

THE APPROACHES OF FREQUENT AND  
INFREQUENT APPLICATION OF  
CHIROPRACTIC TREATMENT:  
A STUDY OF THEIR RELATIVE EFFICACY  
IN THE MANAGEMENT OF MECHANICAL LOW  
BACK PAIN

By

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*I, Robert Mathews, do declare that this  
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## **ABSTRACT**

Variations in prescribed treatment frequencies have resulted from an absence of tested theory. In response to this, the objective of this study was to compare the efficacy of once and three times weekly treatment frequencies in the management of mechanical low back pain. It was hypothesised that both treatment protocols would be effective, but the three times weekly protocol was expected to be more effective.

This randomised clinical trial consisted of experimental and descriptive survey design. Thirty voluntary subjects diagnosed as having facet syndrome, sacroiliac syndrome or a combination of these two were divided into two groups of fifteen and randomly allocated to each study group. Chiropractic treatment was administered, according to the allocated frequency, for a maximum of three weeks.

The outcome measures included the response of patients to the NRS-101 pain intensity scale, the Oswestry Back Disability Index, positive orthopaedic test scores and lumbar spine ranges of motion. Data was collected from these measurement criteria before the onset of treatment, at the end of the last treatment session, and at a follow up consultation one month after the last treatment.

The results were analysed statistically within each group, using paired t-tests, and between the two groups, using unpaired t-tests. All data was tested using a 95% probability estimate.

Over the treatment period both groups responded favourably in terms of average pain intensity, Oswestry disability index percentages, positive orthopaedic test scores and all ranges of motion tested, except for forward flexion in the group treated once weekly, which showed an increase in this range which was considered clinically significant but was not found to be statistically significant.

By the end of the follow-up period the group treated three times weekly showed no significant changes in any of the respective measurement tools, indicating that the improvements achieved over the treatment period were maintained. The group treated once weekly also maintained the improvements observed after treatment in terms of the Oswestry disability index percentages, extension range of motion and left lateral flexion range of motion, but this group continued to show further improvement in terms of pain intensity, positive orthopaedic test scores and forward flexion and right lateral flexion ranges of motion.

When comparison of the results obtained from the two study groups was made it was found that the two groups showed no

significant differences at any time of data collection in terms of pain intensity and Oswestry disability index percentages. Significant differences were found to exist between the two groups in terms of the positive orthopaedic test scores at the initial (  $P=0.0189$  ) and follow-up (  $P=0.0052$  ) consultations, but no difference was detected by the end of the treatment period for this outcome measure. No differences were found between the two groups in terms of range of motion at any time of data collection, except for the group treated once weekly which showed a significantly larger extension range of motion at the end of the follow-up period (  $P=0.0348$  ).

The results supported the hypotheses that each respective treatment protocol would be effective. The hypothesis that the three times weekly treatment protocol would be more effective than treatment once weekly was rejected.

It is therefore concluded that chiropractic treatment administered once weekly for a period of three weeks is as effective as chiropractic treatment administered three times weekly for three weeks, in the management of mechanical low back pain.

## UITTREKSEL

Die frekwensie van voorgeskrewe chiropraktiese behandelings varieer omdat die onderliggende teorie nie proefondervindelik bewys is nie. Denhalwe is hierdie studie daarop gerig om die behandeling van meganiese laerugpyn wat eenmaal per week geskied se doeltreffendheid te vergelyk met die doeltreffendheid van behandeling wat driemaal per week geskied. Die hipotese was dat beide behandelings metodes doeltreffend sal wees maar dat die behandeling drie maal per week meer doeltreffend sal wees.

Die kliniese toetsing, waar die proefpersone na willekeur gekies is, het bestaan uit 'n eksperimentele en beskrywende oorsigtelike ontwerp. Die toetsgroep het bestaan uit dertig vrywillige proefpersone wat gediagnoseer is as sou hulle aan fasset sindroom, sacro-iliese sindroom of 'n kombinasie van die twee ly maar sonder enige kontra-indikasie teen rugmanipulasie. Hierdie proefpersone is op 'n willekeurige wyse in twee groepe van vyftien persone elk verdeel. Chiorpraktiese behandeling is vir 'n maksimum van drie weke toegepas - eenmaal per week op een groep en driemaal per week op die ander groep.

Die resultate is gemeet deur onder andere gebruik te maak van pasiente se respons op die NRS-101 pynintensiteitskaal, die Oswestry Rugongeskiktheidsindeks vorm,

positiewe ortopediese toetsresultate en die grade van beweging vandie lumbaal verwels. Data is by wyse van hierdie metingskriteria versamel voor die aanvang van die behandeling, aan die einde van die laaste behandelingsessie en tydens 'n opvolgkonsultasie een maand na die laaste behandeling. Die resultate is statisties ontleed : binne elke groep met behulp van gepaarde t-toetse, en tussen die twee groepe met behulp van ongepaarde t-toetse. Alle data is by wyse van 'n 95% waarskynlikheidskatting getoets.

Gedurende die behandelingsperiode het beide groepe gunstig gereageer met betrekking tot gemiddelde pynintensiteit, Oswestry ongeskiktheidsindekspersentasies, positiewe ortopediese toetsuitslae en alle grade van beweeglikheid wat getoets is behalwe vooroor fleksie by die groep wat eenmall per week behandel is. Daar was wel 'n verbetering op hierdie gebied wat as klinies betekenisvol beskou kan word maar wat nie as statisties betekenisvol beskou kon word nie.

Aan die einde van die opvolgperiode het die groep wat driemaal per week behandel is, geen betekenisvolle veranderinge in geval van enigeen van die verskillende meetinstrumente getoon nie, wat aandui dat verbeteringe wat gedurende die behandelingsperiode teweeg gebring is, standhoudend was. Die groep wat eenmaal per week behandel is het ook verbetering wat waargeneem is, na die

behandeling behou in sovenne dit meetbaar was met die Oswestry ongeskiktheidsindekspersentasies, ekstensie en liker laterale fleksiebewegings. Verdern het hierdie groep toenemende verbetering getoon met betrekking tot pynintensiteit, positiewe ortopediese toetsresultate, assok vooroor fleksiebewegings en regter laterale fleksiebewegings.

Vergelyking van die resultate wat van die twee studiegroepe verkry is, het op geen stadium gedurende die proses van dataversameling betekenisvolle verskille tussen die twee groepe getoon in sovenne dit die pynintensiteit en Oswestry ongeskiktheidsindekspersentasies betref nie. Daar is gevind dat daar betekenisvolle verskille tussen die twee groepe bestaan met betrekking tot die positiewe ortopediese toetsresultate tydens die eerste ( $P = 0.0189$ ) en opvolgkonsultasies ( $P = 0.0052$ ), maar geen onderskeid kon bepaal word aan die einde van die behandelings periode volgens hierdie meetmetode nie. Daar was geen verskille tussen die twee groepe met betrekking tot die grade van beweeglikheid op enige stadium tydens die proses van data inwinning nie, behalwe dat die groep wat eenmaal per week behandel is aan die einde van die opvolgperiode ekstensiebewegings kon doen wat aansienlik groter was ( $P = 0.0348$ ). Hierdie resultate steun die hipotese dat elke vorm van behandeling effektief sal wees. Die hipotese dat



behandeling driemaal per week meer effektief is as behandeling eenmaal per week, word gevolglik verwerp.

Hieruit volg die afleiding dat by die behandeling van meganiese laerugpyn chiropraktiese behandeling wat eenmaal per week vir drie weke lank toegedien word, net so effektief is as chiropraktiese behandeling wat driemaal per week vir drie weke toegedien word.

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## INTRODUCTION

It has been suggested by Leach (1986: 207) that chiropractic research needs to be directed to three primary areas: evaluation of chiropractic therapy, diagnostic technique, and relative basic science. Each of these areas requires investigation in the laboratory, field and clinical settings. In response to this need this study was directed at evaluating chiropractic therapy in the form of a clinical study.

Clinical studies have shown spinal manipulative therapy to be consistently more effective than any of the array of comparison treatments (Anderson et al. 1992).

The literature mentioning the frequency of manipulative therapy intervention for low back pain is inconsistent in that selected protocols range from one treatment within a two week period to daily treatment over a three to four week period. (Hadler et al. 1987, Kirkaldy-Willis 1988: 287-296, Cox 1990: 28, Shekelle et al. 1992 and Cramer et al. 1993) This lack of consistency in the prescribed frequency of treatment intervention results in considerable confusion to the clinician wishing to make efficient use of spinal manipulative therapy.

The implications of this problem are that professionals utilising manipulation may treat their patients too often,

in which case the cost of treatment is unjustly inflated at the risk of aggravating the patient's condition, and on the other hand, the patient may not be treated often enough, in which case the benefits of treatment will be delayed.

It is thus in the interests of all health professionals treating low back pain that the relevance of frequency of manipulative intervention be scientifically established. However, since the above mentioned studies all claim encouraging results, despite the fact that the authors are non-equivocal with regards frequency of treatment, it may be questioned whether the frequency of treatment has any significant impact at all.

It is problems and questions such as these that were addressed by this study.

The major benefit that is expected from this work is the contribution to the "pool of knowledge", that is, it will provide scientific evidence indicating the relevance of the frequency of manipulative intervention in the treatment of the selected mechanical low back pain syndromes. Future clinical studies involving manipulative therapy will thus have evidence validating their chosen treatment protocol.

The results of this study should be seen as a step toward more clearly defining the frequency of spinal manipulative intervention, and together with future research in this field the goal of being able to predict the number of treatments over a prescribed duration will be achieved.

This will contribute towards establishing a rationale for a more efficient and cost-effective manipulative treatment protocol.

With the above factors in view it can be said that this study will play an important role in the refinement of the treatment of choice for mechanical low back pain and thus improve the efficiency and validity of the role clinicians utilising manipulative therapy have to play in the treatment of such conditions.

## CHAPTER ONE

### 1. THE PROBLEM AND IT'S SETTING

#### 1.1 THE PROBLEM STATEMENT

The purpose of this investigation was to evaluate the effectiveness of three times weekly chiropractic treatment and once weekly chiropractic treatment of mechanical low back pain, in terms of the objective and subjective clinical findings, in order to determine the more effective treatment approach in the management of mechanical low back pain.

#### 1.2 THE SUBPROBLEMS

##### 1.2.1 Subproblem one

The first subproblem was to evaluate 3 times weekly chiropractic treatment of mechanical low back pain in terms of objective and subjective clinical findings in order to establish the effectiveness of this treatment approach in the management of mechanical low back pain.

### 1.2.2 Subproblem two

The second subproblem was to evaluate once weekly chiropractic treatment of mechanical low back pain in terms of objective and subjective clinical findings in order to establish the effectiveness of this treatment approach in the management of mechanical low back pain.

### 1.2.3 Subproblem three

The third subproblem was to integrate the data indicating the possible effectiveness of 3 times weekly and once weekly chiropractic treatment, in terms of subjective and objective clinical findings, in order to determine the more effective treatment approach in the management of mechanical low back pain.

## 1.3 THE HYPOTHESES

### 1.3.1 Hypothesis one

It was hypothesised that 3 times weekly treatments would be effective in the management of mechanical low back pain in terms of the objective and subjective clinical findings.



### 1.3.2 Hypothesis two

It was hypothesised that once weekly chiropractic treatment would be effective in the management of mechanical low back pain in terms of the objective and subjective clinical findings.

### 1.3.3 Hypothesis three

It was hypothesised that 3 times weekly chiropractic treatment would be a more effective treatment approach than the once weekly treatment approach in the management of mechanical low back pain in terms of the objective and subjective clinical findings.

## 1.4 DELIMITATIONS

### 1.4.1

Only those subjects diagnosed as suffering from mechanical low back pain syndrome with no additional pathology contra-indicating spinal manipulative therapy were accepted into the study. Contra-indications to manipulation include those conditions identified in the literature review.

#### 1.4.2

This study was only concerned with the two most common clinical lesions within the Kirkaldy-Willis diagnostic classification of mechanical low back pain, namely: sacroiliac syndrome, posterior facet syndrome, or a combination of these two syndromes. (Kirkaldy-Willis and Cassidy 1988: 134, 216)

#### 1.4.3

Any patients who developed other conditions which could contribute to their mechanical low back pain symptoms during the period of the proposed study were excluded.

### 1.5 ASSUMPTIONS

#### 1.5.1

It was assumed that all patients participating in the study were compliant with the researchers instructions.

#### 1.5.2.

It was assumed that the diagnostic classification set out by Kirkaldy-Willis (1988:134) is accurate and valid.

## 1.6 DEFINITION OF TERMS

Mechanical low back pain: for the purpose of this study refers to posterior facet syndrome and sacroiliac syndrome.

Facet syndrome: refers to the form of mechanical low back pain in which the posterior facet joints of the lumbar spine represent the primary lesion from which the patient's pain originates. (Kirkaldy-Willis 1988: 133-135, Plaughner 1993: 216-217, Schafer and Faye 1989: 217 and Gitelman 1980: 314-322)

Sacroiliac syndrome: refers to the form of mechanical low back pain in which the sacroiliac joints of the pelvis represent the primary lesion from which the patient's pain originates. (Kirkaldy-Willis 1988: 135-137, Gitelman 1980: 298-313)

Chiropractic treatment: for the purpose of this study, will mean the use of spinal manipulative treatment (S.M.T.), and soft tissue therapy (S.T.T.).

Spinal manipulative therapy: refers to the use of specific forms of direct articular manipulation utilising short lever mechanics and characterised by a dynamic, forceful, high velocity thrust of controlled amplitude, after

appropriate stabilisation of adjacent joints has occurred and the joint at the level of interest is tractioned.

The process of manipulation is a passive manual manoeuvre during which an articular element is suddenly carried beyond the usual physiological limit of movement without exceeding the boundaries of anatomical integrity.

