A COMPARATIVE STUDY OF SPINAL MANIPULATIVE THERAPY AND SPINAL MANIPULATIVE THERAPY COMBINED WITH SOFT TISSUE THERAPY IN THE MANAGEMENT OF MECHANICAL LOW BACK PAIN

by

Adrian Neil Gomes

Dissertation submitted in partial compliance with the requirements for the Masters Degree in Technology: Chiropractic, in the Faculty of Health Services at Technikon Natal.

I, Adrian Neil Gomes, do declare that this dissertation is representative of my own work.

Adrian Neil Gomes

15/04/97.
Date

Approved for final submission

15·4·97·

Dr R Mathews M.Tech.C
Supervisor

Date

DEDICATION

"A man will continue to research only so long as he is prompted to by some passionate interest, and this interest will be dependent on the conviction, strictly undemonstrable to science, that the universe has a direction".

Teilhard de Chardin

This thesis is dedicated to my parents, the late Adriano Filipe Gomes and Clara Aida Gomes - the wind beneath my wings.

AKNOWLEDGEMENTS

A special word of thanks to the following people:

Dr Rob Mathews, my supervisor, for his guidance, advice and discipline.

My family and friends, especially Andria Teixeira; for your encouragement, support, and confidence in me.

The patients who participated in this study, for your gifts of patience and time.

Mrs Van Zyl, from the research department, and Mr Worku, the statistician, for your generosity and assistance.

The staff at the School of Chiropractic: Technikon Natal (especially Dr Greg Smith), for your assistance and friendship.

The Technikon Natal library staff, for your untiring willingness to help.

My colleagues and classmates, for inspiration and motivation.

ABSTRACT

There have been few studies performed to determine the combined effects of spinal manipulative therapy with other modalities known to have beneficial physiological effects, especially in terms of mechanical low back pain (Ottenbacher and Difabio 1985). In response to this, the objective of this study was to compare the efficacy of spinal manipulative therapy and spinal manipulative therapy combined with massage in the management of mechanical low back pain, in order to determine the more effective treatment approach.

This randomised clinical trial consisted of experimental and descriptive survey design. Thirty voluntary subjects diagnosed with facet syndrome, sacroiliac syndrome, or a combination of these two were divided into two groups of fifteen patients each, and randomly allocated to each study group. The control group was treated with spinal manipulative therapy only, and the experimental group was treated with spinal manipulative therapy and massage, for a period of approximately three weeks, with a maximum of six treatments per patient.

The Oswestry Low Back Pain Disability Questionaire, the short form McGill Pain Questionaire, and the Numerical Pain Rating Scale-101 were used to investigate the subjective responses; and a goniometer (lumbar spine ranges of motion) and

algometer (pain sensitivity) were utilised to determine the objective readings. This data was collected before the commencement of the first treatment, the sixth treatment, and the follow-up one month following the final treatment.

The results were statistically analysed using non-parametric test statistics, at a 95% confidence interval. The Wilcoxin Signed Ranks Test was used to analyse data within each group and the Mann-Whitney Test was used to analyse data between each group.

The results indicated that both treatment groups were effective at improving certain ranges of motion over the long term, decreasing sensitivity to pain, and improving disability over the short and long term; the experimental group alone was effective in decreasing the perception of pain over the short and long term as well.

No statistical differences were found between the two groups for any of the variables measured. Therefore, the experimental group was not any more effective than the control group, although pain perception was shown to be clinically reduced for the experimental group (P=0.005 for McGill and P=0.002 for NRS-101).

The objective results and one of the subjective results (disability) supported the hypotheses that each treatment group would be effective. The perception of pain only supported the second hypothesis ie: that the experimental group would be effective. The hypothesis that spinal manipulative therapy combined with massage would be more effective than spinal manipulative therapy alone was rejected.

Therefore, it was concluded that spinal manipulative therapy combined with massage is as effective as spinal manipulative therapy alone in the management of mechanical low back pain, in terms of objective and subjective clinical findings.

Future studies should include greater population samples, data regarding patients' age, gender, job description, and education, measures of psychological outcome, other effective types of massage, exercise programs, and patient education (eg: Chiropractic low back wellness clinic).

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LIST OF ABBREVIATIONS

The following abbreviations have been used in the text.

T1:	initial treatment
T6:	final treatment
FU:	follow-up
nsd:	no significant difference
sd:	significant difference
P Value:	two-tailed probability of equalling or exceeding Z value (the large sample test statistic)
S.D:	standard deviation
CTRL:	control group
EXP:	experimental group
SMT:	spinal manipulative therapy
SMT + Massage:	spinal manipulative therapy combined with massage

DEFINITION OF TERMS:

The definition of manipulation utilised in this study is the following: a passive manoeuvre in which specifically directed manual forces are applied to vertebral and extravertebral articulations of the body, with the object of restoring mobility to restricted areas. Short lever manipulation is a high velocity thrust directed specifically at an isolated joint. (Gatterman 1990: 410.)

The diversified method of manipulation is a technique applied after a detailed consultation documenting symptomatology and taking into account age, sex, lifestyle, occupation, and nature of the injury, and with appreciation of the fact that the patient is in the midst of an ongoing process; therefore, it attempts to apply the most ideal technique within the context of the reality of the clinical picture. (Gitelman and Fligg: 483.)

Massage (Swedish) is defined as systematic therapeutic use of friction, stroking and kneading of the body. Manoeuvres performed by hand on and through the skin upon the subcutaneous tissue, with variation in the intensity of pressure exerted, the surface area treated, and the frequency of application. (Gatterman 1990: 410.)

Objective clinical findings are defined as those clinical findings ascertained using a full case history, physical examination, orthopaedic and neurological examinations including: pain sensitivity - using an algometer and patient's lumbar spine range of motion - using a goniometer.

Subjective clinical findings are defined as those clinical findings ascertained using the patient's perception of the pain, including: the Oswestry Low Back Pain Disability Quesionaire, the short form McGill Pain Questionaire and the Numerical Pain Rating Scale-101.

Short term/first treatment interval refers to the time period between the initial visit and the sixth consultation.

Long term/overall treatment interval refers to the time period between the initial visit and the follow-up consultation.

CHAPTER ONE

1 INTRODUCTION:

It has been suggested by Haldeman (1992) that greater emphasis be placed on clinical effectiveness of Chiropractic treatments. Few studies have determined the combined effects of spinal manipulative therapy with other modalities known to have beneficial physiological effects, especially in terms of mechanical low back pain. In response to this, this study undertook to compare two different forms of Chiropractic treatment commonly employed in the management of musculoskeletal disorders, mechanical low back pain in particular, in order to determine which method is clinically more effective.

Eighty percent of the costs associated with low back pain relate to those who have it for greater than three months (ie: are chronic) (Tufo et al. 1991: 1: 67). Furthermore, there is a high incidence of recurrence (Sims-Williams et al. 1979), which also adds to the costs.

The lack of consensus regarding treatment is a further source of increased costs (Cats-Baril and Frymoyer 1991 1: 96). According to Sidley (1994), there are those Chiropractors who use spinal manipulative therapy only and those who also make use of other therapies like massage.

The majority of low back patients seen are in the phase of mechanical dysfunction (Cassidy and Kirkaldy-Willis 1988: 295). Probably as a result of this, spinal manipulative therapy is one of the most commonly utilised treatments for patients with this disorder (Haldeman 1983).

Although most authors suggest that amoungst other things, manipulation produces a reflex inhibition of muscle spasm (Calliet 1981: 129,130), the exact mechanism regarding the effects of spinal manipulative therapy remains unresolved. There is doubt regarding whether strain to a joint appears first, followed by protective muscle contraction, or whether abnormal muscle function leads to joint strain (Kirkaldy-Willis 1988: 50). Nevertheless, it has been shown that scar formation does occur at sites of damage (muscles and joints) in the spines of chronic low back pain sufferers (Jayson et al. 1984).

Spinal manipulative therapy is consistently more effective than any comparison treatment (Anderson et al. 1992), and combining it with other modalities known to have beneficial physiological effects (eg: back school and exercise) has shown improved effectiveness (Ottenbacher and Difabio 1985). Comparative studies of spinal manipulative therapy and spinal manipulative therapy combined with massage have been done (Leboeuf et al. 1987), but to this author's knowledge, no studies have determined the effects of combining spinal manipulative therapy with massage in the treatment of mechanical low back pain.

One of the effects of massage is to break down adhesions and scar tissue (McDowell 1990: 371). It is the most commonly used auxillary therapy in South African Chiropractic practices (Kotze 1995), and yet it's effectiveness in combination with spinal manipulative therapy has almost never been tested. This implies that those Chiropractors using massage in their practices are either wasting their time by massaging their patients, therefore increasing their costs, or that they're getting their patients better more efficiently than those doctors using manipulation alone, therefore increasing the effectiveness of manipulation and decreasing costs.

Making use of the less costly treatment would certainly create substantial savings (Cats-Baril and Frymoyer 1991 1: 96), and perhaps go a little way to bridging the gap between the "straights" and the "mixers" within the Chiropractic profession. The results of this study may contribute to a more efficient and cost-effective method of treating low back pain patients. Furthermore, clinicians will be able to choose what treatment to utilise, based on clinical evidence and not mere opinion.

1.1 AIM:

The purpose of this investigation was to evaluate the effects of spinal manipulative therapy and spinal manipulative therapy combined with massage in the treatment of mechanical low back pain, in terms of objective and subjective clinical findings, in order to determine the more effective approach in the management of mechanical low back pain.

1.2 THE OBJECTIVES:

1.2.1 OBJECTIVE ONE

The first objective was to evaluate the effects of spinal manipulative therapy, in terms of objective and subjective clinical findings, in order to determine the effectiveness of this treatment approach in the management of mechanical low back pain.

1.2.2 OBJECTIVE TWO

The second objective was to evaluate the combined effects of spinal manipulative therapy and massage, in terms of objective and subjective clinical findings, in order to determine the effectiveness of this treatment approach in the management of mechanical low back pain.

1.2.3 OBJECTIVE THREE

The third objective was to integrate the data indicating the possible effects of spinal manipulative therapy and spinal manipulative therapy combined with massage, in terms of objective and subjective clinical findings, in order to determine the more effective approach in the management of mechanical low back pain.

1.3 THE HYPOTHESES:

1.3.1 HYPOTHESIS ONE

It was hypothesised that spinal manipulative therapy would be effective in the management of mechanical low back pain, in terms of objective and subjective clinical findings.

1.3.2 HYPOTHESIS TWO

It was hypothesised that spinal manipulative therapy and massage would be effective in the management of mechanical low back pain, in terms of objective and subjective clinical findings.

1.3.3 HYPOTHESIS THREE

It was hypothesised that spinal manipulative therapy combined with massage would be more effective than spinal manipulative therapy alone in the management of mechanical low back pain, in terms of objective and subjective clinical findings.

CHAPTER TWO

2 REVIEW OF THE RELATED LITERATURE

2.1 INTRODUCTION

There has been, and continues to exist, a schism within the Chiropractic profession regarding the method of treatment of neuromusculoskeletal disorders. This divergence also exists in South Africa and, according to Sidley (1994), involves two groups of practitioners: those who use spinal manipulative therapy only (the "straights"), and those who also make use of other therapies like massage (the "mixers"). Although this distinction is correct, there is no statistical evidence to illustrate the magnitude of this difference. It has been suggested by Haldeman (1992) that greater emphasis be placed on clinical effectiveness of Chiropractic treatments. The primary objective of this study was to determine whether the combined effects of spinal manipulative therapy and massage are significantly more effective than spinal manipulative therapy alone in the management of mechanical low back pain.

The literature review therefore includes the significance of low back pain; the pathophysiology, clinical features and treatments of the most common mechanical low back pain syndromes; a review of spinal manipulative therapy and massage, and a look at the benefits associated with combining spinal manipulative therapy with other therapies.

2.2 LOW BACK PAIN

2.2.1 EPIDEMIOLOGY: INCIDENCE AND PREVALENCE

According to Cassidy and Wedge (1988: 4), low back pain has a life-time prevalence of between 60% and 80% for any population and between 20% and 30% of the population are suffering from it at any given time. It is, after the common cold, the most common health problem in America (Cats-Baril and Frymoyer 1991 1: 95). Chiropractors very often find themselves treating patients with low back pain. A community-based study involving the use of chiropractic services found that low back pain is the most common complaint patients seek chiropractic care for (Shekelle and Brook 1991). In a study comparing patients and patient complaints at six American Chiropractic college teaching clinics, Nyiendo et al. (1989) found that low back problems were the most frequently reported health complaint. Therefore, it is imperative that the most clinically effective and cost-efficient methods be utilised in treating this disorder.

2.2.2 RECURRENCE, CHRONICITY AND COSTS:

Although most attacks of back pain remit either spontaeously or after treatment, there is, according to Sims-Williams et al. (1979), a high incidence of recurrence. Low back pain is also the most common chronic pain problem in the United States (Cardenas and Egan 1990: 1163). This represents a significant problem, which is complicated by the fact that the most common causes of low back pain (ie: Facet Syndrome and Sacroiliac Syndrome), are frequently overlooked, as abnormalities of these conditions are not often demonstrated on X-rays (Bernard and Kirkaldy-Willis 1987).

