

**THE RELATIVE EFFECTIVENESS OF COMBINED SPINAL MANIPULATIVE  
THERAPY AND OCCLUSIONAL SPLINT THERAPY IN THE TREATMENT  
OF CHRONIC TENSION-TYPE HEADACHES**

by

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A dissertation submitted in partial compliance with the requirements for a Master's Degree in Technology in the Department of Chiropractic at Technikon Natal.

I, Gaynor Dorothy Cartwright, do hereby declare that this work is my own, both in conception and execution, except where otherwise indicated in the text.



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## **DEDICATION**

This dissertation is dedicated to my parents, Gordon and Geraldine McFarlane for their continued support and encouragement throughout my studies. To my husband Paul Anthony for his unconditional love, and our daughter Stephanie Gaynor for the new chapter in our life that the completion of this dissertation signifies.

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## TABLE OF CONTENTS

DEDICATION.....	i
ACKNOWLEDGEMENTS .....	ii
TABLE OF CONTENTS.....	iii
ABSTRACT.....	x
PURPOSE.....	x
METHODS.....	x
RESULTS.....	xi
CONCLUSION.....	xi
LIST OF TABLES .....	xii
LIST OF APPENDICES .....	xv
DEFINITION OF TERMS.....	xvi



## **CHAPTER ONE – THE PROBLEM AND IT’S SETTING.....1**

1.	INTRODUCTION.....	2
1.1	THE PROBLEM AND IT’S SETTING.....	2
1.2	THE STATEMENT OF THE PROBLEM.....	3
1.2.1	The first sub-problem.....	3
1.2.2	The second sub-problem.....	3
1.3	THE HYPOTHESIS.....	4
1.3.1	The first hypothesis.....	4
1.3.2	The second hypothesis.....	4
1.4	BENEFITS OF THE STUDY.....	4

## **CHAPTER TWO – REVIEW OF THE RELATED LITERATURE.....5**

2.	REVIEW OF THE RELATED LITERATURE.....	6
2.1	INTRODUCTION.....	6
2.2	CLASSIFICATION OF TENSION-TYPE HEADACHES.....	6
2.3	THE PATHOMECHANICS OF TENSION-TYPE HEADACHES.....	7
2.3.1	Clinical Signs and Symptoms.....	7
2.3.2	Aggravating and Relieving Factors.....	9
2.3.3	Age.....	9
2.3.4	Sex Distribution.....	10

2.3.5	Differential Diagnosis of Tension-Type Headaches.....	10
2.4	MECHANISMS OF TENSION-TYPE HEADACHES.....	12
2.5	AETIOLOGY OF TENSION-TYPE HEADACHES.....	17
2.6	AVAILABLE TREATMENTS FOR TENSION-TYPE HEADACHES.....	19
2.7	MANIPULATION.....	20
2.7.1	Pertinent Biomechanics and Anatomy of the Cervical Spine in Relation to Headaches.....	20
2.7.2	Mechanical and Physiological Effects of Spinal Manipulative Therapy.....	24
2.7.3	Contraindications and Indications to Manipulation.....	25
2.8	BRUXISM.....	27
2.8.1	Introduction.....	27
2.8.2	Activities of the Masticatory system.....	28
2.8.3	Prevalence of Nocturnal Bruxism.....	28
2.8.4	Duration and Intensity of Nocturnal Bruxing Events.....	29
2.8.5	Aetiology of Bruxism.....	30
2.8.6	Clinical Signs and Symptoms of Bruxism.....	32
2.8.7	Diagnostic Features of Bruxism.....	32
2.8.8	The Effect of Bruxism on Masticatory Muscles.....	33
2.8.9	Treatment of Nocturnal Bruxism.....	34
2.9	CONCLUSION.....	35

**CHAPTER THREE – THE DATA, THEIR TREATMENT AND  
THEIR INTERPRETATION.....36**

3.	THE DATA, THEIR TREATMENT AND THEIR INTERPRETATION.....	37
3.1	INTRODUCTION.....	37
3.2	THE STUDY DESIGN AND PROTOCOL.....	37
3.2.1	Objectives of the Study.....	37
3.2.2	Recruiting of Patients.....	38
3.2.3	Inclusion and Exclusion Criteria.....	39
3.2.4	Assumptions.....	40
3.2.5	Allocation of Patients.....	41
3.3	MEASUREMENTS AND OBSERVATIONS.....	42
3.3.1	The Data.....	42
3.3.2	Methods and Measurements.....	43
3.3.3	Admissibility of the Data.....	45
3.4	INTERVENTIONS.....	46
3.4.1	Interventions for the Control Group.....	46
3.4.2	Interventions for the Test Group.....	46
3.5	STATISTICAL ANALYSIS.....	49
3.5.1	Treatment of the Data.....	49
3.5.2	Statistical Analysis of the Data.....	52
3.5.3	General Information.....	54

## **CHAPTER FOUR – THE RESULTS.....55**

<b>4.</b>	<b>THE RESULTS.....</b>	<b>56</b>
4.1	INTRODUCTION.....	56
4.2	DEMOGRAPHIC DATA RELATING TO AGE AND GENDER.....	57
4.2.1	Age and Gender of Patients.....	57
4.3	THE NON-PARAMETRIC UN-PAIRED HYPOTHESIS TEST: THE MANN-WHITNEY U TEST.....	58
4.3.1	The Results of the CMCC Neck Disability Index.....	58
4.3.2	The Results of the Short Form McGill Pain Questionnaire.....	60
4.3.3	The Results of the Numerical Pain Rating Scale 101.....	61
4.3.4	The Results of the Cervical Range of Motion Instrument.....	63
4.3.5	The Results of the Headache Diary.....	69
4.4	THE NON-PARAMETRIC PAIRED HYPOTHESIS TEST: THE WILCOXON SIGNED RANK TEST.....	73
4.4.1	The Results of the CMCC Neck Disability Index.....	73
4.4.2	The Results of the Short Form McGill Pain Questionnaire.....	74
4.4.3	The Results of the Numerical Pain Rating Scale 101.....	75
4.4.4	The Results of the Cervical Range of Motion Instrument.....	76
4.4.5	The Results of the Headache Diary.....	79

<b>CHAPTER FIVE – DISCUSSION OF RESULTS.....</b>	<b>82</b>
5. DISCUSSION OF THE RESULTS .....	83
5.1 INTRODUCTION.....	83
5.2 THE INTRA – GROUP COMPARISONS.....	83
5.2.1 The Subjective Measurements.....	83
5.2.1.1 The CMCC Neck Disability Index.....	83
5.2.1.2 The Short Form McGill Pain Questionnaire.....	84
5.2.1.3 The Numerical Pain Rating Scale 101.....	85
5.2.1.4 The Headache Diary.....	85
5.2.2 The Objective Measurements .....	87
5.2.2.1 The Cervical Range of Motion Instrument.....	87
5.3 THE INTER – GROUP COMPARISONS.....	88
5.3.1 The subjective Measurements.....	88
5.3.1.1 The CMCC Neck Disability Index.....	88
5.3.1.2 The Short Form McGill Pain Questionnaire.....	88
5.3.1.3 The Numerical Pain Rating Scale 101.....	88
5.3.1.4 The Headache Diary.....	89
5.3.2 The Objective Data.....	89
5.3.2.1 The Cervical Range of Motion Instrument.....	89
5.4 PROBLEMS ENCOUNTERED WITH REGARD TO THE SUBJECTIVE DATA.....	90



5.5	PROBLEMS ENCOUNTERED WITH REGARD TO THE OBJECTIVE DATA.....	91
5.6	STUDY LIMITATIONS.....	91
5.7	CONCLUSION.....	92
 <b>CHAPTER SIX – CONCLUSIONS AND RECOMMENDATIONS.....</b>		<b>93</b>
6.	CONCLUSIONS AND RECOMMENDATIONS.....	94
6.1	CONCLUSIONS.....	94
6.2	RECOMMENDATIONS.....	95
6.2.1	Study Size and Power.....	95
6.2.2	Follow-up Studies.....	96
6.2.3	Alternative Objective Measurements.....	96
6.2.4	Blinding.....	96
REFERENCES .....		98
LIST OF APPENDICES.....		106

## **ABSTRACT**

### **PURPOSE**

The purpose of this study, was to investigate and determine what role the treatment of nocturnal bruxism, in conjunction with spinal manipulative therapy, would play in the management of tension-type headaches.

It is hypothesised by the researcher that the treatment of nocturnal bruxism in tension-type headache sufferers by means of a bite guard in conjunction with spinal manipulative therapy, would result in a greater reduction of headache intensity, frequency and duration than spinal manipulative therapy alone. This would therefore result in a far more effective treatment protocol for tension-type headache sufferers.

### **METHODS**

This was a randomised controlled study consisting of two groups, namely the test group and the control group. The control group received spinal manipulative therapy alone, while the test group received spinal manipulative therapy in conjunction with the use of a bite guard for the treatment of nocturnal bruxism.

Each group consisted of 15 subjects, between the ages of 14 and 65 years, selected from the general population, and randomly allocated to the treatment groups.

Each subject was assessed by means of the CMCC Neck Disability Index, the Short-Form McGill Pain Questionnaire, and the Numerical Pain Rating Scale 101. Recordings of range of motion were made by means of a cervical goniometer (CROM). Subjects were also required to record their daily headaches by means of a headache diary.

Statistical analysis was completed using the non-parametric un-paired hypothesis tests i.e. The Mann-Whitney U Test, and the non-parametric paired hypothesis test i.e. The Wilcoxon Signed Rank test, comparing the intra-group and inter-group data respectively.

## RESULTS

Patients in both the control and the test groups responded favourably to their respective treatments in terms of pain perception and disability.

The results did not exhibit enough statistical significance to warrant interest, however there was an indication that patients in both groups showed a favourable clinical response to their respective forms of treatment.

Patients in the control and the test groups demonstrated an improvement indicated by a reduction of disability experienced and the quality of pain perceived regardless of the treatment protocol followed. When patients were asked to record their headaches from day to day the test group demonstrated an overall reduction in the average number, duration and intensity of headaches.

No clinical or statistically significant difference was noted between the two groups.

## CONCLUSION

In conclusion, there was no statistically significant difference present between the two groups to be of concern as regarding the outcome of this research.

It is suggested that spinal manipulative therapy remains a reliable intervention or treatment protocol for the treatment of tension-type headaches. However, further studies with larger sample groups and long-term follow-ups are needed to clearly evaluate the treatment of nocturnal bruxism by way of a bite guard in conjunction with spinal manipulative therapy as an alternative treatment protocol for tension-type headache sufferers.

## LIST OF TABLES

TABLE 4.1: THE AGE DISTRIBUTION OF THE PATIENTS.....	57
TABLE 4.2: THE GENDER DISTRIBUTION OF PATIENTS.....	57
TABLE 4.3: THE INTRA GROUP TREATMENT DATA READINHS FOR THE CMCC NECK DISABILITY INDEX FOR THE CONTROL AND THE TEST GROUP.....	58
TABLE 4.4: THE INTRA- GROUP TREATMENT DATA READINGS OF THE MCGILL SHORT FORM PAIN QUESTIONNAIRE FOR THE CONROL AND THE TEST GROUP.....	60
TABLE 4.5: THE INTRA- GROUP TREATMENT DATA READINGS OF THE NUMERICAL PAIN RATING SCALE FOR THE CONTROL AND THE TEST GROUP.....	62
TABLE 4.6: THE INTRA- GROUP DATA READINGS OF THE CERVICAL RANGE OF MOTION INSTRUMENT FOR THE CONTROL AND THE TEST GROUP – EXTENSION.....	63
TABLE 4.7 THE INTRA-GROUP DATA READINGS OF THE CERVICAL RANGE OF MOTION INSTRUMENT FOR THE CONTROL AND THE TEST GROUP – FLEXION.....	64
TABLE 4.8: THE INTRA-GROUP DATA READINGS OF THE CERVICAL RANGE OF MOTION INSTRUMENT FOR THE CONTROL AND THE TEST GROUP – LEFT LATERAL FLEXION.....	65
TABLE 4.9: THE INTRA-GROUP DATA READINGS OF THE CERVICAL RANGE OF MOTION INSTRUMENT FOR THE CONTROL AND THE TEST GROUP – RIGHT LATERAL FLEXION.....	66
TABLE 4.10: THE INTRA-GROUP DATA READINGS OF THE CERVICAL RANGE OF MOTION INSTRUMENT FOR THE CONTROL AND THE TEST GROUP – LEFT ROTATION.....	67

TABLE 4.11: THE INTRA-GROUP DATA READINGS OF THE CERVICAL RANGE OF MOTION INSTRUMENT FOR THE CONTROL AND THE TEST GROUP – RIGHT ROTATION.....	68
TABLE 4.12: THE INTRA-GROUP DATA READINGS FOR THE HEADACHE DIARY, IN TERMS OF THE AVERAGE NUMBER OF HEADACHES EXPERIENCED FOR THE CONTROL AND THE TEST GROUP.....	69
TABLE 4.13: THE INTRA-GROUP DATA READINGS FOR THE HEADACHE DIARY, IN TERMS OF THE AVERAGE DURATION OF THE HEADACHES EXPERIENCED, FOR THE CONTROL AND THE TEST GROUP.....	70
TABLE 4.14: THE INTRA-GROUP DATA READINGS FOR THE HEADACHE DIARY, IN TERMS OF THE AVERAGE INTENSITY OF THE HEADACHE EXPERIENCED FOR THE CONTROL AND THE TEST GROUP.....	72
TABLE 4.15: THE INTER-GROUP COMPARISON OF THE CMCC DECK DISABILITY INDEX FOR THE CONTROL AND THE TEST GROUP.....	73
TABLE 4.16: THE INTER-GROUP COMPARISON OF THE SHORT FORM MCGILL PAIN QUESTIONNAIRE FOR THE CONTROL AND THE TEST GROUP.....	74
TABLE 4.17: THE INTER-GROUP COMPARISON OF THE NUMERICAL PAIN RATING SCALE 101 FOR THE CONTROL AND THE TEST GROUP.....	75
TABLE 4.18: THE INTER-GROUP COMPARISON OF THE CERVICAL RANGE OF MOTION INSTRUMENT FOR THE CONTROL AND THE TEST GROUP - EXTENSION.....	76
-FLEXION.....	76
-LEFT LATERAL FLEXION.....	77
-RIGHT LATERAL FLEXION....	77



	-LEFT ROTATION.....	77
	-RIGHT ROTATION.....	78
TABLE 4.19:	THE INTER-GROUP DATA READINGS FOR THE HEADACHE DIARY IN TERMS OF THE AVERAGE NUMBER OF HEADACHES EXPERIENCED FOR THE CONTROL GROUP COMPARED TO THE TEST GROUP.....	79
TABLE 4.20:	THE INTER-GROUP DATA READINGS FOR THE HEADACHE DIARY IN TERMS OF THE AVERAGE DURATION OF THE HEADACHES EXPERIENCED FOR THE CONTROL GROUP COMPARED TO THE TEST GROUP.....	80
TABLE 4.21:	THE INTER-GROUP DATA READINGS FOR THE HEADACHE DIARY IN TERMS OF THE AVERAGE INTENSITY OF THE HEADACHES EXPERIENCED, FOR THE CONTROL GROUP COMPARED TO THE TEST GROUP.....	81

## **LIST OF APPENDICES**

APPENDIX #1	Case History
APPENDIX #2	Physical Examination
APPENDIX #3	Cervical Regional Examination
APPENDIX #4	CMCC Neck Disability Index
APPENDIX #5	Short-Form McGill Pain Questionnaire
APPENDIX #6	Numerical Pain Rating Scale
APPENDIX #7	Cervical Range of Motion Goniometer Recording Sheet
APPENDIX #8	Headache Diary
APPENDIX #9	Questionnaire to Establish the Eligibility of the Patient for Research Relating to Nocturnal Bruxism
APPENDIX #10	Patient Consent Form

## **DEFINITION OF TERMS**

**ADJUSTMENT** -a chiropractic procedure utilising controlled force, leverage, direction, amplitude and velocity which is directed at specific joints or anatomical regions (Gatterman 1995:12).

**BITE GUARD** -is a muscle relaxation appliance that is fabricated for the maxillary arch and provides an occlusal relationship considered optimal for the patient. When in place the condyles are in their most musculo-skeletally stable position at the time the teeth are contacting evenly, with the goal of eliminating nocturnal bruxism (Okeson 1993).

