not listing their headaches accurately or compliantly in the headache diaries.

5.5.3 Statistical Limitations

The sample of thirty is too small to do more powerful parametric statistical analyses.
Furthermore due to the small size of the sample, there is a predilection for a Type 2 error (Freiman et al. 1992: 358).

In this study homogeneity was a problem. This author randomly allocated the patients into either treatment group in order to safeguard against selection bias. However ideally matched pairs should be used where the subject is matched with someone of the same or similar age, sex, race and history (Fitz-Gibbon and Morris 1987: 109). In this study's clinical setting and time restraint, it was not possible to achieve this.
Looking at the demographic data in 4.2 it can be seen that the make up of the two groups were not similar with respect to age and sex. It is strongly possible that the heterogeneity of the two groups could have affected the outcome.

5.5.4 Acupuncture

In acupuncture treatment there is no standardised treatment for migraines for example Vincent (1989) gives a different acupuncture formula to Baldry (1989: 98) who gives a different acupuncture formula to Chaitow (1982: 109).

Ernst and White (1997) list a number of problems with respect to this.

- Firstly there is a diverse range of methods of diagnosis and treatment.

- Secondly, there is a lot of variation in needling technique and stimulation.

- Thirdly, there are no standard treating schedules, with each practitioner working according to his/her experience.

- Fourthly, many practitioners individualise their treatment in response to their own subjective feelings.

Ernst and White (1997) conclude," Thus, there is virtually an infinite array of possibilities, so that acupuncture used in different studies is unlikely to be identical."

Another problem in the administering of acupuncture treatment is the accurate localisation of points. Although this author tried to be as accurate as possible, one is not dealing with a perfect system as every person's anatomical landmarks vary. Further investigation needs to be done in the more accurate localisation of acupuncture points and whether discrepancies make such a difference.

5.5.5 Study Design

An important part of measuring of variables in this study was getting the base line measurement. This is particularly important with regard to the headache diary. The base line measurement for this study was taken at the first consultation. Patients gave an estimation of the headaches they had had in the previous month in terms of frequency,

intensity and duration. A far more accurate approach would have been to first assess them for a month in terms of their headache diary before treating them (Vernon 1995).

A further limitation in the study design is the treating of two migraine types (i.e. migraine with aura and migraine without aura). It would have been more scientifically accurate to treat only one migraine type (for example migraine without aura).

Figure 1.

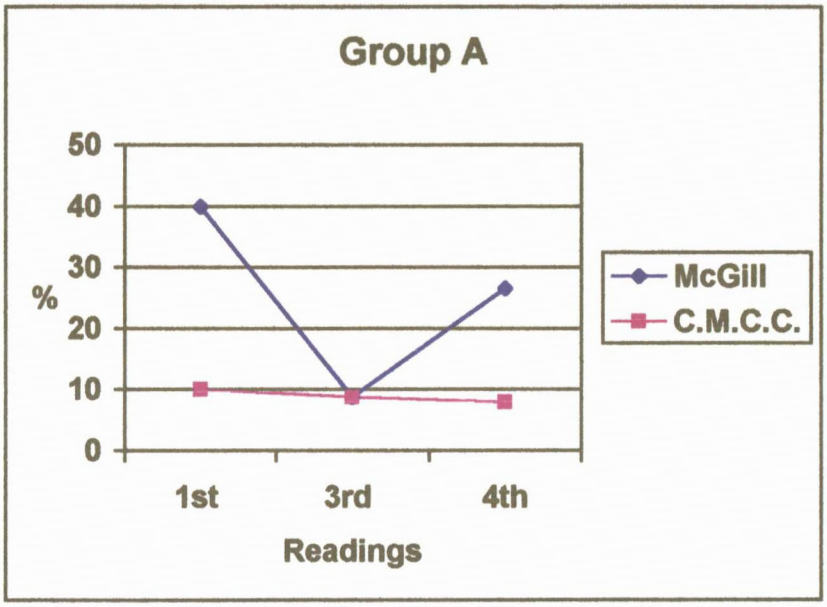


Figure 2.

