A STUDY OF THE RELATIVE EFFECTIVENESS OF THE LUMBAR ROLL AND THE SPINOUS PUSH TECHNIQUE IN THE TREATMENT OF FACET SYNDROME IN THE LUMBAR SPINE

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

by

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December 1995

DECLARATION

I, Petrus Jansen, do hereby declare that this research dissertation is my own work and has to my knowledge not been presented at another university or technikon.

Signed: ______________________

Date: December 1995

The work presented in this dissertation was performed in the Department of Chiropractic, Technikon Natal, Durban.

APPROVED FOR FINAL SUBMISSION

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DEDICATION

I dedicate this work to Carin, my best friend,
for her love and support.

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My sincere thanks and appreciation are extended to the following :

My Heavenly Father for His guidance in my life and for enabling me to complete this study.

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ABSTRACT

Lower back pain due to mechanical dysfunction is a common cause of pain and disability in mankind. Lumbar spine facet syndrome is a major aetiology in mechanical lower back pain.

Previous studies have already shown the value and effectiveness of spinal manipulation in the treatment of mechanical lower back pain. Some chiropractors are of the opinion that the lumbar roll technique is the most effective adjustment in the treatment of facet syndrome in the lumbar spine, while others believe that the spinous push should be the technique of choice.

The aim of this study was to determine which one of these two adjustive procedures is the more effective in the treatment of lumbar spine facet syndrome.

Patients suffering from lower back pain due to mechanical causes were examined for lumbar spine facet syndrome. By means of convenience sampling, thirty subjects were randomly assigned to one of two groups of fifteen each. The experimental group was treated with the spinous push technique and the control group was treated with the lumbar roll technique. Both groups received non-specific soft tissue massage as well.

The objective data were collected by means of a goniometer in terms of spinal range of movement, by an algometer in terms of spinous process tenderness, and Kemp's Test. The subjective data were collected by means of the Oswestry Back Pain and Disability Index, the Short-form McGill Pain Questionnaire and the Numerical Rating Scale.

The Mann Whitney-U Test and the Wilcoxin Signed Rank Test were used to statistically analyse the data in order to indicate any significant differences between and within the treatment groups.

With the inter-group comparisons, the results of the Mann Whitney-U Test revealed no statistically significant differences between the two groups for the algometer readings, Kemp's Test, McGill Pain Questionnaire, Oswestry Back Pain and Disability Index and the different ranges of movement of the lumbar spine as measured with a goniometer.

There was a statistically significant difference for the Numerical Rating Scale between the two groups at the first consultation. This test was the only one in which this initial finding was observed and this, among other reasons, could be attributed to unequal matching of the groups due to the small sample size.

Both groups responded in a similar fashion to the respective treatments given and this study revealed no advantage of the one technique over the other.

With the intra-group comparisons, the Wilcoxon's Signed Rank Test revealed a statistically significant difference of improvement for the experimental group from the first consultation to the final consultation for the algometer readings, Kemp's Test, the Numerical Rating Scale, McGill Pain Questionnaire, the Oswestry Back Pain and Disability Index, lumbar spine extension and left lateral lumbar flexion.

The control group also experienced a statistically significant difference of improvement from the first consultation to the last consultation for the algometer readings, Kemp's Test, the Numerical Rating Scale, Oswestry Back Pain and Disability Index, lumbar spine extension, left lumbar rotation and right lumbar rotation.

Therefore, although each separate treatment group experienced a statistically significant improvement from the first consultation to the last consultation, there was no significant difference in improvement when the two groups were compared.

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CHAPTER ONE

INTRODUCTION

As the incidence of lower back pain is increasing faster than any other ailment of the human race (Medical Bulletin 1981), it has become imperative to identify effective chiropractic treatment of patients who suffer from this ailment. Psychologically, the long- term effects of lower back pain can be devastating, and Cox (1990) stated that the most feared disease among men, second only to cancer, is lower back pain.

Moreover, ninety-three million working days are lost annually due to worker absenteeism caused by lower back pain (Medical Bulletin 1981), while the cost of lower back pain treatment in the USA is surpassing that of heart disease treatment or that of traffic accidents (Toufexus 1980).

1.1 The Prevalence and Incidence of Lower Back Pain

At any one time, 15-40% of the general population suffers from lower back pain. About 80% of the population will have at least one occurrence of back pain in their lives, while 70% will suffer re-occurrence. Low back pain is also the major cause of disability in persons below 45 years of age. (Kirkaldy-Willis and Hill 1979.)