The usual but not obligate characteristic of a manipulative procedure applied to a joint is the thrust which is a brief, sudden and controlled impulse of force with short amplitude, delivered at the end of the physiological range of motion which is often accompanied by an audible "cracking" noise. (Leach 1986: 15)

Soft tissue therapy: refers to the use of effleurage massage and exercise techniques applied to the muscular and ligamentous components surrounding the lumbar spine and sacroiliac joints.

Effectiveness: for the purpose of this study refers to the ability of the respective treatment approach to favourably alter the objective and subjective clinical findings so as to contribute to the resolution of the symptoms and signs of mechanical low back pain.

Subjective clinical findings: refers to the patients responses to the Oswestry Back Disability Index

questionnaire (Appendix A) and the Numerical Rating Scale for Pain Intensity (Appendix B).

Objective clinical findings: refers to the lumbar range of motion readings (Appendix C) and the positive orthopaedic tests scores (Appendix D) recorded by the researcher.

Positive orthopaedic tests:

The following two tests are used to detect a possible facet syndrome:

1. **Kemp's test:** This test is performed with the patient in a seated position and the examiner standing behind the patient. The examiner reaches around the patient's shoulders and upper chest from behind so as to support and control the patient. The patient is directed to lean forward to one side and then to bend obliquely backward as far as possible, at this point the examiner applies axial pressure so as to compress the side of rotation. If this manoeuvre produces or aggravates local pain over the affected spinal segment(s) it may be indicative of a lumbar facet syndrome. (Schafer and Faye 1989: 208-209)

2. **Facet joint challenge:** With the patient in the prone position, the examiner applies medial pressure on the contra-lateral aspects of adjacent spinous processes of the

lumbar vertebrae. Local pain aggravated produced by this procedure is likely to be due to a lumbar spine facet syndrome. Kenna and Murtagh (1989: 104) describe the test as an application of transverse pressure to the spinous processes. They also state that this is a very sensitive movement for detecting pain in an affected spinal segment and for many practitioners it is the preferred method of detection.

The following tests are used to detect a possible sacroiliac syndrome:

1. **Gaenslen's test:** The patient is supine, with knees and hips acutely flexed by the patient who holds his/her knees with both hands and pulls them towards his/her abdomen. This fixes the lumbar spine and pelvis with the surface of the examination table. With the examiner standing at right angles to the patient, the patient is brought well to the side of the table and the examiner slowly hyper-extends the opposite thigh with one hand, while the other hand stabilises the other leg and aids in fixing the lumbar spine. The hyper-extended thigh may be allowed to fall free from the edge of the table. This procedure exerts a rotational force on the corresponding half of the pelvis. The test is positive for sacroiliac syndrome if pain is felt in the area of the sacroiliac joint.

(Schafer and Faye 1989: 208)

**2. Lateral recumbent sacroiliac compression test:** This test is performed with the patient in the lateral recumbent position, with the affected side up. The examiner stands at right angles to the patient, and places a load force over the area between the iliac crest and greater trochanter of the femur. Aggravation of pain over the sacroiliac joint is indicative of a possible sacroiliac syndrome. (Schafer and Faye 1989: 270)

**3. Erichsen's test:** With the patient supine, the examiner's hands are placed on the patients iliac crests and anterior superior iliac spines. The pelvis is then forcibly compressed towards the mid-line. This tends to separate the sacroiliac joints posteriorly, pain experienced over the sacroiliac joints during this procedure is most likely due to a sacroiliac syndrome. (Schafer and Faye 1989: 270)

**4. Patrick-Faber test:** The patient is placed in the supine position, the affected side's hip joint is flexed, abducted and externally rotated with downward pressure applied by the examiner on the patients knee. The eliciting or aggravation of pain over the sacroiliac joints may be indicative of a sacroiliac syndrome.

(Schafer and Faye 1989: 276)

Frequency of treatment: This refers to the number of treatments per duration of the treatment programme.

## CHAPTER TWO

### 2. REVIEW OF THE RELATED LITERATURE

#### 2.1 OVERVIEW

Studies concerned with the frequency and duration of treatment play an important role in the development of treatment plan guidelines. They also play a role in providing new information used to periodically update treatment guidelines. Such studies are based on scientific data and clinical observation.

These guidelines are designed to assist the clinician in decision making based on the expected outcome of the uncomplicated case. They are not absolute and should never be used as a prescriptive "cook book". (Haldeman et al. 1993: 117)

Treatment diversity and variations in clinical evaluation result in the formulation of treatment guidelines by matter of personal opinion. This has resulted in a wide variety of case outcomes. It would be of obvious benefit to the chiropractic profession to be able to base clinical expectation on more than personal opinion.



In response to this Haldeman et al. (1993: 117) have suggested that the guidelines for frequency and duration of care in the uncomplicated case be based on the following:

1. The natural history of common spinal disorders,
2. the characteristics and stages of tissue repair processes and
3. reasonable treatment outcome classified into short and long term goals.

The literature review is thus designed to follow these topics, with the addition of classification, diagnosis and treatment of low back pain as well as epidemiological and demographic factors applicable to this study.

## **2.2 NATURAL HISTORY**

Cassidy and Wedge in Kirkaldy-Willis (1988: 8) suggest that most cases of low back pain are self limiting. Ninety percent of patients with low back pain improve after two months. This percentage declines to two to three percent after six months, and to one percent after one year. Those patients that do recover face a sixty percent recurrence rate over the following two years. For those patients who recover quickly, it seems likely that the injury involves

a minor strain to the posterior facet joints, surrounding ligaments, and para-spinal musculature.

The above mentioned figures concerning the natural history of low back pain correlate very closely with those mentioned by Frymoyer (1991: 17-19).

Nachemson (1992) reviewed current literature concerning natural history studies for low back pain and found that, in general, the prognosis for the low back pain patient is excellent.

Knowledge gained from the natural history can serve as a reference point for treatment outcome expectations. The most meaningful outcome measurements available are the rate of return to work, continued use of health care services and recurrence of back related injuries. (Mayer et al. 1987)

Hadler et al. (1987) found that in their study involving subjects with regional low back pain for less than one month, the natural history seemed " remarkably benign ". They found that eighty percent of their selected population got well in 2 weeks.

### 2.3 CLASSIFICATION OF BACK PAIN IN TERMS OF TIME-COURSE

Each episode of the condition involved may be classified in the context of it's own time-course and described as acute, subacute, chronic or recurrent. Some controversy exists about definitions for each category. They appear to be based upon the duration of absence from work or upon an assessment of relative clinical improvement. Haldeman et al. (1993: 119) mention an aggressive, intermediate and conservative time limit for each category. These categories are presented in table 2.1 below.

Table 2.1 Comparison of time-course classifications for low back pain ( Haldeman et al. 1993: 119)

	Aggressive time limit	Intermediate time limit	conservative time limit
acute	0 - 7 days	0 - 6 weeks	0 - 8 weeks
subacute	1 - 7 weeks	6 - 12 weeks	8 - 16 weeks
chronic	> 7 weeks	> 12 weeks	> 16 weeks

### 2.4 EPIDEMIOLOGY AND DEMOGRAPHIC FACTORS

The intermittent nature of back pain complicates studies on prevalence and patient recall is often poor, while studies on disability are influenced by legal and

socioeconomic factors. This has hampered the growth of available scientific evidence in this field. (Andersson et al. 1991)

Cassidy and Wedge in Kirkaldy-Willis (1988: 4) state that " it is generally accepted that lower back pain affects between 60% and 80% of the population at some stage in their lives, while between 20% and 30% suffer from low back pain at any given time ".

Frymoyer (1991: 21) suggests that epidemiological studies indicate that low back symptoms are extremely common (70%), low back pain of greater than 2 weeks duration is far less common (13 to 22%), serious lumbar spinal pathology and the need for surgery is low, and that disability affects a small, but distinctive subset.

## **2.5 WORK ABSENTEEISM AND COST**

Frymoyer (1991: 10-19) cites numerous studies concerning the impact of low back pain on today's society. The following observations serve as an outline of the economic magnitude of this condition mentioned by this author.

1. In subjects between 25 and 44 years of age, the average days of work lost per 100 workers numbered 28.6 days per year,

2. for the 50 million working males in the U.S.A. between the ages of 18 and 55 years, it was calculated that low back pain resulted in a total of 17 million work days lost each year, and
3. the total cost of low back disorders are estimated to range between 16 and 60 billion dollars or more each year in the U.S.A..

Cassidy and Wedge (1988: 7) refer to industrial studies which show that more than half of the working population will be affected by low back pain at some stage in their working career.

In a controlled prospective study by Bergquist-Ullman and Larsson (1977), involving 217 patients with acute or subacute back pain, it was found that the mean duration of back pain in one year was 60 days, whereas the duration of sick-leave following the initial incident for the 184 compliant patients was 21 days, while the mean duration of absence from work in one year due to recurrences in 151 of these patients was 16 days.

Andersson et al. (1991) mentions that back injuries account for twenty one percent of compensationable work injuries but averaged thirty three percent of the total compensationable cost. Total compensation costs in the

United States for low back pain in 1988 were estimated at 4.6 to 13.4 billion dollars and 6000 dollars per case, where twenty five percent of cases accounted for ninety percent of the cost.

## **2.6 PHASES OF SPINAL DEGENERATION**

The Kirkaldy-Willis classification for the diagnosis of mechanical low back pain was followed in this study.

The classification is categorised according to three stages of spinal degeneration (Kirkaldy-Willis 1988: 117-131), a brief discussion of each phase is given below.

### **Stage 1: PHASE OF DYSFUNCTION**

The pathology in this phase may be due to rotational sprains, synovitis and consequent nipping of the facet joint synovial fringe, para-spinal muscular spasm resulting in joint dysfunction and entrapment of the facet joint meniscoids. The above processes lead to slight degeneration of the articular cartilage within the facet joints and intra-articular adhesions. These processes affect the disc by causing circumferential tears of the annulus fibrosis which coalesce into radial tears and thereby weaken the disc and predispose it to bulging and finally herniation of it's nuclear contents.

The symptoms associated with this phase can be explained by the results of the above mentioned processes as follows:

1. Facet joint inflammation resulting in the production inflammatory metabolites which stimulate pain sensitive nerve endings,
2. muscle spasm resulting in ischaemia and stasis of metabolites, also stimulating pain sensitive nerve endings,
3. joint dysfunction results in disturbed proprioception and gate control which augments the perception of pain, this pain is sclerotogenous in nature and may be referred or localised, and
4. the effects of disc pathology, if severe enough, may result in nerve root irritation following radicular pain characteristics.

#### **Stage 2: PHASE OF INSTABILITY**

Continued degeneration results in disc disruption which involves loss of the intradiscal water, proteoglycans and coalescence of radial annular tears, resulting in a loss in disc height and circumferential bulging of the annulus, hyperlaxity of the facet joint capsule and increased degeneration of the facet cartilage, osseous erosion and osteophyte formation. This results in excessive



intersegmental motion which may lead to subluxation and lateral canal entrapment.

The symptoms associated with this phase include:

1. Coalescence of radial tears resulting in disc herniation which causes nerve root compression and consequently muscle weakness, reduced tendon reflexes and dermatomal hypoaesthesia,
2. inflammation causing muscle spasm and consequent antalgia, and
3. excessive movement results in intermittent lateral nerve root entrapments at one level with radicular patterns of pain referral which are aggravated by flexion, extension and rotational movements.

### **Stage 3: PHASE OF STABILISATION**

Advanced pathology results in enlargement of the superior and inferior articular facets, osteophyte formation, loss of articular cartilage and periarticular fibrosis. In this stage most of the intervertebral disc is replaced by fibrous tissue and is characterised by a marked loss of disc height. Radiological studies show signs of subchondral sclerosis, peripheral osteophytes and some degree of ankylosis.



The symptoms in this phase include:

1. Fixed lateral canal entrapment due to subluxation, osteophytes and disc fibrosis which results in continuous signs muscle weakness, reduced tendon reflexes and dermatomal hypoaesthesia, and
2. central canal stenosis due to the enlarged inferior articular facets and osteophyte formation. The symptoms associated with this condition are related partly to impaired blood circulation and partly to nerve root compression. The consequences may include neurogenic claudication and cauda equina syndrome.

A knowledge of these stages of degeneration along with the above mentioned natural history of low back pain provide a basis for the understanding of the disease processes involved in mechanical low back pain syndromes and thus allow a more accurate diagnosis and treatment protocol formulation, which allows more accurate guidelines concerning the expected frequency and duration of chiropractic care to be formulated.

## **2.7 CLASSIFICATION OF LOW BACK PAIN**

Kirkaldy-Willis (1988: 134) has classified the specific clinical lesions which are collectively referred to as

mechanical low back pain according to the above mentioned stages of spinal degeneration.

The advantage of this classification is that it categorises these specific clinical lesions in correlation with the stage of degeneration in which they are most likely to occur.

This classification system is as follows:

The dysfunction phase:

- Posterior facet syndrome
- Sacroiliac syndrome
- Maigne's syndrome
- Myofascial pain and dysfunction syndromes of the following muscles: gluteus maximus, gluteus medius, gluteus minimus, quadratus lumborum, piriformis, tensor fasciae latae and the hamstring group

The unstable phase:

- Disc herniation
- Facet and disc degeneration
- Lateral stenosis
- Central stenosis
- Disc herniation

The phase of Stabilisation:

- Lateral stenosis
- Central stenosis
- Multilevel stenosis
- Disc herniation

Kirkaldy-Willis and Cassidy (1988: 216) mention a study involving 1293 patients diagnosed as having mechanical low back pain in which the percentage distribution of the specific clinical lesions are revealed. These were as follows:

- |                              |              |
|------------------------------|--------------|
| - Sacroiliac syndrome        | 23%          |
| - Posterior facet syndrome   | 22%          |
| - Herniated nucleus pulposus | 14%          |
| - Lateral canal stenosis     | 13%          |
| - Spondylolisthesis          | 9%           |
| - Myofascial syndromes       | 6%           |
| - Central canal stenosis     | 5%           |
| - Maigne's syndrome          | less than 1% |
| - Other                      | 4%           |

Kirkaldy-Willis and Cassidy (1988: 294-296) also go on to state that in their prospective uncontrolled observational study of 283 subjects who were treated for chronic lower back and leg pain, the best results were obtained in subjects with dysfunction due to posterior facet joint

syndrome or sacroiliac syndrome and that the most definite indication is to treat when in the phase of dysfunction.