The annual costs of low back pain are approximately 50 billion dollars in the United States (Tufo et al. 1991 1: 67). 80% of the costs associated therewith relate to those who have it for greater than three months duration (ie: are chronic) (Tufo et al. 1991 1: 67). Hence, the need to ameliorate this financial burden, not least of all in South Africa (Hupkes 1990), becomes all too apparent. Furthermore, in a review of Chiropractic claims by Nyiendo and Lamm (1991), Chiropractic claimants were found to be more likely to have a history of chronic, recurrent low back pain and more likely to have suffered exacerbation, when compared to medical practitioners' claimants. This indicates that Chiropractors are treating patients with one of the most common, chronic, costly, recurring epidemics in health care today. As Cats-Baril and Frymoyer (1991 1: 95) point out, consistantly utilising the least costly and most effective treatment(s) would certainly create substantial savings.

Cassidy and Kirkaldy-Willis (1988: 295) state that the majority of low back pain patients seen are in the phase of spinal dysfunction.

2.3 SPINAL JOINT DYSFUNCTION:

2.3.1 PATHOPHYSIOLOGY

It is only through a better understanding of pain and its pathophysiology that responsible decisions can be made regarding it's treatment (Weinstein 1991 1: 593).

According to Gitelman (1975: 278), "subluxation" (spinal dysfunction) is a process and not a static condition. Associated changes include hyperaemia, congestion, oedema, minute haemorrhages, fibrosis, local ischaemia, atrophy and ultimately rigidity and adhesions which form not only in the joint capsules but also in the ligaments, tendons and muscles. This has been confirmed in a study by Jayson et al. (1984) of blood fibrolytic activity in patients with severe chronic back pain. According to this study, patients showed evidence of defective fibrinolysis, which could possibly, according to the authors, be associated with fibrin deposition and scar formation and therefore be responsible for the development and/or perpetuation of chronic inflammation and scarring at sites of damage in the spine.

Kirkaldy-Willis (1988: 117) expounds on the relationship between three aspects, namely emotional factors (and/or trauma), changes in muscle, and changes in the facet joints and intervertebral disc. The postulate describes how emotional disturbance (including stress, anxiety and depression) produces local areas of vasoconstriction in muscle, which, together with sustained muscle contraction and accumulation of metabolites result in muscle fatigue. This causes changes in recruitment of motor units in muscle, creating altered patterns of muscle contraction, commonly in the multifidus. Long term changes in muscle result in painful, restricted movement - learned restiction as well as that due to fibrosis, which ultimately leads to the chronic pain syndrome. (Kirkaldy-Willis 1988: 117.)

Some authors suggest that substance P may have a role in chronic degeneration of the spinal motion segment because of it's presence in the dorsal root ganglion, disc annulus, facet joints, and blood plasma (Weinstein, Claverie et al. 1988; Weinstein, Pope et al. 1988). One wonders whether or not it is found in the deep paraspinal muscles as well?

As muscles form a very important component of the spinal joints, injuries to muscle, overuse, and muscle spasm are further explored here.

2.3.1.1 MUSCLE INJURY:

Although lacerations and contusions of the spinal muscles are rare, muscle strains are often implicated in the causation of spinal disorders eg: lumbar strain. Most strains are usually accompanied by substantial haemorrhage. Animal research by Nikolaou et al. (1987) defined the healing process of muscle after controlled muscular strain. Although the haemorrhage had dissapeared and normal function of the muscle had returned after seven days, an inelastic scar had begun to develop. Andersson (1991 1: 267) believes this scar could likely increase the risk of recurrent injury.

2.3.1.2 OVERUSE OF MUSCLES:

Chemical analyses of peripheral contracting muscles demonstrate increased concentrations of lactic acid accompanied by decreased local tissue pH, and the presence of enzymes, that either facilitate anaerobic metabolism or promote local tissue inflammation (Andersson 1991 1: 267). The involvement of lactic acid in producing muscular pain has been refuted by Cailliet (1988: 31), as patients with McArdle's disease (the hereditary absence of muscle phosphorylase preventing the production of lactic acid) also develop muscular pain from sustained exercise (Cailliet 1988: 31). Yet, these patients' muscular pains might be as a result of fibre damage, which is also known to create pain. Therefore, Cailliet's theory may well be refuted. Furthermore, athletes successfully reduce lactate concentrations in their muscles with the use of bicarbonate of soda, which buffers lowered pH levels and reduces delayed onset muscle soreness.

2.3.1.3 MUSCLE SPASM:

Muscle spasm has long been associated with low back pain. Nevertheless, whether it causes the pain or is caused by the pain is still unclear. Working on the premise that acute muscle spasm may be the actual source of pain and decreased spinal mobility, Witt (1991 2: 1623) writes that untreated muscle spasms may remain at a subclinical level, and may be sufficient to predispose patients to future injury.

2.3.2 CLINICAL SIGNS:

The classical changes associated with joint dysfunctions are: added asymmetry, loss of joint motion and tissue texture abnormality (Lamb 1994: 647). Could the latter sign possibly be a tender hypertonus in the deep paraspinal muscles, as pointed out by Bourdillon et al. (1992: 297)?

Regarding the occurrence of reflex muscle spasm, Grieve (1988: 344) states a rather contradictory clinical picture ie: that the muscles are commonly neither tender nor painful; and conversely, at times are tender and included in the site of pain.

It would seem that we know very little regarding muscle pain in the aetiology of low back pain, yet a simple explanation for varying degrees of pain may well be attributed to differing pain tolerance levels.

2.3.3 TREATMENT:

The use of various therapeutic modalities (including manipulation and massage), have been justified in the treatment of mechanical low back pain through their effects on the pain control system ie: 'gate control' (Weinstein 1991 1: 606). As regards manipulation, there is also obviously something to be said for it's mechanical effects on the joint (eg: reducing the pinching of the meniscoid, and breaking up of intra-articular adhesions) (Lamb 1994: 646).

According to Lamb (1994: 645), too much emphasis has been placed on restoring normal joint motion by manipulation when treating spinal dysfunction, often neglecting other components of the segment such as muscle. Would the addition of massage to manipulation hence not provide a more effective therapeutic approach in the treatment of mechanical low back pain?

It is the exact cause of spinal joint dysfunctions however ie: the type of tissue(s) generating the pain, which has eluded many clinicians to date, and resulted in not only various theories of aetiology, but perhaps also different forms of treatment (eg: manipulation vs. manipulation and massage).

2.4 AETIOLOGY OF SPINAL JOINT DYSFUNCTIONS:

Various theories abound regarding the exact cause of spinal dysfunction. Some authors suggest that the joints are primarily responsible, with secondary muscle hypertonus (Mooney and Robertson 1976; Lewit 1977: 4). Others state that the reverse is true (Korr 1975: 183), while still others attribute equal responsibility for joint dysfunction to muscles and the joints (Kirkaldy-Willis 1988: 50). According to Grieve (1988: 345), an important distinction needs to be made between acute muscle spasm of recent onset, often an effect of a joint problem; and chronic soft tissue (including muscle) imbalance, often the cause of chronic joint problems.

2.4.1 JOINT THEORY:

Gainsbury (1985: 88) suggests that 'locking' of the zygapophyseal joints may be due to displacement of a meniscus, resulting in back pain. Bourdillon et al. (1992: 300) however, doubt whether meniscoids could be the 'major source of such a common problem' (low back pain). They do not however, submit any reasons for this point of view. Lewit (1978: 4) examined the cervical spine of patients who were prepared for operation and re-examined them during general anesthesia with myorelaxants. He found that in ten cases, movement restriction had remained unchanged and concluded that the restriction was in the joint. However, this study has been critisized. Leach (1986: 104) states that the study was too small (ie: too few subjects were used) to make any conclusions. Another criticism from Gainsbury (1985: 88) suggests that a period of time (days?) elapsed between the diagnosis and the re-assessment under anaesthesia, which may have allowed the muscles to go into metabolic rigor. Succinyl choline (the myorelaxant Lewit administered) would therefore, have had no effect on the muscle, according to Gainsbury. Gainsbury further stated that a denervated muscle in a state of metabolic rigor would react to stretch with a degree of contraction. However, despite it's proposed weaknesses, Lewit's argument remains convincing as his theory is based upon an experimental trial; Gainsbury's "metabolic rigor" remains untested ie: exactly what metabolic rigor is remains speculative.

Andersson (1991 1: 268) states that noxious stimulation of spinal structures can be responsible for reflex muscle spasm.

In an experiment by Mooney and Robertson (1976), hyperosmolar sodium chloride injected into the lumbar facet joints of humans caused reflex spasm in the hamstring muscles. Furthermore, they noted that the hamstring spasm decreased when the lumbar facet joints were injected with a local aneasthetic. These authors seem to agree with Lewit's suggestion that joint restriction is articular in origin rather than muscular.

Giles (1989: 54) states that it is conceivable that synovial fold blood vessels be a source of pain, although he conceeds that the mechanism by which this occurs is not known. Perhaps the accompanying sympathetics of the blood vessels are the source of this pain, for it is known that retrograde venous pressure can expand the venous plexus draining the spinal canal, resulting in pain (Gatterman 1990: 20).

2.4.2 MUSCLE THEORY:

Some clinicians suggest that movement restriction is due to muscle spasm. Bourdillon et al. (1992: 39) write that palpable tissue texture change at the level of any spinal dysfunction indicates that the soft tissues (muscles) are involved in whatever the cause of the dysfunction is; and that the soft tissues have a role in maintaining the dysfunction. Korr's hypothesis states that proprioceptive activity within muscle creates muscle spasm and resultant fixation of spinal segments (Korr 1975: 183-199). Leach (1986: 105) however states that this model may not be entirely correct and cites Lewit's study in defence of this statement.

The two theories forwarded by the previously mentioned authors are certainly plausible, yet the most convincing theories are by those authors who subscribe to a combination of these afore-mentioned theories.

2.4.3 JOINT AND MUSCLE THEORY:

Mennel (1964: 4) describes a cycle of events that result from joint dysfunction. He states that normal muscular function is dependent on normal joint function, and that impaired muscle function perpetuates and may even cause deterioration in dysfunctional joints.

Kirkaldy-Willis (1988: 50) states that both the muscles activating the joints, as well as the joints themselves, are often responsible for the patients' symptoms associated with low back pain. He confirms the doubt regarding whether the strain to the joint appears first, followed by protective muscle contraction, or whether abnormal muscle function leads to a joint strain.

The debate regarding the exact aetiology of spinal joint dysfunctions will probably never be resolved. As Kirkaldy-Willis (1988: 117) summarises, spinal dysfunctions may be due to rotational sprains, synovitis - with consequent nipping of the synovial fringe, paraspinal muscle spasm, and entrapment of the meniscoids. Indeed, there may be a number of causes. Yet, determining the most effective, and cost-efficient treatment remains of paramount importance.

The most common conditions occuring in the phase of spinal dysfunction are, according to Cassidy and Kirkaldy-Willis (1988: 295), Facet and Sacroiliac Syndromes. As this study has involved the treatment primarily of facet syndromes, the following is a precis of the most important parts of the lumbar facet anatomy and the relevant muscles of the low back.

2.5 ANATOMY

2.5.1 FACET JOINTS:

The zygapophysial joints (facet joints) are surrounded by a loose articular capsule, which attaches to the margins of the articular processes. This fibrous capsule is lined by a synovial membrane. (Moore 1985: 591.)

2.5.2 MUSCLES:

Macintosh and Bogduk (1994: 189,190) describe the back muscles by dividing them functionally into three groups: (i) psoas major and minor; (ii) intertransversarii laterales and quadratus lumborum; and (iii) the lumbar back muscles.

According to Bourdillon et al. (1992: 21), it is essential that the clinician be familiar with the anatomy of the lumbar back muscles in order to identify joint dysfunctions. They are divided into three groups: (i) the short intersegmental muscles-interspinales and intertransversarii mediales; (ii) the polysegmental muscles-multifidus and lumbar components of longissimus and iliocostalis; and (iii) the long polysegmental muscles-thoracic components of longissimus and iliocostalis lumborum.

Furthermore, Bourdillon et al. (1992: 23) state that the deep short muscles (ie: rotatores, intertransversarii and multifidus) are clinically important in diagnosing spinal joint dysfunctions. The multifidus has some control over the tension within the fibrous capsule and therefore must affect the potential spaces of the intracapsular and extracapsular recesses and adipose pads as the joint goes through ranges of motion (Taylor and Twomey 1986). The implications of this are that dysfunction (spasm) of the multifidus muscle probably results in entrapment of the meniscus associated with that particular joint. Would the relief of this spasm through massage help sustain the effects of a manipulation?

2.6 FACET SYNDROME

Bernard and Kirkaldy-Willis (1987) suggest that the facet syndrome is common, but that due to this lesion not being demonstrated radiologically, it is frequently overlooked.

2.6.1 CLINICAL FEATURES:

Kirkaldy-Willis (1988: 49) believes that in order for the clinician to treat low back pain effectively, knowledge of amoungst other things, the clinical presentation, is necessary.