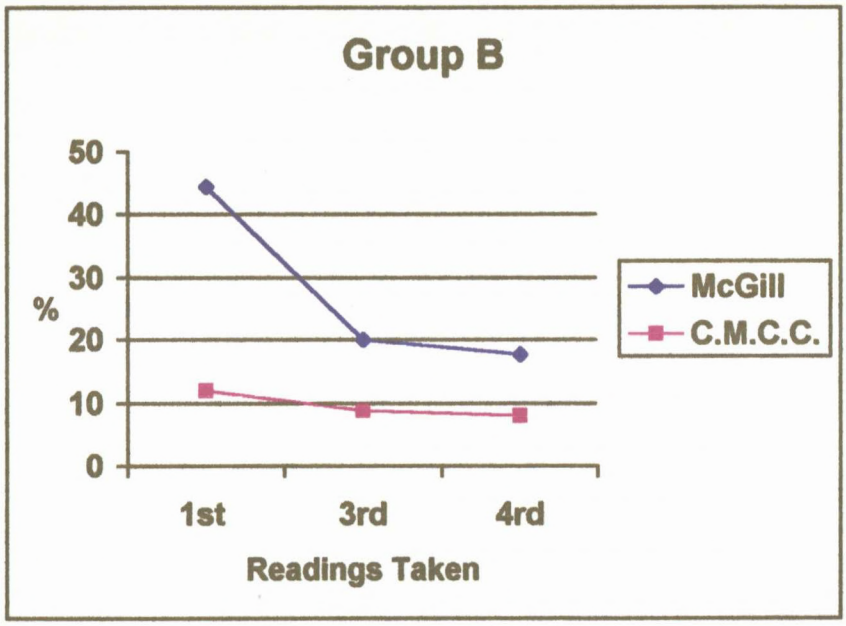


Figure 3.

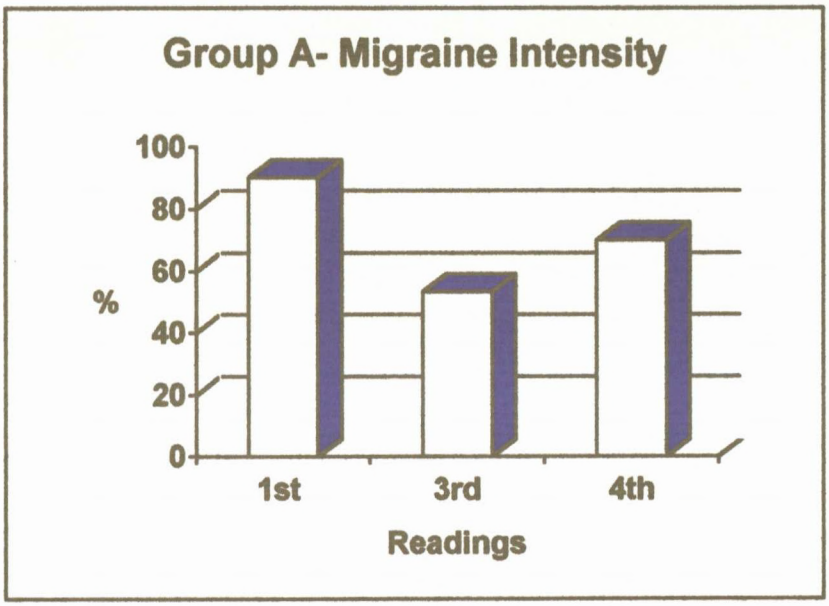

Group A- Migraine Intensity
100
80
60
40
20
0
%
1st
3rd
4th
Readings

Figure 4.

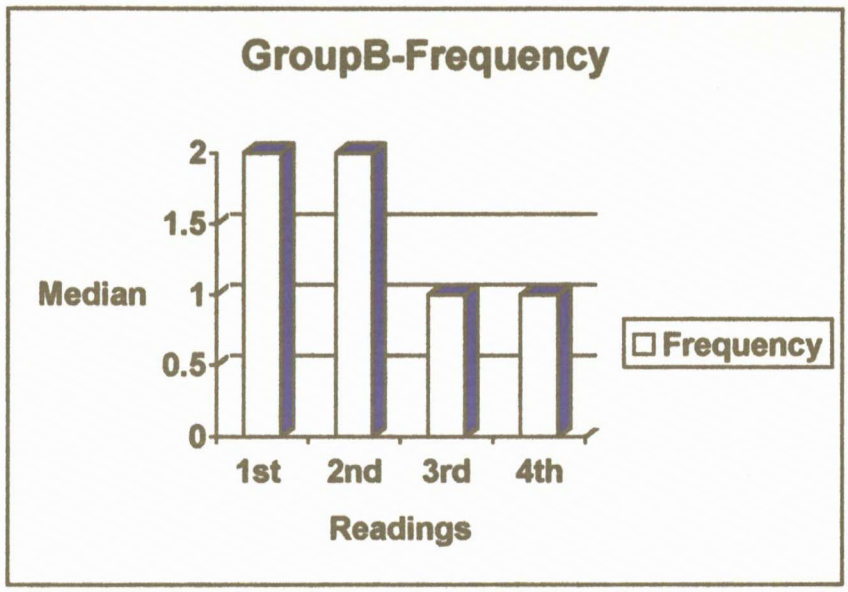

GroupB-Frequency
Median
2
1.5
1
0.5
0
1st
2nd
3rd
4th
Readings
Frequency

Figure 5.