Kelsey and White (1980) reported that lower back pain was diagnosed in 10% of all chronic health problems and that there were 2.5 million lower back injured and 1,2 million lower back disabled adults in the United States. They found that back impairment is the most frequent cause of activity limitation in people below 64 years of age.

A retrospective and cross-sectional analysis in the USA from 1975 to 1978 revealed that, of 1221 males between 18 and 55 years of age, almost 70% had low back pain (Frymoyer *et al.* 1980).

Lower back pain affects 60-80% of all adults with an annual incidence of 5%, while the age group of 25-60 years, which is economically the most productive group, is the one most likely to experience low back pain. In Canada people who suffer lower back pain comprise one out of every four children between the ages of 6 and 13, and one out of every three adolescents (aged between 14 and 18), while in Britain 12% of children between 10 and 12 years of age suffers back pain. (Leboeuf 1990.)

1.2 The Economical Implications of Lower Back Pain

In the age group between 25 and 44 years there is a decrease in work capacity due to lower back pain where an average of 28,6 days per 100 workers is lost per annum with an average of 9 days of bed confinement. (Kelsey and White 1980.)

Fifty million working American males between 18 and 55 years of age lost 17 million days per annum from work due to lower back pain. These patients had more leg complaints, sought more medical care and treatment, and lost more time from work compared to people without lower back pain. (Frymoyer *et al*. 1980.)

In a study among employees at a plant in New York over a ten-year period, Rowe (1969) found that low back pain is the most common excuse for sickness absence second to upper respiratory tract disease. Thirty five percent of sitting workers and 47% of workers with physically demanding jobs visited the medical department of this plant for low back pain in the same time period. Recurrences were frequent, in almost 85% of the patients. (Rowe 1969.)

In the USA, between sixteen and sixty million dollars are lost annually due to lower back pain among workers. There is an average of 250 000 lumbar surgeries with a 15% failure rate and 40 000 re-operations per annum. It is estimated today that 75 million people in the USA suffer lower back pain, with 7 million new victims yearly. Of these, 5 million are partly disabled and 2 million are unable to work at all. The financial costs are enormous, with 5 billion dollars spent yearly on the diagnosis and treatment of lower back pain, and 10 billion dollars on disability compensation, lawsuits and workers' compensation. (Frymoyer 1980.)

The high incidence of disability caused by lower back pain is exacerbated by the fact that 10% of sufferers do not improve after an acute incidence of lower back pain, their symptoms persisting for longer than 3-6 months, becoming chronic. Many chronic lower back pain sufferers drop out of work on a permanent basis. (Leboeuf 1990.) By preventing acute conditions from becoming chronic, a decrease in disability and expenses can be the result.

1.3 The Incidence of Facet Syndrome

The aetiology of lower back pain can be divided into two major headings, namely mechanical lower back pain and pathological lower back pain. The highest incidence of lower back pain is due to mechanical causes, and of these, facet syndrome has been found by some authorities on lower back pain to be the most common. (Kirkaldy-Willis 1988: 88, 210; Cox 1979.)

Facet syndrome in the lumbar spine among the population generally appears to be an extremely common condition presented at chiropractic practices. Unless treated appropriately, this condition can be debilitating. (Leboeuf 1990; Kirkaldy-Willis 1988; Cox 1990.)

In a study by Cox and Schreiner (1984) on the diagnosis and treatment of 576 consecutive cases of lower back pain, facet syndrome at L4 vertebral level was diagnosed in 21,9% and at L5 level in 44,5% of the cases.

In a specific diagnosis of 1293 patients suffering from mechanical lower back pain, facet syndrome was diagnosed in 22% of the patients, second only to sacro-iliac syndrome diagnosed in 23% of the patients (Kirkaldy-Willis 1988: 210).

The perpetuating factors relating to facet syndrome, namely physical stresses, spinal sprain and strain and degenerative processes, are common to all people and therefore the high prevalence of patients present with facet syndrome is not surprising (Cox and Schreiner 1984).

However, a review of the related literature revealed that only a few studies have been published concerning the prevalence and incidence of facet syndrome.

1.4 The Treatment of Lower Back Pain

Research has found that surgery provides little or no cure for lower back pain sufferers. Spinal surgery is expensive and carries a high risk of complications and re-occurrence. (Frymoyer 1980.)

In a comparative study on chiropractic treatment and medical outpatient treatment for lower back pain, Dillon (1981) found that chiropractic treatment surpassed medical treatment markedly in both the cost of treatment and in the time lost by the patient from work. Chiropractic treatment, especially spinal manipulation, has already been shown to be an effective treatment protocol for lower back pain by several researchers in various studies (Meade *et al.* 1990; Sandoz 1976; Kirkaldy-Willis 1988: 292; Anderson 1992).