**BRUXISM** -is a commonly occurring para-function involving sustained tooth contact that is unrelated to function (Klineberg 1991).

**MANIPULATION** -a manual procedure involving a directed thrust which moves a joint past the physiological range of motion without exceeding its anatomical limit (Gatterman 1995:12).

**MOTION PALPATION**- Palpatory diagnosis of passive and active segmental joint range of motion (Heldeman, 1991).

**OBJECTIVE CLINICAL FINDINGS** -refers to procedures utilised by the practitioner that objectively assess the patients condition.

**SPINAL MANIPULATIVE THERAPY**-broadly defined includes all procedures where the hands are used to mobilize, adjust, manipulate, apply traction, massage, stimulate, or otherwise influence the spine and paraspinal tissues with the aim of influencing the patient's health (Heldeman, 1991).

SUBJECTIVE CLINICAL FINDINGS -refers to the pain questionnaires that subjectively assess the patients condition.

# CHAPTER

# ONE

## THE PROBLEM AND IT'S SETTING



## **CHAPTER ONE**

### **1. INTRODUCTION**

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

Headaches have been referred to as the most common medical complaint of civilized man. Headaches not only affect the well-being of people, but have an adverse effect on productivity and profitability in business (Dalezio, 1987:3). Of these headaches, tension-type headaches are recognized as the most common form of headache seen in modern society (Robinson, 1980). Many therapies offer relief from headache, but of particular importance to this study is spinal manipulative therapy. Appropriate evidence is available that supports this therapy as a valid treatment for headaches (Vernon, 1982).

Nocturnal bruxism is often associated with tension or muscle contraction headaches (Mahan and Alling, 1991:190). This has been demonstrated in a study by Jensen and Olesen (1996), wherein they demonstrated that voluntarily sustained tooth clenching of 30 minutes, induced a tension-type headache in patients. Successful treatment of headaches associated with bruxism was established in a study conducted by Berlin and Dessner (1960), wherein 87% of such headaches were controlled effectively by wearing an occlusional splint, commonly known as a bite guard, at night.

This study attempts to provide a more efficient, cost effective yet integrated treatment approach in the treatment of tension-type headaches. Treatment of nocturnal bruxism via a nocturnal bite guard as an adjunct to spinal manipulative therapy may possibly be constructive, not only in the direct treatment of tension-type headaches, but also as a preventative method of treatment. By decreasing the levels of nocturnal bruxism one may be decreasing or removing the causative factor in the tension headache sufferer, and therefore, with no initiating or aggravating mechanisms, the patient's headaches should be less frequent and/or less intense.

## **1.2 THE STATEMENT OF THE PROBLEM**

The purpose of this study was to investigate the relative effectiveness of spinal manipulative therapy alone, as compared to spinal manipulative therapy combined with the use of a nocturnal bite guard, in order to determine the more effective management of tension-type headaches, in terms of the subjective and objective findings.

### **1.2.1 The first sub-problem**

The first subproblem was to investigate the relative effectiveness of spinal manipulative therapy alone, as compared to spinal manipulative therapy combined with the use of a nocturnal bite guard, in terms of the subjective findings, in order to determine their effectiveness in the management of chronic tension-type headaches.

### **1.2.2 The second sub-problem**

The second subproblem was to investigate the relative effectiveness of spinal manipulative therapy alone, as compared to spinal manipulative therapy combined with the use of a nocturnal bite guard, in terms of the objective findings, in order to determine their effectiveness in the management of chronic tension-type headaches.

### **1.3 THE HYPOTHESIS**

#### **1.3.1 The first hypothesis**

It is hypothesised that spinal manipulative therapy, in conjunction with the use of a nocturnal bite guard, in the treatment of tension-type headaches, would be a more successful treatment protocol than spinal manipulative therapy alone, in terms of the subjective findings.

#### **1.3.2 The second hypothesis**

It is hypothesised that spinal manipulative therapy, in conjunction with the use of a nocturnal bite guard, in the treatment of tension-type headaches, would be a more successful treatment protocol than spinal manipulative therapy alone, in terms of the objective findings.

### **1.4 BENEFITS OF THE STUDY**

This research project aims to shed some light on the effectiveness of spinal manipulative therapy alone versus spinal manipulative therapy in conjunction with the use of a nocturnal bite guard in the treatment of chronic tension type headaches.

This should enhance the knowledge of practitioners and provide a little more understanding into the two treatment protocols and where their value may lie in treating chronic tension-type headaches.

This research project could provide a basis for further studies and investigations into the role bruxism and other oral para-functional habits may play in chronic tension-type headaches.

# **CHAPTER TWO**

## **REVIEW OF THE RELATED LITERATURE**

## **CHAPTER TWO**

### **2 REVIEW OF THE RELATED LITERATURE**

#### **2.1 INTRODUCTION**

This chapter will address how the current literature relates to the treatment of tension-type headaches as well as the influence of nocturnal bruxism on these tension-type headaches, and how the treatment of bruxism may influence tension-type headaches, therefore providing a rationale for this study.

Tension-type headaches are the most prevalent form of headache, affecting more than 70% of the population at some point in their lives (Rasmussen, 1995). Furthermore it has been found that the most common headache treated by health practitioners is the tension-type headache, making up approximately 80% of all headache complaints (Dalessio, 1987:172).

#### **2.2 CLASSIFICATION OF A TENSION-TYPE HEADACHE**

The headache classification committee of the International Headache Society currently divides the classification of tension-type headache into episodic and chronic tension-type headache (Headache Classification Committee, 1988).

The diagnostic criteria of the International headache Society defined these two sub-forms of tension-type headache as those associated with disorders of pericranial muscles, and those without. These criteria also take into account frequency and duration of the headaches.



The classification exists as follows:

1. Episodic tension-type headaches require a minimum of 10 previous episodes with a frequency of less than 15 days per month (less than 180 days per year), and may last from 30 minutes to 7 days. They may or may not be associated with disorders of the pericranial muscle as determined by manual palpation, pressure algometer and electromyographic recordings.
2. Chronic tension-type headaches are present for at least 15 days per month (180 days per year), for at least 6 months duration and, as with episodic tension-type headache may or may not be associated with pericranial muscle disorders.

## **2.3 THE PATHOMECHANICS OF TENSION-TYPE HEADACHES**

### **2.3.1 Clinical Signs and Symptoms**

As stated by Martin (1993), tension-type headaches may develop as an ache or sensation of tightness, pressure or constriction, widely varied in intensity, frequency and duration, sometimes long-lasting and commonly suboccipital. These headaches are said to be associated with sustained contraction of skeletal muscles in the absence of permanent structural change, usually as part of the individuals reaction during life stress.

Rasmussen *et al.* (1991) found that patients often use the terms tightness, pressure or soreness when referring to tension-type headaches. Patients also describe the feeling of a tight head band compressing their head as if they were wearing a tight cap. Rasmussen *et al* (1991) also found the tension-type headache to be bilateral in 90% of his patients, with the typical location being occipital, parietal, temporal and frontal.

It is however important to note that 10% of patients suffering from tension-type headaches experience unilateral pain. Lance (1973) suggests that the reason for this may be an imbalance of bite which results in excessive stress on the opposite tempro-

mandibular joint, resulting in pain that is felt in front of the ear and which radiates to the temporal region. Lance (1973) also notes that chronic jaw clenchers experience pain in the temporal area and over the masseter muscles.

Associated visual symptoms as experienced in migraine headaches are lacking in tension-type headache sufferers (Kunkel, 1991). However, with chronic tension-type headaches, the pain can become moderate to severe following which nausea and vomiting have been reported. Phonophobia and photophobia can also be associated with severe chronic tension type headaches but are rare with episodic tension-type headaches (Rasmussen *et al.* 1991).

The most documented associated phenomena found in tension-type headache patients are as follows:

- a) Nausea and vomiting (more with chronic tension-type headaches) (Rasmussen *et al.* 1991).
- b) Photophobia and phonophobia (also with chronic tension-type headaches) (Rasmussen *et al.* 1991)
- c) Difficulty in concentrating, lack of interest in work and hobbies (Lance, 1973).
- d) Depression. Lance (1973) states that one third of patients with tension-type headaches have symptoms of depression.
- e) Indigestion (Lance 1973).
- f) Patients may wake-up with a bruised sensation in the mouth owing to nocturnal bruxism (Lance 1973).
- g) Stiffness and tenderness of the neck (Pertes and Gross 1995).

### **2.3.2 Aggravating and Relieving Factors**

Lance (1973) initially indicated emotional conflict, noise, glare and vaso-constrictors as aggravating factors in tension – type headaches. Thereafter, Okeson (1996) added emotional stress, anxiety, depression, working posture, muscle strains, sleep deprivation, severe snoring, weather changes and menstruation.

It is also noted by Jensen and Olesen (1996) that sustained tooth clenching may not only aggravate a tension-type headache, but can also initiate one.

Relieving factors noted by Lance (1973) included vasodilators, alcohol, aspirin or analgesics.

### **2.3.3 Age**

It is suggested by Dalessio (1987:172) that tension-type headaches may occur at any age, but are more commonly found in adults, which is about the time that individuals experience increased stress in life. This is supported by Friedman *et al.* (1954) who noted the onset of tension-type headaches to occur most commonly between the ages of 20 and 40 years of age.

However, Lance *et al.* (1965) found that 15% of patients remembered symptoms starting from the age of 10 years, and many patients had suffered from tension-type headaches for 10-30 years or more.

#### 2.3.4 Sex Distribution

Tension-type headaches within the general population show a predilection for women (Diamond and Dalessio, 1992:124). This is demonstrated by Rasmussen *et al.* (1991) who reported that the one year prevalence rate for tension-type headaches in men was 63% and in woman 86%. Friedman *et al.* (1954) and Lance (1982) also state that approximately 75% of chronic tension-type headache patients are women.

#### 2.3.5 Differential Diagnosis of Tension-Type Headaches

The migraine headache appears to be the most similar clinical condition to that of tension-type headaches according to Raskin (1988). He draws similarities between the two conditions, and suggests they are somewhat related from a mechanistic view.

The similarities found in both are as follows:

- a) neck muscle contraction
- b) nuchal muscle contraction and pain as a prodromal feature.
- c) Cephalic hyper-aemia
- d) Increased prevalence of epilepsy
- e) Low platelet *seritonin*
- f) Responsiveness of both disorders to *amitriptyline*, *ergonovine* and *propanolol*.

Differential diagnosis for tension-type headaches according to Merck Manual (1992) are as follows:

- |                       |                                 |                          |
|-----------------------|---------------------------------|--------------------------|
| 1) Organic diseases - | A) Raised intercranial pressure | -brain abscess           |
|                       |                                 | -brain tumor             |
|                       |                                 | -subdural haematoma      |
|                       | B) Meningeal irritation         | -meningitis              |
|                       |                                 | -subarachnoid hemorrhage |

- C) Cranial (changes in the skull)      -Padget's disease
- D) Involved sensory nerves of the scalp
- E) Vascular disturbances                      -migraine
  - toxic states
  - hypertension
  - cluster headaches
- F) Extra-cranial                                  -lesions of the eye e.g. iritis
  - lesions of the middle ear e.g. otitis media
  - lesions of the nasal sinuses e.g. sinusitis
  - lesions of the oral cavity

2) Post traumatic

- 3) Psychogenic      A) anxiety states, conversion hysteria
- B) muscle tension

Other differential diagnoses important to this review include tempromandibular joint syndrome and myofascial pain syndromes (Travell and Simons, 1983).

## 2.4 MECHANISMS OF TENSION-TYPE HEADACHES

There are numerous causes of tension-type headaches (Lance 1982 and Raskin 1988). Lacroix and Corbett (1990) stated that because of these various causes, it is difficult to attribute a single distinctive causative factor to this type of headache.

Possible causes of tension-type headaches are as follows:

### VASCULAR CONSIDERATIONS

Early studies by Ostfield *et al.* (1957) on the effects of vasodilating and vasoconstricting drugs on tension-type headaches showed that, vasodilation of constricted intra-muscular arteries by drugs such as *amylnitrate*, *ethyl alcohol* and *nicotinic acid* resulted in relief of the headaches. However, administration of vasoconstrictors such as *noradrenaline* and *ergotamine* aggravated the tension-type headaches.

More recent studies by Drummond and Lance (1981) showed that the temporal arteries in tension-type headache patients fail to dilate normally during exercise, thus reinforcing the belief that tension-type headaches are associated with some traces of vasoconstriction, making the effect of the state of cranial blood vessels an integral part of the etiology of tension-type headaches.

### MUSCLE CONTRACTION

Muscle contraction was previously believed to be the cause of tension-type headaches, hence the name “muscle contraction headache”.

Weisberg *et al.* (1989) stated that patients who have psychological disorders have been found to have a greater predisposition to sustained muscle contraction which, if prolonged, results in pain. When muscle contraction is sustained, muscle tenderness and pain may become evident, probably because of compressed intra-muscular arterioles with subsequent ischemia, the latter persisting for days after the muscles relax.

Weisberg *et al.* (1989) and Gobel *et al.* (1991) support this assumption through experimental and clinical evidence. Gatterman (1990) suggests that tension-type headaches are due to spasm, injury or inflammation of the muscle or myofascial connections to the cranial periosteum.

There is some evidence that masticatory muscle activity may play a role in tension-type headaches (Jensen *et al.* 1993). Masticatory muscle disorders seem to be related to tension-type headaches in a number of studies conducted by Forssell and Kangasniemi (1984) and Gelb and Tarte (1975).

This inter-relationship between tension-type headaches and masticatory muscles was demonstrated most recently by Jensen and Olesen (1996) in their study of the initiating mechanisms of experimentally induced tension-type headaches. In this study tension-type headaches were induced by instructing patients to clench their teeth for 30 minutes. This demonstrated that the sustained muscle contraction induced by the teeth clenching resulted in tension-type headaches exhibited by the test group.

It is also important to note that Lurie (1995) stated that myofascial pain dysfunction syndrome is a psycho-physiological condition that primarily involves the muscles of mastication. Headache is frequently mentioned as a symptom, and the only type of headache that may be directly or indirectly part of the syndrome is muscle contraction or tension-type headache. Lurie (1995) hypothesised that centrally induced increases in muscle tension, frequently combined with parafunctional habits such as clenching or grinding of teeth, result in fatigue and spasm that produce pain, dysfunction and ultimately tension-type headaches.

## PSYCHOLOGICAL FACTORS

It is reported through experimental and clinical observations that there are psychological factors that could be responsible for the development of tension-type headaches (Friedman *et al* 1954). Friedman *et al* (1954) observed that in a study of 1000 patients with tension-type headaches, that 100% of these patients had some form of contributing emotional factor, such as resentment, aggression or hostility.

In a study of 47 episodic tension-type headache sufferers, Hatch *et al.* (1991) found a high level of depression, anger and hostility in these headache sufferers. Cerbo *et al.* (1991) , found that the usage of *amitriptyline* (AMT), an antidepressant, on tension-type headache sufferers was effective in the treatment of these headaches, even though the patients had no anxiety or depression symptoms. It was then concluded by Cerbo *et al.* (1991) that depression is infact a secondary finding of tension-type headaches and would be likely to improve if the headache improved.

## CERVICOGENIC FACTORS

Although controversy exists concerning the role of the cervical spine in the production of head pain (Vernon, 1988:143), there is evidence that suggests the possible effects neck pain has on headache etiologies.

Edmeads (1988) postulates that the following possible conditions must exist for cervicogenic head pain:

- There should be the presence of pain perceptive structures: these include, vertebral periosteum, spinal ligaments, annulus fibrosis of the inter-vertebral discs, synovial joints of occipito-atlanto and atlanto-axial joints, apophyseal joints, cervical musculature and their attachments, cervical nerve roots and vertebral arteries.
- Sufficient pain receptors should be present within the cervical structures that can receive stimulus from pathological causes or physiological dysfunction.



Pathological causes such as the following:

- inflammation / subluxation of apophyseal and synovial joints due to arthritic processes, trauma or infection.
  - Disc herniation and / or trauma that may impinge on cervical nerves and nerve roots.
  - trauma / inflammation of cervical muscles and ligaments.
  - Infection tumor or trauma to the periosteum.
  - Spontaneous dissection, occlusion or irritation to the vertebral artery.
- Recognizable neurological pathways and mechanisms should exist, through which pain can be conveyed from cervical segments to different regions of the head, resulting in:
    - pain to the back of the head that may come from compression, irritation or inflammation of C2 sensory nerve root.
    - orbito-frontal and vertex pain that may originate through the C1 sensory nerve root.
    - Pain referral to the VI dermatome via tentorial nerves which, when stimulated, activate the trigeminal nerve.
    - Stimulation of the upper cervical spine nerve roots (C2-C4) which will effect the trigeminal nerve and thus effect the VI (ophthalmic division of trigeminal) dermatome.
    - Scalp musculature can be effected due to myofascial and aponeuotic connection.