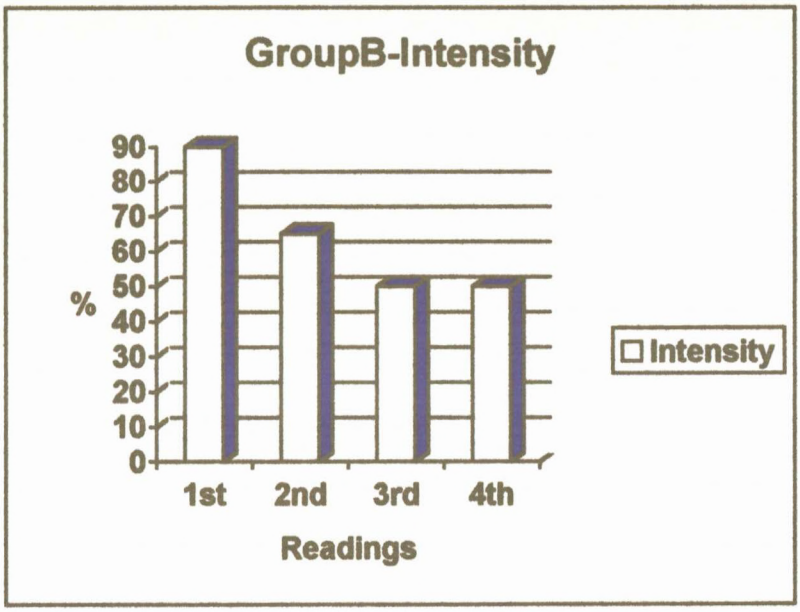
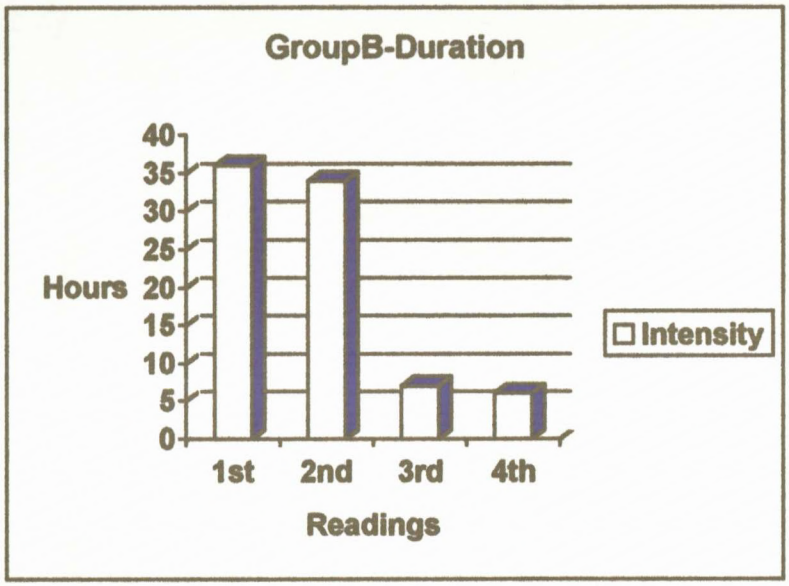

GroupB-Intensity
90
80
70
60
50
40
30
20
10
0
%
1st
2nd
3rd
4th
Readings
Intensity

Figure 6.


GroupB-Duration
40
35
30
25
Hours 20
15
10
5
0
1st
2nd
3rd
4th
Readings
Intensity

CHAPTER 6

6.1 Conclusion

The results indicate statistically significant improvements in both groups with regard to various categories of intra-group subjective measurements. However the adjustment group showed a statistically significant improvement for all the categories, whilst the adjustment with acupuncture group showed a statistically significant improvement for only the McGill Short Form Questionnaire and migraine intensity. Compared to each other, there were no statistically significant differences between the groups indicating that one treatment was not better than the other in alleviating migraine.

In conclusion, in comparing the two different types of treatment, acupuncture with vertebral adjustment versus vertebral adjustment alone, neither was more successful than the other. However due to the small sample size and low powers of many of the statistical comparisons, lending to a high probability of type 2 errors, it is possible that statistically significant differences existed that were not detected by the statistical analysis.

6.2 Recommendations

More controlled studies are needed to accurately assess the effects of manipulation on migraine headaches. Research that has been done in the past is weak and needs further validation (Coulter et al. 1996).

A larger sample size is recommended allowing for parametric statistical analysis to be performed. This would make a trend in the results more apparent and sensitive to subtle changes in data. This study with a sample size of 30 and treatment groups of 15 only can be considered as a pilot study. It therefore cannot carry the weight that a larger sample size would support.