A study performed in Canada by Manga *et al.* (1993) concluded that chiropractic treatment is the most effective treatment available for lower back pain.

Research in chiropractic treatment no longer needs to prove that chiropractic adjustments are effective. Rather, investigations need to be conducted on how these adjustments work, why they work and also on which techniques work best, so that those that are less effective can be disregarded, and only those that are more effective can be used. (Haldeman 1993.)

1.5 The Aim of this Study

This study was concerned with the determination of the more effective of two adjustive techniques for the treatment of lower back pain due to facet syndrome namely the lumbar toll technique and the spinous push technique.
In the chiropractic field there seems to be some dispute among doctors as to which one of the two spinal manipulations, the lumbar roll or the spinous push, is the more effective in the treatment of facet syndrome in the lumbar spine (Till, personal communication 1993). Also, very little information has been found in the literature on specific techniques and on which technique is best.

It is argued that the most effective technique will be that which results in pain relief in the shortest space of time, and which will ensure the most improvement in the active ranges of movement as well as in the length of time the patient is pain free after treatment.

The ramifications of more effective chiropractic treatment of lower back pain are multiple. It is argued that even national expenses due to medical costs and time off from work could be cut drastically if faster, more effective treatment can be devised for patients suffering from lower back pain.

Due to the high incidence of lower back pain and the frequency of facet syndrome as the etiological factor (Cox and Schreiner 1984; Schafer and Faye 1989: 195), a quick but effective treatment is required which will result in less pain, disability and financial loss to both the sufferer and the state.

However, the need for treatment of facet syndrome due to its high prevalance, and the commonness of its perpetuating factors, make it the obligation of primary health care physicians to provide the most appropriate form of treatment for the management of facet syndrome.

The incidence of lower back pain is on the increase and the cost of chronic lower back pain is rising in the Western world (Leboeuf 1990). Therefore it is imperative that any advantage in the two techniques investigated be identified and subsequently followed as the choice of treatment in the management of facet syndrome in the lumbar spine.

CHAPTER TWO

REVIEW OF THE RELATED LITERATURE

2.1 The Pain Sensitivity of the Posterior Facet Joints

Although lower back pain was previously thought to be due, almost exclusively, to intervertebral disc pathology, enough evidence now exists to indicate that the posterior facet joints are cardinal in the production of lower back pain. It was demonstrated that there is a well-differentiated and quite complex sensory nervous innervation to the capsule of the facet joint. These nociceptor, free nerve endings are unmyelinated nerve fibres and are sensitive to chemical or mechanical irritation to the facet joints. (Wyke 1970; Stillwell 1956; Hirsch 1965 and Jackson 1966.)

Giles (1989) describes the pain sensitivity of the facet joints and his findings are supported by further clinical studies done by Jayson (1992: 291-292). Mooney and Robertson (1976: 149-156) demonstrated local pain patterns after injecting saline into the posterior facet joints of the lumbar spine. Their findings suggest that the posterior facet joints in the lumbar spine are a factor in the aetiology of lower back pain.

Jayson (1992: 55) argued that pain experienced due to facet joint injury is produced by mechanical and chemical irritation of the nerve endings in the surroundings of the facet joint.

Injury or degeneration of a joint produces inflammatory by-products which chemically stimulate nociceptive nerve endings resulting in pain (Saal 1986; Wyke 1984). Mechanical irritation due to facet joint subluxation after trauma stimulates pain sensitive nerve endings directly, and inflammatory by-products cause pain indirectly (Haldeman 1992: 204-205).

2.2 The Characteristics of Facet Syndrome

Lower back pain that originates from the posterior facet joints is termed lumbar spine facet syndrome. It is characterised by the following symptoms and signs:

- pain over the affected joint;
- pain referred to the upper buttock, postero-lateral thigh and possibly postero-lateral leg;
- positive joint challenge;
- positive Kemp's sign;
- joint dysfunction at the affected level;
- local tenderness;
- diminished spinal range of motion, especially extension.

(Schafer and Faye 1989: 217; Haldeman 1992: 207-208)

2.3 Weight-bearing on the Facet Joints

The normal load measured on a facet joint varies between 16-20% of the load of an entire motion segment (Jayson 1992: 295; Cailliet 1988: 45-46). This suggests, according to Cailliet (1988), that the facet joint carries only a small percentage of the total load applied axially to the lumbar spine under normal circumstances. Therefore he concluded that the facet joints are not designed for prolonged weight-bearing, but rather as a guiding mechanism for movement.