This syndrome presents with the following symptoms: dull, deep and poorly defined pain, varying from mild to severe; localised pain over the involved area, usually unilateral; referred pain to the buttock, posterior and lateral thigh, and rarely below the knee; aggravated by movement and relieved by rest.

The associated clinical signs are: local tenderness to palpation of the affected areas; hypertonic paraspinal muscles; reduced lumbar spine ranges of motion, especially extension, which causes aggravation of the pain; Kemp's test and lumbar facet joint challenge are usually positive. (Kirkaldy-Willis 1988: 133-135.)

2.6.2 TREATMENT:

According to Kirkaldy-Willis (1988: 250-252), the treatment for recurring and chronic facet syndromes in the phase of dysfunction requires a conservative approach ie: low back school, manipulation and perhaps a course of Physiotherapy and Occupational Therapy, together with a light elastic garment. Gatterman and Panzer (1990: 149) suggests manipulation and pelvic tilt exercises for treatment of a fixation.

Kirkaldy-Willis (1988: 133) also mentions that a facet syndrome may later be complicated by a sacroiliac syndrome.

2.7 SACROILIAC SYNDROME

2.7.1 CLINICAL FEATURES:

Sacroiliac syndrome presents with the following symptoms: Pain over the back of the sacroiliac joint, which varies in degree 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 signs are as follows: Tenderness over the superior iliac spine and in the region of the sacroiliac joint or buttock. Normal movement of the joint is diminished. The Patrick's faber and Gaenslen's tests are usually positive. (Kirkaldy-Willis 1988: 135-137.)

2.7.2 TREATMENT:

Kirkaldy-Willis (1988: 253) suggests manipulation (for 3-4 days) and that if manipulation fails, injection of the joint and surrounding musculature (with bupivacaine). He also states that sometimes, daily manipulation for up to ten days is required. Cassidy and Mierau (1992: 222), suggest the combination of injection with manipulation in difficult cases.

2.8 SPINAL MANIPULATIVE THERAPY

2.8.1 DEFINITIONS:

Spinal manipulative therapy has been referred to as chiropractic adjustment, spinal manipulation, manual therapy or manual medicine (Haldeman 1993). One of the problems in conducting research on manipulation is the obscurity surrounding the definition of the word 'manipulation' (O'Donoghue 1994: 670). The definition of manipulation utilised in this study is the following: a passive manoeuvre in which specifically directed manual forces are applied to vertebral and extravertebral articulations of the body, with the object of restoring mobility to restricted areas. Short lever manipulation is a high velocity thrust directed specifically at an isolated joint. (Gatterman 1990: 410.)

2.8.2 COST-EFFECTIVENESS OF SPINAL MANIPULATIVE THERAPY:

In a comparison of Chiropractic, Medical, and Osteopathic Care for work-related sprains and strains, Johnson et al. (1989) found fewer work days were lost, and lower amounts of disability compensation and provider costs were paid when chiropractic treatment (spinal manipulative therapy) was administered. Stano (1993), in a comparison of health care costs for Chiropractic and Medical patients, suggested significant cost-savings for Chiropractic users.

2.8.3 EFFICACY OF SPINAL MANIPULATIVE THERAPY:

Many studies have been performed in order to determine the effectiveness of spinal manipulative therapy for low back pain. In a review of relevant studies by Haldeman and Phillips (1991 2: 1582-1583), the authors suggest that manipulation is a significantly more effective treatment than bed rest and analgesia, analgesia alone, short wave therapy, heat, exercise and massage, or mobilisation, in the treatment of low back pain. Di-Fabio (1992), in an analysis of valid trials of manual therapy in the treatment of low back pain, concluded that manipulation particularly, is an effective modality in treating the afore-mentioned condition. In a study concerning clinical trials of spinal manipulative therapy, using meta-analytical techniques, Anderson et al. (1992) found spinal manipulative therapy to be consistently more effective in the treatment of low back pain than any of the array of comparison treatments. In a review of relevant randomized clinical trials by Assendelft et al. (1992), in which the efficacy of chiropractic manipulation for low back pain was assessed, it was concluded that chiropractic seemed to be an effective treatment of low back pain. A summary of clinical and related research on the effectiveness of manipulation by Manga et al. (1993), found this management of low back pain to be an effective form of treatment.

2.8.3.1 SPINAL MANIPULATIVE THERAPY COMPARED:

A multi-centre study by Doran and Newell (1975) compared manipulation, physiotherapy, corset, and analgesics. After three weeks, significant improvements in objective findings (flexion and extension) were found within each group. No significant differences were noted between treatment groups.

In a study by Pope et al. (1994), in which manipulation, massage, corset, and transcutaneous muscle stimulation were compared in patients with sub-acute low back pain, the manipulation group scored the greatest improvements in objective (flexion) and subjective (VAS) measurements after three weeks. Again, no significant differences were noted between any of the groups.

A study by Evans et al. (1978) on chronic low back pain, found a significant difference in patients receiving manipulation, in terms of the following: objective (spinal flexion) measurements during the three weeks of treatment; and subjective (pain scores) measurements within four weeks of commencing treatment.

In a study to determine the short-term, objective effect of a spinal manipulation on pain/pressure threshold in patients with chronic low back pain, Cote et al. (1994) compared the data from one group receiving manipulation with another group receiving mobilisation, and found no clinical or statistical significance between treatment groups.

A study on spinal manipulation for low back pain by Hoehler et al. (1981), found that the manipulated group received immediate subjective relief from low back pain. This group was compared with a control group receiving massage. No significant difference was noted between the groups, as both groups had shown substantial improvement.

Ongley et al. (1987), in a study in which patients who received manipulation and local anaesthetic injections, were compared to those who received a similar treatment with less anaesthetic, found that the former (experimental group) had greater improvement in disability and visual analogue scores (subjective) one and six months after terminating treatment.

A study by Leboeuf et al. (1987) found that for the treatment of repetitive strain injury of the upper limb, the group which received spinal manipulative therapy combined with massage improved more than the group who received manipulation only.

2.8.3.2 ACUTE LOW BACK PAIN:

Most of the clinical trials of manipulation have been performed on patients with recent onset of symptoms ie: within two to four weeks, and have excluded patients with any complicating factors such as sciatica or disc herniation (Haldeman 1993).

In a comprehensive review, Shekelle et al. (1992) statistically analyzed the controlled clinical trials of manipulation and concluded that manipulation increased the probability of recovery at 2-3 weeks after commencing treatment. Furthermore, that manipulation demonstrates a hastened recovery from acute, uncomplicated low back pain.

According to Haldeman and Phillips (1991 2: 1582-83), the positive effects of manipulation reported in the trials they reviewed all appear to occur either immediately after the manipulation, or within the first four to six weeks of treatment. A review by Abenhaim and Bergeron (1992) of twenty years of randomised clinical trials of manipulative therapy for the treatment of low back pain, indicated that manipulative therapy offers some positive short term results, yet the long term effects are still unclear.

More recent studies have attempted to assess the long-term effects of manipulation on acute low back pain, with conflicting results. Meade et al.(1990) compared the effects of physical therapy treatment (in hospital) to office-based chiropractic treatment and noted a small, but detectable long term effect of the latter on Oswestry scores over a two year period. The benefits were still apparent at a three year follow-up (Meade et al. 1995). In a controlled multi-centre trial of manual therapy for the treatment of low back pain, Blomberg et al. (1992) concluded that patients receiving manipulation had significantly better outcome in terms of life scores, disability rating, pain scores and duration of sick leave when compared to a control group receiving optimal medical treatment. These findings were still statistically significant following an eight month follow-up. According to Haldeman and Phillips (1991 2: 1582-83) however, attempts at evaluating the long term effects of a brief, two to four week treatment period using manipulation have not demonstrated any significant difference over controls at three or twelve months.

2.8.3.3 CHRONIC LOW BACK PAIN:

Relatively few studies have been performed to determine the effects of manipulation in chronic low back pain (Haldeman 1993). Evans et al. (1978) noted a decrease in codeine use by patients with chronic low back pain; and Ongley (1987) claimed significant improvement in chronic low back pain by using manipulation together with injections. In a review by O'Donoghue (1994: 671), a positive finding in favour of manipulation was seen in the more chronic patients, but the effect was short-lived.

Spinal manipulative therapy has therefore, not been shown to have any overwhelmingly marked effect on chronic low back pain. Would the combination of manipulation and massage provide a more effective outcome in the management of this chronic disorder?

2.8.4 MECHANISM OF PAIN RELIEF:

Calliet (1981: 129,130) and Kirkaldy-Willis and Cassidy (1988: 289-290) state the possible benefits of spinal manipulative therapy. However, despite their postulates, the exact mechanism by which manipulation relieves pain is still uncertain. The more prominent theories, together with relevant studies and other findings are reviewed here.

2.8.4.1 CHANGE IN PAIN THRESHOLD:

Terrett and Vernon (1984) measured tolerance to electrically induced pain in paraspinal tissues and compared manipulation to joint play. Although both groups showed increases in pain tolerance, this was significantly higher in the manipulation group. The possibility of an increase in endorphins was raised, but has not been confirmed (Sanders et al. 1990).

2.8.4.2 RELEASE OF MUSCLE SPASM:

There have been several conflicting studies in regard to changes in muscle following manipulation. According to Grieve (1988: 345), myoelectric activity and spasm do not have definite correlates. A study of paralumbar muscle activity in a low back pain group and normal controls revealed similar E.M.G. resting state readings in both groups (Kravitz et al. 1981). Further studies are clearly necessary as much debate has revolved around the efficacy of using surface electrodes in the measurement of muscle activity (Haldeman 1993).

2.8.4.3 INCREASED RANGE OF MOTION:

A study conducted by Evans et al. (1978) demonstrates an increase in gross range of motion of the lumbar spine following manipulation. Manipulation restores joint range by: releasing minor adhesions; altering the position of an intra-articular loose body; reducing a displaced articular meniscoid and reducing muscle spasm (Lamb 1994: 646). Giles (1989: 169) confirms that the effect of spinal manipulation may well result in the retraction of an entrapped synovial fold and in stretching any fibrotic scar tissue in the joint capsule.

2.8.4.4 PSYCHOLOGICAL EFFECTS OF MANIPULATION:

Pope et al. (1994) have demonstrated that patients' confidence levels increase, and do so with ongoing treatment, when treated with massage, and manipulation, as opposed to TENS, and corsets. (Haldeman 1993).

2.8.5 CONTRA-INDICATIONS:

Gatterman (1990: 67) lists the contra-indications to spinal manipulative therapy. This list includes only those conditions relevant to the Low Back: atherosclerosis of major blood vessels; abdominal aneurism; prostate and bone tumours; bone infections (eg: T.B., osteomyelitis); traumatic injuries (eg: fractures, instability); arthritis (eg: ankylosing spondylitis); psychological disorders (eg: malingering); metabolic disorders (eg: clotting disorders) neurologic disorders (eg: space occupying lesions).

2.9 MASSAGE

In a conference on guidelines for quality assurance and practice in Chiropractic, Haldeman et al. (1992: 109) state that there is little controversy regarding the clinical utility of massage for uncomplicated musculoskeletal dysfunction.

2.9.1 INDICATIONS:

McDowell (1990: 371) suggests that amoungst other things, massage may be utilised for: muscle spasm; local oedema; adhesions and scar tissue; and joint contracture. Knapp (1990:435) suggests that low back pain, amoungst other conditions, is an indication for massage. Bourdillon et al. (1992: 124) mention that soft tissue techniques (including massage) may be used to 'tidy up' after a skeletal treatment (eg: manipulation) or as preparation for such. In referring to soft tissue therapy, Greenman (1989: 71) states that these procedures may prepare the tissues for specific joint mobilisation (manipulation) or that they may be therapeutic in themselves. Meeker (1992: 525) writes that massage may be prescribed alone or in conjunction with other manual care, for example: chiropractic adjustments.

2.9.2 CONTRA-INDICATIONS:

Massage should not be administered if the following conditions exist: acute circulatory disturbance; acute inflammation; malignancy; oedema (secondary to heart failure, kidney disease, embolus/thrombus, obstruction of lymph channels); skin conditions (acne, eczema, ulcerations, acute burns, wounds); communicable diseases; and hyperaesthesia of the skin.(McDowell 1990: 371.)

2.9.3 EFFECTS:

A review of the effects of traditional massage according to Palastanga (1994: 811-819) is rather long-winded. McDowell (1990: 371) offers a more concise and relevant list: Massage mechanically assists the flow of blood and lymph to increase circulation and reduce oedema; maintains muscle flexibility and viability; breaks up scar tissue, adhesions and fibrosis; provides sedation and stimulation.

2.9.4 TECHNIQUES:

The treatment methods of massage commonly employed in the management of vertebral joint problems are: Stroking

/Effleurage; Kneading/Petrissage; Vibration/Tapotement and Frictions (Grieve 1988: 535).

McDowell (1990: 371-2) describes the effects of each of the relevant methods: Superficial effleurage: creates a reflex increase in circulation; deeper effleurage a reflex as well as mechanical increase.

Petrissage: mechanically milks the muscles.