An important recommendation is the institution of a recorded pre-treatment period. The importance of this is to be able to document as an accurate migraine baseline. This can then serve as an accurate base from which to chart the progression of the migraines during and after treatment.

It is recommended that a drug diary be used to reinforce the findings of the headache diary. This diary would include the drugs taken, which could be evaluated according to a sliding scale in terms of potency and also the amount. A drug diary could furthermore be a good objective measurement of the success or failure of the treatment.

With regard to acupuncture, other combinations of points could be used. It is possible that the points used in this study were not the most appropriate, and that more appropriate ones exist. Furthermore it is possible that different combinations of acupuncture points could be used for the different types of migraine (i.e. migraine with aura and migraine without aura).

Investigation into more accurate localisation of acupuncture points is recommended. Furthermore, these would have to be subjected to reliability studies.

Lastly, it is recommended that future studies involve only one kind of migraine type, for the sake of scientific accuracy and simplicity.

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Addendum A

TECHNIKON NATAL CHIROPRACTIC DAY CLINIC

CASE HISTORY

Patient: _____ Date # _____

Filo #: _____

X-ray #: _____

Age: _____ Sex: _____ Occupation: _____

Intern: _____ Signature: _____

FOR CLINICIAN'S USE ONLY

Initial visit clinician: Signature:

Case History:

Examination:

Previous: TN Current: TN
Other Other

X-ray Studies:

Previous: TN Current: TN
Other Other

Clinical path. lab.:

Previous: TN Current: TN
Other Other

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 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. Family history:
   - Immediate family:
     - Age
     - Health
     - Cause of death
     - DM
     - Heart disease
     - TB
     - HBP
     - Stroke
     - Kidney disease
     - CA
     - Arthritis
     - Anaemia
     - Headaches
     - Thyroid disease
     - Epilepsy
     - Mental illness
     - Alcoholism
     - Drug addiction
     - Other

8. Psychosocial history:

Home situation

Daily life

Important experiences

Religious beliefs

9. Review of systems:

General

Skin

Head

Eyes

Ears

Nose/sinuses

Mouth/throat

Neck

Breasts

Respiratory

Cardiac

Gastro-intestinal

Urinary

Genital

Vascular

Musculoskeletal

Neurologic

Haematologic

Endocrine

Psychiatric.

TECHNIKON NATAL

TECHNIKON NATAL CHIROPRACTIC DAY CLINIC

PHYSICAL EXAMINATION

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

1. VITALS

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

2. GENERAL EXAMINATION

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

Urinalysis:

3. CARDIOVASCULAR EXAMINATION

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

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

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

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

Percussion: - borders of heart

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

4. RESPIRATORY EXAMINATION

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

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

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

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

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

5. ABDOMINAL EXAMINATION

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

Inspection
- Shape:
- Scars:
- Hernias:

Palpation
- Superficial:
- Deep = Organomegally:

- Masses (intra- or extramural)
- Aorta:

Percussion - Rebound tenderness:
- Ascites:
- Masses:

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

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

6. G.U.T EXAMINATION

External genitalia:
Hernias:
Masses:
Discharges:

7. NEUROLOGICAL EXAMINATION

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

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

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

Evidence of head trauma:

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

Cranial Nerves:

I Any loss of smell/taste:
Nose examination:

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

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

III Ocular Muscles:
Eye opening strength:

IV Inferior and Medial movement of eye:

V
a. Sensory - Ophthalmic:
- Maxillary:
- Mandibular:
b. Motor - Masseter:
- Jaw lateral movement:
c. Reflexes - Corneal reflex
- Jaw jerk

VI Lateral movement of eyes

VII
a. Motor - Raise eyebrows:
- Frown:
- Close eyes against resistance:
- Show teeth:
- Blow out cheeks:
b. Taste - Anterior two-thirds of tongue:

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

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

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

XII Inspection of tongue (deviation):

Motor System:

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

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

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

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

Sensory System:

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

b. Joint position sense
- Finger:
- Toe:

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

Cerebellar function:

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

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

8. SPINAL EXAMINATION:(See Regional examination)

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

9. BREAST EXAMINATION:

Summon female chaperon.