In a study by Haas and Nyiendo (1992), also concerned with low back pain syndromes, the Kirkaldy-Willis classification system was also used to group the involved patients into three categories which correlate with the three phases of spinal degeneration. These were as follows :

Group 1 : Nonspecific low back pain, included all causes of low back pain that were not of a radicular nature.

Group 2 : Included all low back pain attributable to radiculopathy but with out associated neurological deficits.

Group 3 : Represented low back pain attributable to radiculopathy with associated neurological deficits.

According to these authors Group 1 represented the majority of the patients that were suffering from low back pain (67%). This evidence supports the findings of Kirkaldy-Willis and Cassidy (1988: 216) mentioned above, since the syndromes with the highest frequency of occurrence, namely sacroiliac and facet syndrome, are classified within the dysfunctional phase and this phase

is broadly representative of the Group 1 classification used by Haas and Nyiendo (1992).

## **2.8 THE DIAGNOSIS OF MECHANICAL LOW BACK PAIN SYNDROMES**

The diagnosis of facet syndrome and sacroiliac syndrome is based on an understanding of the site and nature of these clinical lesions. The following section will deal with the relevant presentation of these lesions.

### **2.8.1. The Posterior Facet Syndrome**

This syndrome presents with the following symptoms:

Localised pain over the involved area which is usually unilateral. Referred pain to the buttock, posterior and lateral thigh, and rarely below the knee. This pain is of a sclerotogenous nature i.e. dull, deep and poorly defined. The severity of pain may vary from mild to severe and is aggravated by movement but relieved by rest.

The associated clinical signs include:

Local tenderness on palpation of the affected areas, hypertonic paraspinal musculature, and reduced lumbar spine range of motion, especially in extension which aggravates

the condition due to facet joint compression. Kemp's test and lumbar facet joint challenge are usually positive. (Kirkaldy-Willis 1988: 133-135)

### 2.8.2 The Sacroiliac Syndrome

This syndrome presents with the following symptoms:

Pain over the back of the sacroiliac joint that varies in degrees of severity. Referred pain to the groin, over the greater trochanter, down the back of the thigh to the knee and occasionally down the lateral or posterior leg to the ankle, foot and toes.

The associated clinical signs include:

Tenderness on application of pressure over the posterior superior iliac spine and in the region of the sacroiliac joint or buttock. Movement of the joint is reduced. Normally the joint moves by rotating in the sagittal plane. The range of motion of this joint is assessed by motion palpation. The Patrick Faber, Gaenslen's, Erichsen's and lateral recumbent sacroiliac compression tests are normally positive. (Kirkaldy-Willis 1988: 135-137)

Kirkaldy-Willis (1988: 133) mentions that one specific lesion may set the stage for the development of another, for example, the facet syndrome may be complicated by a sacroiliac syndrome at a later date.

### 2.8.3 Differential Diagnosis

The process of diagnosing these specific clinical lesions also involves differentiating mechanical back pain from other more ominous diseases which also result in low back pain and are considered as non-manipulable lesions.

Wedge and Tchang in Kirkaldy-Willis (1988: 230) summarise these as follows :

**Vascular diseases** such as abdominal aortic aneurysm and peripheral vascular disease.

**Neurological diseases** such as nerve root tumours (neurofibromas and neurilemmomas), spinal cord tumours and diabetic neuropathy.

**Spondylogenic diseases** such as multiple myeloma, secondary malignancy, osteoid osteoma, pathological fractures, vertebral osteomyelitis and ankylosing spondylitis.

Other symptomatic forms of mechanical low back pain such as Maigne's syndrome and myofascial syndromes (dysfunctional phase) and all syndromes of the unstable and stabilisation phases will also be differentiated.

## 2.9 OUTLINE OF TREATMENT

The role of the manual therapeutic methods employed by chiropractors has become increasingly recognised as an effective and efficient form of treatment for musculoskeletal pain and dysfunction (Anderson et al. 1992).

Calliet (1981: 129-130) summarises the possible benefits of spinal manipulation as follows:

1. A facet joint is immobilised by an acute synovial reaction and adherence of the adjacent joint surfaces of the facets. The passive movement of the manipulation separates these surfaces,
2. manipulation allows an entrapped meniscus to exit the facet joint in which it became entrapped,
3. the capsule of the facet joint becomes lodged between two adjacent articular surfaces and the manipulative process allows this capsule to be freed,



4. the mechano-receptors of the joint capsule are desensitised by the abrupt movement of the joint (manipulation), and reflex protective spasm is eliminated and allows the joint to move again,
5. the spindle systems of the adjacent muscles are reflexly stimulated by the dynamic thrust of the manipulation and reciprocally relax the extrafusal muscle fibres, and
6. the mal-aligned spinal segments are realigned to conform to the centre of gravity.

Twomey (1992) also mentions the factors concerning the rationale of manipulative therapy but also emphasises the importance of joint movement and exercise.

The rationale for the latter is based on current biological research which shows that movement is of value in maintaining the health and integrity of collagenous, muscular, and bony tissues. The musculoskeletal system thrives on stress and movement and reacts adversely to prolonged rest or immobilisation.

This concept emphasises the use of not only manipulation in the treatment of low back complaints but also the prescription of stretching and strengthening exercise programmes with the aim of encouraging patient mobility as soon as is reasonably acceptable.

Kirkaldy-Willis and Cassidy (1988: 289-290) suggest that the most reasonable explanation for the favourable results observed with manipulation of an affected joint complex is three fold:

1. A direct mechanical effect on the facet joints, which may reduce a subluxation of 1 to 2mm,
2. stretching of hypertonic posterior segmental spinal muscles by the thrust applied, resulting in abolition of pain coming from the muscles, ligaments, and tendons, and
3. increased neural output produced by mechano-receptor stimulation that may modulate pain perception through the gate control mechanism.

According to Haldeman et al. (1993: 120), the Mercy Centre Conference lead to the recommendation that treatment plans be based on the following protocol:

When the patient exhibits acute distress, efforts to reduce soft tissue and joint stresses are applied to decrease inflammation and swelling. A short term of reduced mobility to limit the joint loading effects of gravity may be warranted. Passive forms of treatment, including manual and palliative procedures, may be used, depending on the type of mechanical lesion present. When pain and discomfort have

abated, the area can be re-mobilized with low speed and minimal load exercises directed to improve flexibility without incurring mechanical stress. As the range of pain free motion improves, a gradual increase in exertion can be introduced. Lastly, when a maximal range of motion is achieved rehabilitation for strength and endurance can begin. Should the patient fail to progress through the stages proportional to the natural history, a search for complication, somatization, non-compliance or re-injury should be made. After correcting these factors trial therapy can be implemented again.

Beimborn and Morrissey (1988) report that return to work usually can be commenced at an 80% to 90% level of pre-injury status. Even then, some residual pain can be expected, although it will usually be offset by the benefits of increased productive functioning.

While only 4% of back pain patients fail to return to a pre-injury level after 6 months, these patients are responsible for most back related health care costs. (Haldeman 1990)

The evidence from studies of manipulative therapy, back schools and physical therapy, shows that when conservative therapies cease, the natural course of on-going disability

manifests itself again in these cases. Clearly, new options are needed to improve upon these long range clinical outcome statistics. The chiropractic profession has responded to this need in managing cases at risk of becoming chronic. Advanced understanding for the progression of acute pain to chronic deconditioning and the risk of physician dependence has resulted in more clinicians actively specialising in preventative and rehabilitative practice. (Haldeman et al. 1993: 121)

According to Valfors (1985) patients at risk of becoming chronic present common warning signs, which are:

1. Stationary symptoms of somatic pain for two to three weeks,
2. functional impairment,
3. chemical dependency used recreationally or for pain control, and
4. emotional distress that may include family disruption.

The presence of such indicators should signal the practitioner to move away from passive care as soon as possible.

Haldeman et al. (1993: 120) mention that the Washington State Department of Labor and Industries Chiropractic

Advisory Committee recommended that a second opinion be called for if there is no subjective or objective improvement (or worsening) in 2 weeks, or after treatment of three times per week that exceeds four weeks.

#### **2.10 FREQUENCY AND DURATION OF TREATMENT**

The literature pertaining to the treatment of low back pain revealed that few authors mentioned the frequency of treatment employed, and in those that did the frequency varied. A synopsis of the literature concerned with treatment of low back pain is discussed below.

Haldeman et al. (1993: 124) reported that, initially, more aggressive in-office intervention of three to five sessions per week for one to two weeks is indicated. Progressively declining frequency is expected to discharge the patient, or result in the conversion to elective care in which treatment is given for residual subjective complaints alone.

In the treatment of the posterior facet syndrome Kirkaldy-Willis (1988: 251) advocates either manipulation or facet joint injection with local anaesthetic. Since the latter does not fall within the realm of chiropractic care it will not be discussed here.

As for manipulation, he advocates daily treatment for 7 to 10 days.

In the case of sacroiliac syndrome, as with the posterior facet syndrome, Kirkaldy-Willis (1988: 253) advocates either manipulation or joint injection with local anaesthetic but he suggests that manipulation is by far the most certain way of relieving the patient's pain. He states that for sacroiliac syndrome, manipulation for three to four days often relieves the associated pain and restores joint motion. Mention is also made however that sometimes daily manipulation for up to 10 days is required.

Cox (1990: 28) refers to studies concerning the number of manipulative treatments to maximum improvement. The studies revealed that facet syndrome responded with 80% improvement in 20-30 treatments but with 50% of the sample showing maximum improvement in 10 or less treatments. He omits however to mention the duration of the treatment programme.

Shekelle et al. (1992) conducted a study concerning the use, complications and efficacy of spinal manipulation as a treatment of low back pain. On statistical analysis of the collected data using a 95% probability estimate they found that after three weeks of manipulative treatment, in patients with uncomplicated acute low back pain, the

recovery rate of patients varied between 50% and 67%. No mention of the number of treatments was given.

In a study evaluating chiropractic care of low back pain Cramer et al. (1993) used a treatment period of 10 days, but the study makes no mention as to the frequency of treatment within this period.

As can be seen from the above mentioned factors, with the exception of Kirkaldy-Willis (1988: 251, 253) and Haldeman et al. (1993: 124), none of the above authors make mention of the frequency of treatment applications i.e. the number of treatments per duration of the treatment programme.

A clearer mention of frequency and duration of treatment was found in studies specifically concerned with this topic.

Phillips and Butler (1982) found a mean of 12.5 treatments in their study which looked at the case records of 3943 patients from multiple private chiropractic offices.

Nyiendo and Haldeman (1987) reported a range for the number of patient visits across all complaints presenting to a chiropractic clinic as 1 to 81, with a mean of 4.4 .

Phillips (1981) found a mean of 9 treatments in 871 cases. The patients included all categories of episode time-course (acute, subacute and chronic). Symptoms were present for less than 30 days in 57%, for 60 to 180 days in 11%, and for longer than 180 days in 22%. The mean length of case management was 11.4 days. Treatment was given to 24% for a week or less while 56% received care for up to 30 days.

Jarvis et al. (1991) examined worker's compensation data and calculated a mean of 12.9 treatments over an average duration of 54.5 days.

One hundred patients with lumbosacral pain were treated with up to 4 sessions of manipulation. They were followed for 1 to 3 years. Recurrence of symptoms appeared in only 11.7% during that time. (Guifu et al. 1984)

Cox et al. (1983) reported that of 100 consecutive low back pain patients, a 50% reduction in pain within a mean of 10 treatments over 16 days. Maximum relief was gained at 41 days and after 16 treatment sessions.

In a prospective study controlled for volunteer bias, Triano et al. (1992) reported a range of 1 to 22 sessions. Several conclusions from this study are useful in judging



the frequency and duration of care for symptomatic episodes:

1. Patients with chronic disorders may require more treatment to resolve symptomatic episodes than do other categories of complaint,
2. lordotic areas of the spine, on average, require twice the care of complaints involving the thoracic and transitional areas of the spine,
3. most cases studied resolved well within 6 weeks of intervention, consistent with the expectations from the natural history, and
4. patients for whom care is necessary beyond 6 weeks may require up to 11 additional treatments before reaching resolution (mean = 3.8).

Although these studies specifically looked at frequency and duration of treatment, they still reported widely diverse results. The number of treatments range from 1 to 22, with an average mean of between 9 and 13 treatments being most often reported.

## **2.11 PREDICTIONS FROM CASE HISTORY**

Haldeman et al. (1993: 120) state that most back pain studies have found that the duration of symptoms is a

predictor of response to treatment with manual procedures, that is that the duration of symptoms is inversely related to the likelihood of a positive clinical response.

Bronfort (1986) reported that patients with a shorter duration of symptoms were more likely to respond to manipulation, he found an 85% cure rate within 6 months for patients with less than 7 days of initial pain before treatment, but only a 35% cure rate for patients with more than 28 days of initial pain.

## **2.12 THE EFFICACY OF SPINAL MANIPULATIVE THERAPY**

Chiropractic care is the treatment of choice in most cases of mechanical low back pain syndromes. The basis of this statement is grounded on numerous scientific trials. The following section gives a brief synopsis of some of the studies concerned with this topic.

It must be noted however that few of these studies mention the frequency of treatment and with the exception of the fact that all patients receiving chiropractic treatment were treated with spinal manipulative therapy, no apparent correlation concerning the duration and/or number of treatments administered can be made.