Tapotement: includes hacking motions and increases the circulation to the area.

Frictions: break up superficial and/or deep adhesions of muscle; used to loosen the tissue beneath the skin.

2.9.5 MECHANICAL DEVICES:

Although various devices and electrical equipment are available for delivering massage, use of the hands is considered the most effective method of application because palpation may be used as an assessment as well as treatment (Geiringer et al. 1988: 286). Furthermore, it is generally conceeded that mechanical devices are not therapeutically effective (Knapp 1990: 435).

2.10 TOUCH

It is salient at this point to focus briefly on the concept of human touch. Medical science has largely failed to develop this vital area of communication (Ojanlatva 1994), which perhaps accounts for the greater satisfaction both chiropractic and physiotherapy treatments seem to elicit from patients, at least in regard to low back pain therapy (Overman et al. 1988; Cherkin and MacCornack 1989).

2.11 SPINAL MANIPULATIVE THERAPY COMBINED WITH OTHER THERAPIES

According to Bronfort (1992: 437), as many of the conditions traditionally treated with spinal manipulative therapy, for example, low back pain, are multifactorial disorders, it would seem relevant to investigate the effectiveness of spinal manipulative therapy in combination with other conservative therapeutic approaches that have been shown to have beneficial effects (eg: certain back school, exercise, and functional restoration programs). In a review of controlled clinical trials regarding the clinical efficacy of manipulation, Haldeman and Phillips (1991 2: 1583) state that manipulation combined with physiotherapy was not found to be significantly more effective than a well organised back school. However, a study by Coxhead et al. (1981) suggests that combining treatments is more effective than utilising a single treatment protocol. They found that when manipulation, traction, exercise and corsets were offered simultaneously, the improvement rate increased from 69% for a single treament to 88%. Ottenbacher and Difabio (1985), in a review of studies using manipulation / mobilisation, noted that the effect of spinal manipulative therapy was greater when performed in conjunction with other forms of therapy (including posture and exercise), rather than when performed alone. Patients were also less likely to develop recurring back pain.

According to Wood and Becker (1981: 25), the integration of therapeutic techniques (ie: massage, manual orthopaedic techniques and therapeutic exercise) is highly desirable in establishing control over newly mobilised ranges of motion. Gatterman (1990: 397) states that in most cases when manipulation is the treatment of choice, adjunctive procedures are of benefit.

In reference to Bronfort's suggestion, massage has also been found to have beneficial physiological effects (Goats 1994), yet, there have been few studies in which massage is combined with other modalities. Leboeuf et al. (1987) compared patients receiving spinal manipulative therapy with those receiving spinal manipulative therapy combined with massage for the treatment of repetitive strain injuries of the upper limb(s), and found that the patients receiving spinal manipulative therapy and massage improved more than the group receiving chiropractic adjustments only.

2.12 SUMMARY

The costs of incidence, recurrence and chronicity associated with low back pain are enormous (Tufo et al. 1991 1: 67). The majority of low back patients treated are in the phase of spinal dysfunction (Cassidy and Kirkaldy-Willis 1988: 295). In order to better understand this pandemic, the pathophysiology and aetiology of spinal joint dysfunctions are reviewed. Anatomy of the relevant components of the low back (facet joints and muscles) is also mentioned. Thereafter, the clinical features of the two most common syndromes associated with mechanical low back pain follow. It is knowledge of the afore-mentioned (ie: pathophysiology, aetiology, anatomy and clinical features) which assists the clinician in formulating a relevant treatment plan (Kirkaldy-Willis 1988: 49). Treatment protocols for facet and sacroiliac syndromes are then reviewed.

Spinal manipulative therapy is one of the most commonly used treatments for patients with low back pain (Haldeman 1983); hence, it's efficacy and mechanism of pain relief are included. The indications, contra-indications, techniques and effects of massage preceed a few paragraphs on the importance of touch.

The use of spinal manipulative therapy in combination with other effective therapies has been found to increase the effectiveness of the former (Ottenbacher and Difabio 1985).

Therefore, the purpose of this investigation is to evaluate the effects of spinal manipulative therapy and spinal manipulative therapy combined with massage in the treatment of mechanical low back pain, in terms of objective and subjective clinical findings, in order to determine the more effective approach in the management of mechanical low back pain.

CHAPTER 3

3 MATERIALS AND METHODS

3.1 INTRODUCTION

This chapter deals with the methods employed in data collection, as well as the statistical methods used for the interpretation of the data.

3.2 THE DATA

The data used in this study was of two kinds: primary and secondary data. The nature of each of these two types of data shall be discussed below.

3.2.1 THE PRIMARY DATA:

The primary data consisted of the following:
Patients' pain sensitivity, as determined by an algometer.
Patients' lumbar spine range of motion, as determined by a goniometer.
Patients' disability, as determined by an Oswestry Low Back Pain Disability Questionaire (Appendix D).
Patients' pain perception, as determined by a short form McGill Pain Questionaire (Appendix E) and a Numerical Pain Rating Scale-101 (Appendix F).

3.2.2 THE SECONDARY DATA:

This consisted of recognised diagnostic and evaluatory criteria as pertains to patients' perceptions of pain sensitivity, spinal range of motion, disability and pain perception.

3.3 RESEARCH METHODOLOGY AND MATERIALS USED

The objective of this study was to evaluate the effects of spinal manipulative therapy and spinal manipulative therapy combined with massage in the treatment of mechanical low back pain, in terms of objective and subjective clinical findings, in order to determine the more effective approach in the management of mechanical low back pain.

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

Patients were recruited from the greater Durban area by use of convenience sampling ie: advertisements placed in the local newspaper, *The Natal Mercury* and the local radio station, *East Coast Radio*. It was advertised that free treatment would be administered to people suffering from low back pain who were willing to participate in this study. Upon telephonic reply, these potential patients had the exact study protocol explained to them and after agreeing to participate, an initial consultation was scheduled.

At the initial consultation, potential candidates for the study underwent a full case history (Appendix A), physical examination (Appendix B) and regional low back examination (Appendix C). During this process, they were screened for lumbar facet syndrome, sacroiliac syndrome, or a combination of these two syndromes. When clinically indicated, patients were X-Rayed (lumbar spine and pelvis) for any contra-indications to spinal manipulative therapy and/or massage. Following examination, a diagnosis was determined. Patients were not excluded from the study because of their age, previous treatment, or use of any medication.

The orthopaedic tests utilised to diagnose facet syndrome were Kemp's test and lumbar facet joint challenge; and those used to diagnose sacroiliac syndrome were Patrick's Faber test and Gaenslen's test. Kemp's test (axial compression) is performed with the patient sitting. The examiner reaches around the patient's shoulders from behind and rotates and extends the patient. Axial compression is then applied with the patient maximally extended and rotated right and then left. Pain in the lumbar region is indicative of a positive test. (Gatterman and Panzer 1990: 141.) Lumbar facet joint challenge ('springing') is performed with the patient prone. The examiner places a thumb on the spinous process tip and pushes laterally, varying the force. The joint may be bounced with a little more vigor if there is no pain response. This produces end-feel, which is never reached abruptly in a normal joint. A joint with restricted mobility has lost the springiness at the end position. It is this springiness that one palpates for when performing facet joint challenge. (Gatterman 1990: 49, 84.) Patrick's Faber test requires that the patient lie supine, and that the examiner place the patient's test leg so that the foot of the test leg is on top of the knee of the opposite leg. The examiner then slowly lowers the test leg in abduction toward the examining table. A positive test is indicated by the test leg remaining above the opposite straight leg. The word Faber indicates flexion, abduction, and external rotation of the hip at the commencement of the test. This test may, besides a sacroiliac joint problem, indicate a hip problem or iliospoas spasm. (Magee 1992: 343.) Gaenslen's test requires that the patient lie supine with the patient positioned so that the test hip extends beyond the edge of the table. The patient draws both legs up onto the chest and then slowly lowers the test leg down into extension. Pain in the ipsilateral sacroiliac joint is indicative of a positive test. (Magee 1992: 319.) Motion palpation, as instructed at Technikon Natal (with reference to principles in Schafer and Faye (1989: 211-216, 256-259)) was used to identify segments with restricted or abnormal motion patterns in the lumbar spine and sacroiliac joints. According to a study done by Evans (1994: 545), palpation was found to be a sufficiently precise technique for the assessment of intervertebral movement. This was used to ascertain which technique would be utilised to manipulate patients.

Eligible candidates were required to complete an informed consent form (Appendix G), afterwhich they were allocated either to the control group (SMT) or the experimental group (SMT+Massage), by means of random sampling. Sampling had already been completed prior to patients entering the study.

This random sampling method involved dividing the population of 30 into six groups of 5 , each group containing different combinations of SMT and SMT+Massage. These are presented below, with the letter S representing the SMT group and the letter M representing the SMT+Massage group.

Group1:SSMSM	Group4:MMSSM
Group2:MSMSS	Group5:SMMMS
Group3:MSSMS	Group6:SSMMM

This resulted in two groups of 15 patients each; one group receiving spinal manipulative therapy and the other group receiving spinal manipulative therapy and massage.

There was no blinding of either the patients or the researcher in this study. According to Winer (1985: 98) requirements for the double blind, or even the single blind trial are difficult to fulfill because patients are aware of whether they have had manual therapy or not, and it is difficult to guarantee that patients will not reveal their treatment to the doctor. At the first, sixth, and one month follow-up consultations, each patient was required to complete the Oswestry Low Back Pain Disability Questionaire (Fairbank et al. 1980), the short form McGill Pain Questionaire (Melzack 1987) and the Numerical Pain Rating Scale-101 (Jensen et al. 1986) prior to each treatment. In addition, the following measurements were taken: patients' lumbar spine ranges of motion (with a goniometer) and pain sensitivity in the affected area (with an algometer), also prior to each treatment.

Patients were treated for a maximum of six treatments over a period of approximately three weeks, with a follow-up consultation one month after the sixth consultation. This treatment protocol was used as favourable responses to manipulation normally occur over seven to ten days (Gatterman 1990: 163). If a patient's condition resolved completely before the six treatments were complete, they were then monitored for the remainder of the consultations. If the same condition recurred within the monitored period, they continued treatment until the sixth consultation. If a patient's condition recurred after the sixth treatment (ie:

the follow-up period), these findings were recorded at the follow-up consultation.

Patients in both groups were treated using the diversified method of manipulation. The techniques used were those as described by Szaraz (1990: 137, 145, 156, 143, 139, 141), and included the lumbar roll (pisiform-mamillary), spinous push/hook, sitting lumbar, upper sacroiliac joint (flexed inominate), and lower sacroiliac joint (extended inominate). The lumbar roll, spinous hook and sitting lumbar techniques were used for manipulating the lumbar spinal segments. Discrimination of technique utilised was based on success of manipulation using the lumbar roll; if this failed (ie: no audible sound), the spinous hook was used and if this failed, the sitting lumbar technique was utilised. The upper and lower sacroiliac techniques were administered according to motion palpation findings of restricted movement.

Patients in the SMT+Massage group received a traditional (Swedish) massage prior to the required manipulation, as taught at Technikon Natal. The paraspinal muscles of the lumbar spine were massaged, between the levels of L1 and L5. Techniques included: Stroking / Effleurage; Kneading / Petrissage; Vibration/Tapotement and Frictions. The specific method of application for each technique is described according to McDowell (1990: 371-2).

Superficial effleurage: strokes should be parallel to the direction of the muscle fibres, and heavier in the direction towards the heart. It should begin with light pressure, progressing to heavier pressure (to tolerance) and terminating with light pressure.

Petrissage: mechanically milks the muscles. It is performed either between the thumb and fingers or chiefly with the palm. Pressure may vary from light to heavy. Strokes are either centripetal or transverse to the muscle fibres.

Tapotement: includes hacking motions with the ulnar aspects of the little, ring and middle fingers respectively - in rapid succession.

Frictions: the fingers or thumb are not permitted to slide on the skin. Small circular or linear strokes are used to loosen the tissue beneath the skin.

All patients were encouraged to avoid any activity that differed from their usual daily routines. Any adverse effects to either treatment method was recorded in the patients' files.

The experimental design of the study involved lumbar spine ranges of motion (as determined by a goniometer) and pain sensitivity (determined by use of an algometer).

Lumbar spine ranges of motion were measured in flexion, extension, left lateral flexion, right lateral flexion, left rotation and right rotation, with the use of a BROM II (back range of motion) goniometer, supplied by Performance Attainment Associates (3600 LA Bore Rd, Suite 6, Saint Paul, MN 55110-4144). The BROM II has been found to be a reliable instrument in the measurement of certain planes of lumbar mobility (Breum et al. 1995). The goniometer consisted of two sets of instruments: one used for the measurement of flexion and extension (part A), and one (part B) utilised for left and right lateral flexion (with a coronal-facing compass) and left and right rotation (with a horizontal-facing compass) The method of measurements utilised is as follows:

For flexion and extension: marks were made over the skin at the S1 process below (point 1) and the T12 spinous process above (point 2). The fulcrum of part A of the goniometer was then placed over point 1, and the valcro straps secured around the patient's waist, whilst the goniometer's marker was then placed at point 2. This reading was then taken as an initial reading. The patient was then asked to bend forward as far as possible, whilst the goniometer was held firm so as to prevent any movement off the afore-mentioned points. At the limit of flexion, a second reading was taken. The first reading was then subtracted from this second reading in order to obtain the number of degrees for flexion. The patient was then asked to stand up straight once more and another initial reading (for extension) was taken. The patient was then instructed to bend backwards as far as possible, again whilst the goniometer was held firm so as to prevent any movement off the above-mentioned points, and at this limit, the second reading for extension was taken. This reading was then subtracted from the first for the number of degrees for extension.