Frymoyer *et al.* (1991: 1487) found that the majority of the weight-bearing force in the lumbar spine is on the intervertebral discs that separate two succeeding vertebrae.

Moreover, they found that the facet joint carries maximally only about 20% of the total load placed under normal conditions on the lumbar spine. They concluded that forward flexion increases the load on the intervertebral discs while simultaneously decreasing the load on the posterior facet joints. (Frymoyer *et al.* 1991.)

When the facet joints are excessively loaded by external mechanical forces, the surrounding joint capsule, which is pain sensitive, is stretched which decreases the resilience of the intervertebral discs resulting in lower back pain (Yang and King 1984). Lorenz *et al.* (1983) stated that anatomically there is a measurable increase in the normal load on the facets on extension of the lumbar spine.

Prolonged weightbearing increases the pain experienced in facet syndrome. By inducing extension to the lumbar spine, the same pain is experienced, while patients obtain marked relief when forward flexion is induced. The reason for this is that, in extension, the facet joint is in a close-pack position and in flexion it assumes a loose-pack position. (Schafer and Faye 1989: 204; Gatterman 1990: 147.)

Extension on the other hand increases the loading on the facet joints while, at the same time, decreasing intervertebral disc load. Anatomically the intervertebral disc is designed to carry most of the weight load while the facet joints are functionally a steering mechanism during movement. The lumbar facet joints also serve as a constraint to excessive movement because of their orientation. (White and Panjabi 1990: 39-40, 112, 342-345.)

Extension of the functional lumbar spine unit is limited by mechanical approximation of the rear zygapophyseal joint structures, while flexion is limited by the posterior longitudinal ligament, the intervertebral ligaments and the erector spinae muscle fascia sheath. This results in the fact that extension is halted by solid, non-compressible structures compared to flexion. (Cailliet 1988: 45-46.)

2.4 Hyperextension of the Lumbar Spine

As early as in 1925, Danforth and Wilson stated that hyperextension of the lumbar spine causes the posterior superior articulating facets of the posterior joints to be driven upwards towards the posterior inferior articulating facets of the vertebrae above. Later studies support their findings (Cailliet 1988). Another study indicates an increase in back pain in females with hyperlordosis, which included female gymnasts between the ages of six and twenty years (Mellin 1990). This finding correlates with other studies (Schafer and Faye 1989: 204; Gatterman 1990: 162), namely that hyperextension structurally or induced by motion predisposes people to lower back pain due to facet joint irritation. Trauma affecting the posterior facet joints in the lumbar spine results from a hyperextension type of injury (Gatterman 1990: 161).

Jayson (1992: 294) stated that the approximation of the facet joint surfaces, as in hyperextension of the lumbar spine, causes pain due to the possible impingement or entrapment of the meniscoids. This leads to the well-known 'catch' in the back with severe lower back pain, which is often associated with lumbar facet syndrome.

2.5 Kemp's Test for Facet Syndrome

The most sensitive orthopaedic and chiropractic test for lumbar spine facet syndrome is Kemp's Test. In this test the patient stands or sits and the physician then extends and rotates the patient to one side at a time, exerting downward pressure. This results in compression of the facet joint on the side being tested. (Haldeman 1992: 291; Gatterman 1990: 141-142.) Pain experienced by the patient over a facet joint on the side of testing indicates a positive test for facet syndrome (Schafer and Faye 1989: 204, 208-209).

Lumbar spine hyperextension commonly results in facet syndrome with local tenderness and muscle spasm over the involved joint. Kemp's Test will usually be positive (Gitelman 1980: 297-330), implying a connection between lumbar hyperextension and facet syndrome.

2.6 Spinal Manipulation and Facet Syndrome

The lumbar spine is capable of marked movement in the sagittal plane, i.e. flexion and extension, while rotary movement is limited (Peary 1985; Cailliet 1988: 60). Rotation is decreased when the lumbar spine is flexed compared to a neutral position (Gunzburg *et al.* 1991). Rotatory injuries to the lumbar spine are more likely to damage the intervertebral disc annulus (Farfan 1977).

Adams and Hutton (1980) stated that the major benefits of flexion manipulation of the lumbar spine are: increased transport of metabolites into the intervertebral disc, decreased stress on the apophysial joint and the posterior annulus fibrosis, and giving the spine a high compressive strength.

In earlier studies lumbar spine flexion exercises were found to be valuable in the treatment of lower back pain and also when used in conjunction with spinal manipulative techniques (Zylbergold and Piper 1981).