In a randomised controlled trial Meade et al. (1990) compared chiropractic and hospital out patient treatment of mechanical low back pain. The results of the study led the authors to conclude that for patients with mechanical low back pain in whom manipulation is not contraindicated, chiropractic treatment almost certainly offers worthwhile, long term benefit in comparison with hospital out patient management. These findings prompted the authors to suggest that chiropractic be introduced into the British national health service practice.

Di-Fabio (1992) researched the efficacy of manual therapy in the treatment of low back pain by analysis of valid trial studies and concluded that manual therapy, particularly manipulation, is an effective modality when used to treat patients with low back pain.

In a controlled multi-centre trial of manual therapy in low back pain by Blomberg et al. (1992) it was concluded that patients receiving specific manual treatment such as manipulation had a significantly better outcome with respect to quality of life scores, disability rating, pain scores and duration of sick leave as compared to the control group who received standardized but optimal medical treatment. These findings were still significant after an eight month follow up period.

Anderson et al. (1992) conducted a study concerning clinical trials researching the effectiveness of spinal manipulative therapy by using meta-analytical techniques. The data sources for this study were located by citation tracking using the Index Medicus from 1980 onward and the Chiropractic Research Archives Collection. The authors concluded that spinal manipulative therapy proved to be consistently more effective in the treatment of low back pain than were any of the array of comparison treatments.

Leach (1986: 197-198) refers to a multi-centre study by Doran and Newell who compared manipulation to physiotherapy, corset application, and analgesic therapy. After three weeks of therapy, 64% of the manipulated group, 52% of the physiotherapy group (who received more treatments than those in the manipulated group), and 49% and 48% in the corset and analgesic groups, respectively, reported that they were better.

Kirkaldy-Willis and Cassidy (1988: 294) completed a prospective observational study in which they treated 283 subjects who presented with chronic lower back and leg pain and concluded that manipulation is of considerable value in carefully selected subjects. They emphasise the need for an accurate diagnosis which includes defining the clinical lesion and the phase in which the clinical lesion presents.

The most definite indication is to treat mechanical conditions presenting in the phase of dysfunction. Most of the 283 cases were treated for dysfunction, and no subjects were made worse by manipulation.

Phillip (1992), in a retrospective study in Victoria, Australia, compared the medical and chiropractic management of all work-related mechanical low-back pain claimants within a period of twelve months. He found that for chiropractic patients a significant reduction was seen in the number of claimants requiring compensation days and that fewer compensation days were taken by claimants. He also noted that more patients who had undergone medical treatment progressed to the chronic stage as compared to those who received chiropractic care, and that the average payment per claim was greater with medical management.

Hadler et al. (1987) conducted a controlled trial comparing manipulation and mobilization as treatments for acute low back pain. They found that in the first week following treatment, the manipulated subjects improved to a greater degree ( $P = 0.009$ , t-test) and did so more rapidly ( $p < 0.025$ , Wilcoxon rank-sum test).

## 2.13 SUMMARY

The natural history of low back pain is relatively short and the prognostic indicators are good. From evidence provided in the literature a period of two months seems to represent a conservative time frame in which 80 to 90 percent of symptomatic patients will recover. (Kirkaldy-Willis and Wedge in Kirkaldy-Willis 1988: 8, Nachemson 1992, and Haldeman et al. 1993: 128)

Epidemiological studies revealed that low back pain is a very common disorder. (Cassidy and Wedge in Kirkaldy-Willis 1988: 4, and Frymoyer 1991: 21)

The Kirkaldy-Willis classification of mechanical low back pain was outlined and discussed in terms of the phases of spinal degeneration. It was found that this classification was used in another study by Haas and Nyiendo (1992) which reported similar results to Kirkaldy-Willis and Cassidy (1988: 216) in terms of percentage distribution within the frame of this classification system.

The diagnosis of facet and sacroiliac syndromes was discussed and followed by an outline of the guidelines pertaining to the treatment of low back pain syndromes.

On reviewing the literature pertaining to the frequency and duration over which treatment was to be administered it was found that authors concerned more specifically with treatment guidelines varied in their advocated frequency of intervention when mentioned, such as Kirkaldy-Willis (1988: 251, 253) and Haldeman (1993: 124), but most authors did not mention the frequency of treatment employed. A clearer mention of the frequency of treatment was found in studies specifically concerned with this topic.

Some of these findings are presented in table 2.2 below:

Table 2.2 Comparison of the mean number of treatments over treatment duration

Author/s	mean number of treatments	average duration of treatment
Phillips and Butler (1982)	12.5	not given
Nyiendo and Haldeman (1987)	4.4	not given
Phillips (1981)	9	11.4 days
Jarvis <u>et al.</u> (1991)	12.9	54.5 days
Guifu <u>et al.</u> (1984)	4	not given
Cox <u>et al.</u> (1983)	16	41 days

Although these studies specifically looked at frequency and duration of treatment, it was noted that they still report widely diverse results.

The literature review was concluded by citing studies suggesting that spinal manipulative therapy is not only effective, but also more effective than other conventional forms of treatment.



## CHAPTER THREE

### 3. MATERIALS AND METHODS

#### 3.0 INTRODUCTION

This chapter covers the methods employed in data collection and the statistical methods used for data interpretation.

#### 3.1 THE DATA

The data used were of two kinds: primary and secondary data. The nature of these two subtypes of data are discussed below.

##### 3.1.1 The primary data

The primary data included:

The patients symptoms recorded in a case history form (Appendix E).

The patients physical signs recorded on a physical examination form (Appendix F) and a regional low back examination form (Appendix G).

Radiographs of the lumbar spine and pelvis, when needed, to rule out the presence of pathological conditions delimiting applicants from participation in the study.

The response of patients subjected to chiropractic treatment in terms of:

- Disability, measured with the Oswestry Back Disability Index questionnaire (Appendix A).
- Pain perception, measured with the NRS-101 questionnaire, a numerical rating scale of pain intensity (Appendix B).
- Range of motion of the lumbar spine, measured with a goniometer, for flexion, extension, and lateral flexion ranges (Appendix C).
- The presence of positive orthopaedic tests (Appendix D).

### 3.1.2 The secondary data

The secondary data comprised the following:

An outline of the criteria necessary for the diagnosis of mechanical low back pain as described by Kirkaldy-Willis (1988: 134) and the literature applicable to this topic.

### 3.2 CRITERIA GOVERNING ADMISSIBILITY OF THE DATA

The diagnosis of mechanical low back pain syndrome was based on the Kirkaldy-Willis model for the classification of mechanical low back disorders (Kirkaldy -Willis 1988: 134) and the presence of these syndromes were screened for by means of a comprehensive case history, physical examination and regional lumbar examination.

Only data from the relevant questionnaires completed under the supervision of the researcher were used.

Only the range of motion measurements taken by the researcher were used.

The Oswestry Back Disability Index (Appendix A) and the numerical pain rating scale (Visual Analogue Scale 101) (Appendix B) which were used in assessing the subjective response of patients to treatment, are accepted as being valid measurement criteria. (McDowell and Newell 1987: 239-259)

### **3.3 RESEARCH METHODOLOGY AND MATERIALS USED**

The objective of this study was to evaluate the relative effectiveness of 3 times weekly chiropractic treatment and once weekly chiropractic treatment of mechanical low back pain in order to determine the more effective treatment approach in the management of mechanical low back pain.

Both experimental and questionnaire design were the methods employed in the process of data collection.

Patients were recruited by placing an advertisement in the *Natal Mercury* indicating that free treatment would be given

to patients suffering from low back pain who would be willing to participate in the research programme.

On reply patients had the research programme explained to them and an initial consultation was arranged.

On consultation patients were screened for the presence of lumbar facet syndrome, sacroiliac syndrome or a combination of these two entities, and for any conditions delimiting the patient from the study, by means of: a case history (Appendix E), physical examination (Appendix F), regional low back examination (Appendix G) and radiographic examinations if necessary.

Patients found eligible for inclusion in the study were required to complete an informed consent document (Appendix H) and assigned to the three times weekly treatment or once weekly treatment group by a pre-established random sampling method.

This involved dividing the population of 30 into 6 groups of 5, each group contained different combinations of once and three times weekly treatment allocations, these allocations are presented below, with the number 3 representing the three times weekly treatment allocation and 1 representing the once weekly treatment allocation.

Group 1 : 33131

Group 2 : 13133

Group 3 : 13313

Group 4 : 11331

Group 5 : 31113

Group 6 : 33111

Patients were allocated to their group of treatment prior to entering the study. This resulted in two groups of 15 subjects, with the one group receiving once weekly treatment and the other receiving 3 times weekly treatment. The treatment period was set over a three week period, this meant that the three times weekly group could receive a maximum of nine treatments and the once weekly group a maximum of three treatments. The relevant data was collected at the initial consultation, the final treatment which was either once the patient was free of symptoms and signs or at the ninth or third treatment for the three times weekly or once weekly treatment groups respectively, and at a follow up consultation one month after the final treatment.

Once examination of each patient was completed a diagnosis was derived. When considered necessary by the author a radiographic examination of the lumbar spine and pelvis was undertaken.

Before treatment the symptomatic joints were identified by orthopaedic tests and motion palpation.

The orthopaedic tests used specifically to diagnose facet or sacroiliac syndrome were : Kemp's test, lumbar facet joint challenge, Patrick Faber's test, Gaenslen's test, Erichsen's test, and the lateral recumbent sacroiliac compression test.

Motion palpation, as taught at Technikon Natal with reference to the motion palpation principles set out by Schafer and Faye (1989: 211-216, 256-259), was then used to identify segments with restricted or abnormal motion patterns in the lumbar spine and sacro-illiac joints.

Patients were then manually massaged (effleurage) in the prone position for approximately 5 minutes over the lumbar paraspinal muscles prior to receiving spinal manipulative therapy.

The patient was then set-up for spinal manipulation which was administered to the affected spinal segment according to the diversified method of manipulation. These methods included the "lumbar roll technique (pisiform-mamillary)", the "spinous hook technique (pull)", the "upper sacroiliac joint - flexed innominate technique" and the "lower sacroiliac joint - extended innominate technique" as

described by Szaraz (1990). The lumbar roll and spinous hook techniques were used for manipulation of the lumbar spinal segments. Discrimination as to which technique was used on the lumbar spine was based on the success of manipulation using the lumbar roll technique, if this failed the spinous hook was used. The upper sacroiliac technique was administered in accordance with the motion palpation findings of restricted movement in the upper sacroiliac articulation, and the lower sacroiliac technique if restricted motion was found in the lower sacroiliac articulation.

Each patient was instructed to do two home exercises over the duration of the study. These included the pelvic tilt and knee to chest raise.

The pelvic tilt as described by Kenna and Murtagh (1989: 333) involved instructing the patient to lie on their back with their feet flat on the floor, arms at their sides and knees bent. The exercise was performed by drawing in the abdomen and pressing the lumbar region of the back against the floor by tightening and slightly raising the buttocks off the floor. This tilts the pelvis upward. The abdominal contraction was then held for a count of seven after which the patient relaxed. This was done for 5 to 10 repetitions twice daily.

The knee to chest raise as described by Kenna and Murtagh (1989: 336) involved instructing the patient to lie flat on their back, then bend one leg up and grasp it with their hand on that side just below the knee, the exercise was performed by holding the leg in this position for a count of ten while the head is bent forward so that the forehead approaches the bent knee. The exercise is then repeated on the other side. This was done twice daily.

The research involved experimental methodology by observation and descriptive survey methodology by questionnaires.

The experimental design involved lumbar spine ranges of motion (Appendix C) and positive orthopaedic test scores (Appendix D).

**Lumbar spine range of motion** was measured in flexion, extension, left lateral flexion and right lateral flexion with a digital goniometer: the *Autogon 2*, supplied by *Smith and Nephew Rolyan Inc.* (N93W14475 Whittalou Way, P.O. Box 555, Menomonee Falls WI 53051). The instructed method of measurement is discussed below.

**For flexion and extension** - Marks were made on the overlying skin at the patient's greater trochanter



(point 1), at a point on the lower costal margin as it intersected with the mid-axillary line (point 2) and at a point 10 to 15cm below the greater trochanter in line with the lateral aspect of the femur (point 3). The fulcrum of the goniometer was then placed over point 1 , with the goniometer's upper arm centre line over point 2, and the lower arm centre line over point 3. In this position the goniometer was set so as to record zero degrees, and this was stored in the machines memory as reading #1. The patient was then instructed to bend forward as far as possible while the goniometer was held stationary at points 1 and 3. At the limit of forward bending (flexion) the upper arm of the goniometer was moved so that it aligned with point 2 and this position was recorded as reading #2 and stored into the memory. The patient was then instructed to stand up straight again and the upper goniometer arm was relocated to intersect at point 2 once again where it would read a measurement of zero degrees and this was recorded as reading #3 into memory. The patient was then instructed to bend backwards (extension) as far as possible, at this limit the upper arm was again relocated over point 2 and this reading was recorded as #4 into the memory.

**For left and right lateral flexion** - skin markings were made over the second sacral tubercle which lies in the mid-line between the posterior superior iliac spines (point 4),

over the twelfth thoracic spinous process (point 5) and over a point immediately above the beginning of the gluteal cleft (point 6). The goniometer was aligned so that the fulcrum was over point 4, the centre line of the upper arm over point 5 and the centre line of the lower arm over point 6, with the goniometer recording zero degrees in this position the reading was stored as #5. The patient was then instructed to laterally bend to the left as far as possible while the fulcrum and lower arm positions were held stationary ( points 4 and 6 ). At the limit of this range the upper arm was relocated over point 5 and the reading was recorded as #6. The patient was then instructed to stand upright once more and the upper arm was relocated to point 5 with the zero position recorded as #7. The patient was then asked to laterally bend to the right and the readings at end range were recorded and stored as reading #8.