Edmeads (1988) was the first to describe the role of cervical joints in the production and radiation of pain which occurs through several mechanisms involving sensory nerve roots in the cervical spine, as well as the neurological processes associated with the relevant anatomy.

Bogduk (1992), stated that cervicogenic headaches arise as a result of cervical synovial joint dysfunction. He demonstrated this in the following manner: the synovial joint dysfunction was identified by abnormal motion palpation findings with subsequent reduction of the headache after the administration of anaesthetic into the affected joint.

Many occupations require tremendous overuse of the neck for example prolonged working in front of the computer and secretarial work. Static muscle positions and awkward working environments, resulting in disturbances within the joints and related musculature (Gatterman, 1990:253). These disturbances in posture, whether affecting the joint or muscles, result in degeneration, joint instability, myofascial trigger points and rheumatoid arthritis (Vernon, 1988:152).

Myofascial trigger points occur as hyper-irritable sites in a taut skeletal muscle band that has the ability to refer pain away from its point of origin. Active trigger points are those that cause the patient pain, whereas latent trigger points are those that exhibit few clinical signs and symptoms, except for weakness and restriction of muscular movement (Travell and Simons, 1983:12). It is recognized by Travell and Simons (1983:13) that active trigger points are more likely to be encountered in muscles involving posture, namely the neck, shoulder, pelvic and masticatory muscles. The upper trapezius, levator scapulae, and sternocleidomastoid muscles frequently exhibit myofascial tendencies causing headache (Travell and Simons, 1983:166).

## 2.5 AETIOLOGY OF TENSION-TYPE HEADACHES

Vernon (1988:170) has constructed an anatomical model to explain the causes of pain arising in the head as a result of the cervical spine. The model is as follows:

Within the first category:

- a) EXTRA SEGMENTAL – the large muscles found within the cervical region i.e. Trapezius, Sternocleidomastoid, Levator scapula, Splenius, Occipito-frontalis and Semispinalis capitis are prone to various low-level, intensifying stresses e.g. postural strain, occupational strain, trauma (whiplash injuries), and myofascial components known as “trigger points”, the latter being covered extensively by Travell and Simon (1983). The muscle hypertonicity or tension causes secondary entrapment of neurovascular structures, such as the greater occipital nerve as it exits through the upper borders of the Trapezius musculature, thus possibly creating referred head pain (Vernon, 1988:171).

The second category:

- b) INTER SEGMENTAL – encompasses the joints, i.e. the intervertebral joints, apophyseal joints, uncovertebral joints, and the deeper short segmental muscles.

Boake (1972) stated that pain and muscle spasm is caused by a locking of the joints as a result of an impinged synovium or cartilage fibril obstructing proper movement.

According to Bogduk (1979 and 1992) and Bogduk *et al.* (1985) it is an anatomical finding that the joints and ligaments of the first three cervical vertebrae are supplied by branches of C1, C2 and C3 spinal nerves. The nerve supply of these vertebrae congregate at the spinal nucleus of the trigeminal nerve, which is the fundamental nociceptive nucleus of the upper neck and head, making this nucleus the medium through which stimuli from the cervical structures are registered.

The third category:

- c) INFRA SEGMENTAL – described by Vernon (1988:175) as a low-pitched,

concentrated disturbance of nerve roots, dorsal root ganglia and sympathetic nerve fibers as they become intruded upon by structural deformities, degeneration (osteophytes) or irritated by inflammation.

The fourth category:

- d) INTRA SEGMENTAL – is primarily concerned with the influence that sensory input has on the transmission of pain in the central nervous system.

Diamond and Dalessio (1992;124) attribute the mechanism of tension-type headaches to chronic muscle contraction anywhere in the body, as a result of muscle spasm linked to the central nervous system involving neural pathways and reflex arcs. The mechanism by which the muscle becomes involuntarily spasmed or induced to remain contracted, has been explained via the pathways involved.

Gatterman (1990:252) discusses the arthrokinetic reflex which involves the intra articular nociceptors. When intra articular nociceptors are irritated by mechanical or chemical stimuli produced by joint pain, there begins an arthrogenic muscle spasm with referred pain due to the activation of convergent neurons. This arthrokinetic reflex may also be initiated by joint fixation or hypomobility. Cervical manipulation may bring about a change in the abnormal cervical biomechanics, to the extent that the clinical features of tension-type headaches are diminished.

Pain is produced through several pathways in the nervous system (Faucet *et al*,1980) i.e. via chemical substances. This study is only concerned with those caused by bony dis-relationships and nervous stimuli.

The mechanism is as follows:

- \* a bony dis-relationship will cause stretching of muscles, tendons and ligaments which activate nervous stimuli in the dorsal roots of a specific spinal nerve (Faucet *et al*. 1980).
- \* The stimuli then travel via the posterior funiculus up the dorsal columns to the

nucleus ventralis posterolateralis (VPL) of the thalamus (responsible for crude awareness of pain) and the somesthetic cortex where the stimulus registers as pain (Tan and Wong, 1990:208).

- \* A subluxation also induces nervous stimuli, which, via the dorsal root of the spinal nerves at the effected level, transmit impulses through the posterior horns via the association neurons and then upwards through the spinoreticular tracts to the reticular activating system (Faucet *et al.* 1980).
- \* At this point the impulse is able to affect several different structures e.g. any stimuli that proceeds to the limbic lobe may cause mental and behavioral changes leading to anxiety and headache (Faucet *et al.* 1980).
- \* Any conduction of impulses to the cerebral cortex will then run through the corticoreticular tracts and down the medial and lateral reticulaospinal tracts which synapse with the anterior horn and lower motor neurons to cause alteration of muscle tone leading to muscle spasticity and ultimately pain (Faucet *et al.* 1980).

## **2.6 AVAILABLE TREATMENTS FOR TENSION-TYPE HEADACHES**

There are several treatments available for the management of tension-type headaches (Gatterman, 1990). Two basic groups exist, namely the medical group and the Chiropractic group, both groups having a number of overlaps as far as treatment is concerned.

The medical field has a number of approaches which include pharmacological intervention, bio-feedback, massage and relaxation therapy.

The more conservervative approaches includes spinal manipulative therapy, massage, trigger point therapy, ice and heat therapy.

## **2.7 MANIPULATION**

Gatterman (1990) reports that spinal manipulative therapy helps in the treatment of tension-type headaches. Looking back through the literature Broake (1979) and Robinson (1980) hold the same point of view. They suggest that skilful manipulation of the cervical spine may provide relief (transient or long lasting) in the treatment of tension-type headaches.

### **2.7.1 Pertinent Biomechanics and Anatomy of the Cervical Spine in Relation to Headaches.**

#### **PAIN PRODUCED VIA NERVE STRUCTURE INVOLVEMENT**

It is possible that pain arising in the head as a result of a cervical aetiology has its origins through any structure innervated by the nociceptive nerve endings of the first four cervical nerves (Curl, 1994:55). Some examples of some of these structures are (Edmeads, 1988):

- Apophyseal joints
- Synovial joints of the occipito-atlanto and atlanto-axial junctions
- Annulus fibrosis of the intervertebral discs (IVD)
- Spinal ligaments
- Vertebral periosteum
- Cervical muscles and their bony attachments
- Cervical nerve roots
- Vertebral arteries

The particular nerves that will elicit pain within the cervical spine are (Curl, 1994:55):

**1. Dorsal rami (posterior primary division)**

these rami innervate:

- Deep back muscles.
- Zygapophyseal joints and interspinous ligaments (both supplied via the medial branch of the dorsal ramus).
- The lateral branch of the dorsal ramus will innervate (excluding C1) the following muscles; the erector spinae, splenius capitis, and cervical muscles as well as the sensory supply to the skin at the back of the neck.
- C1 dorsal ramus terminates in the suboccipital region, and may give rise to orbital, frontal and vertex pain (Edmeads, 1988).
- C2 dorsal ramus and its medial branch encompass the suboccipital area as well as the posterior occiput up to the vertex. This nerve root is important because it can produce posterior occiput pain if snared between a posterior cervical muscle (Curl, 1994:57).

**2. Ventral rami (anterior primary division)**

These rami innervate:

- Longus capitis.
- Longus coli.
- Rectus capitis anterior.
- Lateralis muscles.
- Vertebral bodies.
- Anterior longitudinal ligaments.
- Anterior aspect of the intervertebral discs
- components of the cervical and brachial plexuses which innervate the upper extremities.

### **3 The recurrent meningeal nerve**

These nerves in the cervical spine are formed by the ventral rami and the sympathetic nerves in conjunction with the vertebral artery (Curl. 1994:58).

The fibers of these nerves supply:

- Posterior aspects of the intervertebral discs
- Posterior longitudinal ligament
- Anterior spinal dura mater
- Posterior vertebral bodies
- Uncovertebral joints

C1 – C3 recurrent meningeal nerves supply:

- The atlanto-axial joints
- Tectorial membrane
- Parts of the cruciate ligament
- Alar ligaments

Within the posterior cranial fossa:

- Cranial dura mater
- Region of the clivus associated with C3

### **4 Sensory nerves and their relationship with the cervical autonomic chain.**

It has been noted (Edmeads 1988), that the posterior cervical sympathetic chain, in association with irritation by osteophytes, may cause headaches and other sensory disturbances. An increase in sympathetic output may increase smooth muscle tone and with it cause vasoconstriction leading to ischemia, spasticity and ultimately pain (Faucret *et al.* 1980).



## PAIN PATHWAYS

See relevant sections on spinothalamic pathways which have already been discussed in an earlier section.

## THE TRIGEMINAL SYSTEM

The trigemino-cervical nucleus within the grey matter of the spinal cord is known to extend as far as the upper 3 to 4 spinal cord segments. Sensory axons not only terminate within these spinal cord segments, but also have collaterals to adjacent segments, and all stimuli from structures in the upper neck, head and throat will be interceded within the trigemino-cervical nucleus (Bogduk 1992).

## PAIN REFERAL

It is possible for pain to be referred away, even to great distances from its source (Curl, 1994:69). Somatic referred pain is produced by a skeletal related structure e.g. joints, ligaments and muscles, and is often described as dull and aching (curl, 1994:70).

Radicular pain originates via activation of sensory fibers at the level of the involved root or it's ganglion e.g. intervertebral disc protrusion, joint arthrosis.

### **2.7.2 Mechanical and Physiological Effects of Spinal Manipulative Therapy**

Spinal joint manipulation is an assisted passive motion applied to the spinal apophyseal joints (Curl, 1994:293). The term adjustment is considered unique as a term to describe chiropractic manipulation, in that it entails use of short lever, specific, high – velocity, controlled, forceful thrusts by hand aimed at individual articulations (Gatterman, 1995:12). Directly after an adjustment there is a temporary increase in active and passive ranges of motion into the paraphysiological space (Sandoz, 1976). Sandoz (1976) notes that because of the swift action that occurs into the paraphysiological space, together with the stretching of the articular capsule up to the point of compromising the anatomical integrity, an adjustment can be representative of a concentrated arousal of joint proprioceptors.

The specific effects of spinal manipulation can be narrowed down to certain mechanical and reflex mechanisms (Curl,1994:297).

The mechanical mechanisms are as follows:

- Mechano-receptor stimulation
- stretching of muscle spindles
- increase in active and passive joint motion

The reflex mechanisms are as follows:

- inhibition of pain
- inhibition of muscle spasm
- stimulation of the autonomic nervous system

Gatterman (1995:106) refers to the following possible mechanical changes that can be noted as a result of manipulative therapy:

- it produces changes in the alignment of the joints
- it influences any motion dysfunction
- effects the dynamics of the spinal curvature

Heldeman (1991:3) draws the following conclusions as concerning the effects of manipulation on pain relief:

- an increase in local pain threshold levels and thus a greater pain tolerance
- muscle spasm release
- increased range of motion
- certain psychological effects as a result of the manipulation improve the patients sense of well being
- decrease the chances of disc protrusion

### **2.7.3 Contraindications and Indications to Manipulation**

The following pathological findings have been noted as contra-indications to manipulation.

- osteoporosis / osteomalacia (especially post menopausal females, and those on long-term corticosteroid therapy)
- bleeding disorders
- certain spondyloarthropathies e.g. rheumatoid arthritis, psoriatic arthritis, Reiter's syndrome, ankylosing spondylitis
- atlanto-axial instability
- advanced spondylotic changes
- degenerative disc disease

- degenerative spinal lesions e.g. fractures and dislocations
- segmental instability especially craniocervical transition
- cervical disc herniations with neurological deficit
- any spinal cord pathology
- spinal cord compression

The risk of cerebrovascular accidents can be reduced by, reducing the use of extension with rotation (Gatterman 1990:67), reducing excessive force during the manipulation and then prior to treatment, the neck should be held in extension and rotation on both sides for at least 45 seconds, if the patient complains of dizziness or nausea and nystagmus are observed then manipulation is contra-indicated.

Indications of manipulation are (Schafer and Faye,1990:40):

- increasing spinal mobility
- freeing entrapped or stretched nerves
- returning inter vertebral disc's and inter vertebral foramina to their normal boundaries
- to extend shortened tendons and ligaments
- to break adhesion

## **2.8 BRUXISM**

### **2.8.1 Introduction**

According to Klineberg (1991) bruxism is a commonly occurring para-function involving sustained tooth contact that is unrelated to function. Tooth clenching may occur with the teeth in centric (centric bruxism) or in lateral contact positions (lateral bruxism) and may occur during the day (diurnal bruxism) or at night during sleep (nocturnal bruxism). Bruxism is a manifestation of stress and anxiety. Clinical research suggests that there may be a specific group of subjects who brux and who generate greater jaw muscle activity than other groups, which if sustained will lead to clinical signs and symptoms.

It is important for the purpose of this research to take note of the role bruxism may play in the cause of tension-type headaches. With this in mind Jagger *et al.* (1994) recognize that recurrent headaches are a frequent accompaniment of pain and tenderness in the masticatory muscles and that bruxism can produce temporal headaches. Similarly the association between recurrent headaches, bruxism and symptoms of temporomandibular joint dysfunction is well recognized by Magnusson and Carisson (1978). Magnusson and Enbom (1984) also stated that, tension-type headaches may sometimes be precipitated by clenching the teeth or introducing a high occlusal contact. Although the relationship is not clear one must be aware of the increased masticatory muscle activity that may contribute to a tension-type headache.

### **2.8.2 Activities of the masticatory system**

Okeson (1993) stated that the activities of the masticatory muscles can be divided into two basic types: functional - which include chewing, speaking and swallowing - and parafunctional, which include clenching or grinding of the teeth, as well as various oral habits. The term muscle hyperactivity has also been used to describe any increased muscular activity over and above that necessary for function. For the purposes of discussion in this study, parafunctional activity can be subdivided into two general types as stated earlier, diurnal and nocturnal. Nocturnal bruxism will be looked into in more detail.

Data from various sources have suggested that parafunctional activity during sleep is quite common and seems to take the form of single episodes (referred to as clenching) and rhythmic contractions (known as bruxing). Whether these activities result from different etiologic factors or are the same phenomenon in two different presentations is not known. In many patients both activities occur and are sometimes difficult to separate. For that reason clenching and bruxism are often referred to as bruxing events (Okeson, 1993).

### **2.8.3 Prevalence of Nocturnal Bruxism**

According to Jagger *et al.* (1994) the prevalence of nocturnal bruxism is difficult to determine since this activity is performed subconsciously and questioning alone is therefore unreliable. Studies by questionnaire, revealed that approximately 15 – 20% of people are aware of bruxing or habitually clenching their teeth. Bruxism was also found to be common in young children from the time the deciduous teeth erupt and it is found in all age groups in both dentate subjects and in those with artificial teeth (Jagger *et al.* 1994).



Scharer (1974) states bruxing to be a common oral motor behavior, where the reported incidence varies between 15 – 88% of adult subjects studied. It is also stated that this parafunctional habit may result in headache, muscle pain, muscle hypertrophy, sore teeth, tooth abrasion, mandibular muscle fatigue and temporo mandibular joint changes.

Powell (1965) reported that most people brux about 10 seconds per hour on the average during sleep.