For left and right lateral flexion: part B of the goniometer was used. A magnet was valcro strapped to the original point 2 (T12 spinous process) and the two bases of part B placed horizontally on either side of the affected segment so that the coronal-facing compass faced the researcher in the coronal plane. If there was more than one affected area, the area causing the most pain/discomfort was utilised. The goniometer's compass was then allowed to point downwards and an initial reading taken. Then, the patient was asked to laterally bend to the left as far as possible, whilst the goniometer was held firmly so as to prevent any movement off the above-mentioned segments. A second reading was taken and the difference between first and second readings calculated. This reflected the number of degrees for left lateral flexion. This procedure was then repeated for right lateral flexion and a reading taken, which indicated the degrees of right lateral flexion.

For left and right rotation: part B of the goniometer was again used, with the instrument in the same position as for left and right lateral flexion. This time however, the horizontal-facing compass was used for taking readings. An initial reading was taken. The patient was then instructed to rotate as much to the left as possible and a second reading taken. The difference revealed the number of degrees of left rotation. This procedure was repeated for right rotation, and another reading taken. The readings were then recorded in the patients' files.

Pain sensitivity was measured with the use of an algometer (Fischer 1986), supplied by Wagner Instruments (P.O. Box 1217, Greenwich, CT 06836, USA). The pressure algometer provides a means of quantifying treatment, including manipulation, in order to identify improvement (Fischer 1986).

The patient was asked to indicate the area of most pain/discomfort, usually at one or both sides of the involved segment. If this area was on one side of the involved segment, the head of the algometer was placed on that side and depressed. The patient was instructed to indicate immediately when the pressure became painfully perceptible. Upon noting the patient's response, the pressure was then removed and a reading taken (maximum out of 10Kg per square centimetre). When the pain/discomfort was bilateral(ie: on both sides of the involved segment(s)), both readings were taken. The average of both readings was then calculated and rounded off to the nearest decimal place. All these figures were then recorded in the patients' files.

The descriptive survey design used the Oswestry Low Back Pain Disability Questionaire (Appendix D), the short form McGill Pain Questionaire (Appendix E) and the Numerical Pain Rating Scale-101 (Appendix F). According to McDowell and Newell (1987: 239-259), as well as Triano et al. (1993), both the Oswestry Low Back Pain Disability Questionaire and the Numerical Pain Rating Scale-101 are accepted as valid and reliable measurement criteria. Furthermore, Haas et al. (1995) found the Oswestry Low Back Pain Disability Questionaire appropriate for monitoring low back pain and Jensen et al. (1986) found the 101-point rating scale the most practical index when compared with six other methods of measuring clinical pain intensity.

The Oswestry Low Back Pain Disability Questionaire consists of ten sections of six questions each. For each section, the total possible score is 5 points, with the point distribution ranging from zero (if the first statement of the respective section was marked) to five (if the sixth [last] statement was chosen). Upon completion of the questionaire, the points for each section were added, with the maximum possible score being fifty. The final score was then converted to a percentage for each patient, for 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, and then converted to a percentage. Similarly, if more than one section was not answered, the total score was then divided by five less points per section un-answered before converting to a percentage. (Fairbank et al. 1980.) These scores were calculated and recorded in the patients' files at the times of data collection.

The short form McGill Pain Questionaire was analysed as follows: points were allocated to each word in each column (of mild, moderate, and severe) for the sensory dimension of pain experience (ie: the first eleven words on the questionaire). Each patient's response for each word was then added together, divided by 91,89, and then multiplied by 100, in order to give a percentage. (Melzack and Katz 1992: 152-167.) This was done before the first, sixth and follow-up consultations, for each patient.

The Numerical Pain Rating Scale-101, a numerical pain intensity scale, was used to measure the subjective response of patients to treatment in terms of their perception of the pain intensity. This questionaire instructed the patient to rate their 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 patients' files. The average pain intensity was calculated by adding the values representing worst and least pain and then dividing this by two. (Jensen et al. 1986.) The average pain intensity experienced by each patient over the treatment and follow-up periods were then utilised for statistical analysis.

Statistical analysis was taken over two periods: viz: the treatment and the follow-up periods.

Due to the fact that the population size numbered only thirty, non-parametric test statistics (ie: the Wilcoxin Signed Ranks Test and the Mann-Whitney Test) were used in analysing the data. Statistical analyses therefore assume that the population involved is symmetric (ie: normally distributed).

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

The Wilcoxin Signed Ranks Test was used to determine whether any significant change occurred between the initial and final treatments, the initial and the follow-up appointment, and between the final treatment and the one month follow-up consultation, within each study group. In each respective hypothesis test conducted, the null hypothesis (Ho) stated that no significant difference existed between for example the initial and final consultation. The null hypothesis (Ho) was rejected if the P value was less than α; and it was concluded that there was a significant difference within the group at the α = 0,05 level of significance. Ho was accepted if P was greater than or equal to α; with the conclusion that there was no significant difference within the group at the α = 0,05 level of significance. The P value was calculated by dividing the value of the two-tailed probability of equaling or exceeding the value of Z, by 2, and where α = 0,05 ie: 95% level of significance.

The Mann-Whitney Test was used to determine whether any significant difference existed between the two groups at the time of initial, final or follow-up consultations. Each respective hypothesis test conducted was treated similarly to that described for the Wilcoxin Signed Ranks Test.

3.4 THE SPECIFIC TREATMENT OF EACH OBJECTIVE

3.4.1 OBJECTIVE ONE:

The first objective of this study was to evaluate the effects of spinal manipulative therapy of mechanical low back pain, in terms of objective and subjective clinical findings, in order to determine the effectiveness of this treatment approach in the management of mechanical low back pain.

3.4.1.1 THE DATA REQUIRED:

The data required for testing the hypothesis of objective one was the response of the patients in this group to the Oswestry Low Back Pain Disability Quesionaire (Appendix D), the short form McGill Pain Questionaire (Appendix E), the Numerical Pain Rating Scale-101 (Appendix F), the readings obtained of lumbar spine ranges of motion (Appendix H) and pain sensitivity (Appendix I).

3.4.1.2 HOW THE DATA WAS SECURED:

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

This data was recorded in each patient's file at the aforementioned times of data collection.

All questionaires were completed under the researcher's supervision.

3.4.2 OBJECTIVE TWO:

The second objective of this study was to evaluate the combined effects of spinal manipulative therapy and massage treatment of mechanical low back pain, in terms of objective and subjective clinical findings, in order to determine the effectiveness of this treatment approach in the management of mechanical low back pain.

3.4.2.1 THE DATA REQUIRED:

The data required for testing the hypothesis of objective two was the response of the patients in this group to the Oswestry Low Back Pain Disability Quesionaire (Appendix D), the short form McGill Pain Questionaire (Appendix E), the Numerical Pain Rating Scale-101 (Appendix F), the readings obtained of lumbar spine ranges of motion (Appendix H) and pain sensitivity (Appendix I).

3.4.2.2 HOW THE DATA WAS SECURED:

The data required was obtained as for objective one.

3.4.3 OBJECTIVE THREE:

The third objective of this study was to integrate the data indicating the possible effects of spinal manipulative therapy and spinal manipulative therapy combined with massage, in terms of objective and subjective clinical findings, in order to determine the more effective approach in the management of mechanical low back pain.

3.4.3.1 THE DATA REQUIRED:

The data required for testing the hypothesis of objective three was the response of the patients in both groups to the Oswestry Low Back Pain Disability Quesionaire (Appendix D), the short form McGill Pain Questionaire (Appendix E), the Numerical Pain Rating Scale-101 (Appendix F), the readings obtained of lumbar spine ranges of motion (Appendix H) and pain sensitivity (Appendix I).

3.4.3.2 HOW THE DATA WAS SECURED:

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

CHAPTER FOUR

4 RESULTS

4.1 INTRODUCTION

This chapter deals with the results obtained after statistically analysing the data from the measurement criteria utilised, viz:

the lumbar spine ranges of motion;

the pain sensitivity (as determined by the algometer).

the short form McGill Pain Questionaire;

the Numerical Pain Rating Scale-101; and

the Oswestry Low Back Pain Disability Questionaire.

The results obtained for the Wilcoxin Signed Ranks Test are tabulated below, under the non-parametric paired hypothesis tests. The tables include the level of significance (P value) and the standard deviation (SD).

For the Mann-Whitney Tests, the data is presented in tables under the non-parametric un-paired hypothesis tests; the level of significance (P value) and the standard deviation (SD) are also indicated here. The age and gender distribution are also tabulated following the afore-mentioned results.

4.2 CRITERIA GOVERNING ADMISSIBILITY OF THE DATA

Only responses to the Oswestry Low Back Pain Disability Questionaire, the short form McGill Pain Questionaire and the Numerical Pain Rating Scale-101, completed under the researcher's supervision were utilised. Similarly, only the readings for pain sensitivity and lumbar spine range of motion taken by the researcher were used. The Kirkaldy-Willis model for the classification of mechanical low back disorders (Kirkaldy-Willis 1988: 134) was used for the diagnosis of mechanical low back pain syndromes. These syndromes were screened for by means of a comprehensive case history (Appendix A), physical examination (Appendix B), and regional low back examination (Appendix C).

4.3 NON-PARAMETRIC PAIRED HYPOTHESIS TESTS

4.3.1 RANGES OF MOTION

Lumbar spine ranges of motion were recorded with the use of a goniometer. Six ranges were measured: flexion, extension, left rotation, right rotation, left lateral flexion, and right lateral flexion.

FLEXION:

Table 4.1 One sample analysis of flexion, comparing the initial, final, and follow-up consultations of the SMT (control) group:

	(T1-T6)	(T6-FU)	(T1-FU)
P Value	0.09(nsd)	0.5(nsd)	0.09(nsd)
	T1	T6	FU
S.D	8.91	4.81	3.54

Table 4.2 One sample analysis of flexion, comparing the initial, final, and follow-up consultations of the SMT + Massage (experimental) group:

	(T1-T6)	(T6-FU)	(T1-FU)
P Value	0.05(nsd)	0.27(nsd)	0.002(sd)
	T1	T6	FU
S.D	7.94	5.72	3.54

The null hypothesis is accepted for the control group, because there was no statistically significant change between the initial and final treatment. The null hypothesis is rejected for the experimental group, as there was a statistically significant change that occurred between the initial and final treatments, which indicates an improvement as a result of this intervention.

EXTENSION:

Table 4.3 One sample analysis of extension, comparing the initial, final, and follow-up consultations of the SMT (control) group:

	(T1-T6)	(T6-FU)	(T1-FU)
P Value	0.19(nsd)	0.09(nsd)	0.002(sd)
	T1	T6	FU
S.D	2.92	3.04	2.33

Table 4.4 One sample analysis of extension, comparing the initial, final, and follow-up consultations of the SMT + Massage (experimental) group:

	(T1-T6)	(T6-FU)	(T1-FU)
P Value	0.39(nsd)	0.19(nsd)	0.39(nsd)
	T1	T6	**FU**
S.D	3.17	1.98	1.71

The null hypothesis is rejected for the control group, as there was a statistically significant change that occurred between the initial and final treatments, which indicates an improvement as a result of this intervention. The null hypothesis is accepted for the experimental group, because there was no statistically significant change between the initial and final treatment.

LEFT ROTATION:

Table 4.5 One sample analysis of left rotation, comparing the initial, final, and follow-up consultations of the SMT (control) group:

	(T1-T6)	**(T6-FU)**	**(T1-FU)**
P Value	0.17(nsd)	0.5(nsd)	0.17(nsd)
	T1	**T6**	**FU**
S.D	3.68	5.15	3.61

Table 4.6 One sample analysis of left rotation, comparing the initial, final, and follow-up consultations of the SMT + Massage (experimental) group:

	(T1-T6)	**(T6-FU)**	**(T1-FU)**
P Value	0.38(nsd)	0.14(nsd)	0.38(nsd)
	T1	**T6**	**FU**
S.D	4.59	3.81	3.01

The null hypothesis is accepted for both the control and the experimental group, as there was no statistically significant change that took place between the initial and final treatments, which indicates no improvement in left rotation as a result of either treatment.