At all times the examiner ensured that no movement occurred at the hip joints.

The readings taken were retrieved from the machines memory and recorded in the patient's file.

Rotational ranges of motion were not measured as the apparatus did not allow for such measurements.

**Positive orthopaedic tests** were used in experimental observation by allocating a scoring system to specific relevant tests. As discussed in the review of the related literature the positive orthopaedic tests for the respective conditions considered in this study are: positive Kemp's test and positive lumbar facet joint challenge for facet syndrome, and positive Patrick Faber, Gaenslen's, Erichsen's and lateral recumbent sacroiliac compression tests for sacro-illiac syndrome. Patients were assessed for the presence of positive signs to these tests at the times of data collection.

In order to statistically analyse this data the following scoring system was employed:

Positive Kemp's test-----	20 points
Positive lumbar facet joint challenge-----	20 points
Positive Patrick Faber test-----	10 points
Positive Gaenslens test-----	10 points
Positive Erichsen's test-----	10 points
Positive lateral recumbent sacroiliac compression test-----	10 points

This system was developed by the author with the assistance of Mr. K Reich, a statistician at Technikon Natal.

The reason for allocating 20 points to each of the orthopaedic tests applicable to facet syndrome was that there were only two tests considered in the process of the facet joint testing as opposed to the four tests applicable to the sacroiliac joint which have been allocated 10 points each. This system thus prevented magnification of the sacroiliac syndrome over the facet syndrome in that the maximum total score for each syndrome was 40 points.

The total score was recorded for each patient at the respective times of data collection in the patients' file.

The descriptive survey design made use of the Oswestry Back Disability Index (Appendix A) and the NRS-101, a numerical pain rating scale (Appendix B).

The **Oswestry Back Disability Index** questionnaire consists of 10 sections of 6 questions each. For each section the total possible score is 5 points, with the point distribution varying from zero if the first statement of the respective section was marked, and up to five if the last (sixth) statement was chosen. The points obtained for each sectioned are added, with the maximum possible score being fifty.

The final score was converted to a percentage score for each individual patient at that particular consultation. In the event that one section was not completed the highest possible score became 45 and the total score was then calculated out of 45 before being converted to the percentage. Similarly if more than one section was not answered the total score was divided by 5 less points per section un-answered before percentage conversion took place.

These scores were calculated and recorded in the patients file at the respective times of data collection.

The **NRS-101**, a numerical pain intensity scale was used to measure the subjective response of patient's to treatment in terms of their perception of the pain intensity they experienced. This questionnaire instructed the patient to rate his/her pain at it's worst and at it's least on a numerical scale of zero to one hundred, with zero indicating "no pain at all" and one hundred indicating "pain as bad as it could be". This data was collected at the respective times and recorded in the patient's file. The average pain intensity was calculated by adding the values representing worst and least pain and then dividing this by two, the average pain intensity experienced by each patient over the treatment and follow-up periods were then

used for statistical analysis.

Data derived from these four measurement tools was collected at the initial consultation, the final treatment and at a follow up visit one month later. This allowed statistical analysis over two periods, namely : the treatment period and the follow-up period.

The data was analysed using the computer software programme *STATGRAPHICS PLUS VERSION 6*, supplied by *Manugistics* .

Paired t-tests (one sample analysis) were used to determine whether any significant change occurred between the initial consultation and final treatment, and between the final treatment and the follow up visit one month later, within each respective study group. In each respective hypothesis test conducted comparison was made in terms of chronological order of data collection, that is data collected from the final treatment was subtracted from the initial consultation and similarly data from the follow up visit was subtracted from the data produced at the final treatment. Therefore, in the case of rejection of the null hypothesis, a resultant positive mean of the given confidence interval would indicate that the data collected showed an overall decrease, and a negative mean of the given confidence interval would indicate an overall

increase in readings collected.

Unpaired t-tests (two sample analysis) were used to determine whether there was any significant difference between the two groups at the time of initial consultation, final treatment given and at the follow up visit one month later.

Similarly, as described above in the paired T-tests interpretation of the mean for the given confidence interval (positive or negative) was used when the null hypothesis was rejected. In the unpaired T-tests this indicated which study group showed larger values and which showed lower values. For example if subtracting the results of the once weekly treated group from the 3 times weekly treated group yielded a positive mean, it would indicate that the once weekly treated group had a lower mean, i.e. showed lower overall values, and vice versa if the mean was negative.

All confidence intervals were constructed at a 95% confidence interval, ie.  $\alpha = 0.05$ .

T-tests of the null hypothesis (ie. that the two groups show no significant difference) were thus rejected for any P value less than 0.05, and accepted for any P value

greater than 0.05.

Statistical analyses using t distributions are categorised as parametric test statistics and in using them it is assumed that the population involved is normally distributed. With respect to this it was assumed that the population involved in this study was representative of the population in the greater Durban area.

### **3.4 THE SPECIFIC TREATMENT OF THE DATA OF EACH SUBPROBLEM**

#### **3.4.1 SUBPROBLEM ONE**

The first subproblem was to evaluate 3 times weekly chiropractic treatment of mechanical low back pain in terms of subjective and objective clinical findings in order to establish the effectiveness of this treatment approach in the management of mechanical low back pain.

##### **3.4.1.1 The data needed**

The data needed for testing the hypothesis of subproblem one was the response of patients in this group to the Oswestry Low Back Pain Disability Questionnaire (Appendix A), the NRS-101 numerical rating scale of pain intensity (Appendix B),



the recorded lumbar spine ranges of motion (Appendix C) and the scores obtained from the presence of positive orthopaedic tests (Appendix D).

#### 3.4.1.2 How the data was secured

All data was collected from the participating patients treated at the Technikon Natal Chiropractic Day Clinic.

This data was recorded in each patient's file at the times of data collection (discussed above in the research methodology).

All questionnaires were completed under the supervision of the author.

#### **3.4.2 SUBPROBLEM TWO**

The second subproblem was to evaluate once weekly chiropractic treatment of mechanical low back pain in terms of subjective and objective clinical findings in order to establish the effectiveness of this treatment approach in the management of mechanical low back pain.

#### 3.4.2.1 The data needed

The data needed for testing the hypothesis of subproblem one was the response of patients in this group to the Oswestry Low Back Pain Disability Questionnaire (Appendix A), the NRS-101 numerical rating scale of pain intensity (Appendix B), the recorded lumbar spine ranges of motion (Appendix C) and the scores obtained from the presence of positive orthopaedic tests (Appendix D).

#### 3.4.2.2 How the data was secured

The data needed was secured as for subproblem one.

#### **3.4.3 SUBPROBLEM THREE**

The third subproblem was to integrate the data indicating the effectiveness of 3 times weekly and once weekly chiropractic treatment, in terms of subjective and objective clinical findings, in order to determine the more effective treatment approach in the management of mechanical low back pain.

#### 3.4.3.1 The data needed

The data needed for testing the hypothesis of subproblem three was the response of patients in both groups to the Oswestry Low Back Pain Disability Questionnaire (Appendix A), the NRS-101 numerical rating scale of pain intensity (Appendix B), the recorded lumbar spine ranges of motion (Appendix C) and the scores obtained from the presence of positive orthopaedic tests (Appendix D).

#### 3.4.3.2 How the data was secured

The data needed was recorded in the files of all participating patients during the process of securing data for subproblems one and two.

### **3.5 General remarks**

Of the 36 patients found eligible for inclusion into the study, 5 were non-compliant, 1 developed additional pathology contributing to her low back pain, and 30 completed the research programme.

## CHAPTER FOUR

### 4. RESULTS

#### 4.0 INTRODUCTION

This chapter covers the results obtained after statistically analysing the data collected from the measurement criteria used, namely:

- the pain intensity questionnaires (NRS-101),
- the Oswestry Back Disability questionnaires,
- the positive orthopaedic test scores, and
- the lumbar spine ranges of motion.

The results obtained for the paired t-tests are tabulated and show the confidence intervals ( C.I.), the significance level ( P VALUE ) and confidence interval means ( MEAN ) obtained for each study group.

In tabulation of the unpaired t-tests the results are presented at the respective times of data comparison, which were as follows:

- the initial consultation (INITIAL CONS.),
- the final treatment (FINAL TX), and
- the follow-up consultation (F/U CONS.).

The age and gender distribution of the population studied are also tabulated at the end of the chapter.

4.1 PAIN INTENSITY

Pain intensity was measured with the NRS-101 pain intensity scale (Appendix B). The following results were obtained:

Table 4.1 One sample analysis (paired t-tests) for the average pain intensity experienced during the period between the initial consultation and the final treatment:

	3 times weekly treatment	once weekly treatment
C.I.	(13.426 ; 34.107)	(15.378 ; 31.622)
P VALUE	0.0002	0.00002
MEAN	23.8	23.5

The null hypothesis is rejected for both study groups, which indicates that a statistically significant change took place during this period.

Table 4.2 One sample analysis (paired t-tests) for the average pain intensity experienced during the period between the final treatment and the one month later follow up visit:

	3 times weekly treatment	once weekly treatment
C.I.	(-5.502 ; 5.902)	(2.062 ; 17.938)
P VALUE	0.9411	0.0172
MEAN	0.2	10

The null hypothesis is rejected for the once weekly treated study group, which indicates that a statistically significant change took place during this period. The null hypothesis is not rejected for the three times weekly treated study group, which indicates that no statistically significant change took place during this period.

Table 4.3 Two - sample analysis (unpaired t-test) comparing the average pain intensity experienced for both groups :

	confidence interval	mean	P value
INITIAL CONS.	(-18.493 ; 15.893)	-1.3	0.8779
FINAL TX	(-15.389 ; 13.323)	-1	0.8838
F/U CONS.	(-23.539 ; 1.872)	-10.8	0.0916

The null hypothesis was not rejected in each case above, indicating that there was no statistically significant difference between the two study groups.

#### 4.2 OSWESTRY BACK DISABILITY INDEX

The Oswestry Low Back Pain Disability Index questionnaire (Appendix A) was used to measure the percentage disability subjectively experienced by each patient. The collected data was analysed and produced the following results:

Table 4.4 One sample analysis (paired t-tests) for the Oswestry Disability Index during the period between the initial consultation and the final treatment:

	3 times weekly treatment	once weekly treatment
C.I.	(2.644 ; 11.076)	(1.768 ; 10.845)
P VALUE	0.0036	0.0099
MEAN	6.9	6.3

The null hypothesis is rejected for both study groups, which indicates that a statistically significant change took place during this period.

Table 4.5 One sample analysis (paired t-tests) for the Oswestry Disability Index during the period between the final treatment and the follow up visit one month later:

	3 times weekly treatment	once weekly treatment
C.I.	(-2.218 ; 0.218)	(-1.406; 5.712)
P VALUE	0.0999	0.2152
MEAN	2.2	2.2

The null hypothesis was not rejected for both study groups, which indicates that no statistically significant change took place during this period.

Table 4.6 Two - sample analysis (unpaired t-test) comparing the Oswestry Disability Index scores obtained for both groups :

	confidence interval	mean	P value
INITIAL CONS.	(-11.601 ; 5.134)	-3.2	0.4352
FINAL TX	(-10.890 ; 5.530)	-2.7	0.5091
F/U CONS.	(-14.343 ; 2.676)	-5.8	0.1712

The null hypothesis was not rejected in each case above, indicating that no statistically significant change took place during these periods.



### 4.3 POSITIVE ORTHOPAEDIC TEST SCORES

Patrick Faber's test, Erichsen's test, sacroiliac compression, and Gaenslen's test were the orthopaedic tests used to assess for sacroiliac syndrome.

Facet joint challenge and Kemp's test were used to assess for lumbar facet syndrome.

The scores obtained (Appendix D) were analysed and produced the following results:

Table 4.7 One sample analysis (paired t-tests) for the positive orthopaedic test scores obtained during the period between the initial consultation and the final treatment:

	3 times weekly treatment	once weekly treatment
C.I.	(15.855 ; 37.478)	(16.223 ; 31.778)
P VALUE	0.0001	0.00001
MEAN	26.7	24

The null hypothesis was rejected for both study groups, which indicates that a statistically significant change took place during this period.

Table 4.8 One sample analysis (paired t-tests) for the positive orthopaedic test scores obtained during the period between the final treatment and the follow up consultation one month later:

	3 times weekly treatment	once weekly treatment
C.I.	(-1.758 ; 7.091)	(2.009 ; 12.657)
P VALUE	0.2170	0.0104
MEAN	2.7	7.3

The null hypothesis is rejected for the once weekly treated study group, which indicates that a statistically significant change took place during this period. The null hypothesis is not rejected for the three times weekly treated study group, which indicates that no statistically significant change took place during this period.

Table 4.9 Two - sample analysis (unpaired t-test) comparing the positive orthopaedic test scores obtained for both groups :

	confidence interval	mean	P value
INITIAL CONS.	(-21.863 ; -2.137)	-12	0.0189
FINAL TX	(-19.659 ; 0.992)	-9.3	0.0746
F/U CONS.	(-23.449 ; -4.550)	-13.9	0.0052

The null hypothesis was not rejected for comparison at the time of the final treatment, indicating that no statistically significant difference existed between the two study groups at this time. The null hypothesis was rejected for the data collected at the initial consultation and follow-up visit, indicating that a statistically significant difference existed between the two study groups at these times.

#### 4.4 RANGE OF MOTION

Lumbar spine ranges of motion (Appendix C) were recorded using a goniometer. Four ranges were measured: forward flexion, extension, right lateral flexion and left lateral flexion. The data obtained for each respective range of motion was analysed and produced the following results:

Table 4.10 One sample analysis (paired t-tests) for extension readings obtained during the period between the initial consultation and the final treatment:

	3 times weekly treatment	once weekly treatment
C.I.	(-17.554; -8.579)	(-9.174;-2.159)
P VALUE	0.00002	0.0038
MEAN	-13.1	-5.7

The null hypothesis is rejected for both study groups, which indicates that a statistically significant change took place during this period.