Through sleep studies Kydd and Daly (1985) reported that a group of 10 bruxists rhythmically clenched their teeth for a total mean duration of 11.4 minutes per night and these episodes commonly occurred in single episodes lasting 20-40 seconds.

#### **2.8.4 Duration and Intensity of Nocturnal Bruxing Events**

It is interesting to note that during studies conducted by Clarke *et al.* (1984) that two of the 10 patients exerted forces during nocturnal bruxing events that actually exceeded the maximum force they could apply to the teeth during voluntary clenching.

More recently Rugh *et al.* (1991) demonstrated that 66% of nocturnal bruxing events exhibited a greater force than the force of chewing, and 1% of the events exceeded the force of a voluntary maximum clench.

### **2.8.5 Aetiology of Bruxism**

The aetiology of bruxism is not always clear, but a number of causes have been proposed (Klineberg, 1991).

#### **a) GENETIC FACTORS**

Genetic factors have been implicated as a cause of bruxism. Lindquist (1974) studied 117 pairs of identical twins and concluded that hereditary factors are important in the genesis or pattern of bruxism.

In a study of 2290 students Reding *et al.* (1966) found that there was a positive correlation between bruxists and blood relatives. Bruxism was also found to be significantly more frequent in children of parents who were or who had been bruxists.

#### **b) LOCAL FACTORS**

Tooth contact interferences were reported initially by Ramfjord (1961) who examined 34 patients with severe bruxism. Results showed reduced EMG (electro-myographic) activity in the “rest position” following occlusal adjustment. “Normal” muscle activity and complete relief of symptoms were obtained in all patients.

#### **c) SYSTEMIC FACTORS**

The following systemic factors have been reported as a cause of bruxism:

- Allergy – Marks (1980) described a severe bruxing habit in allergic children. Marks suggests intestinal parasitic infections and gastro intestinal disturbances from food allergy as possible causes.
- Nutritional disturbances may act as predisposing factors more commonly in children than adults (Marks, 1980).
- Urological disturbances and endocrine disorders have also been considered (Marks 1980).



#### d) PSYCHOGENIC FACTORS

Bruxism occurs in association with psychic tension, anxiety and suppressed aggressiveness. Stress is most likely to be the most potent cause of bruxism, due to the increased level of excitation of the reticular activating system which provides an increased background level of excitement and potentiates all evoked responses. Stress is more commonly associated with individuals who are compulsive achievers and in students during examinations ( Reding *et al.* 1966).

Nocturnal bruxism is now considered to be a sleep disorder that is stress related.

Nocturnal bruxism was described by Reding *et al.* (1966) as possibly occurring during Rapid eye movement (REM) sleep in association with generalized muscle movement and dreaming.

#### e) OCCUPATIONAL FACTORS

Demanding occupations may cause diurnal bruxism during periods of concentration during the day time, and nocturnal bruxism in association with anticipated occupational challenges and demands.

#### f) OTHER FACTORS :- as stated by Mahan and Alling (1991) are;

- \*heightened emotional state
- \*occlusional interferences
- \*physical pain and anxiety
- \*sympathetic nervous system over activity
- \*drugs such as *amphetamines*
- \*brain damage
- \*arousal reaction during sleep
- \*allergies



### **2.8.6 Clinical Signs and Symptoms of Bruxism**

When structural tolerances of the masticatory system are exceeded, various structures can break down, leading to particular symptoms. Some of the more common symptoms are pulpitis, tooth wear, tooth mobility, masticatory muscle pain, tempro-mandibular joint pain, ear pain and headache pain (Okeson, 1993:158).

The clinical signs of bruxism according to Klineberg (1991) are:

- |    |                         |  |
|----|-------------------------|--|
| a) | Teeth                   | -the teeth show wear<br>-there is mobility and spreading of teeth<br>-fractured cusps and split teeth  |
| b) | Muscles                 | -there is muscle fatigue and /or pain<br>-muscle hypertrophy<br>-elevated masseter EMG   |
| c) | tempro mandibular joint | -show possible overloading<br>-articular sounds (popping, clicking)<br>-internal derangement<br>-radiographic changes in contour of condyles |

### **2.8.7 Diagnostic features of Bruxism**

The diagnostic features of bruxism comprise of the following, according to Jagger *et al* (1991):

- occlusal sounds during sleep
- functional tooth surface wear i.e. attrition facets
- masticatory muscle fatigue or pain, especially on waking
- masticatory muscle tenderness
- recurrent headaches



- fractured fillings or split teeth
- soreness of oral mucosa beneath dentures
- tenderness on percussion of teeth
- mucosal ridging of tongue and cheeks

#### **2.8.8 The Effect of Bruxism on Masticatory Muscles**

The muscles of mastication and those relevant to this study are the masseter muscles, the temporalis muscles, the medial and lateral pterygoid muscles, the digastric muscle, the trapezius muscle, the sternocleidomastoid muscle, the splenius capitis and splenius cervicis muscles, the posterior cervical muscles and the suboccipital muscles (Trevell and Simons, 1983).

Experimental clenching of the teeth leads to masticatory muscle fatigue and pain (Jagger *et al.* 1991).

Parafunctional activity often results in sustained muscle contraction over long periods of time. This type of isometric activity inhibits normal blood flow within the muscle tissues. As a result there is an increase in metabolic by-products within the muscle tissue, creating the symptoms of fatigue, pain, spasm and headache (Okeson, 1993).

It is of importance to note that the effects of bruxism are experienced long after the bruxing event. Christensen (1971) noted that when normal subjects grind their teeth intermittently for 30 minutes, they experience mandibular elevator muscle pain that peaks 2 hours later and lasts up to 7 days.

### **2.8.9 Treatment of Nocturnal Bruxism**

There is great difficulty in the treatment of nocturnal bruxism as the para-functional behavior occurs during sleep and therefore the patient has little control over it, so biofeedback and de-stressing related treatment, which is successful for diurnal bruxism, prove useless for the treatment of nocturnal bruxism.

There are two methods for treatment of nocturnal bruxism identified by Mahan and Alling (1991).

- a) Drug therapy – for the purpose of this study, drug therapy will not be discussed.
- b) The use of occlusional splint therapy (a bite guard) which eliminates or greatly reduces bruxism.

The mechanism whereby occlusal splints work is uncertain but several possibilities have been suggested by Jagger *et al.* (1991), they are:

- a splint encourages occlusal disengagement and reduces habitual clenching or bruxism either voluntarily or reflexly
- occlusal interferences are eliminated
- increase in occlusal vertical dimension reduces force of muscle contractions
- the relationship of the mandibular condyle, articular disc and articular fossa is altered

The ultimate goal of the splint therapy is to reduce bruxism and therefore the symptoms caused by bruxism, namely muscle spasm, pain and headache.

## 2.9 CONCLUSION

It has been shown in studies and through the literature that centrally induced increase in muscle tension, frequently combined with parafunctional habits such as clenching or grinding of teeth, result in muscle fatigue and spasm that produce pain and dysfunction, and that headache is frequently mentioned as a symptom thereof. It is also noted that the only type of headache that may be directly or indirectly associated with this muscle fatigue and spasm are muscle spasm or tension-type headache (Laurie, 1995).

Literature has shown that nocturnal bruxism causes muscle fatigue and pain, and that bruxism is brought on by anxiety states. Literature has also shown that tension-type headaches are precipitated by anxiety and stress with muscle contraction and spasm also a causative factor.

The muscles involved are common to both bruxism and tension-type headaches namely the muscles of mastication and related cervical muscles.

It is therefore feasible to investigate whether the simultaneous treatment of bruxism (through the use of a bite guard, also known as an occlusional splint) and tension-type headaches (with spinal manipulative therapy of the cervical spine) will prove to have better results in terms of subjective and objective findings, as compared to spinal manipulative therapy alone for the treatment of tension-type headaches.

# **CHAPTER THREE**

**THE DATA, THEIR TREATMENT  
AND THEIR INTERPRETATION**

## **CHAPTER THREE**

### **3 THE DATA, THEIR TREATMENT AND THEIR INTERPRITATION**

#### **3.1 INTRODUCTION**

This is an outline of the procedures followed in the execution of this dissertation with respect to the following:

- study design and protocol
- measurements and observations
- statistical analysis

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

##### **3.2.1 Objectives of the study**

The object of this study was to determine the effectiveness of each respective treatment method in terms of the objective and subjective measurements. The study would attempt to ascertain whether there existed a more effective treatment method in the management of chronic tension-type headaches.

### **3.2.2 Recruiting of patients**

This study was a randomized comparative study in which 30 patients between the ages of 14 and 65 were recruited by means of advertisements placed at libraries, shopping centers and at Technikon natal.

On presentation at the Chiropractic Day Clinic a prospective patient was evaluated in terms of:

- a complete case history (appendix # 1 )
- a complete physical examination (appendix # 2 )
- a regional examination of the cervical spine (appendix # 3 )

On collation of this information it would be decided by the researcher if the patient was a chronic tension-type headache sufferer according to the diagnostic criteria set out by Raskin in chapter two.

The prospective patient was, at this stage, required to complete a screening questionnaire (appendix # 9 ) to establish the possible presence of habitual bruxism (Dr Beaumont, communication 2000). If the patient had a positive response to any of the questions set out in this questionnaire, habitual bruxism was suspected. An appointment was then made with Dr Beaumont B.D.S, M.Dent. M.F.O.S. (Witwatersrand) a Maxillo Facial and Oral surgeon who then confirmed the diagnosis of bruxism.

The method by which Dr Beaumont (communication, 2000) diagnosed the potential patients, was as follows:

- examination of facial musculature for hypertrophy
- examination of head and neck posture
- temporomandibular joint (TMJ) examination for functional clicks, crepitations, delayed translation or pain



- patient history of stress and anxiety, and previous dental treatments
- examination of a plaster cast, study models made from alginate impressions taken from all 30 patients. These study models enable examination of excessive abrasive facets on tooth surfaces.

The alginate impressions of the patient's maxillary arch's were made by Dr Beaumont. These impressions were then delivered within 24 hrs (to avoid distortion through dehydration) to Natal Technikon Dental Technology department who then prepared the plaster cast study models for examination by Dr Beaumont. Dr Beaumont then confirmed his diagnosis after examination of these models.

### **3.2.3 Inclusion and exclusion criteria**

1. Only those patients diagnosed as suffering from chronic, tension-type headaches according to the Headache Classification Committee of the International Headache Society (Raskin, 1998:215), and who presented with no additional pathology contraindicating spinal manipulative therapy were accepted into the study. Patients who had other conditions as well as tension-type headaches were accepted, however only the tension-type headaches were treated.
2. Patients younger than 14 years of age or older than 65 years of age were excluded from the study. Patients older than 65 years of age were excluded due to the likelihood of phase 3 degeneration (Kirkaldy-Willis, 1992:111) being present in their lumbar and cervical spines.
3. Patients presenting with hard neurological signs were excluded from the study.

4. Patients presenting with any illness that may affect, perpetuate or cause their headaches, were excluded. For example, influenza, sinusitis (Crompton and McHardy 1993:354), raised intracranial pressure, meningitis or elevated blood pressure (Cull and Will, 1993:846,849).
5. Patients presenting with evidence of vascular insufficiency of the neck or cranial structures were excluded from the study.
6. Patients were asked to refrain from the use of muscle relaxants, anti-inflammatories and/or analgesic medication that may influence the results of the study. Patients were to refrain from receiving manual therapy to the cervical and thoracic spine for the duration of the study so as not to influence the results of the study.
7. Only those patients diagnosed with nocturnal bruxism, as defined by Dr Eric Beaumont (Communication 2000), were accepted into the study.

#### **3.2.4 Assumptions**

1. It is assumed that chronic tension-type headaches are a recognizable pathological entity.
2. It is assumed that participants do indeed have chronic tension-type headaches based on the diagnostic criteria.
3. It is assumed that spinal manipulative therapy is beneficial in the management of chronic tension-type headaches.
4. It is assumed that the bite guard does reduce nocturnal bruxism.

5. It is assumed that relief from tension-type headaches will be due to the treatment intervention given during the course of this study.
6. It is assumed that samples are representative of the population which is normally distributed.
7. It is assumed that the variance of all the groups is homogeneous.
8. It is assumed that patients were compliant in terms of the treatment protocol set out in the study.

### **3.2.5 Allocation of patients**

Once the patients were admitted to the study, they were then allocated into one of two groups, either the test group or the control group. This was achieved through convenience sampling and all 30 patients were randomly assigned to each group.

The random allocation of patients took place as follows: A box was filled with 30 pieces of paper, on each was printed the letter X or Y. As a patient was accepted into the study, they were required to draw a piece of paper from the box. If the letter X appeared on the paper, that patient would form part of the test group, however, if the letter Y appeared on the paper that patient would form part of the control group.

### **3.3 MEASUREMENTS AND OBSERVATIONS**

#### **3.3.1 The Data**

The data required in this study consists of two types, namely primary and secondary data.

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

The primary data, consisting of both subjective and objective data, was obtained directly from the patients using the following communicated and observed methods.

The following methods make up the subjective data:

- CMCC Neck Disability Index
- Short Form McGill Pain Questionnaire
- The Numerical Pain Rating Scale 101
- The Headache Diary

The following method makes up the objective data:

- Cervical Range of Motion Goniometer

##### **THE SECONDARY DATA**

The secondary data was obtained from current literature involving chiropractic, tension-type headaches and bruxism.

### **3.3.2 Methods of measurement**

#### **SUBJECTIVE DATA**

\* The CMCC Neck Disability Index (appendix # 4):

The purpose of this questionnaire was to indicate to the researcher how neck pain affects the patients ability to cope with everyday activities. There are 10 questions, each question scores a minimum of 0 and a maximum of 5 points, making a maximum accumulated total of 50.

The CMCC Neck Disability Index has been found to have a high degree of reliability and consistency. The questionnaire has also shown acuteness to changes in disability and severity throughout the period of treatment (Vernon and Mior, 1991:409).

Vernon and Mior (1991:409), have found that the questionnaire is applicable to a wide age range, does not seem to be effected by gender, and has an adequate level of validity.

\* The Short-Form McGill Pain Questionnaire (appendix # 5):

The purpose of this questionnaire was to depict the sensory aspect of the pain experienced. The questionnaire consists of 15 descriptive words, each of which are ranked according to an intensity scale: 0=none, 1=mild, 2=moderate, 3=sever (Melzack, 1975).

\* The Numerical Pain Rating Scale 101 (appendix # 6):

This questionnaire was used to indicate by means of percentages the intensity of the pain experienced before treatment, when the pain is at its worst, and when it is at its least. An average between these two was used to produce an indication of the pain intensity experienced.

It has been confirmed by Jensen *et al.* (1992) that the Numerical Pain Rating Scale 101 has more practical advantages over other procedures, as it was simple to score, can be dealt with in a written or verbal form, and does not seem to be associated with age.

\* The Headache Diary (appendix # 8):

The headache diary was used to determine the frequency, duration and intensity of the headaches over the three week treatment period.

## OBJECTIVE DATA

\* Cervical Range of Motion (appendix # 7):

The CROM, or cervical range of motion instrument manufactured by Performance Attainment Associates, was used to measure neck motion. Ranges of motion utilized were flexion, extension, lateral flexion to the left and right, rotation to the right and left. The ranges of motion were measured in degrees.

A study was carried out by Youdas *et al.* (1991:81) to ascertain the reliability of the CROM instrument as compared to two other similar instruments. The CROM instrument demonstrated the highest degree of reliability. It was also observed that the instrument had a good inter-examiner reliability, and did not aggravate the subjects pain while being used.

### **3.3.3 Admissibility of the data**

Only data obtained from the CMCC Neck Disability Index, the Short-form McGill Pain questionnaire, the Numerical Pain Rating Scale and the Headache Diary, that were correctly completed under supervision were used.

Only data collected, with the use of the cervical range of motion instrument, by the researcher were used in the study.

Data used, was only the data taken from subjects that were admitted into the study. Both groups completed the same data and received the same CROM measurements. All that differed was the manner of treatment.

### **3.4 INTERVENTIONS**

#### **3.4.1 Interventions for the Control Group**

Those 15 patients that were selected for control group received spinal manipulative therapy of any fixated segments found in the cervical or thoracic spine by means of motion palpation (Schafer and Faye 1989:100-109).

#### **3.4.2 Interventions for the Test Group**

Those 15 patients that were selected for the test group received spinal manipulative therapy of any fixated segments found. As well as the manipulative therapy, these patients were required to wear a bit guard while sleeping over the treatment period.