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

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

Addendum C

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

Patient: _____ File: _____

Date: _____ Intern/Resident: _____

Clinician: _____ Sign: _____

OBSERVATION:

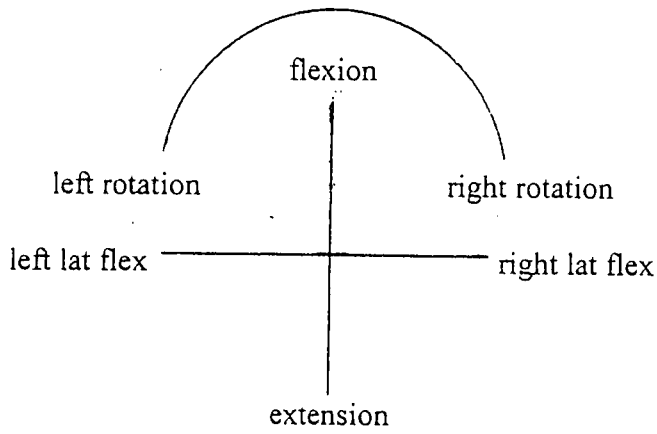
Posture
Swellings
Scars
Discolouration
Hair Line
Bony & Soft Tissue Contours

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:

Addendum D

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.

Vernon and Mior 1991

Addendum E

MEASUREMENT OF PAIN

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) _____
TIRING-EXHAUSTING	0) _____	1) _____	2) _____	3) _____
SICKENING	0) _____	1) _____	2) _____	3) _____
FEARFUL	0) _____	1) _____	2) _____	3) _____
PUNISHING-CRUEL	0) _____	1) _____	2) _____	3) _____

Melzack 1987

Addendum F

CROM Procedure Manual

Procedure for Measuring Neck Motion with the CROM

CROM (Cervical Range of Motion Instrument) is a product of:

Performance Attainment Associates
3600 Labore Road, Suite 6
St. Paul, MN 55110-4144

Introduction

Pain and loss of motion in the cervical region are common problems that increase with age. Over 40 million adult Americans suffer from some form of osteoarthritis or degenerative joint disease, and 50 to 85 percent of these people will experience debilitating back or neck pain of a temporary or chronic nature.

Accurate measurement of cervical motion during the course of a therapeutic regime can provide objective data on the benefits of the selected treatment. However, currently available measurement devices are time consuming, cumbersome, poorly standardized and poorly accepted by practitioners. In response to this lack of a acceptable means of measurement, existing devices were evaluated and the following design criteria established:

- easily applied
- measures all planes of motion
- comfortable
- time efficient
- easily adjusted
- quickly read
- standardized landmarks and positioning
- standardized protocol
- reproducibility
- simple design
- reasonable cost

Based on these criteria, the CROM instrument, accessories and protocol were developed. The CROM accurately and quickly measures the range of sagittal, coronal and horizontal movements that can be performed by the head and neck.

To perform and document accurate cervical measurements you will need the following items:

- CROM Instrument, including the rotation arm and the forward head arm
- magnetic yoke
- vertebra locator
- tape measure
- recording sheets
- procedure manual

The CROM Instrument is aligned on the nose bridge and ears and is fastened to the head by a velcro strap (see figure 1).

Three dial angle meters are used to take most of the measurements. The **sagittal plane meter** and the **lateral flexion meter** are gravity meters. The **rotation meter** is magnetic and responds quickly to the shoulder-mounted **magnetic yoke**, accurately measuring cervical rotation. Because the rotation meter is controlled by the magnetic yoke, shoulder substitution is eliminated.

Two frequently observed problems seen in patients with cervical dysfunction are forward head (cranio-thoracic postures) and rounded shoulders (scapular protraction). Forward head is the anterior glide of the cervical spine and head with cervical hyperextension. The CROM Instrument, with the **forward head arm** and the **vertebra locator**, accurately measures forward head (see figure 2).

Rounded shoulder is the anterior movement of the scapula (shoulder and upper extremity) on the thorax. Rounded shoulder measurements are taken with the **tape measure**.