RIGHT ROTATION:

Table 4.7 <u>One sample analysis of right rotation, comparing the initial, final, and follow-up consultations of the SMT (control) group:</u>

	(T1-T6)	**(T6-FU)**	**(T1-FU)**
P Value	0.17(nsd)	0.36(nsd)	0.38(nsd)
	T1	**T6**	**FU**
S.D	3.10	4.06	3.58

Table 4.8 <u>One sample analysis of right rotation, comparing the initial, final, and follow-up consultations of the SMT + Massage (experimental) group:</u>

	(T1-T6)	**(T6-FU)**	**(T1-FU)**
P Value	0.39(nsd)	0.07(nsd)	0.38(nsd)
	T1	**T6**	**FU**
S.D	6.17	3.76	3.16

The null hypothesis is accepted for both the control and the experimental group, as there was no statistically significant change that took place between the initial and final treatments, which indicates no improvement in right rotation as a result of either treatment.

LEFT LATERAL FLEXION:

Table 4.9 One sample analysis of left lateral flexion, comparing the initial, final, and follow-up consultations of the SMT (control) group:

	(T1-T6)	**(T6-FU)**	**(T1-FU)**
P Value	0.05(nsd)	0.5(nsd)	0.02**(sd)**
	T1	**T6**	**FU**
S.D	4.65	5.14	4.42

Table 4.10 One sample analysis of left lateral flexion, comparing the initial, final, and follow-up consultations of the SMT + Massage (experimental) group:

	(T1-T6)	**(T6-FU)**	**(T1-FU)**
P Value	0.02**(sd)**	0.29(nsd)	0.01**(sd)**
	T1	**T6**	**FU**
S.D	5.28	4.56	5.94

The null hypothesis is rejected for both the control and the experimental group, as there was a statistically significant change that occurred between the initial and final treatments, which indicates an improvement in left lateral flexion as a result of these interventions.

RIGHT LATERAL FLEXION:

Table 4.11 One sample analysis of right lateral flexion, comparing the initial, final, and follow-up consultations of the SMT (control) group:

	(T1-T6)	**(T6-FU)**	**(T1-FU)**
P Value	0.11(nsd)	0.5(nsd)	0.01**(sd)**
	T1	**T6**	**FU**
S.D	4.40	5.29	3.84

Table 4.12 One sample analysis of right lateral flexion, comparing the initial, final, and follow-up consultations of the SMT + Massage (experimental) group:

	(T1-T6)	**(T6-FU)**	**(T1-FU)**
P Value	0.09(nsd)	0.39(nsd)	0.21(nsd)
	T1	**T6**	**FU**
S.D	5.21	5.41	6.21

The null hypothesis is rejected for the control group, as there was a statistically significant change that occurred between the initial and final treatments, which indicates an improvement as a result of this intervention. The null hypothesis is accepted for the experimental group, because there was no statistically significant change between the initial and final treatment.

Table 4.13 Summary of pre-treatment and post-treatment goniometer measurements for Wilcoxin's Signed Rank tests:

	P Value	
T1-FU	**SMT**	**SMT+MASS**
FLEXION	0.09(nsd)	0.002**(sd)**
EXTENSION	0.002**(sd)**	0.39(nsd)
LEFT ROTATION	0.17(nsd)	0.38(nsd)
RIGHT ROTATION	0.38(nsd)	0.38(nsd)
LEFT LATERAL FLEXION	0.02**(sd)**	0.01**(sd)**
RIGHT LATERAL FLEXION	0.01**(sd)**	0.21(nsd)

4.3.2 PAIN SENSITIVITY (ALGOMETER)

Pain sensitivity was recorded with the use of an algometer. The following readings were taken:

Table 4.14 One sample analysis of pain sensitivity, comparing the initial, final, and follow-up consultations of the SMT (control) group:

	(T1-T6)	**(T6-FU)**	**(T1-FU)**
P Value	0.02**(sd)**	0.39(nsd)	0.02**(sd)**
	T1	**T6**	**FU**
S.D	16.45	19.56	19.39

Table 4.15 One sample analysis of pain sensitivity, comparing the initial, final, and follow-up consultations of the SMT + Massage (experimental) group:

	(T1-T6)	**(T6-FU)**	**(T1-FU)**
P Value	0.005 **(sd)**	0.06(nsd)	0.001 **(sd)**
	T1	**T6**	**FU**
S.D	19.36	16.01	16.78

The null hypothesis is rejected for both the control and the experimental group, as there was a statistically significant change that occurred between the initial and final treatments, which indicates an improvement in pain sensitivity as a result of these interventions.

4.3.3 PAIN PERCEPTION (MCGILL)

Pain perception was measured with the use of the short form McGill Pain Questionaire (McGill) and the Numerical Pain Rating Scale-101 (NRS-101). The following results were obtained:

Table 4.16 <u>One sample analysis of pain perception (McGill), comparing the initial, final, and follow-up consultations of the SMT (control) group:</u>

	(T1-T6)	**(T6-FU)**	**(T1-FU)**
P Value	0.002 **(sd)**	0.13 (nsd)	0.09 (nsd)
	T1	**T6**	**FU**
S.D	12.15	14.58	17.44

Table 4.17 <u>One sample analysis of pain perception (McGill), comparing the initial, final, and follow-up consultations of the SMT + Massage (experimental) group:</u>

	(T1-T6)	**(T6-FU)**	**(T1-FU)**
P Value	0.0002 **(sd)**	0.27 (nsd)	0.005 **(sd)**
	T1	**T6**	**FU**
S.D	13.37	7.61	13.77

The null hypothesis is accepted for the control group, because there was no statistically significant change between the initial and final treatment. The null hypothesis is rejected for the experimental group, as there was a statistically significant change that occurred between the initial and final treatments, which indicates an improvement as a result of this intervention.

4.3.4 PAIN PERCEPTION (NRS-101)

Table 4.18 One sample analysis of pain perception (NRS-101), comparing the initial, final, and follow-up consultations of the SMT (control) group:

	(T1-T6)	**(T6-FU)**	**(T1-FU)**
P Value	0.13(nsd)	0.5(nsd)	0.19(nsd)
	T1	**T6**	**FU**
S.D	12.55	19.77	17.31

Table 4.19 One sample analysis of pain perception (NRS-101), comparing the initial, final, and follow-up consultations of the SMT + Massage (experimental) group:

	(T1-T6)	**(T6-FU)**	**(T1-FU)**
P Value	0.01**(sd)**	0.03**(sd)**	0.002**(sd)**
	T1	**T6**	**FU**
S.D	7.81	16.49	15.39

The null hypothesis is accepted for the control group, because there was no statistically significant change between the initial and final treatment. The null hypothesis is rejected for the experimental group, as there was a statistically significant change that occurred between the initial and final treatments, which indicates an improvement as a result of this intervention.

4.3.5 DISABILITY

Disability was measured with the Oswestry Low Back Pain Disability Questionaire. The following results were obtained:

Table 4.20 One sample analysis of disability, comparing the initial, final, and follow-up consultations of the SMT (control) group:

	(T1-T6)	(T6-FU)	(T1-FU)
P Value	0.003 **(sd)**	0.39 (nsd)	0.01 **(sd)**
	T1	**T6**	**FU**
S.D	9.35	8.17	15.15

Table 4.21 One sample analysis of disability, comparing the initial, final, and follow-up consultations of the SMT + Massage (experimental) group:

	(T1-T6)	(T6-FU)	(T1-FU)
P Value	0.003 **(sd)**	0.11 (nsd)	0.005 **(sd)**
	T1	**T6**	**FU**
S.D	11.16	9.32	7.17

The null hypothesis is rejected for both the control and the experimental group, as there was a statistically significant change that occurred between the initial and final treatments respectively, which indicates an improvement in disability as a result of these interventions.

4.4 NON-PARAMETRIC UN-PAIRED HYPOTHESIS TESTS

4.4.1 RANGES OF MOTION

FLEXION:

Table 4.22 Two sample analysis of flexion, comparing the control group with the experimental group:

CTRL-EXP	**T1**		**T6**		**FU**	
P Value	0.18(nsd)		0.39(nsd)		0.11(nsd)	
	CTRL	**EXP**	**CTRL**	**EXP**	**CTRL**	**EXP**
S.D	8.91	7.94	4.81	5.72	3.54	3.54

EXTENSION:

Table 4.23 Two sample analysis of extension, comparing the control group with the experimental group:

CTRL-EXP	**T1**		**T6**		**FU**	
P Value	0.44(nsd)		0.48(nsd)		0.11(nsd)	
	CTRL	**EXP**	**CTRL**	**EXP**	**CTRL**	**EXP**
S.D	2.92	3.17	3.04	1.98	2.33	1.71

LEFT ROTATION:

Table 4.24 Two sample analysis of left rotation, comparing the control group with the experimental group:

CTRL-EXP	**T1**		**T6**		**FU**	
P Value	0.04**(sd)**		0.04**(sd)**		0.08(nsd)	
	CTRL	**EXP**	**CTRL**	**EXP**	**CTRL**	**EXP**
S.D	3.68	4.59	5.15	3.81	3.61	3.01

RIGHT ROTATION:

Table 4.25 Two sample analysis of right rotation, comparing the control group with the experimental group:

CTRL-EXP	**T1**		**T6**		**FU**	
P Value	0.01 **(sd)**		0.02 **(sd)**		0.07 (nsd)	
	CTRL	**EXP**	**CTRL**	**EXP**	**CTRL**	**EXP**
S.D	3.10	6.17	4.06	3.76	3.58	3.16

LEFT LATERAL FLEXION:

Table 4.26 Two sample analysis of left lateral flexion, comparing the control group with the experimental group:

CTRL-EXP	**T1**		**T6**		**FU**	
P Value	0.29 (nsd)		0.13 (nsd)		0.37 (nsd)	
	CTRL	**EXP**	**CTRL**	**EXP**	**CTRL**	**EXP**
S.D	4.65	5.28	5.14	4.56	4.42	5.94

RIGHT LATERAL FLEXION:

Table 4.27 Two sample analysis of right lateral flexion, comparing the control group with the experimental group:

CTRL-EXP	**T1**		**T6**		**FU**	
P Value	0.06 (nsd)		0.13 (nsd)		0.36 (nsd)	
	CTRL	**EXP**	**CTRL**	**EXP**	**CTRL**	**EXP**
S.D	4.40	5.21	5.29	5.41	3.84	6.21

The null hypothesis is accepted, as 100% of the measurements did not indicate a statistically significant difference between final treatments of the control and experimental groups, indicating no difference in the efficacy of the treatments.

Table 4.28 Summary of pre-treatment and post-treatment goniometer measurements for Mann-Whitney tests:

	P Value
T1-FU	**SMT vs SMT+MASS**
FLEXION	0.11(nsd)
EXTENSION	0.11(nsd)
LEFT ROTATION	0.08(nsd)
RIGHT ROTATION	0.07(nsd)
LEFT LATERAL FLEXION	0.37(nsd)
RIGHT LATERAL FLEXION	0.36(nsd)

4.4.2 PAIN SENSITIVITY (ALGOMETER)

Table 4.29 Two sample analysis of pain sensitivity (algometer), comparing the control group with the experimental group:

CTRL-EXP	**T1**		**T6**		**FU**	
P Value	0.18(nsd)		0.49(nsd)		0.10(nsd)	
	CTRL	**EXP**	**CTRL**	**EXP**	**CTRL**	**EXP**
S.D	16.45	19.36	19.56	16.01	19.39	16.78

The null hypothesis is accepted, as it was shown that the algometer readings did not indicate a statistically significant difference between the final treatments of the control and experimental groups, hence indicating that there was no difference in efficacy of the treatments.

4.4.3 PAIN PERCEPTION (MCGILL)

Table 4.30 Two sample analysis of pain perception (McGill), comparing the control group with the experimental group:

CTRL-EXP	T1		T6		FU	
P Value	0.36(nsd)		0.11(nsd)		0.43(nsd)	
	CTRL	EXP	CTRL	EXP	CTRL	EXP
S.D	12.15	13.37	14.58	7.61	17.44	13.77

The null hypothesis is accepted, as it was shown that the McGill readings did not indicate a statistically significant difference between the final treatments of the control and experimental groups, hence indicating that there was no difference in efficacy of the treatments.

4.4.4 PAIN PERCEPTION (NRS-101)

Table 4.31 Two sample analysis of pain perception (NRS-101), comparing the control group with the experimental group:

CTRL-EXP	T1		T6		FU	
P Value	0.35(nsd)		0.40(nsd)		0.23(nsd)	
	CTRL	EXP	CTRL	EXP	CTRL	EXP
S.D	12.55	7.81	19.77	16.49	17.31	15.39

The null hypothesis is accepted, as it was shown that the NRS-101 readings did not indicate a statistically significant difference between the final treatments of the control and experimental groups, hence indicating that there was no difference in efficacy of the treatments.

4.4.5 DISABILITY

Table 4.32 Two sample analysis of disability, comparing the control group with the experimental group:

CTRL-EXP	T1		T6		FU	
P Value	0.48(nsd)		0.20(nsd)		0.35(nsd)	
	CTRL	EXP	CTRL	EXP	CTRL	EXP
S.D	9.35	11.16	8.17	9.32	15.15	7.17

The null hypothesis is accepted, as it was shown that the disability readings did not indicate a statistically significant difference between the final treatments of the control and experimental groups, hence indicating that there was no difference in efficacy of the treatments.