The treatment period lasted for three weeks, during which time, each patient had 9 treatment visits. At the first treatment visit each patient was required to complete an informed consent form before any treatment was administered (appendix # 10).

The patients of both the test group and the control group were also required at each treatment visit to complete the CMCC Neck Disability Index, Short-form McGill Pain questionnaire and the Numerical Pain Rating Scale 101, under the researchers supervision. Following the completion of the questionnaires the patients had their cervical range of motion measured by the researcher. This procedure took place at each treatment visit, prior to treatment. The patients from both groups where also required to complete the headache diary at the end of each day, during the treatment period.

The manipulation or adjustment techniques used were those outlined by the diversified method of adjusting (Szaraz,1984), and all adjustments where administered by the researcher.



The adjustments used were as follows:

- occipital rotation – mastoid contact (Szaraz, 1984:2.7)
- occipital lateral flexion – mastoid contact (Szaraz, 1984: 2.9)
- rotatory cervical – index contact (Szaraz, 1984: 2.19)
- supine lateral break (Szaraz, 1984:2.20)
- thumb move (Szaraz, 1984: 4.1)
- combination (Szaraz, 1984: 4.2)
- hypo-thenar lateral spinous (Szaraz, 1984: 6.1)
- crossed bilateral (Szaraz, 1984: 6.4)
- anterior thoracic (Szaraz, 1984: 6.8)

Selection of the technique used was based on the spinal level treated, direction of the fixation, patient build and comfort.

The bite guard used by the test group patients was obtained in the following manner: An alginate impression of the patient's maxillary arch was made by Dr Beaumont during the patient's diagnostic visit, as stated previously. This alginate impression was then delivered to Technikon Natal Dental department where the impression was filled with a suitable gypsum product (preferably die stone). When the stone was adequately set the cast was withdrawn from the impression. Any excess stone was trimmed on a model trimmer to the depth of the vestibule.

It was at this stage that all 30 casts from all 30 potential patients were given to Dr Beaumont, for examination of excessive abrasive facets on the tooth surfaces, and final diagnosis. The 15 casts from those 15 patients falling into the test group were retained for the bite guard / appliance to be made.

The bite guard was then made from a 2mm thick clear resin sheet, which was adapted to the cast with the use of a pressure or vacuum adapter. The outline of the

appliance was then cut off the cast with a separating disk. The cut was made at the level of the interdental papilla on the buccal and labial surfaces of the teeth. The posterior palatal area was cut with the separating disk along a straight line connecting the distal aspects of each second molar. The resin bite appliance was then removed from the stone cast and any excess resin in the palatal area was trimmed away with a lathe, with a hard rubber wheel (Okeson, 1993:467).

The resulting product, was a 2mm thick, clear, bite guard / appliance that was to be worn by the test patient at night during sleep, with the proposed outcome of reducing nocturnal bruxism, via the mechanisms outlined in Chapter two. This appliance was made and ready for the patient at the first treatment visit.

### **3.5 STATISTICAL ANALYSIS**

#### **3.5.1 Treatment of the data**

The data obtained was treated using the following statistical methods:

- The Non Parametric Un-paired Hypothesis tests i.e. The Mann –Whitney U test to compare data within the groups (intra- group comparison).
- The Non Parametric Paired Hypothesis test i.e. The Wilcoxon’s Signed Rank test to compare data between the groups (inter- group comparison).
- Summary statistics.

#### **THE MANN-WHITNEY U TEST**

The Non Parametric Un-Paired Hypothesis test i.e. The Mann-Whitney U test will determine if there was a significant improvement within the individual groups. The data from the CMCC Neck Disability Index, the Short Form McGill Pain Questionnaire, the Numerical Pain Rating Scale and the Cervical Range of Motion Instrument was collated as follows:

- the 1<sup>st</sup> treatment was compared with the 5<sup>th</sup> treatment
- the 1<sup>st</sup> treatment was compared with the 9<sup>th</sup> (final) treatment
- the 5<sup>th</sup> treatment was compared with the 9<sup>th</sup> (final) treatment

The data from the Control group and the Test group were dealt with in the same manner i.e.

1<sup>st</sup> Treatment ----- 5<sup>th</sup> Treatment

1<sup>st</sup> Treatment ----- 9<sup>th</sup> Treatment

5<sup>th</sup> Treatment ----- 9<sup>th</sup> Treatment

The figures were compared to determine standard deviation and level of significance.

Data from the Headache diary was collated and compared in the following manner, for both the test and the control group, with respect to three variables, namely the number of headaches experienced, the average intensity and the average duration of the headaches:

- An average of the treatment results for week 1 was compared to the average treatment results for week 2.
- An average of the treatment results for week 1 was compared to the average treatment results for week 3.
- An average of the treatment results for week 2 was compared to the average treatment results for week 3.

These figures were compared to determine standard deviation and level of significance.

## THE WILCOXON'S SIGNED RANK TEST

All subjective and objective data , collected and assessed using the Non Parametric Paired Hypothesis test i.e. The Wilcoxon's Signed Rank test, will determine if there was a significant difference between the two groups at the end of the first, fifth and finale treatments.

The data compared from the CMCC Neck Disability Index, the Short Form McGill Pain Questionnaire, the Numerical Pain Rating Scale and the Cervical Range of Motion Instrument, was collated in the following manner:

- the 1<sup>st</sup> treatment from the control group compared to the 1<sup>st</sup> treatment from the test group.
- The 5<sup>th</sup> treatment from the control group compared to the 5<sup>th</sup> treatment from the test group.
- The 9<sup>th</sup> treatment from the control group compared to the 9<sup>th</sup> treatment from the test group.

i.e.:

CONTROL GROUP Tx 1 -----	TEST GROUP Tx 1
CONTROL GROUP Tx 5 -----	TEST GROUP Tx 5
CONTROL GROUP Tx 9 -----	TEST GROUP Tx 9

The figures were compared to determine standard deviation and level of significance.

Data from the headache diary was collated in the following manner, with respect to the above mentioned variables:

- An average of the 1<sup>st</sup> week's results from the control group were compared with an average of the 1<sup>st</sup> weeks results from the test group.
- An average of the 2<sup>nd</sup> week's results from the control group were compared with an average of the 2<sup>nd</sup> weeks results from the test group.
- An average of the 3<sup>rd</sup> week's results from the control group were compared with an average of the 3<sup>rd</sup> weeks results from the test group.

i.e.

CONTROL GROUP AVE. WK1 ----- TEST GROUP AVE. WK 1

CONTROL GROUP AVE. WK2 ----- TEST GROUP AVE. WK 2

CONTROL GROUP AVE. WK3 ----- TEST GROUP AVE. WK 3

All the data was compared to determine the standard deviation and the level of significance.

### **3.5.2 Statistical analysis of the data**

The subjective data comprising of the CMCC Neck Disability Index, the Short Form McGill Pain Questionnaire, the Numerical Pain Rating Scale and the Headache Diary as well as the objective data comprising of the Cervical range of motion readings was collated and analyzed in the following manner:

#### **THE MANN-WHITNEY TEST:**

With the use of statistical methods via SPSS computer program, the data was analyzed using the Non Parametric Unpaired Hypothesis test i.e. The Mann-Whitney U test. This was used in order to ascertain whether or not a significant difference existed within each of the two groups.

The null hypothesis stated that there was no improvement within each of the groups with respect to the variable of comparison at the  $\alpha = 0.05$  level of significance.

The alternative hypothesis stated that there was an improvement within the treatment groups at the same level of significance.

#### **Decision rule:**

The null hypothesis was rejected at the alpha level of significance if  $p \text{ value} < \alpha$ , where  $p$  was the observed significance level or probability value. Otherwise the null hypothesis was accepted.

## **THE WILCOXON'S SIGNED RANK TEST:**

The non Parametric Paired Hypothesis test i.e. The Wilcoxon's Signed Rank test was used to determine whether a significant difference existed between the control and the test groups.

In each test, the null hypothesis stated that there was no improvement between the two related samples being compared, at the  $\alpha = 0.05$  level of significance.

The alternative hypothesis stated that there was an improvement at the same level of significance.

### **Decision rule:**

The null hypothesis was rejected at the alpha level of significance if  $p \text{ value} < \alpha$ , where  $p$  was the observed significance level or probability value. Otherwise, the null hypothesis was accepted at the same level.

Summary statistics were utilized to determine means between groups.

### **3.5.3 General information**

This dissertation was completed using the following software programs:

- \* Microsoft office '97 - Microsoft Word  
-Microsoft Excel
- \* SPSS statistical program



# **CHAPTER**

# **FOUR**

## **THE RESULTS**

## **CHAPTER FOUR**

### **4 THE RESULTS**

#### **4.1 INTRODUCTION**

The statistical findings of this study are presented in this chapter.

This study consisted of a sample size of 30 patients: 15 patients fell into the Control Group “C” (receiving spinal manipulative therapy only), and the remaining 15 patients fell into the Test group “T” (they received spinal manipulative therapy as well as having to wear a bite guard during sleep).

The data was analyzed at a 95% confidence level ( $p < 0.05$ ).

This chapter will represent the data and attempt to analyze the data in tabular form in order to accept or reject the relevant hypothesis.

Intra and inter-treatment results were analyzed for both groups.

## 4.2 DEMOGRAPHIC DATA RELATING TO AGE AND GENDER

### 4.2.1 Age and Gender of Patients

Table 4.1: The age distribution of the patients

AGE CATEGORY (YEARS)	PERCENTAGE OF PATIENTS IN EACH AGE CATEGORY
10 – 19	3.3%
20 – 29	50%
30 – 39	13.3%
40 – 49	13.3%
50 – 59	16.7%
60 – 69	3.3%

Table 4.2: Gender distribution of patients:

MALE	FEMALE
10	20

### 4.3 THE NON PARAMETRIC UN-PAIRED HYPOTHESIS TESTS : THE MANN-WHITNEY U TEST

#### 4.3.1 The results of the CMCC Neck Disability Index

**KEY:** 1<sup>st</sup> Tx = the first treatment

5<sup>th</sup> Tx = the fifth treatment

9<sup>th</sup> Tx = the ninth and final treatment

**p-value** = the observed significance level or probability value

**(S)** = a statistically significant difference

TABLE 4.3: The intra group treatment data readings of the CMCC Neck Disability Index for the control and the test group.

TREATMENT COMPARISON		CONTROL GROUP	TEST GROUP
1 <sup>st</sup> Tx → 9 <sup>th</sup> final Tx	1 <sup>st</sup> Tx Mean Rank	18.80	19.53
	9 <sup>th</sup> Tx Mean Rank	12.20	11.47
	P – VALUE	<b>0.039 (S)</b>	<b>0.012 (S)</b>
1 <sup>st</sup> Tx → 5 <sup>th</sup> Tx	1 <sup>st</sup> Tx Mean Rank	18.70	17.93
	5 <sup>th</sup> Tx Mean Rank	12.30	13.07
	P – VALUE	<b>0.045 (S)</b>	<b>0.127</b>
5 <sup>th</sup> Tx → 9 <sup>th</sup> final Tx	5 <sup>th</sup> Tx Mean Rank	15.43	17.10
	9 <sup>th</sup> Tx Mean Rank	15.57	13.90
	P – VALUE	<b>0.966</b>	<b>0.317</b>

In the control group, when comparing the 1<sup>st</sup> and final treatment as well as the 1<sup>st</sup> and 5<sup>th</sup> treatment, the null hypothesis is rejected and we accept the alternate hypothesis. This indicates that at the  $\alpha = 0.05$  level of significance, there was a significant improvement within the control group when comparing the above treatments.

However the null hypothesis was accepted when comparing the 5<sup>th</sup> and final treatments. At an  $\alpha = 0.05$  level of significance there was no significant difference between the 5<sup>th</sup> and the last treatment.

In the test group, the null hypothesis is rejected when comparing the 1<sup>st</sup> and the final treatments. At a 0.05 level of significance there was a statistically significant improvement between these two treatments. However the null hypothesis was accepted in the last two instances when comparing the 1<sup>st</sup> and 5<sup>th</sup> treatments, and the 5<sup>th</sup> and final treatments. At the same level of significance the data showed there to be no statistical difference between these treatments.

The CMCC Neck Disability Index was used to indicate how neck pain and headaches affect the patient's ability to cope with everyday activities.

#### 4.3.2 The results of the Short Form McGill Pain Questionnaire

**KEY:** 1<sup>st</sup> Tx = the first treatment

5<sup>th</sup> Tx = the fifth treatment

9<sup>th</sup> Tx = the ninth and final treatment

**p-value** = the observed significance level or probability value

**(S)** = a statistically significant difference

TABLE 4.4: The intra group treatment data readings of the McGill Short Form Pain Questionnaire for the control and the test group.

<b>TREATMENT COMPARISON</b>		<b>CONTROL GROUP</b>	<b>TEST GROUP</b>
1 <sup>st</sup> Tx → 9 <sup>th</sup> final Tx	1 <sup>st</sup> Tx Mean Rank	18.40	19.13
	9 <sup>th</sup> Tx Mean Rank	11.36	10.57
	<b>P – VALUE</b>	<b>0.026 (S)</b>	<b>0.006 (S)</b>
1 <sup>st</sup> Tx → 5 <sup>th</sup> Tx	1 <sup>st</sup> Tx Mean Rank	19.47	17.73
	5 <sup>th</sup> Tx Mean Rank	11.53	16.67
	<b>P – VALUE</b>	<b>0.013 (S)</b>	<b>0.174</b>
5 <sup>th</sup> Tx → 9 <sup>th</sup> final Tx	5 <sup>th</sup> Tx Mean Rank	14.03	17.13
	9 <sup>th</sup> Tx Mean Rank	16.04	12.71
	<b>P – VALUE</b>	<b>0.523</b>	<b>0.158</b>

In the control group, the null hypothesis is rejected with respect to the comparison between the 1<sup>st</sup> and the final treatment, and the 1<sup>st</sup> and the 5<sup>th</sup> treatments. The alternate hypothesis was therefore accepted at  $\alpha = 0.05$  level of significance, indicating that there

was a significant improvement when comparing the data from the above treatment periods.

The null hypothesis was accepted when comparing the 5<sup>th</sup> and the final treatment, as there was no significant difference between the two treatments at the  $\alpha = 0.05$  level of significance.

In the test group the null hypothesis was rejected when comparing the 1<sup>st</sup> and the final treatments as there was a significant improvement noted at the  $\alpha = 0.05$  level of significance.

The null hypothesis was accepted in the final two comparisons, namely the 1<sup>st</sup> and the 5<sup>th</sup> treatments, and the 5<sup>th</sup> and final treatments. No significant statistical difference was noted at the  $\alpha = 0.05$  level of significance, for the above mentioned treatments.

### 4.3.3 The results of the Numerical Pain Rating Scale 101

**KEY:** 1<sup>st</sup> Tx = the first treatment

5<sup>th</sup> Tx = the fifth treatment

9<sup>th</sup> Tx = the ninth and final treatment

**p-value** = the observed significance level or probability value

**(S)** = a statistically significant difference

TABLE: 4.5: The intra group treatment data readings of the Numerical Pain Rating Scale for the control and the test group.

<b>TREATMENT COMPARISON</b>		<b>CONTROL GROUP</b>	<b>TEST GROUP</b>
1 <sup>st</sup> Tx → 9 <sup>th</sup> final Tx	1 <sup>st</sup> Tx Mean Rank	17.37	17.77
	9 <sup>th</sup> Tx Mean Rank	13.63	13.23
	<b>P – VALUE</b>	<b>0.250</b>	<b>0.161</b>
1 <sup>st</sup> Tx → 5 <sup>th</sup> Tx	1 <sup>st</sup> Tx Mean Rank	16.67	15.67
	5 <sup>th</sup> Tx Mean Rank	14.33	15.33
	<b>P – VALUE</b>	<b>0.486</b>	<b>0.935</b>
5 <sup>th</sup> Tx → 9 <sup>th</sup> final Tx	5 <sup>th</sup> Tx Mean Rank	16.13	17.50
	9 <sup>th</sup> Tx Mean Rank	14.87	13.50
	<b>P – VALUE</b>	<b>0.713</b>	<b>0.217</b>

In both the control group and the test group, the null hypothesis was accepted at the  $\alpha = 0.05$  level of significance. There was no statistically significant difference when comparing the treatments for either the control or the test group.