Table 4.11 One sample analysis (paired t-tests) for extension readings obtained during the period between the final treatment and the follow up visit one month later:

	3 times weekly treatment	once weekly treatment
C.I	(-9.310; 2.510)	(-4.618 ;1.284)
P VALUE	0.2374	0.2457
MEAN	-3.4	-1.7

The null hypothesis is not rejected for both study groups, which indicates that no statistically significant change took place during this period.

Table 4.12 One sample analysis (paired t-tests) for forward flexion readings obtained during the period between the initial consultation and the final treatment:

	3 times weekly treatment	once weekly treatment
C.I.	(-33.624 ; -8.509)	(-14.379 ; 2.512)
P VALUE	0.0029	0.1540
MEAN	-21.1	-5.9

The null hypothesis is rejected for the three times weekly treated study group, which indicates that a statistically significant change took place during this period.

The null hypothesis is not rejected for the once weekly treated study group, which indicates that no statistically significant change took place during this period.

Table 4.13 One sample analysis (paired t-tests) for forward flexion readings obtained during the period between the final treatment and the follow up visit one month later:

	3 times weekly treatment	once weekly treatment
C.I.	(-7.146 ; 3.679)	(-11.676; -0.591)
P VALUE	0.5033	0.0324
MEAN	-1.7	-6.1

The null hypothesis is rejected for the once weekly treated study group, which indicates that a statistically significant change took place during this period. The null hypothesis is not rejected for the three times weekly treated study group, indicating that no statistically significant change took place during this period.

Table 4.14 One sample analysis (paired t-tests) for right lateral flexion readings obtained during the period between the initial consultation and the final treatment:

	3 times weekly treatment	once weekly treatment
C.I.	(-12.042;-4.092)	(-6.378;-2.022)
P VALUE	0.0006	0.0010
MEAN	-8.1	-4.2

The null hypothesis is rejected for both study groups, which indicates that a statistically significant change took place during this period.

Table 4.15 One sample analysis (paired t-tests) for right lateral flexion readings obtained during the period between the final treatment and the follow up visit one month later:

	3 times weekly treatment	once weekly treatment
C.I.	(-2.939 ; 3.472)	(-7.137; -1.129)
P VALUE	0.8609	0.0105
MEAN	0.3	-4.1

The null hypothesis is rejected for the once weekly treated study group, which indicates that a statistically significant change took place during this period. The null hypothesis is not rejected for the three times weekly treated study group, indicating that no statistically significant change took place during this period.

Table 4.16 One sample analysis (paired t-tests) for left lateral flexion readings obtained during the period between the initial consultation and the final treatment:

	3 times weekly treatment	once weekly treatment
C.I.	(-9.956 ; -3.644)	(-9.192 ; -1.342)
P VALUE	0.0004	0.0121
MEAN	-6.8	-5.3

The null hypothesis is rejected for both study groups, which indicates that a statistically significant change took place during this period.

Table 4.17 One sample analysis (paired t-tests) for left lateral flexion readings obtained during the period between the final treatment and the follow up visit one month later:

	3 times weekly treatment	once weekly treatment
C.I.	(-5.205 ; 1.872)	( -4.870 ; 1.403)
P VALUE	0.3294	0.2556
MEAN	-1.7	-1.7

The null hypothesis is not rejected for both study groups, which indicates that no statistically significant change took place during this period.

Table 4.18 Two - sample analysis (unpaired t-test) comparing the extension ranges of motion obtained for both groups :

	confidence interval	mean	P value
INIITIAL CONS.	(-2.040 ; 8.174)	3.1	0.2288
FINAL TX	(-11.491 ; 2.824)	-4.3	0.2250
F/U CONS.	(-11.669 ; -0.464)	-6.1	0.0348



The null hypothesis was not rejected at the time of data collection at the initial consultation and after the final treatment, indicating that no statistically significant difference existed between the two study groups at these times. The null hypothesis was rejected for the data collected at the follow-up visit, indicating that a statistically significant difference existed between the two study groups at this time.

Table 4.19 Two - sample analysis (unpaired t-test) comparing the forward flexion ranges of motion obtained for both groups :

	confidence interval	mean	P value
INITIAL CONS.	(-9.104 ; 22.170)	6.5	0.3992
FINAL TX	(-20.428 ; 3.228)	-8.6	0.1475
F/U CONS.	(-12.878 ; 4.478)	-4.2	0.3299

The null hypothesis was not rejected in each case above, indicating that no statistically significant change took place during these periods.

Table 4.20 Two - sample analysis (unpaired t-test)  
comparing the right lateral flexion ranges of motion  
obtained for both groups:

	confidence interval	mean	P value
INITIAL CONS.	(-2.526 ; 6.393)	1.9	0.3820
FINAL TX	(-6.175 ; 2.309)	-1.9	0.3583
F/U CONS.	(-1.490 ; 6.423)	2.5	0.2120

The null hypothesis was not rejected in each case above, indicating that no statistically significant change took place during these periods.

Table 4.21 Two - sample analysis (unpaired t-test)  
comparing the left lateral flexion obtained for both  
groups:

	confidence interval	mean	P value
INITIAL CONS.	(-3.093 ; 4.693)	0.8	0.6769
FINAL TX	(-5.057 ; 3.457)	-0.8	0.7031
F/U CONS.	(-5.931 ; 4.464)	-0.7	0.7746

The null hypothesis was not rejected in each case above, indicating that no statistically significant change took place during these periods.

#### 4.5 POPULATION AGE AND GENDER DISTRIBUTION

Table 4.22 Table of average age distribution

	3 times weekly treatment group	once weekly treatment group
mean	43.9 years	42.9 years

Table 4.23 Table of gender distribution

	3 times weekly treatment group	once weekly treatment group
males	6	12
females	9	3

#### 4.6 GENERAL REMARKS

This chapter presented the results obtained from the collected data. The discussion, interpretation and implications of these results are dealt with in the following chapter.

## CHAPTER FIVE

### 5. DISCUSSION

This chapter involves the discussion of the results obtained from the NRS-101 pain intensity scale, the Oswestry back disability index, the positive orthopaedic test scores and lumbar spine ranges of motion. The author's conclusions and recommendations for future studies are also discussed.

Paired t-tests for average pain intensity during the treatment period resulted in rejection of the null hypothesis for both study groups, indicating that a statistically significant change was observed for each study group. These changes were all in the form of a reduction in pain intensity since both confidence interval means were positive (Table 4.1). Analysis of average pain intensity over the follow-up period showed no significant change for the group treated three times weekly, but did indicate a significant change in average pain intensity for the group treated once weekly. This change in the group treated once weekly was in the form of a further decrease in pain intensity since a positive mean was obtained (Table 4.2). These results were compared, using unpaired t-tests, and it was found that no significant difference

in average pain intensity existed between the two study groups at any time of data collection (Table 4.3).

These results indicate that both groups responded favourably over the treatment period, in terms of average pain intensity, this supports hypothesis one and two.

Comparison of the pain intensity data indicated that both groups experienced very similar pain intensities at the initial visit, improved by very similar amounts after the treatment period, and maintained this improvement over the one month follow-up period. Although the group treated once weekly showed a greater improvement over the follow-up period, it was not statistically significant enough to show a difference between the two study groups over this period. In view of these facts hypothesis three is not supported since the group treated three times weekly did not show any significantly better results than the group treated once weekly.

Paired t-tests for the Oswestry Disability Index during the treatment period resulted in rejection of the null

hypothesis for both study groups, which means that a statistically significant change was observed for each study group during this period. The change was in the form of a significant reduction in Oswestry disability scores

for each group since a positive mean was found in each case (Table 4.4). Both study groups showed significant decreases in the disability associated with low back pain.

Paired t-tests for the follow-up period resulted in accepting the null hypothesis for both study groups, which indicated that no significant changes took place during this period (Table 4.5).

These results were compared, using unpaired t-tests, and it was found that no statistically significant difference existed between the two study groups, in terms of the Oswestry disability index scores, at all times of data collection (Table 4.6).

Since both treatment protocols resulted in favourable changes over the treatment period hypothesis one and two are supported. Comparison of the Oswestry disability index data obtained from both groups showed no statistical difference at each time of data collection. This indicates that both groups showed very similar disability index scores at the initial visit, improved by very similar amounts over the treatment period, and maintained this improvement over the one month follow-up period. Although the group treated once weekly showed further improvement over the follow-up period it was not significant enough to

show a difference between the two study groups when compared over this period, this trend was also seen for the once weekly treated group in the pain intensity results.

Hypothesis three is thus not supported since the group treated three times weekly did not show any significantly better results than the group treated once weekly.

These results seem to follow a similar pattern to those reported for pain intensity and this may indicate that although the NRS-101 pain intensity questionnaire and Oswestry disability index questionnaire are subjective measurements, the responses of patients to these were of a consistent nature.

The paired t-tests for the positive orthopaedic test scores obtained during the treatment period resulted in rejection of the null hypothesis for both study groups, meaning that statistically significant changes took place during this period. These changes were significant decreases (the mean is positive in both cases) in positive orthopaedic test scores (Table 4.7).

Paired t-tests for the positive orthopaedic test scores obtained during the follow-up period resulted in rejecting the null hypothesis for the once weekly study group,

indicating that a statistically significant change took place during this period. This change was in the form of a significant reduction in positive orthopaedic test scores. The same is not true for the three times weekly treatment group since the null hypothesis is not rejected, this suggests that this group showed no significant change during this period (Table 4.8).

When the results of the positive orthopaedic test scores obtained were compared (unpaired t-tests), the null hypothesis was accepted for the time of the final treatment indicating that there was no statistically significant difference between the two study groups at this time.

The null hypothesis is however rejected for the time of initial consultation and for the follow-up visit which means that there was a statistically significant difference between the two study groups at the start of the study and at the end of the study. The calculations involved subtracting the data of the group treated three times weekly from that of the group treated once weekly, the resultant means of the confidence intervals obtained were negative and this indicates that the once weekly treated group showed significantly lower orthopaedic test scores at the initial consultation and follow-up visit (Table 4.9).

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The results indicate that both groups showed a significant reduction in positive orthopaedic test scores over the treatment period, this supports hypothesis one and two.

Comparison of the data obtained from the positive orthopaedic test scores (unpaired t-tests) obtained from both groups shows no statistical difference after the treatment period, but a statistical difference between the two groups was evident at the initial consultation and at the follow-up visit.

The fact that the two groups differed significantly (the once weekly treated group showed lower over all orthopaedic test scores) at the initial consultation is not consistent with the findings reported in the subjective measurement tools.

In order to recover to a level of no significant difference the once weekly treated group had to recover to a lesser extent than did the group treated three times weekly, this could explain the results obtained after the treatment period. The difference that existed between the two groups at the end of the follow-up period can be explained by the fact that the group treated once weekly continued to show a statistically significant reduction in the positive orthopaedic test scores where as the other group did not.

This trend of further improvement over the period between the final treatment and follow-up visit is observed in both subjective measurement tools as well, but was not significant enough to show a difference when the results obtained from the two groups were compared. This could be because the orthopaedic tests were more sensitive to this change than were the subjective measurements.

Hypothesis three is thus not supported since the group treated three times weekly did not show any significantly better results than the group treated once weekly.

The paired t-test results for range of motion over the treatment period showed that the group treated three times weekly showed a significant improvement in extension (Table 4.10), forward flexion (Table 4.12), right lateral flexion (Table 4.14) and left lateral flexion (Table 4.16).

All these results therefore support hypothesis one.

Paired t-test results for range of motion over the treatment period showed that the group treated once weekly showed a significant improvement in extension (table 4.10), right lateral flexion (table 4.14) and left lateral flexion (table 4.16), but no significant change in forward flexion (table 4.12) was observed.

The paired t-test for forward flexion in the once weekly treated group involved subtracting the readings obtained at the final treatment from those taken at the initial consultation. This yielded a mean of -5.9 for the confidence interval, and because of the negative nature of this mean the forward flexion readings after treatment had to be of a larger value than those at the initial consultation. This meant that a clinically significant increase in forward flexion did take place, but it was not large enough to be considered statistically significant. Hypothesis two is therefore supported by statistically significant improvements in the extension, left lateral flexion and right lateral flexion readings, and a clinically significant improvement in forward flexion readings. Paired t-tests over the follow-up period (Tables 4.11, 4.13, 4.15 and 4.17) revealed that the group treated three times weekly showed no further changes in any range of motion, indicating that this group maintained the overall improvements in range of motion observed for the treatment period and thus also supports hypothesis one. The once weekly treated group continued to show even further improvement with respect to forward flexion (Table 4.13) and right lateral flexion (Table 4.15), while the extension (Table 4.11) and left lateral flexion (Table 4.13) readings remained unchanged. The response of the once weekly treated group over the follow-up period thus also supports

hypothesis two. These results also show a similar pattern to those obtained from the subjective measurement tools and the positive orthopaedic test scores since the once weekly treated group showed some form of continued improvement (in forward flexion and right lateral flexion) during the follow-up period, indicating that the results obtained from each measurement tool consistently followed this trend.

Comparison of the two groups showed no significant difference in extension (Table 4.18), forward flexion (Table 4.19), right lateral flexion (Table 4.20) and left lateral flexion (Table 4.21) at the initial consultation and final treatment. At the follow-up consultation a month later the two groups once again showed no significant differences except for the once weekly treated group which showed a greater extension range of motion (table 4.18).

The overall implications of the unpaired t-tests are that the group treated three times weekly showed no significantly better changes in any range of motion and once again hypothesis three is not supported.