4.5 POPULATION AGE AND GENDER DISTRIBUTION

Table 4.33 Table of average age and gender distribution:

	SMT	SMT+MASSAGE
AVERAGE AGE	36.3 years	29.0 years
AGE RANGE	20-55	19-60
MALES	9	5
FEMALES	6	10

4.6 POPULATION SYNDROME DISTRIBUTION

Table 4.34 Table of Facet, Sacroiliac, and Facet and Sacroiliac Syndrome Distribution:

	SMT	SMT+MASSAGE
FACET	13	13
SACROILIAC	0	0
FACET+SACROILIAC	2	2

4.7 GENERAL REMARKS

Of the 33 patients found eligible for inclusion in this study, three were non-compliant. Thirty patients completed the study. No adverse effects to either manipulation or massage were found.

CHAPTER FIVE

5 DISCUSSION

5.1 INTRODUCTION

This chapter involves the discussion of results after statistical analysis of the data obtained from the goniometer and algometer readings, the short form McGill Pain Questionaire, the Numerical Pain Rating Scale-101; and the Oswestry Low Back Pain Disability Questionaire.

The results are discussed in two parts, viz: objective and subjective results. Each measurement parameter is discussed, and involves both the intra-treatment and inter-treatment statistical evaluation.

The evaluation of the intra-treatment results of the initial and follow-up treatments (overall treatment interval) gives an indication of the efficacy of the treatment program. The comparison of: the initial and sixth treatments (first treatment interval); and the sixth and follow-up treatments (second treatment interval) are also evaluated so as determine the period with the most favourable response to treatment.

The evaluation of inter-treatment data, assessing the first treatment measurements, illustrates any differences in the objective and subjective findings between the control and experimental groups, in terms of symptoms and signs at the beginning of the study. Comparing sixth treatment data demonstrates any difference in the rate of improvement between the groups, and follow-up treatment comparison indicates which treatment program is more effective on a long-term basis.

5.2 OBJECTIVE DATA

5.2.1 RANGES OF MOTION

5.2.1.1 INTRA-TREATMENT COMPARISON

The six lumbar spine ranges of motion were considered.

When the overall treatment intervals were evaluated, there were significant differences shown in the control group (SMT) and experimental group (SMT+Massage) viz: in extension, left lateral flexion, and right lateral flexion for SMT; and in flexion and left lateral flexion for SMT+Massage. No significant findings were found overall, in left rotation and right rotation. These findings suggest that overall, both treatment groups were effective in terms of increasing various ranges of motion, except for rotational ranges. This supports hypotheses one and two, in terms of ranges of motion.

When a comparison of the first treatment interval was conducted, the only significant difference was in the experimental group (SMT+Massage), for left lateral flexion. The second treatment interval failed to demonstrate any significant difference in any of the ranges of motion. These results suggest that for left lateral flexion only, the first treatment interval of the experimental group is the period with the most favourable response. This fails to support hypotheses one and two, in terms of ranges of motion.

5.2.1.2 INTER-TREATMENT COMPARISON

Statistical comparison of the initial consultations illustrated significant differences between the two groups for left and right rotation only. On comparing the sixth consultations, the same result occurred ie: significant differences for left and right rotation.

No significant differences were noted on comparison of the follow-up consultations. This result suggests a similarity between the two treatment groups in terms of improving most ranges of motion ie: that both treatments were equally effective for most ranges of motion. No significant difference was noted between treatment groups, except for left and right rotation between the first and second treatment intervals. This fails to support hypothesis three, in terms of ranges of motion.

5.2.2 PAIN SENSITIVITY (ALGOMETER)

5.2.2.1 INTRA-TREATMENT COMPARISON

Significant improvements were noted for the overall treatment intervals in both the control and experimental groups. Significant improvements in the first treatment interval, for both groups were also noted. No significant difference was found in the second treatment interval, in either group. These findings suggest that overall, both treatment groups were effective in terms of decreasing pain sensitivity, and that the first treatment interval is the period with the most favourable response for both groups. This supports hypotheses one and two in terms of pain sensitivity.

5.2.2.2 INTER-TREATMENT COMPARISON

No significant differences were noted between either group for any period of treatment, which suggests a similarity between the two groups in terms of pain sensitivity ie: that both treatments were equally effective. This fails to support hypothesis three, in terms of pain sensitivity.

5.2.3 INTERPRETATION OF OBJECTIVE FINDINGS

In terms of objective clinical findings:

Firstly, it was hypothesised that spinal manipulative therapy would be effective in the management of mechanical low back pain; and

Secondly, it was hypothesised that spinal manipulative therapy and massage would be effective in the management of mechanical low back pain;

Hence, both treatment groups seem to be effective in improving certain lumbar spine ranges of motion over the long term; and decreasing sensitivity to pain, in the short and long term.

Thirdly, it was hypothesised that spinal manipulative therapy combined with massage would be more effective than spinal manipulative therapy alone in the management of mechanical low back pain.

The experimental group was not shown to be more effective than the control group (ie: both groups are equally effective) in improving ranges of motion and in decreasing sensitivity to pain.

However, discretion is cautioned on interpretation of this data, for the following reasons: The goniometer may not have been sensitive enough to subtle variations in lumbar spine ranges of motion, considering the fact that it was calibrated in two degree increments. Furthermore, measurement error on the part of the researcher cannot be discounted, for both the goniometer and the algometer.

The results of this study agree with those of Doran and Newell (1975), Evans et al. (1978), and Pope et al. (1994), where improvements in objective findings were noted in patients receiving manipulation. Yet, in the study by Evans et al. (1978), there was a significant decrease in spinal flexion three weeks post-treatment. These results do not support the findings of Cote et al. (1994), who found no short-term improvement in pain sensitivity, following manipulation. The reason for this is probably because their measurements were taken immediately, 15 minutes, and 30 minutes post-treatment. The readings in this study were taken at the following consultation, which would have allowed sufficient time for any effect to be observed. The time intervals in the Cote et al. (1994) study are hardly sufficient to have allowed any significant changes to have been effected.

5.3 SUBJECTIVE DATA

5.3.1 PAIN PERCEPTION (MCGILL)

5.3.1.1 INTRA-TREATMENT COMPARISON

A significant difference was noted for the overall treatment interval in the experimental group. For the first treatment interval, significant differences were noted in both the control and experimental groups. No significant difference was found within the second treatment interval in either group. These findings suggest that overall, the experimental group was effective in terms of decreasing pain perception (McGill), and that the first treatment interval is the period with the most favourable response for both groups. This supports hypotheses two, in terms of pain perception (McGill).

5.3.1.2 INTER-TREATMENT COMPARISON

No significant differences were noted between either group for any period of treatment, which suggests a similarity between the two groups in terms of pain perception, as recorded by the short form McGill Pain Questionaire (Appendix E) ie: that both treatments were equally effective. This fails to support hypothesis three, in terms of pain perception.

5.3.2 PAIN PERCEPTION (NRS-101)

5.3.2.1 INTRA-TREATMENT COMPARISON

Significant differences were noted for all treatment periods within the experimental group. No significant differences were found between any period within the control group. These findings suggest that overall, the experimental group was effective in terms of decreasing pain perception, as measured by the NRS-101 (Appendix F), and that the first and second treatment intervals of the experimental group both exhibit favourable responses. This supports hypotheses two, in terms of pain perception.

5.3.2.2 INTER-TREATMENT COMPARISON

No significant differences were noted between either group for any period of treatment, which suggests a similarity between the two groups in terms of pain perception (NRS-101) ie: that both treatments were equally effective. This fails to support hypothesis three, in terms of pain perception.

5.3.3 DISABILITY

5.3.3.1 INTRA-TREATMENT COMPARISON

Significant improvements were noted for the overall treatment intervals in both the control and experimental groups. Significant improvements in the first treatment interval, for both groups were also noted. No significant difference was found in the second treatment interval, in either group. These findings suggest that overall, both treatment groups were effective in terms of improving disability, and that the first treatment interval is the period with the most favourable response for both groups. This supports hypotheses one and two in terms of disability.

5.3.3.2 INTER-TREATMENT COMPARISON

No significant differences were noted between either group for any period of treatment, which suggests a similarity between the two groups in terms of disability ie: that both treatments were equally effective. This fails to support hypothesis three, in terms of disability.

5.3.4 INTERPRETATION OF SUBJECTIVE FINDINGS

In terms of subjective clinical findings:

Firstly, it was hypothesised that spinal manipulative therapy would be effective in the management of mechanical low back pain; and

Secondly, it was hypothesised that spinal manipulative therapy and massage would be effective in the management of mechanical low back pain;

Hence, the experimental group seems to be effective in decreasing the perception of pain, over the short term and the long term. Both treatment groups seem to be effective in improving disability, over the short term and the long term.

Thirdly, it was hypothesised that spinal manipulative therapy combined with massage would be more effective than spinal manipulative therapy alone in the management of mechanical low back pain.

Yet, the results indicate that the experimental group was not shown to be more effective than the control group (ie: both groups are equally effective) in decreasing sensitivity to pain, and in improving disability.

The results of this study do not agree with those of Evans et al. (1978), Hoehler et al. (1981), and Pope et al. (1994), in which it was found that the groups receiving manipulation had significant reductions in pain. This was not found to be the case in this study. Only the experimental group in this study seemed to be effective in decreasing pain perception. The reasons for this are unclear.

Furthermore, the results of this study do not support the findings of Leboeuf et al's (1987) study, in which patients with repetitive strain injuries of the upper limb(s) were treated either with spinal manipulative therapy alone or with spinal manipulative therapy combined with massage. The reasons for this discrepancy may have something to do with the following: the two conditions treated were completely different ie: low back pain and repetitive strain injury of the upper limb (including treatment of the neck and shoulder girdle); and the types of massage used may have been different (eg: Swedish massage vs. deep transverse friction massage). Leboeuf et al. (1987) did not elaborate on the type of massage utilised.

These results do however support a study by Ongley et al. (1987), in which the manipulated group improved in pain perception and disability, one and six months post-treatment. Finally, the studies by Doran and Newell (1975), Pope et al. (1994), Cote et al. (1994) and Hoehler et al. (1981) all demonstrated that there were no significant differences between treatment groups. This study supports these findings.

5.4 AGE AND GENDER

The average ages and ranges of age distributions are tabulated in table 4.33. 46.7% of the patients accepted into the study were males, whilst 53.3% were females. These figures denote a fairly even distribution of gender within this study. The study by Leboeuf et al. (1987) consisted of 92.1% females and 7.9% males, a rather uneven distribution of patients in terms of gender.

5.5 FACET AND SACROILIAC SYNDROMES

According to Cassidy and Kirkaldy-Willis (1988: 295), the majority of low back pain patients seen are in the phase of dysfunction. This was true of all the patients seen in this study. Furthermore, the majority of patients encountered (87%) were diagnosed as suffering from a Facet Syndrome. Only a few patients (13%) presented with a combination of Facet and Sacroiliac Syndromes. No patients presented with Sacroiliac Syndrome alone. In the study by Cassidy and Kirkaldy-Willis (1988: 294), 19.1% of the patients presented with a Facet Syndrome, 17.0% of the patients presented with a combination of Facet and Sacroiliac Syndromes, and 24.4% of the patients presented with a Sacroiliac Syndrome. The differences observed between this study and that by Cassidy and Kirkaldy-Willis are probably due to a far greater population sample size in the latter study.

5.6 COMMENT

The author of this study submits that chronic multifidus spasm, which may have an effect on fixations (Taylor and Twomey 1986), is only temporarily relieved by manipulation, and that in time (hours/days), the fixation is reinstated due to recurring injury in the multifidus muscle, resulting in recurrences of low back pain. The following points serve to expound this view.

Firstly, correction of the joint dysfunction does result in reduction of muscle spasm (Calliet (1981: 129,130), but Bourdillon et al. (1992: 301) contend that this spasm may bring back the dysfunction. They question whether the short period of proprioceptor silence following a high velocity thrust is enough to change the tone in the gamma system in order to allow the muscle spindles to resume their normal length. Woolf (1984) states that even brief nociceptor input has been shown to cause long term changes for up to six weeks in muscle activity. If this is so, and if one accepts that muscles in spasm may be involved in maintaining a dysfunction (Bourdillon et al. 1992: 299), why the high rate of recurrence of low back pain? A recent study by Cote et al.

(1994) on patients with chronic low back pain has found no short-term effect of manipulation on pain threshold.

Secondly, in an experiment conducted by Cailliet (1988: 31), he noted that metabolites remain within muscle even after blood flow has returned, and that the accumulation of metabolites causes muscular pain. One of the postulated effects of manipulation is that it causes a reflex inhibition of muscle spasm. This implies that the muscle returns to 'normal' ie: return of blood flow and decreased myoelectric activity. However, there is little if any agreement regarding changes (or lack thereof) in electromyographic activity following manipulation (Grice 1974; Kravitz et al.1981), and even if the muscular blood flow does return to normal, this will not ensure the elimination of pain, as metabolites remain within the muscle (Cailliet 1988: 31). Therefore, release of muscle spasm by manipulation alone will not, in this author's opinion, completely resolve the Facet or Sacroiliac Syndrome. Other methods besides manipulation need to compliment this treatment protocol. Yet, to accept this argument is to ignore the results of this study, which one can only do by ignoring the value of statistical significance-a mission impossible!