#### 4.3.4 The results of the Cervical Range of Motion Instrument.

**KEY:** 1<sup>st</sup> Tx = the first treatment

5<sup>th</sup> Tx = the fifth treatment

9<sup>th</sup> Tx = the ninth and final treatment

**p-value** = the observed significance level or probability value

**(S)** = a statistically significant difference

**CROM** = Cervical Range Of Motion Instrument

TABLE 4.6: The intra group data readings of the Cervical Range Of Motion Instrument for the control and the test group - Extension

#### **CROM - EXTENSION**

<b>TREATMENT COMPARISON</b>		<b>CONTROL GROUP</b>	<b>TEST GROUP</b>
1 <sup>st</sup> Tx → 9 <sup>th</sup> final Tx	1 <sup>st</sup> Tx Mean Rank	14.23	13.67
	9 <sup>th</sup> Tx Mean Rank	16.77	17.33
	<b>P – VALUE</b>	<b>0.424</b>	<b>0.240</b>
1 <sup>st</sup> Tx → 5 <sup>th</sup> Tx	1 <sup>st</sup> Tx Mean Rank	14.53	14.20
	5 <sup>th</sup> Tx Mean Rank	16.47	16.80
	<b>P – VALUE</b>	<b>0.539</b>	<b>0.404</b>
5 <sup>th</sup> Tx → 9 <sup>th</sup> final Tx	5 <sup>th</sup> Tx Mean Rank	15.07	14.77
	9 <sup>th</sup> Tx Mean Rank	15.93	16.23
	<b>P – VALUE</b>	<b>0.784</b>	<b>0.635</b>

In both the control group and the test group, the null hypothesis was accepted, as there was no significant statistical difference at the  $\alpha = 0.05$  level of significance when comparing the intra group data.

TABLE 4.7: The intra group data readings of the Cervical Range Of Motion Instrument for the control and the test group - Flexion

**CROM - FLEXION**

<b>TREATMENT COMPARISON</b>		<b>CONTROL GROUP</b>	<b>TEST GROUP</b>
1 <sup>st</sup> Tx → 9 <sup>th</sup> final Tx	1 <sup>st</sup> Tx Mean Rank	15.83	15.33
	9 <sup>th</sup> Tx Mean Rank	15.17	15.67
	<b>P – VALUE</b>	<b>0.818</b>	<b>0.915</b>
1 <sup>st</sup> Tx → 5 <sup>th</sup> Tx	1 <sup>st</sup> Tx Mean Rank	13.80	15.33
	5 <sup>th</sup> Tx Mean Rank	17.20	15.67
	<b>P – VALUE</b>	<b>0.241</b>	<b>0.914</b>
5 <sup>th</sup> Tx → 9 <sup>th</sup> final Tx	5 <sup>th</sup> Tx Mean Rank	17.30	15.50
	9 <sup>th</sup> Tx Mean Rank	13.70	15.50
	<b>P – VALUE</b>	<b>0.235</b>	<b>1.000</b>

The null hypothesis was accepted for all the compared treatments both from the control group and the test group, as there was no significant difference noted between the data at the  $\alpha = 0.05$  level of significance.

TABLE 4.8: The intra group data readings of the Cervical Range Of Motion Instrument for the control and the test group – left lateral flexion

**CROM – LEFT LATERAL FLEXION**

<b>TREATMENT COMPARISON</b>		<b>CONTROL GROUP</b>	<b>TEST GROUP</b>
1 <sup>st</sup> Tx→9 <sup>th</sup> final Tx	1 <sup>st</sup> Tx Mean Rank	12.93	13.73
	9 <sup>th</sup> Tx Mean Rank	18.07	17.27
	<b>P – VALUE</b>	<b>0.100</b>	<b>0.263</b>
1 <sup>st</sup> Tx → 5 <sup>th</sup> Tx	1 <sup>st</sup> Tx Mean Rank	12.73	15.07
	5 <sup>th</sup> Tx Mean Rank	18.27	15.93
	<b>P – VALUE</b>	<b>0.073</b>	<b>0.779</b>
5 <sup>th</sup> Tx→9 <sup>th</sup> final Tx	5 <sup>th</sup> Tx Mean Rank	15.47	14.37
	9 <sup>th</sup> Tx Mean Rank	15.53	16.63
	<b>P – VALUE</b>	<b>0.983</b>	<b>0.475</b>

The null hypothesis was accepted for all the compared treatments both from the control group and the test group, as there was no significant difference noted between the data at the  $\alpha = 0.05$  level of significance.

TABLE 4.9: The intra group data readings of the Cervical Range Of Motion Instrument for the control and the test group – right lateral flexion

**CROM – RIGHT LATERAL FLEXION**

<b>TREATMENT COMPARISON</b>		<b>CONTROL GROUP</b>	<b>TEST GROUP</b>
1 <sup>st</sup> Tx→9 <sup>th</sup> final Tx	1 <sup>st</sup> Tx Mean Rank	15.17	13.47
	9 <sup>th</sup> Tx Mean Rank	15.83	17.53
	<b>P – VALUE</b>	<b>0.833</b>	<b>0.191</b>
1 <sup>st</sup> Tx → 5 <sup>th</sup> Tx	1 <sup>st</sup> Tx Mean Rank	14.57	14.77
	5 <sup>th</sup> Tx Mean Rank	16.43	16.23
	<b>P – VALUE</b>	<b>0.555</b>	<b>0.638</b>
5 <sup>th</sup> Tx→9 <sup>th</sup> final Tx	5 <sup>th</sup> Tx Mean Rank	16.67	14.13
	9 <sup>th</sup> Tx Mean Rank	14.33	16.87
	<b>P – VALUE</b>	<b>0.456</b>	<b>0.379</b>

The null hypothesis was accepted for all the compared treatments, both from the control group and the test group, as there was no significant difference noted between the data at the  $\alpha = 0.05$  level of significance.

TABLE 4.10: The intra group data readings of the Cervical Range Of Motion Instrument  
for the control and the test group – left rotation

**CROM – LEFT ROTATION**

<b>TREATMENT COMPARISON</b>		<b>CONTROL GROUP</b>	<b>TEST GROUP</b>
1 <sup>st</sup> Tx→9 <sup>th</sup> final Tx	1 <sup>st</sup> Tx Mean Rank	8.30	9.50
	9 <sup>th</sup> Tx Mean Rank	22.70	21.50
	<b>P – VALUE</b>	<b>0.000 (S)</b>	<b>0.000 (S)</b>
1 <sup>st</sup> Tx → 5 <sup>th</sup> Tx	1 <sup>st</sup> Tx Mean Rank	8.63	11.50
	5 <sup>th</sup> Tx Mean Rank	22.37	19.50
	<b>P – VALUE</b>	<b>0.000 (S)</b>	<b>0.007 (S)</b>
5 <sup>th</sup> Tx→9 <sup>th</sup> final Tx	5 <sup>th</sup> Tx Mean Rank	13.93	11.87
	9 <sup>th</sup> Tx Mean Rank	17.07	19.13
	<b>P – VALUE</b>	<b>0.295</b>	<b>0.012 (S)</b>

In the control group the null hypothesis was rejected when comparing the 1<sup>st</sup> and final treatments, and the 1<sup>st</sup> and 5<sup>th</sup> treatments. The data shows a significant statistical improvement in left rotation at the 0.05 level of significance. However the null hypothesis was accepted when comparing the 5<sup>th</sup> and final treatments, as there was no statistical difference between the treatments at the above level of significance.

In the test group the null hypothesis was rejected and the alternative hypothesis accepted for all three treatment comparisons, as there was a significant statistical improvement at the  $\alpha = 0.05$  level of significance.

TABLE 4.11: The intra group data readings of the Cervical Range Of Motion Instrument for the control and the test group – right rotation

**CROM – RIGHT ROTATION**

<b>TREATMENT COMPARISON</b>		<b>CONTROL GROUP</b>	<b>TEST GROUP</b>
1 <sup>st</sup> Tx→9 <sup>th</sup> final Tx	1 <sup>st</sup> Tx Mean Rank	13.17	11.80
	9 <sup>th</sup> Tx Mean Rank	17.83	19.20
	<b>P – VALUE</b>	<b>0.124</b>	<b>0.018 (S)</b>
1 <sup>st</sup> Tx → 5 <sup>th</sup> Tx	1 <sup>st</sup> Tx Mean Rank	14.17	15.07
	5 <sup>th</sup> Tx Mean Rank	16.83	15.93
	<b>P – VALUE</b>	<b>0.385</b>	<b>0.783</b>
5 <sup>th</sup> Tx→9 <sup>th</sup> final Tx	5 <sup>th</sup> Tx Mean Rank	14.50	11.87
	9 <sup>th</sup> Tx Mean Rank	16.50	19.13
	<b>P – VALUE</b>	<b>0.505</b>	<b>0.018 (S)</b>

In the control group, the null hypothesis was accepted for all three treatment comparisons, as there was no statistical difference noted at the  $\alpha = 0.05$  level of significance.

In the test group, when comparing the 1<sup>st</sup> and final treatments and the 5<sup>th</sup> and final treatments the null hypothesis was rejected as there was a significant statistical difference between these treatments. However when comparing the 1<sup>st</sup> and 5<sup>th</sup> treatments the null hypothesis had to be accepted as there was no statistical difference noted at the  $\alpha = 0.05$  level of significance.

#### 4.3.5 The results of the Headache Diary

**KEY:** AVE. WK 1 = the average number of headaches experienced in week one

AVE. WK 2 = the average number of headaches experienced in week two

AVE. WK 3 = the average number of headaches experienced in week three

**p-value** = observed significance level or probability value

**(S)** = a statistically significant difference

TABLE 4.12: The intra group data readings for the Headache Diary, in terms of the average number of headaches experienced, for the control and test group.

#### **AVERAGE NUMBER OF HEADACHES**

<b>TREATMENT COMPARISON</b>		<b>CONTROL GROUP</b>	<b>TEST GROUP</b>
<b>AVE. WK 1 → AVE. WK 2</b>	1 <sup>st</sup> wk Mean Rank	16.30	19.53
	2 <sup>nd</sup> wk Mean Rank	14.70	13.47
	<b>P – VALUE</b>	<b>0.605</b>	<b>0.054 (S)</b>
<b>AVE. WK 1 → AVE. WK 3</b>	1 <sup>st</sup> wk Mean Rank	20.37	21.88
	3 <sup>rd</sup> wk Mean Rank	10.63	11.13
	<b>P – VALUE</b>	<b>0.001 (S)</b>	<b>0.001 (S)</b>
<b>AVE. WK 2 → AVE. WK 3</b>	2 <sup>nd</sup> wk Mean Rank	18.83	19.44
	3 <sup>rd</sup> wk Mean Rank	12.17	13.56
	<b>P – VALUE</b>	<b>0.031 (S)</b>	<b>0.051 (S)</b>

When comparing the average number of headaches experienced in the control group per week, the null hypothesis is rejected when comparing the average of the 1<sup>st</sup> and 3<sup>rd</sup> weeks of treatment and the 2<sup>nd</sup> and 3<sup>rd</sup> weeks of treatment. The data shows a significant improvement between these weeks of treatment at the  $\alpha = 0.05$  level of significance.

However when comparing the 1<sup>st</sup> and 2<sup>nd</sup> weeks of treatment, the data shows no difference between the weeks of treatment at the same level of significance, and therefore the null hypothesis was accepted in this instance.

When comparing the average number of headaches experienced in the test group over the three-week treatment period, the null hypothesis was rejected for all three paired comparisons. The data shows a significant improvement in the number of headaches experienced over the three weeks of treatment at the  $\alpha = 0.05$  level of significance.

TABLE 4.13: The intra group data readings for the Headache Diary, in terms of the average duration of the headaches experienced, for the control and test group.

#### AVERAGE DURATION OF THE HEADACHES

TREATMENT COMPARISON		CONTROL GROUP	TEST GROUP
AVE. WK 1 → AVE. WK 2	1 <sup>st</sup> wk Mean Rank	18.47	19.81
	2 <sup>nd</sup> wk Mean Rank	12.53	13.19
	P – VALUE	<b>0.064</b>	<b>0.045 (S)</b>
AVE. WK 1 → AVE. WK 3	1 <sup>st</sup> wk Mean Rank	18.03	20.19
	3 <sup>rd</sup> wk Mean Rank	12.97	12.81
	P – VALUE	<b>0.114</b>	<b>0.026 (S)</b>
AVE. WK 2 → AVE. WK 3	2 <sup>nd</sup> wk Mean Rank	15.27	17.06
	3 <sup>rd</sup> wk Mean Rank	15.73	15.94
	P – VALUE	<b>0.884</b>	<b>0.733</b>



In the control group, the null hypothesis is accepted for all three of the paired comparisons. No difference was noted in the average duration of the headaches from week to week at the  $\alpha = 0.05$  level of significance.

In the test group, however, the null hypothesis was rejected when comparing the average of the 1<sup>st</sup> and 2<sup>nd</sup> week, as well as the 1<sup>st</sup> and last week of treatment. The alternative hypothesis was accepted, as a significant improvement was noted in the average duration of the headaches at the  $\alpha = 0.05$  level of significance.

The null hypothesis was accepted in the test group when comparing the 2<sup>nd</sup> and the 3<sup>rd</sup> week of treatment as no difference was noted at the same level of significance.

TABLE 4.14: The intra group data readings for the Headache Diary, in terms of the average intensity of the headaches experienced, for the control and test group.

#### AVERAGE INTENSITY OF THE HEADACHES

TREATMENT COMPARISON		CONTROL GROUP	TEST GROUP
AVE. WK 1 → AVE. WK 2	1 <sup>st</sup> wk Mean Rank	14.67	16.28
	2 <sup>nd</sup> wk Mean Rank	16.33	16.72
	P – VALUE	<b>0.599</b>	<b>0.893</b>
AVE. WK 1 → AVE. WK 3	1 <sup>st</sup> wk Mean Rank	16.77	20.31
	3 <sup>rd</sup> wk Mean Rank	14.23	12.69
	P – VALUE	<b>0.420</b>	<b>0.019 (S)</b>
AVE. WK 2 → AVE. WK 3	2 <sup>nd</sup> wk Mean Rank	16.90	19.88
	3 <sup>rd</sup> wk Mean Rank	14.10	13.13
	P – VALUE	<b>0.374</b>	<b>0.037 (S)</b>

In the control group, the null hypothesis is accepted for all three of the paired comparisons. No difference was noted in the average intensity of the headaches from week to week at the  $\alpha = 0.05$  level of significance.

In the test group, the null hypothesis was accepted when comparing the 1<sup>st</sup> and the 2<sup>nd</sup> week of treatment. No significant difference was noted in the intensity of the headaches at the  $\alpha = 0.05$  level of significance.

However, when comparing the 1<sup>st</sup> and 3<sup>rd</sup> week, as well as the 2<sup>nd</sup> and 3<sup>rd</sup> week of treatment the null hypothesis was rejected, as there is a significant improvement in the intensity of the headaches experienced over this period. The null hypothesis was rejected at the  $\alpha = 0.05$  level of significance.

#### 4.4 THE NON PARAMETRIC PAIRED HYPOTHESIS TEST: THE WILCOXON SIGNED RANK TEST

##### 4.4.1 The results of the CMCC Neck Disability Index

**KEY:** Tx = treatment

1,5 or 9= treatment number

C = for the control group

T = for the test group

(S) = statistically significant difference

**p-value** = probability value

TABLE 4.15: The inter group comparison of the CMCC Neck Disability Index for the control and the test group.

TREATMENT COMPATISONS	MEAN CONTROL	MEAN TEST	P – VALUE
Tx 1 C → Tx 1 T	9.2667	11.2000	<b>0.050 (S)</b>
Tx 5 C → Tx 5 T	6.0667	8.9333	<b>0.175</b>
Tx 9 C → Tx 9 T	5.9333	7.4667	<b>0.502</b>

When comparing the 1<sup>st</sup> treatment of the control group, with the 1<sup>st</sup> treatment of the test group, the null hypothesis is rejected as there is a statistically significant difference between the two groups at this stage of treatment. The null hypothesis was rejected at the  $\alpha = 0.05$  level of significance.

When comparing the inter group data from the 5<sup>th</sup> and final treatments of the respective groups, the null hypothesis was accepted as there was no statistical difference between the two groups at the above-mentioned level of significance.

#### 4.4.2 The results of the Short Form M McGill Pain Questionnaire

**KEY:** Tx = treatment

1,5 or 9= treatment number

C = for the control group

T = for the test group

(S) = statistically significant difference

p-value = probability value

TABLE 4.16: The inter group comparison of the Short Form McGill Pain Questionnaire for the control and the test group.