Figure 1: CROM with rotation arm and magnetic yoke

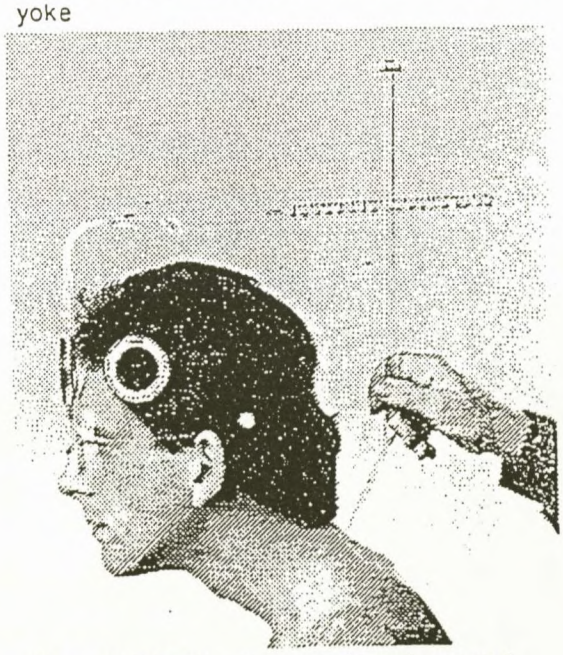


Figure 2: CROM with forward head arm and vertebra locator

Suboccipital Flexion and Extension

Instruct the subject to position the **CROM Instrument** as if putting on a pair of glasses. Fasten the velcro strap in line with the bows. You will not need the magnetic yoke, rotation arm, forward head arm or vertebra locator for these measurements. Instruct the subject to stand facing away from an outside corner of a wall or edge of a open door frame. The subject's sacrum, thoracic spine and occiput must be in contact with the corner of the wall or door edge (see figure 3). Instruct the subject to maintain constant pressure to prevent substitution movements. Since the sagittal plane meter normally reads zero when the ear bows are parallel to the horizontal plane, this reading (zero or otherwise) indicates the subject's resting suboccipital posture; record it on the recording sheet*.

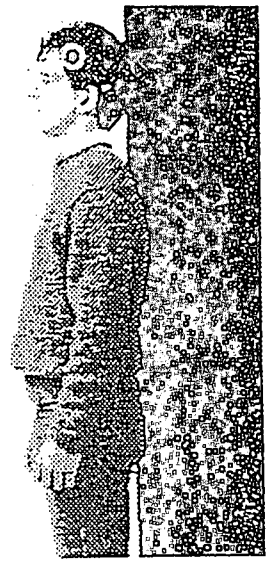


Figure 3: Resting posture

Instruct the subject to flex the suboccipital area as much as possible while maintaining equal pressure at the skull, thorax and sacrum (see figure 4). Record this measurement.

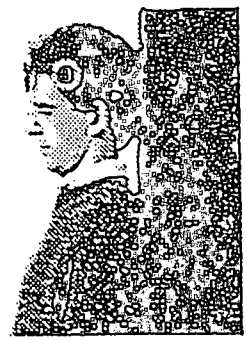


Figure 4: Flexion

Instruct the subject to extend the suboccipital area as much as possible without allowing the skull, thorax and sacrum to leave the contact surface (see figure 5). Record this measurement.

Figure 5: Extension

*A sample recording sheet is provided in the back of this manual. Tablets of the recording sheet may be ordered from your dealer as PAA Form 101.

Cervical Flexion and Extension

Instruct the subject 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. Next, instruct the subject to position the CROM instrument as if putting on a pair of glasses. Fasten the velcro straps snuggly in line with the bows. You will not need the magnetic yoke, rotation arm, forward head arm or vertebra locator for these measurements.

To assure full flexion in this multi-joint area, first instruct the subject to "nod your head to make a double chin" (suboccipital flexion). Then encourage the subject to flex further until full cervical flexion is obtained (see figure 6). To take the reading on the sagittal plane meter, read through the meter's beveled edge; from this angle the pointer will be magnified to the dial edge. Record this measurement in the appropriate space on the recording sheet.

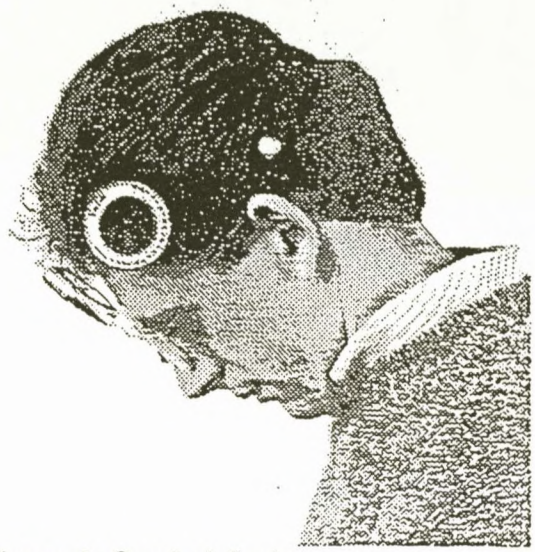


Figure 6: Cervical flexion

To measure cervical extension, first instruct the subject to "nod your head back" (suboccipital extension). Then have the subject extend further until full extension is achieved (see figure 7). Record this measurement also.