Finally, holistic health care (including therapeutic massage and touch) has, according to Keegan (1989), gradually faded from traditional medicine. In many cases, machines have replaced human touch as a means of delivering patient care (Geiringer et al. 1988: 287). This has also ocurred in Chiropractic to some extent, with the invention and use of the Activator method of manipulation. A study conducted on South African practicing chiropractors found that of all the auxillary techniques utilised, massage was mostly used, but this by only fifty eight percent of the practitioners (Kotze 1995). An increased use of massage within the Chiropractic profession, together with a renewed interest in manual therapeutic intervention within the medical community (Geiringer et al. 1988: 287), augers well for Chiropractic in the future health care of musculoskeletal disorders.

With the above-mentioned points in mind, it would appear that the treatment of joint disturbances should include measures which relax muscle and restore its normal vascularity and extensibility, while restoration of normal painless joint range remains the primary treatment aim (Grieve 1988: 535).

Notwithstanding the afore-mentioned arguments, it would seem -according to this study-that despite the benefits of the individual treatments, spinal manipulative therapy and spinal manipulative therapy combined with massage are equally effective. The implications of this regard the Physiotherapists, perhaps more so than the Chiropractors ie: that Physiotherapists may utilise manipulation as an adjunct to massage and perhaps improve the efficacy of their treatments. However, this is not to say that massage is ineffective as an auxillary treatment to manipulation. Indeed, more than half the Chiropractors in South Africa utilise this adjunctive therapy (Kotze 1995), hence there must be some inherent value in using massage. Furthermore, there were a number of weaknesses in this study, which may well account for the results hereof. Therefore, a word of caution is advised in the interpretation of these results, as future studies may not support these findings.

5.7 STUDY WEAKNESSES

In an effort to minimise variables, connective tissue massage and deep transverse friction massage were not employed in this study. Only Swedish massage was utilised. Other studies have either compared manipulation to massage (Pope et al. 1994), or perhaps used firmer/deeper massage (Leboeuf et al. 1987) in their treatments. Firmer massage is probably more effective than Swedish massage's frictions.

Again, in an effort to minimise variables, patients in this study were not instructed to participate in any exercise programs (ie: stretching/strengthening exercises). This may have resulted in delayed recovery rates. Recommendations regarding avoidance of the above-mentioned weaknesses are described in the following chapter.

CHAPTER SIX

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

This study consisted of 30 patients diagnosed with mechanical low back pain, specifically Facet Syndrome, Sacroiliac Syndrome, or a combination of both. The patients were divided into a control and and an experimental group. The former received spinal manipulative therapy and the latter spinal manipulative therapy combined with massage. Each patient received six treatments and one month follow-up.

The results indicate that both treatment groups are effective in: improving certain lumbar spine ranges of motion (long term), decreasing sensitivity to pain and improving disability (short and long term); and that the experimental group is effective in decreasing the perception of pain (short and long term). This study supports the use of manipulation for mechanical low back pain.

Despite a subtle clinical difference in favour of the massaged group, there is sufficient evidence to conclude that spinal manipulative therapy combined with massage is no more effective than spinal manipulative therapy alone in the management of mechanical low back pain, in terms of objective and subjective clinical findings.

6.2 RECOMMENDATIONS

In a study by Phillips et al. (1992) on the descriptive profile of low back pain patients of field practicing Chiropractors compared with those of Chiropractic clinics, the authors suggest that clinical variation in sociodemographic variables do exist, and therefore, that one consider clinical findings when extrapolating research findings to the Chiopractic profession in general. It is hence recommended that future studies consider the following patient characteristics: age, gender, job description, and education, so as to further validate the results.

Greater population sample sizes may be necessary in order to expose more subtle variations between treatment groups.

Bolton (1994) suggests that psychological measures of outcome be considered in back pain trials. According to Korr (1978: XV), the consequences of manipulative therapy include, amoungst other things, the enhancement of the sense of well being. It is recommended hence, that future studies measure this important aspect of low back pain.

Two types of massage, namely connective tissue massage and deep transverse friction massage deserve special mention with regards to low back pain. (Haldeman and Phillips 1991 2: 1602). Future studies would do well to include these two forms of massage.

Exercise is an important component of the complete care of any acute or chronic patient with spinal dysfunction (Witt 1991 2: 1621). In a clinical trial of intensive muscle training for chronic low back pain, Manniche et al. (1988) found that the results consistenly favoured intensive dynamic back extensor exercises over three months, when compared with a similar programme at one fifth the intensity, or one month of thermotherapy, massage and mild exercises combined. Asfour et al. (1990) found that patients with chronic low back dysfunction had gains in strength, particularly with short training sessions of six weeks or less. Therefore, it is recommended that future trials include similar exercises as a part of the treatment protocol for chronic low back pain.

Two important forms of rehabilitation are also mentioned for inclusion in future studies of chronic low back pain:

Chiropractic low back wellness clinic: Cox (1994) found a positive acceptance from ninety-five percent of the patients attending a chiropractic low back wellness clinic. Cox concluded that the school is a positive program from the patients' and doctor's viewpoints.

The McKenzie approach: the McKenzie approach (Donelson 1990; and Moss 1994: 391- 399) to evaluating and treating chronic low back pain requires special mention as well. Stankovic and Johnell (1990) compared the McKenzie method to patient education in "mini back school" in a prospective randomized trial for the management of acute low back pain and found the McKenzie treatment superior for five out of the seven variables studied.

Finally, a study evaluating the levels of substance P in the deep paraspinal muscles of chronic low back pain patients would go a long way to determining the effects substance P may have on perpetuating chronic low back pain.

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APPENDIX A

TECHNIKON NATAL CHIROPRACTIC DAY CLINIC

CASE HISTORY

Patient: ______________________ Date # __________

File #: __________

X-ray #: __________

Age: __________ Sex: ________ Occupation: __________

Intern: ______________________ Signature: __________

FOR CLINICIAN'S USE ONLY

Initial visit clinician: Signature:

Case History:

Examination:

Previous: 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
Anaemia
Headaches
Thyroid disease
Epilepsy
Mental illness
Alcoholism
Drug addiction
Other

8. Psychosocial history:

Home situation

Daily life

Important experiences

Religious beliefs

9. Review of systems:

General

Skin

Head

Eyes

Ears

Nose/sinuses

Mouth/throat

Neck

Breasts

Respiratory

Cardiac

Gastro-intestinal

Urinary

Genital

Vascular

Musculoskeletal

Neurologic

Haematologic

Endocrine

Psychiatric.

APPENDIX B

TECHNIKON 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.

Miner'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			R	
III	IV	VI	III	IV	VI

visual fields
accomodation
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 teeth
- roof
- tongue
  - inspection
  - movement
  - taste
  - palpation
- pharynx
  - inspection
  - CN X

Neck:
- posture
- size
- swelling
- scars
- 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.rot.:	70	
R.rot.:	70	

Flex.

L.Rot. R.Rot.

L.Lat. flex. R.lat. 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
    crepitus
    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
- PMI
- 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
  - psoas sign
  - obturator sign
  - cutaneous hyperaesthaesia
  - rectal exam
  - Murphy's sign.

Male genitals and hernias.
Inspection:
skin
prepuce
glans
meatus
nits/lice
scrotum
inguinal/femoral bulges
Palpation:
penis (tenderness/induration)
testes
epididymis
inguinal canal
femoral canal
cremasteric reflex
Auscultation:
scrotal mass.
Peripheral 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 (feet & 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 & perianal 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, organized)
- Memory and attention:
  - orientation (time, place, person)
  - remote memory
  - recent memory
  - new learning ability
- Higher cognitive functions:
  - information and vocabulary (general & specialised knowledge)
  - abstract thinking.

APPENDIX C

TECHNIKON NATAL

TECHNIKON NATAL CHIROPRACTIC DAY CLINIC.

REGIONAL EXAMINATION -- LUMBAR SPINE AND PELVIS.

PATIENT: ____

FILE # : ____________________ **DATE:** ____________________

INTERN/RESIDENT: ______________________________________

SUPERVISING CLINICIAN : _______________________________

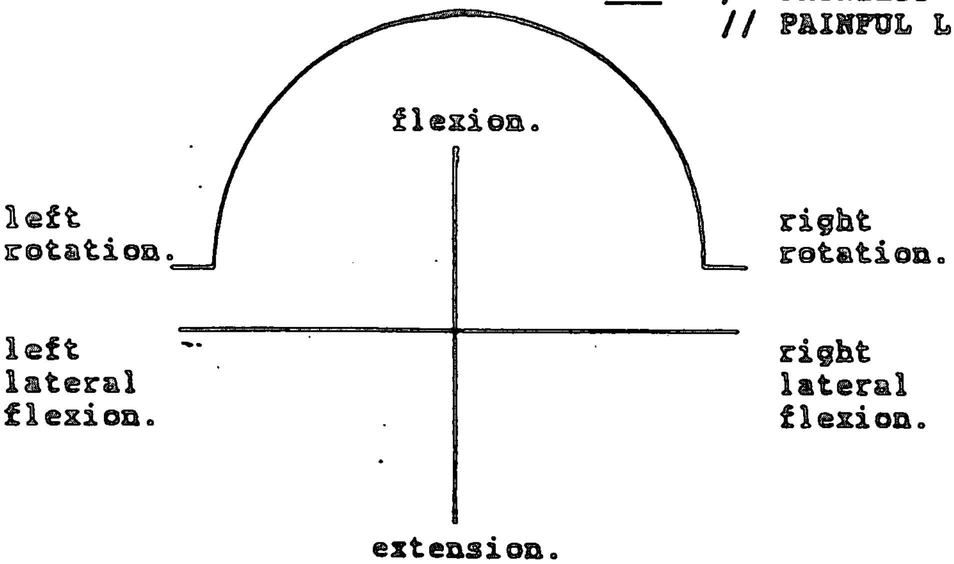
STANDING :

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

ActiveMF Trigger Points:
- QL
- Glut. Med.
- Glut. Max.
- Glut. Min.
- Piriformis
- Hamstrings
- TFL

MOTION PALPATION :

t.play		Left						Right					Jt.play	
'A	Lat	Fle	Ext	LF	AR	PR		Fle	Ext	LF	AR	PR	P/A	'at
							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.
T12		
L1		
L2		
L3		
L4		
L5		
S1		
S2		
S3		

MYOTOMES:	Left	Right.
hip flex		
hip int rot		
hip ext rot		
hip abd		
hip add		
knee flex		
knee ext		
dorsiflex		
plantarflex		
eversion		
ext.hall.long		

REFLEXES:	Left	Right
C5		
C6		
C7		

Tripod
Kemp's Test

COMMENTS:

APPENDIX D

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.

APPENDIX E

PATIENT NAME : ______________________________

FILE # : __________ DATE : ______________

	NONE	MILD	MODERATE	SEVERE
1 THROBBING	0) ____	1) ____	2) ____	3) ____
2 SHOOTING	0) ____	1) ____	2) ____	3) ____
3 STABBING	0) ____	1) ____	2) ____	3) ____
4 SHARP	0) ____	1) ____	2) ____	3) ____
5 CRAMPING	0) ____	1) ____	2) ____	3) ____
6 GNAWING	0) ____	1) ____	2) ____	3) ____
7 HOT-BURNING	0) ____	1) ____	2) ____	3) ____
8 ACHING	0) ____	1) ____	2) ____	3) ____
9 HEAVY	0) ____	1) ____	2) ____	3) ____
10 TENDER	0) ____	1) ____	2) ____	3) ____
11 SPLITTING	0) ____	1) ____	2) ____	3) ____
12 TIRING-EXHAUSTING	0) ____	1) ____	2) ____	3) ____
13 SICKENING	0) ____	1) ____	2) ____	3) ____
14 FEARFUL	0) ____	1) ____	2) ____	3) ____
15 PUNISHING-CRUEL	0) ____	1) ____	2) ____	3) ____

McGILL PAIN QUESTIONNAIRE

APPENDIX F

NUMERICAL PAIN RATING SCALE 101.

Patient 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 one hundred (100) 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 bes 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 one hundred (100) would mear "pain as bad as it could be".

Please write only one number.

0 ____________________________________ 100

APPENDIX G

INFORMED CONSENT FORM

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

TITLE OF RESEARCH PROJECT

____

____

NAME OF SUPERVISOR

____

NAME OF RESEARCH STUDENT

____

PLEASE CIRCLE THE APPROPRIATE ANSWER

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

2. Have you had an opportunity to ask questions regarding this study? YES/NO
3. Have you received satisfactory answers to your questions? YES/NO

4. Have you had an opportunity to discuss this study? YES/NO
5. Have you received enough information about this study? YES/NO

6. Who have you spoken to? ______________________________

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

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

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

PATIENT/SUBJECT* Name____________________ Signature____________________
(in block letters)

PARENT/GUARDIAN* Name____________________ Signature____________________
(in block letters)

WITNESS Name____________________ Signature____________________
(in block letters)

RESEARCH STUDENT Name____________________ Signature____________________
(in block letters)