TREATMENT COMPATISONS	MEAN CONTROL	MEAN TEST	P – VALUE
Tx 1 C → Tx 1 T	8.4000	10.0667	<b>0.333</b>
Tx 5 C → Tx 5 T	4.0667	6.7333	<b>0.109</b>
Tx 9 C → Tx 9 T	4.7333	4.3333	<b>0.660</b>

When comparing the inter group data from the 1<sup>st</sup>, 5<sup>th</sup> and final treatments, the null hypothesis was accepted as there was no statistical difference between the two groups at the  $\alpha = 0.05$  level of significance.

#### 4.4.3 The results of the Numerical Pain Rating Scale 101

**KEY:** Tx = treatment

1,5 or 9= treatment number

C = for the control group

T = for the test group

(S) = statistically significant difference

p-value = probability value

TABLE 4.17: The inter group comparison of the Numerical Pain Rating Scale 101 for the control and the test group.

TREATMENT COMPATISONS	MEAN CONTROL	MEAN TEST	P – VALUE
Tx 1 C → Tx 1 T	43.8667	46.6667	0.442
Tx 5 C → Tx 5 T	40.8667	48.3333	0.163
Tx 9 C → Tx 9 T	39.5333	41.0000	0.900

When comparing the inter group data from the 1<sup>st</sup>, 5<sup>th</sup> and final treatments, the null hypothesis was accepted as there was no statistical difference between the two groups at the  $\alpha = 0.05$  level of significance.

#### 4.4.4 The results of the Cervical Range of Motion Instrument

**KEY:** Tx = treatment

1,5 or 9= treatment number

C = for the control group

T = for the test group

(S) = statistically significant difference

p-value = probability value

TABLE 4.18: The inter group comparisons of the Cervical Range of Motion Instrument  
for the control and the test group

#### **EXTENSION**

<b>TREATMENT COMPATISONS</b>	<b>MEAN CONTROL</b>	<b>MEAN TEST</b>	<b>P – VALUE</b>
<b>Tx 1 C → Tx 1 T</b>	63.8000	59.8667	<b>0.261</b>
<b>Tx 5 C → Tx 5 T</b>	66.6667	61.4667	<b>0.304</b>
<b>Tx 9 C → Tx 9 T</b>	67.5333	64.6667	<b>0.448</b>

#### **FLEXION**

<b>TREATMENT COMPATISONS</b>	<b>MEAN CONTROL</b>	<b>MEAN TEST</b>	<b>P – VALUE</b>
<b>Tx 1 C → Tx 1 T</b>	49.3333	51.4000	<b>0.449</b>
<b>Tx 5 C → Tx 5 T</b>	50.2000	51.3333	<b>0.475</b>
<b>Tx 9 C → Tx 9 T</b>	49.0000	51.2667	<b>0.176</b>

**LEFT LATERAL FLEXION**

<b>TREATMENT COMPATISONS</b>	<b>MEAN CONTROL</b>	<b>MEAN TEST</b>	<b>P – VALUE</b>
<b>Tx 1 C → Tx 1 T</b>	39.8000	41.9333	<b>0.621</b>
<b>Tx 5 C → Tx 5 T</b>	44.1333	43.1333	<b>0.724</b>
<b>Tx 9 C → Tx 9 T</b>	44.6000	45.0667	<b>0.608</b>

**RIGHT LATERAL FLEXION**

<b>TREATMENT COMPATISONS</b>	<b>MEAN CONTROL</b>	<b>MEAN TEST</b>	<b>P – VALUE</b>
<b>Tx 1 C → Tx 1 T</b>	41.3333	39.1333	<b>0.623</b>
<b>Tx 5 C → Tx 5 T</b>	42.1333	40.5333	<b>0.507</b>
<b>Tx 9 C → Tx 9 T</b>	42.0000	43.0000	<b>0.704</b>

**LEFT ROTATION**

<b>TREATMENT COMPATISONS</b>	<b>MEAN CONTROL</b>	<b>MEAN TEST</b>	<b>P – VALUE</b>
<b>Tx 1 C → Tx 1 T</b>	44.9000	63.0000	<b>0.001 (S)</b>
<b>Tx 5 C → Tx 5 T</b>	69.4667	68.0000	<b>0.402</b>
<b>Tx 9 C → Tx 9 T</b>	71.9333	71.6667	<b>0.813</b>

## RIGHT ROTATION

TREATMENT COMPATISONS	MEAN CONTROL	MEAN TEST	P – VALUE
Tx 1 C → Tx 1 T	69.1333	70.4333	<b>0.775</b>
Tx 5 C → Tx 5 T	70.4000	67.5333	<b>0.193</b>
Tx 9 C → Tx 9 T	71.7333	72.3333	<b>0.928</b>

When comparing all the inter group data the null hypothesis was accepted for all the comparisons except for left rotation. When comparing the 1<sup>st</sup> treatment from the control group and the 1<sup>st</sup> treatment from the test group, the null hypothesis was rejected as a significant difference was noted between the control and the test group, at the  $\alpha = 0.05$  level of significance.



#### 4.4.5 The results of the Headache Diary

**KEY:** AVE. WK 1 = the average number of headaches experienced in week one

AVE. WK 2 = the average number of headaches experienced in week two

AVE. WK 3 = the average number of headaches experienced in week three

C = the control group

T = the test group

**p-value** = observed significance level or probability value

**(S)** = a statistically significant difference

TABLE 4.19: The inter group data readings for the Headache Diary, in terms of the average number of headaches experienced, for the control group as compared to the test group.

#### NUMBER OF HEADACHES EXPERIENCED

TREATMENT COMPATISONS	MEAN CONTROL	MEAN TEST	P – VALUE
WK 1C→ WK 1T	2.6000	2.8125	<b>0.869</b>
WK 2C→ WK 2T	2.2000	1.8750	<b>0.256</b>
WK 3C→ WK 3T	1.3333	1.1250	<b>0.506</b>

When comparing the inter group data between the control and the test group, in terms of the number of headaches experienced, the null hypothesis was accepted as there was no difference noted between the two groups. The null hypothesis was rejected at the  $\alpha = 0.05$  level of significance.

TABLE 4.20: The inter group data readings for the Headache Diary, in terms of the average duration of the headaches experienced, for the control group as compared to the test group.

**AVERAGE DURATION OF THE HEADACHES EXPERIENCED**

<b>TREATMENT COMPATISONS</b>	<b>MEAN CONTROL</b>	<b>MEAN TEST</b>	<b>P – VALUE</b>
<b>WK 1C → WK 1T</b>	4.5267	6.2406	<b>0.320</b>
<b>WK 2C → WK 2T</b>	2.3700	3.6875	<b>0.394</b>
<b>WK 3C → WK 3T</b>	2.6967	3.1937	<b>0.637</b>

When comparing the average duration of the headaches experienced between the respective groups, the null hypothesis is accepted, as there is no significant difference in the duration of the headaches experienced by either the control or the test group. The null hypothesis was accepted at the  $\alpha = 0.05$  level of significance.

TABLE 4.21: The inter group data readings for the Headache Diary, in terms of the average intensity of the headaches experienced, for the control group as compared to the test group.

**AVERAGE INTENSITY OF THE HEADACHES EXPERIENCED**

<b>TREATMENT COMPATISONS</b>	<b>MEAN CONTROL</b>	<b>MEAN TEST</b>	<b>P – VALUE</b>
<b>WK 1C→ WK 1T</b>	2.9800	3.7594	<b>0.155</b>
<b>WK 2C→ WK 2T</b>	3.2667	3.8156	<b>0.393</b>
<b>WK 3C→ WK 3T</b>	2.7867	2.3125	<b>0.726</b>

When comparing the intensity of the headaches experienced between the control and the test group, the null hypothesis has to be accepted once again as there is no difference noted between the groups at the  $\alpha = 0.05$  level of significance.

# **CHAPTER**

# **FIVE**

## **DISCUSSION OF RESULTS**

## **CHAPTER FIVE**

### **5 DISCUSSION OF RESULTS**

#### **5.1 INTRODUCTION**

This chapter will discuss the results of the subjective and objective data presented in chapter four. The data will be discussed in the following manner:

1. Intra-group treatment comparison – The assessment of the intra-treatment results represent the efficacy of each treatment regime.
2. Inter-group treatment comparison – The appraisal of the 1<sup>st</sup> treatment measurements, will exhibit any variance in the subjective and objective findings between the two groups in terms of their original signs and symptoms. The comparison of the final treatments confirms which treatment protocol is more effective.

#### **5.2 THE INTRA-GROUP COMPARISONS**

##### **5.2.1 The Subjective Measurements**

###### **5.2.1.1 The CMCC Neck Disability Index**

Analysis of the data collated from the CMCC neck disability index is shown in table 4.3. This indicates an overall improvement in both the control and the test group in terms of a reduction in disability experienced by the patients.

On closer examination one can see that in the control group, which received only the spinal manipulative therapy, improvement was made in the initial treatments as indicated in the comparison between the 1<sup>st</sup> and 5<sup>th</sup> treatments where a statistically significant

difference is visible. However little to no improvement was made in the latter part of the treatment period, as demonstrated when comparing the 5<sup>th</sup> and 9<sup>th</sup> treatments, where no clinically significant difference exists between these treatments. When comparing the 1<sup>st</sup> and the final treatments, the overall improvement is shown, indicating that the improvement obtained initially (between the 1<sup>st</sup> and 5<sup>th</sup> treatments) was maintained throughout the treatment period.

In the test group, which received the spinal manipulative therapy as well as the nocturnal bite guard, improvement was also exhibited, however this improvement was gradual, over the three week treatment period. This can be seen due to the fact that there was no statistical improvement when comparing the 1<sup>st</sup> and 5<sup>th</sup> treatments and the 5<sup>th</sup> and final treatments, where as a clinically significant improvement is demonstrated when comparing the 1<sup>st</sup> and the final treatments.

#### 5.2.1.2 The Short Form McGill Pain Questionnaire

Statistical assessment of the treatment data from the Short Form McGill Pain Questionnaire, shown in table 4.4 depicts an improvement in both the control and the test group.

The Short Form McGill Pain Questionnaire was used to indicate the quality of the head-pain as perceived by the patient over the treatment period.

In the control group, improvement was noted in the initial stages of the treatment period, and this improvement was then maintained to the end of the treatment period. This is demonstrated in examination of the data, comparing the 1<sup>st</sup> and 5<sup>th</sup> treatments, where a clinically significant improvement is noted, and the 5<sup>th</sup> and 9<sup>th</sup> treatments where no improvement is demonstrated. However on comparison of the initial and finale treatments the improvement is noted.

In the test group, as demonstrated in the results from the CMCC Neck Disability Index, improvement in the patient's perception of the headaches took place over the entire treatment period. This is deduced from the fact that no statistical difference exists when comparing the 1<sup>st</sup> and 5<sup>th</sup>, and the 5<sup>th</sup> and 9<sup>th</sup> treatments, however the clinically significant improvement becomes apparent when comparing the 1<sup>st</sup> and finale treatments.

#### 5.2.1.3 The Numerical Pain Rating Scale 101

The Numerical Pain rating Scale was used to give an indication to the patient's perception of the intensity of the headaches experienced. Within the control and the test group there was a slight improvement within the respective groups, and more so within the test group, however these improvements where not substantial enough to warrant further discussion.

#### 5.2.1.4 The Headache Diary

The headache diary was used to give an indication of the frequency, duration and intensity of the chronic tension-type headaches experienced by the patients over the three week treatment period. This was achieved by the patients keeping a record from day to day of their experiences.

In table 4.12 the average number of headaches experienced by the patients appear. Here the daily results where averaged for each week and then compared.

On examination of the control group results, there was a clinically significant reduction in the average number of headaches experienced by the patients when comparing the results from the 1<sup>st</sup> week and the final week, as well as the 2<sup>nd</sup> and the final week of treatment.

This indicates that in the control group, the improvement was most marked towards the end of the treatment period, in terms of the frequency of headaches experienced.

On examination of the test group's results, a reduction in the number of headaches experienced is evident. This improvement developed consistently over the three week treatment period as is demonstrated by the clinically significant improvement evident in the tabulated data.

When looking at the average duration of the headaches experienced, no clinically significant improvements were noted in the control group. In the test group a marked reduction in the duration of the headaches is evident when comparing the 1<sup>st</sup> and the 3<sup>rd</sup> week, as well as the 1<sup>st</sup> and the 2<sup>nd</sup> week. These results indicate that the improvement was made in the initial part of the treatment period and maintained to the end of the treatment period.

Moving on to the intensity of the headaches, once again no improvement was noted in the control group. Significant clinical improvements were noted in the test group. The data, tabulated in table 4.14 shows that this improvement was made in the last week of treatment, as is demonstrated when comparing the 2<sup>nd</sup> and final weeks of treatment, as well as the 1<sup>st</sup> and last week of treatment.

In summary, as far as the results from the headache diary are concerned the only improvement noted in the control group was a reduction in the frequency of the headaches. In the test group, improvement was noted, not only in the frequency of the headaches, but also in the average duration and intensity of the headaches. These results could be due to the fact that with both groups receiving spinal manipulative therapy, there was a reduction in the frequency of the headaches, which should be expected, as spinal manipulative therapy has been shown to have value in the treatment of chronic tension-type headaches (Halderman, 1991). However, with the introduction of the nocturnal bite guard in the test group, this could be responsible for the reduction in duration and intensity of the headaches demonstrated in this group. This phenomena has been



demonstrated in a study conducted by Hansson *et al.* (1990), in which the aim of his study was to show the association between headache and temporo-mandibular disorders. One group of headache sufferers was treated with medication prescribed by a neurologist and the other was treated with a mandibular stabilization splint. After his 6 week treatment period more patients treated with the stabilization splint reported a decreased intensity of the headaches, as well as a reduction in the frequency of headache attacks.

In conclusion, the test group shows greater all round improvement as compared to the control group in terms of the intra-group data collated from the headache diary.

## **5.2.2 The Objective Measurements**

### **5.2.2.1 The Cervical Range of Motion Instrument**

The Cervical Range of Motion instrument was used to obtain objective type measurements, allowing the researcher to obtain a non-biased clinical representation of the changes that may have occurred in the patients after the treatment therapies.

The results indicate no overall significant improvement in the cervical range of motion within the test or the control group, which indicates that the use of a nocturnal bite guard had no influence on increasing or decreasing the patient's cervical mobility.

## **5.3 THE INTER-GROUP COMPARISONS**

### **5.3.1 The subjective measurements**

#### **5.3.1.1 The CMCC Neck Disability Index**

The results of the measurements of the CMCC Neck Disability Index shows a significant statistical difference in the degree of disability experienced, between the control group and the test group. Both groups showed improvement in the level of disability experienced, however at the end of the 3 week treatment period there was no statistical difference between the two groups, indicating that one group did not improve to a greater degree than the other.

#### **5.3.1.2 The results of the Short Form McGill Pain Questionnaire**

The inter-group comparison of the Short Form McGill Pain Questionnaire shows no statistical difference between the groups, either at the onset of treatment or after the three weeks of treatment. Patients in both groups showed significant improvement in the perception of their pain caused by the tension-type headache, however both groups improvement was to a similar degree therefore once again neither group showing levels of improvement over and above the other.

#### **5.3.1.3 The results of the Numerical Pain Rating Scale 101**

The inter-group data for the Numerical Pain Rating Scale showed no improvement between the groups in terms of the perceived intensity of the pain experienced, similarly as stated earlier, there was no statistical improvement exhibited within each group.

#### 5.3.1.4 The results of the Headache Diary

In terms of the number of headaches experienced, the average duration and the average intensity of the headaches, the results of these measurements demonstrated no significant difference between the groups. This indicates that both treatment groups were related in character in terms of the above mentioned factors at the outset of the treatment.

Examination of the measurements of the 2<sup>nd</sup> and the final week's treatments shows no significant improvement in either group over the treatment period, however on examination of the intra-group data one notes significant improvement within the groups.

#### 5.3.2 The Objective Data

##### 5.3.2.1 The results of the Cervical Range of Motion Goniometer

The results of the measurements from the CROM, disclose no significant difference in the degree of mobility experienced by the patients at the outset of the study, implying that both treatment groups were of related character. These results did not alter with treatment, as there was no statistical difference noted between the groups at the 5<sup>th</sup> or the final treatments.

The results indicate that the interventions used in this study had no clinically significant influence on the cervical range of motion exhibited by the patients of each treatment group.