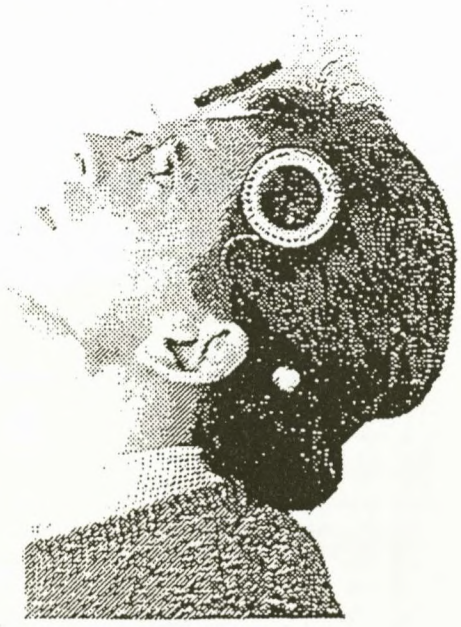


Figure 7: Cervical extension

Lateral Flexion

Instruct the subject 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. Note: to eliminate rotation during lateral flexion the subject should focus on a point on a wall straight ahead. The sagittal plane meter will read zero if the subject is looking straight ahead. The lateral flexion meter will also read zero if the head is not laterally flexed. If the lateral flexion meter does not read zero, record the reading as lateral flexion at rest. You will not need the magnetic yoke, rotation arm, forward head arm nor vertebra locator for these measurements.

Instruct the subject to flex the head laterally to the left, keeping the shoulders level and without rotating the head (see figure 8). Monitor for shoulder elevation by lightly placing your hand on the right shoulder, and correct manually any head motion outside the coronal plane. Note and record the measurement from the lateral flexion meter.

Figure 8: Left lateral flexion

Now instruct the subject to flex the head laterally to the right, again keeping the shoulders level without rotating the head (see figure 9). As before, monitor for left shoulder elevation and correct head motion.

Figure 9: Right lateral flexion

Rotation

You will need to use the CROM instrument plus the magnetic yoke and rotation arm for these measurements. To obtain an accurate rotation measurement, first determine which direction is north.*

Next, place the magetic yoke on the subject's shoulders with the arrow pointing north (see figure 10). Instruct the subject 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 lateral flexion and sagittal plane meters must read zero for the rotation meter to be level; if necessary, assist the subject into the correct position. As the subject faces straight ahead, grasp the rotation meter between your thumb and index finger and turn the meter until one of the pointers is at zero.

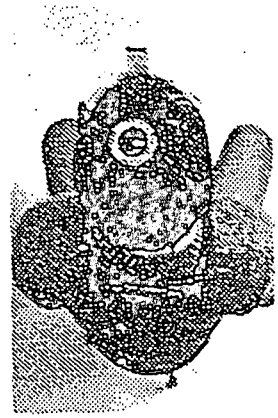


Figure 10: Magnetic yoke pointing north

Instruct the subject to focus on a horizontal line on the wall so the head is not tipped during rotation. Have the subject turn the head as far to the left as possible (see figure 11), and to ensure that no shoulder rotation occurs, lightly stabilize the right shoulder with your hand. (Note: if the head and shoulders are rotated together the pointer will not move because the magnetic yoke positioned on the shoulders eliminates shoulder substitution.) Record this measurement in the appropriate place on the recording sheet.

Figure 11: Left rotation

While you lightly stabilize the left shoulder, instruct the subject to turn the head as far as possible to the right (see figure 12). Record this measurement also.

Figure 12: Right rotation

*You can find magnetic (map) north by noting the direction of the red needle on the rotation meter when it is at least four feet from the magnetic yoke.

Forward Head

Instruct the subject 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 side and feet flat on the floor. You will need to use the CROM instrument plus the forward head arm and the vertebra locator for this measurement, but not the magnetic yoke nor the rotation arm.

Attach the forward head arm on the CROM in place of the rotation arm (see figure 13). Stand to the subject's left side so you can read the sagittal plane meter. To assure that the forward head arm is horizontal, assist the subject to position the head with the sagittal plane meter reading zero. While the subject maintains this position, locate the seventh cervical vertebra and place the foot (bottom tip) of the vertebra locator on the spinous process. Position the locator so the bubble is centered within the vertical lines on the vial. The forward head arm is calibrated in centimeters for the horizontal distance from the nose bridge to the locator contact point with the seventh vertebra.