The reliability of the goniometer: *Autogon 2* supplied by *Smith and Nephew Rolyan Inc.* (N93W14475 Whittalou Way, P.O. Box 555, Menomonee Falls WI 53051), used for measuring lumbar spinal range of motion in this study is

questionable. The reason being that the anatomical landmarks used for placement of the lever arms were marked on the skin of the patient and since the movement of overlying skin is not in direct relationship to the movement of spinal motion segments the validity of these measurements is questionable.

The difference observed in extension range of motion between the two groups at the end of the follow-up period is similar to the trend seen in the orthopaedic test scores and indicates that the group treated once weekly continued to show a statistically significant improvement where as the other group did not.

This trend of further improvement over the period between the final treatment and follow-up visit is observed in both subjective measurement questionnaires too, but was not significant enough to show a difference when the results obtained from the two groups were compared.

This trend is only statistically significant in two cases, namely: the positive orthopaedic test scores and the extension range of motion. Since pain intensity and all other ranges of motion showed no significant differences between the two groups, there is more evidence to support the conclusion of no significant differences between the

two groups than there is to suggest that the once weekly treated group showed more favourable results.

When considering all the results obtained the trend of supporting hypotheses one and two and rejecting hypothesis three is evident throughout. This trend is of a more meaningful nature since it is statistically supported for each measurement tool.

The findings of this study suggest that the frequencies of three times weekly and once weekly chiropractic treatment appear to be equally effective in the management of mechanical low back pain. The results obtained are therefore in agreement with the findings of authors, such as Nyiendo and Haldeman (1987) and Guifu et al. (1984) who suggest that a lower frequency of treatment is effective, as well as authors, such as Haldeman et al. (1993: 124) and Kirkaldy-Willis (1988: 253) who suggest a higher frequency of treatment is effective.

The reason for the widely diverse range of treatment frequencies suggested by studies such as those by Jarvis et al. (1991), Nyiendo and Haldeman et al. (1987) and Phillips (1981) is therefore still unclear. A possible explanation may be the economic factors involved. Most private practices are run on a cash basis as opposed to

this study which was set in a teaching clinic at which patients involved in research programmes were treated free of charge. This is interesting since the study by Phillips and Butler (1982) drew it's data from multiple private chiropractic offices and suggested a mean frequency of 12.5 treatments, similarly Jarvis et al. (1991), who looked at worker's compensation data, found a relatively high mean frequency of 12.9 treatments. On the other hand, when considering authors such as Triano et al. (1992), who based their study at a teaching clinic where treatment expense was eliminated as a factor effecting the clinical decision making, the mean treatment frequency seemed to be significantly lower, similarly Nyiendo and Haldeman (1987) found a relatively low mean of 4.4 treatments.

Bearing in mind the high costs involved in the treatment of low back pain (Andersson et al. 1991), it would be logical that existing treatment protocols be adapted so as to follow the lowest effective treatment frequency.

Since this study suggests that a lower frequency of one treatment per week for three weeks seems as effective as three treatments per week, then the lower treatment frequency should be followed by practitioners involved in this field. This issue is undoubtedly controversial and although the relationship of treatment expense and

treatment frequency seems obvious, future investigations concerned specifically with this topic are required before any substantiated claims and suggested treatment protocols can be made.

The outcome of this study is encouraging since both treatment groups showed statistically significant improvement over the treatment period. A three week treatment period was selected on the basis that it has been used before (Shekelle et al. 1992), adequately covers the guidelines suggested by Haldeman et al. (1993: 124) of one to two weeks of aggressive intervention, and is considered adequate enough by the author since Hadler et al. (1987) found that patients respond maximally in the first week of manipulative intervention. Nevertheless this response can only be related to the treatment of lumbar facet and sacroiliac syndromes, and the age (Table 22) and gender (Table 23) distributions involved in this study.

Since the relationship of age or gender distribution and treatment frequency was not an objective of this study the author is compelled to offer a strong caution that the results obtained can not be generalised to other populations or treatment frequencies. In view of this, the treatment frequencies used in this study can't be condoned until further scientific demonstrations of efficacy in



other relevant populations are made.

The phase of dysfunction, according to the Kirkaldy-Willis diagnostic model (1988: 133-154) for categorising mechanical lower back pain, encompasses several diagnoses, of these posterior facet syndrome, sacroiliac syndrome and a combination of these two were all accepted into this study. The reason being that Kirkaldy-Willis and Cassidy (1988: 216) found these to be the most common conditions within this classification system. The possibility of treating a specific syndrome, such as sacroiliac syndrome only, should be adapted in future studies as this will improve the validity of the results obtained.

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**7. APPENDICES**

*APPENDIX A*  
*OSWESTRY BACK DISABILITY INDEX QUESTIONNAIRE*  
*AND PERCENTAGES OBTAINED*

# OSWESTRY BACK DISABILITY INDEX

PATIENT NAME: \_\_\_\_\_ FILE #: \_\_\_\_\_ DATE: \_\_\_\_\_

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

## Section 1 - Pain Intensity

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

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

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

## Section 3 - Lifting

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

## Section 4 - Walking

- ☐ Pain does not prevent me walking any distance.
- ☐ Pain prevents me walking more than 1 mile (2.2 km).
- ☐ Pain prevents me walking more than 1/2 mile (1.1 km).
- ☐ Pain prevents me walking more than 1/4 mile (0.5 km).
- ☐ I can only walk using a stick or crutches.
- ☐ I am in bed most of the time and have to crawl to the toilet.

## Section 5 - Sitting

- ☐ I can sit in any chair as long as I like.
- ☐ I can only sit in my favorite chair as long as I like.
- ☐ Pain prevents me from sitting more than 1 hour.
- ☐ Pain prevents me from sitting more than 1/2 hour.
- ☐ Pain prevents me from sitting more than 10 minutes.
- ☐ Pain prevents me from sitting at all.

## Section 6 - Standing

- ☐ I can stand as long as I want without extra pain.
- ☐ I can stand as long as I want, but it gives me extra pain.
- ☐ Pain prevents me from standing for more than one hour.
- ☐ Pain prevents me from standing for more than 30 minutes.
- ☐ Pain prevents me from standing for more than 10 minutes.
- ☐ Pain prevents me from standing at all.

## Section 7 - Sex Life

- ☐ My sex life is normal and causes no extra pain.
- ☐ My sex life is normal but causes some extra pain.
- ☐ My sex life is nearly normal but it is very painful.
- ☐ My sex life is severely restricted by pain.
- ☐ My sex life is nearly absent because of pain.
- ☐ Pain prevents any sex life at all.

## Section 8 - Social Life

- ☐ My social life is normal and gives me no extra pain.
- ☐ My social life is normal but increases the degree of pain.
- ☐ Pain has no significant effect on my social life apart from limiting my more energetic interests, for example, dancing.
- ☐ Pain has restricted my social life and I do not go out as often.
- ☐ Pain has restricted my social life to my home.
- ☐ I have no social life because of pain.

## Section 9 - Sleeping

- ☐ I have no trouble sleeping.
- ☐ I can sleep well only by using pills.
- ☐ Even when I take pills I have less than six hours sleep.
- ☐ Even when I take pills I have less than four hours sleep.
- ☐ Even when I take pills I have less than two hours sleep.
- ☐ Pain prevents me from sleeping at all.

## Section 10 - Travelling

- ☐ I can travel anywhere without extra pain.
- ☐ I can travel anywhere but it gives me extra pain.
- ☐ Pain is bad but I manage trips over two hours.
- ☐ Pain restricts me to trips of less than one hour.
- ☐ Pain restricts me to trips under 30 minutes.
- ☐ Pain prevents me from travelling, except to the doctor or hospital.

# OSWESTRY BACK DISABILITY INDEX PERCENTAGES

## ONCE WEEKLY TREATMENT GROUP

INITIAL %	FINAL TX %	FOLLOW UP %
31	24	26
22.5	20	22.8
18	15.5	2
16	10	2
11.1	8	6
16	2	2
32	4.4	8
40	28	38
14	8	6
2	6	6
38	24	20
4.4	0	2.2
12	6	4
8	10	2
17.7	22.2	8.8

## THREE TIMES WEEKLY TREATMENT GROUP

INITIAL %	FINAL TX %	FOLLOW UP %
20	12	14
34	8	8
12	12	14
36	24	28
20	17.7	20
22	12	14
16	10	10
8.8	0	0
8	6	11.1
40	48.8	44.4
13.3	4	6
22.5	15	15
14	8.8	8.8
26.6	14	14
38	36	36

***APPENDIX B***  
***NRS-101 PAIN INTENSITY SCALE AND AVERAGE***  
***RATINGS OBTAINED***

NRS-101 : Numerical rating scale of pain intensity

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

File number: \_\_\_\_\_ Date: \_\_\_\_\_

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

Please write only one number.

0 \_\_\_\_\_ 100

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

Please write only one number.

0 \_\_\_\_\_ 100

AVERAGE SCORES OBTAINED FROM THE NRS-101 QUESTIONNAIRE  
ONCE WEEKLY TREATMENT GROUP

intial	final	f/u
65	40	20
45	40	13
50	15	18
40	20	0
30	5	8
75	65	35
15	13	5
100	50	25
55	23	23
28	25	25
60	30	0
40	0	0
50	15	30
60	30	30
33	23	13

THREE TIMES WEEKLY TREATMENT GROUP

initial	final	f/u
50	50	45
53	0	0
58	28	30
43	8	40
45	45	45
43	23	23
55	30	13
10	0	0
35	16	13
15	5	5
100	40	35
65	20	13
100	75	75
45	45	45
50	25	25



*APPENDIX C*  
*RANGE OF MOTION READINGS OBTAINED*

LUMBAR SPINE RANGES OF MOTION

LEGEND: FF=FORWARD FLEXION EX=EXTENSION RLF=RIGHT LATERAL FLEXION LLF=LEFT LATERAL FLEXION  
INI=INITIAL CONSULTATION FIN=FINAL CONSULTATION FU=FOLLOW UP CONSULTATION

ONCE WEEKLY TREATMENT GROUP

FF-INI	FF-FIN	FF-FU	EX-INI	EX-FIN	EX-FU	RLF-INI	RLF-FIN	RLF-FU	LLF-INI	LLF-FIN	LLF-FU
77	79	77	19	19	21	0	11	14	9	13	12
79	83	80	15	17	23	6	10	19	8	12	14
67	84	92	26	34	27	12	17	28	7	12	12
83	81	90	19	29	23	11	17	23	8	21	33
50	86	79	10	18	28	4	9	27	4	10	13
58	80	85	10	9	14	5	13	14	14	11	12
58	38	72	18	35	32	21	18	26	20	19	35
34	55	53	3	10	12	4	9	10	7	9	9
81	76	88	14	18	20	7	6	10	7	13	9
72	71	72	17	24	26	8	17	17	9	11	16
34	29	47	9	6	18	6	10	13	5	7	5
51	74	80	10	16	14	9	15	14	8	11	10
57	68	70	30	30	30	21	20	20	24	26	24
92	80	87	9	10	14	13	13	14	12	8	10
86	84	88	15	34	32	23	28	26	17	29	24

THREE TIMES WEEKLY TREATMENT GROUP

FF-INI	FF-FIN	FF-FU	EX-INI	EX-FIN	EX-FU	RLF-INI	RLF-FIN	RLF-FU	LLF-INI	LLF-FIN	LLF-FU
68	54	76	13	24	42	14	18	25	10	13	27
61	93	85	10	9	18	11	22	17	11	22	15
71	90	74	13	38	25	7	14	13	4	16	16
42	83	89	4	11	23	3	29	15	8	21	13
60	78	86	7	19	46	2	9	21	4	7	10
86	83	90	3	30	21	6	12	15	11	18	19
9	60	76	9	17	29	2	7	8	4	9	16
72	90	79	21	37	36	11	15	16	8	8	20
75	93	90	17	21	19	13	19	17	11	11	19
90	92	90	27	37	30	16	14	17	14	14	16
67	70	76	11	18	22	6	14	14	16	16	12
42	78	78	10	26	30	9	15	14	19	20	18
50	53	54	6	32	30	4	13	12	5	15	15
72	91	90	19	32	30	14	16	14	14	18	15
16	89	90	8	23	24	3	25	20	8	16	18

*APPENDIX D*  
*POSITIVE ORTHOPAEDIC TEST SCORES OBTAINED*

# POSITIVE ORTHOPAEDIC TEST SCORES OBTAINED

## THREE TIMES WEEKLY TREATMENT GROUP

INITIAL	FINAL	F/U
50	20	20
60	0	0
60	30	30
40	30	30
60	40	40
70	0	0
60	40	40
20	0	0
50	50	20
60	40	40
80	40	30
40	0	0
40	20	20
40	20	20
30	30	30

## ONCE WEEKLY TREATMENT GROUP

INITIAL	FINAL	F/U
40	20	0
40	0	0
40	20	20
40	20	0
20	20	20
30	0	0
40	0	0
40	20	0
40	20	10
60	20	0
50	0	0
40	20	20
20	20	20
40	20	0
40	20	20

*APPENDIX E*  
*CASE HISTORY FORM*

TECHNIKON NATAL CHIROPRACTIC DAY CLINIC

CASE HISTORY

Patient: \_\_\_\_\_ Date # \_\_\_\_\_  
Pilo #: \_\_\_\_\_  
X-ray #: \_\_\_\_\_  
Age: \_\_\_\_\_ Sex: \_\_\_\_\_ Occupation: \_\_\_\_\_  
Intern: \_\_\_\_\_ Signature: \_\_\_\_\_

FOR CLINICIAN'S USE ONLY

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

Case History:

Examination:

Previous: TN  
Other

Current: TN  
Other

X-ray Studies:

Previous: TN  
Other

Current: TN  
Other

Clinical path. lab.:

Previous: TN  
Other

Current: TN  
Other

Case status:

PTT: Conditional: Signed off: Final sign out:

Recommendations:

Intern's case history

1. Source of history:
2. Chief complaint: (patient's own words)

3. Present illness:

Location

Onset

Duration

Frequency

Pain (character)

Progression

Aggravating factors

Relieving factors

Associated S & S

Previous occurrences

Past treatment and outcome

4. Other complaints:

5. Past history:

General health status

Childhood illnesses

Adult illnesses

Psychiatric illnesses

Accidents/injuries

Surgery

Hospitalizations



6. Current health status and life-style:

Allergies

Immunizations

Screening tests

Environmental hazards  
(home, school, work)

Safety measures  
(seat belts, condoms)

Exercise and leisure

Sleep patterns

Diet

Current medication

Tobacco

Alcohol

Social drugs

7. Family history:

Immediate family:

Age

Health

Cause of death

DM

Heart disease

TB

HBP

Stroke

Kidney disease

CA

Arthritis

Anemia

Headaches

Thyroid disease

Epilepsy

Mental illness

Alcoholism

Drug addiction

Other

8. Psychosocial history:

Home situation

Daily life

Important experiences

Religious beliefs

9. Review of systems:

General

Skin

Head

Eyes

Ears

Nose/sinuses

Mouth/throat

Neck

Breasts

Respiratory

Cardiac

Gastro-intestinal

Urinary

Genital

Vascular

Musculoskeletal

Neurologic

Haematologic

Endocrine

Psychiatric.