The results could be attributed to the fact that both groups received spinal manipulative therapy and therefore the spinal manipulative therapy would have a similar and characteristic effect on both groups. It is then evident that by the addition of the

nocturnal bite guard to the test group patients, that this bite guard did not influence the patients cervical range of motion, weather it be in a positive or negative capacity.

#### **5.4 PROBLEMS ENCOUNTERED WITH REGARD TO SUBJECTIVE RESULTS**

A weakness exists in all studies utilizing questionnaires due to the lack of patient understanding in correctly completing the subjective questionnaires, thus bringing about error and inaccuracies in the subjective data. Patients may also have answered their questionnaires to please the researcher, thus recording greater improvements in their condition then there actually was. The only way in which this problem could be overcome would be to have stricter supervision of the completion of the different questionnaires.

Another problem encountered was that with the questionnaires answered on a specific day over the treatment period, they sometimes did not give an accurate indication of the overall patient wellbeing. For example a patient could be showing good improvement with the reduction in pain intensity, disability and frequency on the days leading up to the treatment, but then on the day of treatment, they are struck with a sever headache, which then is the only information that is reflected in the data measurements. This problem was overcome with the use of the headache diary, which was used to record the day to day progression of the patient. This could be the reason the headache diary results showed the greatest improvements, which as first glance seem to be inconsistent with the questionnaire results.

## **5.5 PROBLEMS ENCOUNTERED WITH REGARD TO THE OBJECTIVE RESULTS**

Accuracy of the goniometer used combined with observer bias may decrease the efficacy of the results, these errors can be reduced by use of more technologically advanced equipment if available that is less likely to be subject to human error. Electronic measuring devices for the goniometer would be more sensitive in picking up the smaller differences and changes than the human eye thus decreasing observer bias.

## **5.6 STUDY LIMITATIONS**

From the statistical analysis of this study there is no statistically significant difference between spinal manipulative therapy alone and spinal manipulative therapy in conjunction with the use of a nocturnal bite guard in the treatment of chronic tension-type headaches.

However, clinical results do show that both therapies are valuable in the treatment of chronic tension-type headaches.

## **5.7 CONCLUSION**

Although the test group showed a slightly better improvement over the control group, clinically it is negligible. Overall both treatment protocols showed equal rates of improvement as well as degree of efficacy.

With regard to the use of a nocturnal bite guard as an adjunct to the treatment of chronic tension-type headaches, this researcher would encourage the use of the appliance. However this opinion applies to those patients wherein bruxism is confirmed in conjunction with chronic tension-type headaches, not just patients suffering from tension-type headaches alone. Practitioners who choose to use a nocturnal bite guard will do well to realize that not every individual will find this sort of treatment beneficial, owing to the inconvenience, comfort and aesthetic appearance of the appliance, these patients may therefore be non-compliant and this will therefore inhibit favorable treatment results.

# **CHAPTER**

# **SIX**

## **CONCLUSIONS AND RECOMENDATIONS**

## **CHAPTER SIX**

### **6 CONCLUSIONS AND RECOMMENDATIONS**

#### **6.1 CONCLUSIONS**

This study comprised of 30 patients, all of which were diagnosed with chronic tension-type headaches and nocturnal bruxism, after extensive clinical and physical examinations.

The patients were randomly placed into two groups of 15, the control group received spinal manipulative therapy only, for the relief of chronic tension-type headaches, while the test group received spinal manipulative therapy in conjunction with a nocturnal bite guard (to be used at night) for the relief of the above headaches.

Each patient received 9 treatments over a period of 3 weeks.

It is evident from the data that patients in both the test group and the control group responded favorably to their respective treatments in terms of the disability and quality of pain perceived.

The test group showed significant improvements in the average number of headaches, duration and intensity experienced when this data was tracked on a daily basis. The control group showed similar results however no change was noted in the duration or intensity of these patient's headaches.

Despite the improvements noted within each treatment group, little differences were seen between the therapies, which makes it difficult to distinguish the more superior therapy for chronic tension-type headaches. The long-term efficacy of spinal manipulative therapy and a nocturnal bite guard was not taken into account in this study. This may be achieved in future studies by including a follow-up consultation after a specific and pre-determined time period has elapsed.



It can therefore be stated in the context of this study that spinal manipulative therapy alone would seem to be the treatment of choice in the management of chronic tension-type headaches, until larger studies can be conducted to more clearly evaluate the use of combined spinal manipulative therapy with bite guard therapy for the treatment of chronic tension-type headaches. This study can therefore be used in the future as a foundation to build and extend further research on.

## **6.2 RECOMMENDATIONS**

The findings of this study are not conclusive in determining the most efficient therapy for the treatment of chronic tension-type headaches, although it has proven that both treatment protocols are effective therapies in their own right.

The following areas need to be considered for future studies:

### **6.2.1 Study Size and Power**

A major weakness of this study is the sample size of 15 patients per group. This sample size is small and therefore may not be representative of the population suffering from chronic tension-type headaches.

There is also a close connection between sample size and the power of statistical tests. A smaller sample size allows for the greater likelihood of a type ii error occurring i.e. that one may accept a false null hypothesis. This results due to the inability to detect small but clinically relevant treatment differences from small sample sizes

### **6.2.2 Follow-up studies**

In retrospect this study was short sighted in that it did not include a long-term follow-up examination. This would have aided in determining the long-term effects of the two treatment protocols.

This would have contributed greatly in determining which treatment would be more superior, in the reduction of frequency, intensity, duration and disability of these headaches, which is the ultimate aim to a successfully treatment protocol.

### **6.2.3 Alternative objective measurements**

Electro-myographic (EMG) studies of the masticatory and cervical spine musculature would give a good indication as to their tonicity. Both masticatory muscle hypertonicity and cervical spine hypertonicity are characteristics in tension-type headaches and bruxism, and therefore how they may be influenced by the relative treatment therapies would be of importance in accessing the efficacy of the respective treatment protocols.

### **6.2.4 Blinding**

In order to add to the strength of this study an element of blinding should be used to reduce the researcher's bias.

An effective and relatively east blinding technique that could be added to the study is to allow one consistent neutral member to elicit the objective measurements from the patients. The neutral member is not to know which therapy the patient is receiving in order to maintain an objective and unbiased data gathering procedure.

Another way to decrease researcher bias is to utilize a neutral member to determine which patients will receive the nocturnal bite guard. The researcher is then blinded with

regard to who is using the bite guard and who is not ( ie. Test and control group patients are unknown to the researcher) therefore reducing the researcher bias once again.

These procedures were not included in this study due to time constraints placed on the study itself and the lack of the constant availability of one consistent neutral member at the clinic at all times.

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## **LIST OF APPENDICES**

APPENDIX #1	Case History
APPENDIX #2	Physical Examination
APPENDIX #3	Cervical Regional Examination
APPENDIX #4	CMCC Neck Disability Index
APPENDIX #5	Short-Form McGill Pain Questionnaire
APPENDIX #6	Numerical Pain Rating Scale
APPENDIX #7	Cervical Range of Motion Goniometer Recording Sheet
APPENDIX #8	Headache Diary
APPENDIX #9	Questionnaire to Establish the Eligibility of the Patient for Research Relating to Nocturnal Bruxism
APPENDIX #10	Patient Consent Form

**TECHNIKON NATAL CHIROPRACTIC DAY CLINIC**  
**CASE HISTORY**

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

**FOR CLINICIAN'S USE ONLY**

Initial visit clinician: \_\_\_\_\_ Signature: \_\_\_\_\_

**Case History:**

**Examination:**

Previous:

Current:

**X-Ray Studies:**

Previous:

Current:

**Clinical Path. lab:**

Previous:

Current:

**Case Status:**

PTT:            Conditional:            Signed Off:            Final Sign out:

**Recommendations:**

**Intern's Case History**

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

**3. Present Illness:**

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

**4. Other Complaints:**

**5. Past Medical History:**

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

**6. Current health status and life-style:**

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

**7. Immediate Family Medical History:**

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

**8. Psychosocial history:**

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

**9. Review of Systems:**

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



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:**  
**Hemias:**  
**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 & Gag reflex:
- X 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:

# 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

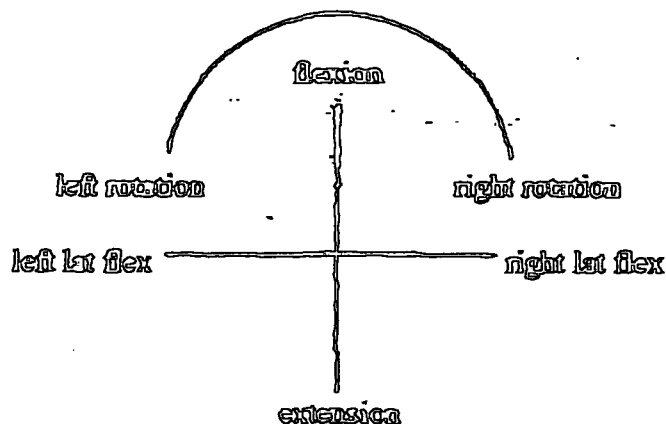
### RANGE OF MOTION:

Flexion (45°):

LR Rotation (70°):

Extension (70°):

LR Lat Flex (45°):



### PALPATION:

Lymph Nodes  
Thyroid Gland

Trachea

### ORTHOPAEDIC EXAMINATION:

Tenderness

Trigger Points:

SCM

Semispinali

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:  
RUM:

Orthopaedic/Neuro/  
Vascular:  
Observ/Palpation:

Upper Thoracics:  
Motion Palpation:  
Joint Play:

Basic Exam: Thoracic Spine:  
Case History:

ROM: Motion Palp:  
Active:  
Passive:

Orthopaedic/Neuro/  
Vascular:  
Observ/Palpation:



# 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 carry on everyday life. Please answer every section and mark in each section only the ONE box which applies to you. Think of you as a patient and not of the symptoms or any one problem in particular to you, but please just mark the box which most clearly 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 only 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 moderate 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 severe 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. disruption).
- ☐ My sleep is mildly disturbed (1-2 hrs. disruption).
- ☐ My sleep is moderately disturbed (3-4 hrs. disruption).
- ☐ My sleep is greatly disturbed (5-6 hrs. disruption).
- ☐ My sleep is completely disturbed (7-8 hrs. disruption).

## 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.

### SHORT-FORM MCGILL PAIN QUESTIONNAIRE

Patient Name: \_\_\_\_\_

Date: \_\_\_\_\_

	NONE (0)	MILD (1)	MODERATE (2)	SEVERE (3)
THROBBING				
SHOOTING				
STABBING				
SHARP				
CRAMPING				
GNAWING				
HOT-BURNING				
ACHING				
HEAVY				
TENDER				
SPLITTING				
TIRING- EXHAUSTING				
SICKENING				
FEARFUL				
PUNISHING-CRUEL				

## NUMERICAL RATING SCALE 101 QUESTIONNAIRE

Patient Name: \_\_\_\_\_

File No.: \_\_\_\_\_

Date: \_\_\_\_\_

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

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

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## CERVICAL RANGE OF MOTION RECORDING SHEET

NAME.....

**FILE NUMBER .....**

[illegible]

## HEADACHE DIARY

Patient Name: \_\_\_\_\_

File No.: \_\_\_\_\_

Date: \_\_\_\_\_

<b>WEEK ONE – DAY</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>DATE:</b>							
<b>DID YOU HAVE A HEADACHE TODAY?</b>							
<b>IF YES, HOW LONG DID IT LAST? (HOURS)</b>							
<b>HOW SEVERE WAS IT? (0-10)</b> <b>NONE-----0</b> <b>MILD-----2</b> <b>MODERATE-----4</b> <b>HEAVY-----6</b> <b>SEVERE-----8</b> <b>INTOLERABLE-----10</b>							

<b>WEEK TWO – DAY</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>DATE:</b>							
<b>DID YOU HAVE A HEADACHE TODAY?</b>							
<b>IF YES, HOW LONG DID IT LAST? (HOURS)</b>							
<b>HOW SEVERE WAS IT? (0-10)</b> <b>NONE-----0</b> <b>MILD-----2</b> <b>MODERATE-----4</b> <b>HEAVY-----6</b> <b>SEVERE-----8</b> <b>INTOLERABLE-----10</b>							

<b>WEEK THREE – DAY</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>DATE:</b>							
<b>DID YOU HAVE A HEADACHE TODAY?</b>							
<b>IF YES, HOW LONG DID IT LAST? (HOURS)</b>							
<b>HOW SEVERE WAS IT? (0-10)</b> <b>NONE-----0</b> <b>MILD-----2</b> <b>MODERATE-----4</b> <b>HEAVY-----6</b> <b>SEVERE-----8</b> <b>INTOLERABLE-----10</b>							

**QUESTIONNAIRE TO ESTABLISH THE ELIGIBILITY OF THE  
PATIENT FOR RESEARCH RELATING TO NOCTURNAL BRUXISM**

Please circle the correct answer, yes or no:

- 1) Do you suffer from any facial or temporal pain? (YES/NO)
- 2) Is the above pain worse in the morning? (YES/NO)
- 3) Do you experience clicking or grating of your  
Tempromandibular joint (jaw) (YES/NO)
- 4) Are you aware that you grind your teeth? (YES/NO)
- 5) Are you aware of reduced jaw opening or locking of the  
jaw? (YES/NO)
- 6) Do you find that your symptoms are worse during or after  
times of stress? (YES/NO)

## INFORMED CONSENT FORM

### A STUDY OF THE EFFICACY OF SPINAL MANIPULATIVE THERAPY ALONE COMPARED TO SPINAL MANIPULATIVE THERAPY COMBINED WITH THE USE OF OCCLUSIONAL SPLINT THERAPY IN THE TREATMENT OF CHRONIC TENSION-TYPE HEADACHES

Supervisor : Dr. M. Atkinson  
Researcher : Gaynor Cartwright

PLEASE CIRCLE THE APPROPRIATE ANSWER:

1. Have you asked questions regarding the study? YES/NO
2. Have you received answers to your questions? YES/NO
3. Have you had an opportunity to discuss the study? YES/NO
4. Have you received enough information about the study? YES/NO
5. Do you understand the implications of your involvement in this study? YES/NO
6. Do you understand that you are free to withdraw from this study?
  - a. at any time.
  - b. Without giving a reason for withdrawing.
  - c. Without affecting your future health careYES/NO
7. Do you agree to voluntarily participate in this study? YES/NO

IF YOU HAVE ANSWERED NO TO ANY OF THE ABOVE PLEASE OBTAIN THE NECESSARY INFORMATION BEFORE GIVING CONSENT.

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

Patient Name : ..... Signature : .....

Parent Name : ..... Signature: .....

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

## **PATIENT CONSENT FORM**

Dear Patient

Please read the following consent form carefully as it contains important information regarding the research with which you will be participating at the Technikon Natal Chiropractic Clinic with respect to tension – type headaches.

All treatment received at the Technikon Natal Chiropractic Clinic will be used for research purposes, therefore the result of the research in which you will participate will contribute to further knowledge and understanding of tension – type headaches, and help the Chiropractic profession in determining the best treatment for tension – type headaches sufferers.

All patients participating in the above-mentioned research will remain anonymous, and all information submitted by the patient to the researcher (Gaynor Cartwright) will be confidential.

Participation in the research project will benefit you in that:

- A) You will receive treatment for your tension – type headache free of charge.

The benefits of the research for the profession/researcher will be the following:

- A) The Chiropractic profession will gain further understanding in the treatment of tension – type headaches.
- B) Completion of the researcher's Masters Degree in Technology: Chiropractic.

### **Rules for Participation in this research project:**

- A) For the duration of this research project you will not be allowed to receive any other treatment for tension-type headache, this includes drug therapy, physiotherapy, acupuncture, massage or any other form of treatment.
- B) Treatment will take place at the Technikon Natal Chiropractic Clinic in Ritson Road, Durban and will be spread over an approximate period of three weeks. Appointments for treatment must be kept punctually and unchanged as much as possible, this is to ensure the successful completion of the research and ultimately, the maximum benefit for the patient.



Involvement in the research project is entirely voluntary and you are thus under no obligation to participate. If you are uncertain about any aspects of this research please feel free to ask the researcher any questions you may have at this time.

I, the undersigned, \_\_\_\_\_, have read the above document and understand all that is contained therein and agree to abide by the rules as set out herein.

DATED at DURBAN this                      day of                      2000.

Signed \_\_\_\_\_

Witness \_\_\_\_\_