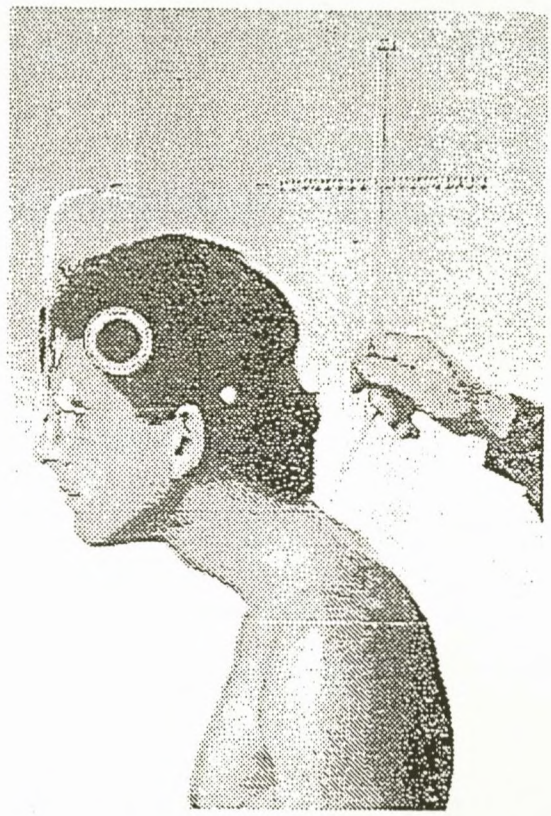


Figure 13: CROM with forward head arm and vertebra locator

Now, instruct the subject to slide the head as far back as possible, while keeping the chin level. Note the measurement at the junction of the forward head arm and the vertebra locator and record it as retraction.

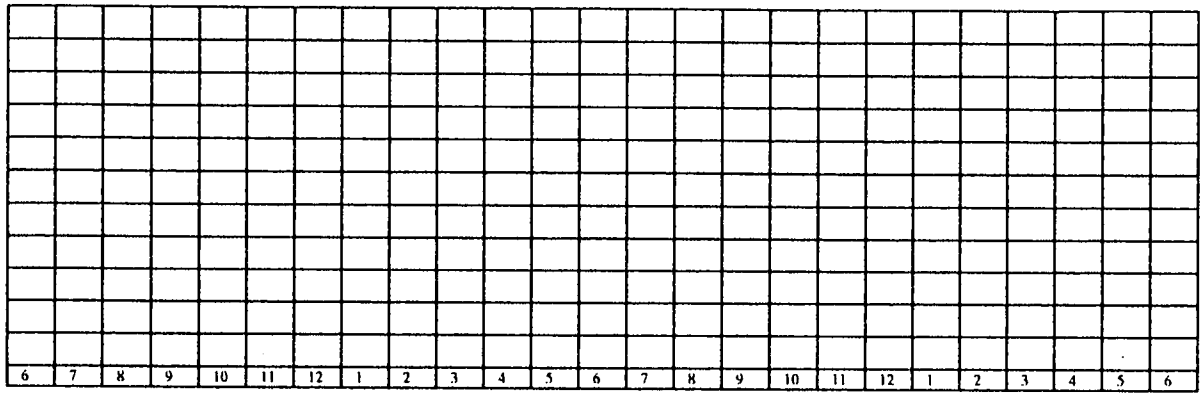
Next, instruct the subject to relax and record this measurement as the resting posture.

Then, instruct the subject to protract or protrude the head forward as much as possible, while keeping the chin level. Record this measurement as protraction.

Addendum G

Headache Diary

Name: Date



Directions for use:

1) Each graph represents one 24-hour cycle.
2) Intensity is measured from 0 to 100 percent and is represented by the columns.
3) Duration is measured in the number of hours along the bottom of the graph. The graph starts from 6:00 am in the morning to 6:00 am the following morning.
4) Subject is to indicate when the migraine started (time) and it's intensity by marking the appropriate space with an X and thereafter the migraine progression hourly, until it subsides.

0	No Headache
20	Slightly Painful – I can only notice it when I focus my attention on it
40	Mildly Painful – I can ignore it most of the time
60	Moderately Painful – I continually notice it but I can continue what I am doing
80	Very Painful – I can only perform tasks which require little concentration
100	Extremely Painful – It makes it virtually impossible to do anything

Addendum H

INFORMED CONSENT FORM

(To be completed in duplicate by patient/subject*) *Delete whichever is not applicable.

TITLE OF RESEARCH PROJECT

_____

_____

NAME OF SUPERVISOR

_____

NAME OF RESEARCH STUDENT

_____

PLEASE CIRCLE THE APPROPRIATE ANSWER

1. Have you read the research information sheet? YES/NO

2. Have you had an opportunity to ask questions regarding this study? YES/NO

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

4. Have you had an opportunity to discuss this study? YES/NO

5. Have you received enough information about this study? YES/NO

6. Who have you spoken to? _____

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

8. Do you understand that you are free to withdraw from this study? YES/NO
   a) at any time
   b) without having to give a reason for withdrawing, and
   c) without affecting your future health care.

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

PATIENT/SUBJECT* Name_____ Signature_____
(in block letters)

PARENT/GUARDIAN* Name_____ Signature_____
(in block letters)

WITNESS Name_____ Signature_____
(in block letters)

RESEARCH STUDENT Name_____ Signature_____
(in block letters)