*APPENDIX F*  
*PHYSICAL EXAMINATION FORM*

REGENHORN NATAL CHIROPRACTIC DAY CLINIC

PHYSICAL EXAMINATION

Underline abnormal findings in RED and elaborate on back of relevant page, if necessary.  
Mark "NAD" if normal.

Patient: \_\_\_\_\_ File # \_\_\_\_\_

Last name

First name

Clinician: \_\_\_\_\_ Signature: \_\_\_\_\_

Intern: \_\_\_\_\_ Signature: \_\_\_\_\_

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

Height: \_\_\_\_\_ Weight: \_\_\_\_\_ Temp: \_\_\_\_\_

Rates: Heart: \_\_\_\_\_ Pulse: \_\_\_\_\_ Respiration: \_\_\_\_\_

Blood pressure: Arms: L / R /

Legs: L / R /

General appearance:

STANDING EXAMINATION.

Minor's sign

Skin changes

Posture

erect

Adam's

"Ranges of motion:

T/L spine: Flexion: 90 Fingers to floor

Extension: 50

R.lat.flex.: 30 Fingers down leg

L.lat.flex.: 30 Fingers down leg

Rot.to R.: 35

Rot.to L.: 35

Flex.

L.Rot.

R.Rot.

L.lat  
flex.

R.lat.  
flex.

Ext.

/ = pain-free limitation; // = painful limitation.

Romberg's sign.

Pronator drift.

Trendelenburg's sign.

Gait.

rhythm

balance

pendulousness

on toes

on heels

tandem

Half squat.

Scapular winging.

Muscle tone.

Spasticity/Rigidity.

Shoulder:

skin

symmetry

ROM - glenohumeral

scapulo-thoracic

acromioclavicular

elbow

wrist

Chest measurement

inspiration

expiration

Visual acuity

Breast examination:

Inspection:

skin

size

contour

nipples

arms overhead

hands against hips

leaning forward.

Palpation:

axillary lymph nodes.

SEATED EXAMINATION.

Spinal posture

Head

scalp

skull

face

skin

Eyes

conjunctiva

sclera

eyebrows

eyelids

lacrimal gland

nasolacrimal duct

alignment

corneal reflex

ocular movement

L  
III IV VI

R  
III IV VI

visual fields

accommodation

iris

pupils

red reflex

optic disc

vessels  
general background  
macula  
vitreous  
lens

Ears:

auricle  
ear canal  
drum  
auditory acuity  
Weber test  
Rinne test

Nose:

external  
internal  
septum  
turbinates  
olfaction

Sinuses (frontal & maxillary):

tenderness  
transillumination

Mouth and pharynx:

lips  
buccal mucosa  
gums and tooth  
roof  
tongue  
inspection  
movement  
taste  
palpation  
pharynx  
inspection  
C X

Neck:

posture  
size  
swelling  
nodes  
discoloration  
hair line



ROM:

Flexion: 45 chin to larynx  
chin to sternum  
Extension: 55 forehead parallel  
to floor  
L.lat.flex: 40  
R.lat.flex: 40  
L.ret.: 70  
R.ret.: 70

Flex.

L.Ret.

R.Ret.

L.Lat.  
flex.

R.lnt.  
flex.

Ext.

lymph nodes  
trachea  
thyroid  
carotid arteries (thrills, bruit)

CN V

CN VII

CN VIII (nystagmus)

CN IX

CN XI

TMJ --

Inspection

ROM

deviation

Palpation

cropitus

tenderness

Neurological:

Dermatomes

C5

C6

C7

C8

T1

Tendon reflexes

biceps

triceps

brachioradialis

Muscle strength

C5

C6

C7

C8

T1

Coordination:

point-to-point

dysdiadochokinesia

Thorax:

Chest:

Inspection:

skin

shape

respiratory distress

rhythm (respiratory)

depth "

effort "

intercostal/supraclavicular retraction

Palpation:

tenderness

masses

respiratory expansion

tactile fremitus

Percussion:

lungs (posterior)

diaphragmatic excursion

kidney punch

Auscultation:

breath sounds

vesicular

bronchial

adventitious sounds

crackles (rales)

wheezes (rhonchi)

voice sounds

broncophony

whispered pectoriloquy

egophony

Cardiovascular:

auscultation (aortic murmurs)

Allen's test

SUPINE EXAMINATION

JVP

EMI

auscultation heart (L.lat.recumbent)

respiratory excursion

percussion chest (anterior)

breast palpation

The abdomen:

Inspection:

skin

umbilicus

contour

peristalsis

pulsations

hernias (umbilical/incisional)

Auscultation:

bowel sounds

bruit

Percussion:

general

liver

spleen

Palpation:

superficial reflexes

cough

light

rebound tenderness

deep

liver

spleen

kidneys

aorta

intra-/retro-abdominal wall mass

shifting dullness

fluid wave

Acute abdomen:

where pain began and now

cough

tenderness

guarding/rigidity

rebound tenderness

Rovsing's sign

psos sign

obturator sign

cutaneous hyperaesthesia

rectal exam

Murphy's sign.

## Male genitals and hormones.

### Inspection:

- skin
- prepuce
- glans
- meatus
- nits/lico
- scrotum
- inguinal/femoral bulges

### Palpation:

- penis (tenderness/induration)
- testes
- epididymis
- inguinal canal
- femoral canal
- cremasteric reflex

### Auscultation:

- scrotal mass.

### Periphereal vasculature:

#### Inspection:

- skin
- nail beds
- pigmentation
- hair loss

#### Palpation:

- pulses - radial, brachial, femoral, popliteal, post.tibial, dorsalis pedis
- lymph nodes - epitrochlear, femoral (horizontal & vertical)
- temperature (foot & legs)
- Manual compression test
- Retrograde filling (Trendelenburg) test
- Arterial insufficiency test

### Musculoskeletal:

#### ROM

##### hip

- flex. 90/120
- ext. 15
- abd. 45
- add. 30
- int rot 40
- ext rot 45

##### knee

- flex. 130
- ext. 0/15

##### ankle

- plantar flex 45
- dorsiflex 20
- inversion 30
- eversion 20

- leg length

**Neurological:****dermatomes**

L1

L2

L3

L4

L5

S1

**muscle strength**

hip flexion

knee extension

ankle dorsiflexion

plantar flexion

**tendon reflexes**

patellar

Achilles

**plantar reflex****Rectal examination:****Inspection**

sacrococcygeal &amp; perineal areas

**Palpation**

sphincter tone

tenderness

induration

nodules

prostate

seminal vesicles

**Mental status****Appearance and behaviour:**

level of consciousness

posture and motor behaviour

dress, grooming, personal hygiene

facial expression

affect

**Speech and language:**

quantity

rate

volume

fluency

aphasia (prn)

**Mood****Thought processes (logical, relevant, organised)****Memory and attention:**

orientation (time, place, person)

remote memory

recent memory

new learning ability

**Higher cognitive functions:**

information and vocabulary (general &amp; specialised knowledge)

abstract thinking.

*APPENDIX G*  
*REGIONAL LOW BACK EXAMINATION FORM*

TECHNIKON NATAL CHIROPRACTIC DAY CLINIC.

REGIONAL EXAMINATION -- LUMBAR SPINE AND PELVIS.

PATIENT: \_\_\_\_\_

FILE # : \_\_\_\_\_ DATE: \_\_\_\_\_

INTERN/RESIDENT: \_\_\_\_\_

SUPERVISING CLINICIAN : \_\_\_\_\_

STANDING :

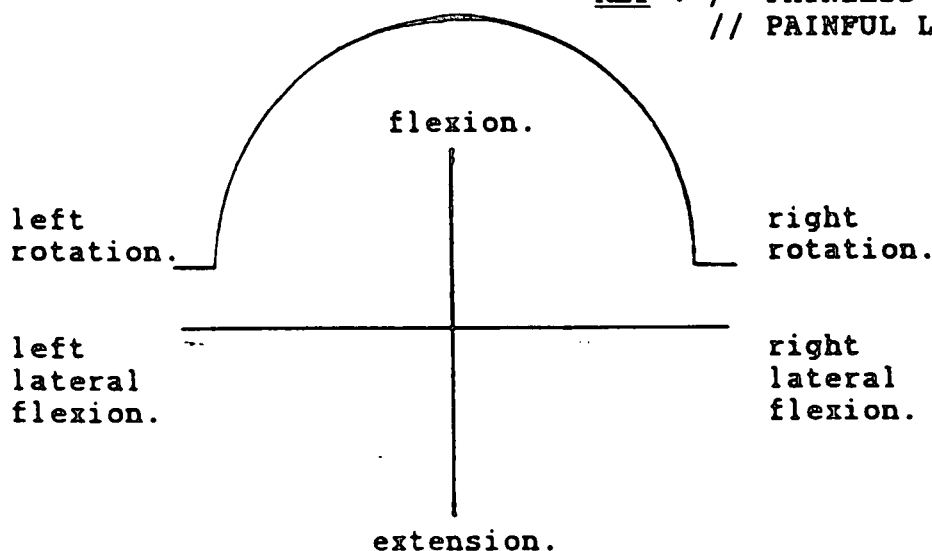
Posture  
Minor's Sign  
Skin  
Scars  
Discoloration  
Muscle tone  
Bony and soft tissue contours

Spinous percussion  
Schober's Test (6cm)  
Treadmill  
Body Type  
Attitude

RANGE OF MOTION.

Forward Flexion = 40-60 degrees. (15cm from floor)  
Extension = 20-35 degrees.  
L/R Rotation = 3-18 degrees.  
L/R Lateral flexion = 15-20 degrees.

KEY : / PAINLESS LIMITATION.  
// PAINFUL LIMITATION.



SUPINE :

Skin.  
Hair.  
Nails..

Observe abdomen  
Fasciculations  
Abdominal reflexes  
Auscultate abdomen/groin  
Palpate abdomen/groin  
Pulses (abdomen)  
: Pulses (extremities)

SLR  
Bowstring  
Plantar reflex  
Circumference (thigh, calf)  
Leg length :  
                    actual  
                    apparent  
Sciatic notch  
Patrick Faber  
Gaenslen's Test  
Gluteus Maximus Stretch  
Hip medial rotation  
Psoas Test  
Thomas' Test :  
                    hip joint  
                    rectus femoris

LATERAL RECUMBENT :

S-I compression  
Ober's Test  
Femoral nerve stretch  
Myotomes :  
    QL  
    Gluteus Medius

NON-ORGANIC SIGNS :

Pin Point Pain.  
Axial Compression.  
Trunk Rotation.  
Burn's Bench Test.  
Flip Test.  
Hoover's Test.  
Ankle Dorsiflexion Test.

PRONE :

Gluteal skyline  
Skin rolling  
Iliac crest compression  
Facet joint challenge  
S-I tenderness  
Erichson's Test  
Pheasant's Test  
Myotomes :  
    GluteusMaximus  
Active MF Trigger Points:  
    QL  
    Glut. Med.  
    Glut. Max.  
    Glut. Min.  
    Piriformis  
    Hamstrings  
    TFL



MOTION PALPATION :

---

Jt.play		Left						Right						Jt.play	
P/A	Lat	Fle	Ext	LF	AR	PR		Fle	Ext	LF	AR	PR		P/A	Lat
							T10								
							T11								
							T12								
							L1								
							L2								
							L3								
							L4								
							L5								
					U	L	SI	U	L						

GAIT :

Rhythm

On toes (standing)

On heels (standing)

Half-squat on one leg

Remarks : \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

NEUROLOGICAL EXAMINATION :

DERMATOMES: Left; Right. MYOTOMES: Left; Right. REFLEXES: Left; Right

T12		hip flex		C5	
L1		hip int rot		C6	
L2		hip ext rot		C7	
L3		hip abd			
L4		hip add			
L5		knee flex			
S1		knee ext			
S2		dorsiflex			
S3		plantarflex			
		eversion			
		ext.hall.long			

Tripod

Kemp's Test

COMMENTS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

***APPENDIX H***  
***INFORMED CONSENT DOCUMENT***

INFORMED CONSENT DOCUMENT:

File number: \_\_\_\_\_

I, \_\_\_\_\_ (full name)  
do this \_\_\_\_\_ day of \_\_\_\_\_ (month) 1994,  
agree to participate in the research programme at the  
Chiropractic Day Clinic, Technikon Natal, 11 Ritson Road,  
Berea, Durban.

I understand and agree to abide by the patient instructions  
and research conditions that have been explained to me.

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

Signature: \_\_\_\_\_

Witness: \_\_\_\_\_

Signature: \_\_\_\_\_