Cox (1990), Gatterman (1990: 161, 266) and Kirkaldy-Willis (1988) stated that the 90/90 position (i.e flexion of the lumbar spine by flexing the hips and knees simultaneously to ninety degrees) resulted in drastic relief of pain in facet syndrome. Cox (1990) described good results in using the Flexion Distraction Table in the treatment of facet syndrome.

The facet joint is more susceptible to torsional stress in side posture adjustments than the intervertebral disc (Byfield 1991).

Previously Adams and Hutton (1980) postulated that the facet joints limit rotational strain on the intervertebral disc and that the facet joints get damaged first. Failure of the facet joints occur after only two degrees of rotation compared to nine degrees for the intervertebral disc. This finding was supported by Stokes (1987), who concluded that the facet joints play a major role in limiting rotation.

Hence the major corrective effect of the chiropractic adjustment is attributed to the production of forced opening of the two opposing facet joints. This releases a possible entrapped meniscoid, stretches the joint capsule, ligaments and surrounding muscles and relieves nerve irritation. In effect muscle spasm is reduced and the normal functional ability of the affected facet joint is regained. (Cailliet 1988: 129.)

Cailliet (1988: 129) argued that the benefits gained by spinal manipulation are as follows:

- The passive movement of manipulation separates the adjacent facet joint surfaces. The facets are immobilized by the acute synovial reaction and by the 'adherence' of adjacent joint surfaces in acute facet syndrome.
- Meniscoids which exist within the facet joint become entrapped, and spinal manipulation, due to separation of the joint surfaces, results in the release of these structures.
- The joint capsule may become lodged between the two adjacent articular surfaces and can be released by spinal manipulation.

A number of manipulative techniques for the treatment of lower back pain have been described by Basmajian (1987: 157-163), Schafer and Faye (1989: 222-236) and Gitelman (1980), but no specific technique was preferred.

This highlights the lack of knowledge on the effectiveness of specific spinal manipulative techniques.

Baldwin (1982), though, described a technique called the 'activator lift' where a Lee Fuhr activator gun is used to adjust the lumbar spine. The spine is flexed and brought to slight extension while throughout this movement the affected segment is activated for 6 to 8 times by the gun. This technique has been found effective in facet syndrome treatment; hence this study supported manipulation of the lumbar spine in a neutral or flexed position. These researchers made no mention of the effect of favouring extension rather than flexion for adjusting the spinal segments.

In practice the favoured technique in the treatment of facet syndrome used by most chiropractors is probably the lumbar roll which results in an increased lordosis momentarily, in the process of thrusting anteriorly and cephalad (Till 1993, personal communication). However no previous studies support extension-rotation as the most desirable adjustment in the treatment of facet syndrome in the lumbar spine. Neither does the anatomical and physiological capabilities of the lumbar spine support this.

With the lumbar roll adjustment (Szaraz 1984), the mechanical stresses placed on the spine are of an extension and rotatory nature (Haldeman 1992:519-522). Furthermore, in extension there is an increased range of rotation compared to that of a neutral or flexed lumbar spine position (White and Panjabi 1990: 342-344). Theoretically, this should increase the susceptibility of an already traumatised facet joint to further injury and irritation. If an already traumatised spine, whether chronic or acute, is adjusted into extension, then it stands to reason that it must traumatise those joints further, or at least aggravate the patient's symptoms.

In the spinous push technique (Szaraz 1984), the position of the lumbar spine is more flexed compared to its position in the lumbar roll. This limits the possible obtainable rotational degree. Additionally, the degree of leg drop in this technique is minimal, which should cause less stress to the already traumatised patient's facet joints and should also protect the intervertebral disc from injury.

The thoracolumbar junction facet joints offer resistance to extension and rotation movement due to their morphology. This resistance is neccessary to reduce torsional stress to the lumbar spine. (Singer and Giles 1988; Maigne 1980.)

Thus, vigorous counter rotational techniques applied to the lumbar spine, as in the lumbar roll, can increase the symptoms and possibly cause further injury to the facet joints (Singer and Giles 1988; Maigne 1980.)

It is therefore argued that, when a patient with lumbar facet syndrome is placed in a position with his lumbar spine in more of a flexed position while being manipulated, possible further trauma to the intervertebral disc will be limited. Further irritation due to possible extension of the lumbar spine will consequently be prevented.

2.7 Comments

If flexion exercises improve the condition of the patient's condition while extension movement aggravates it, then lumbar spine manipulation with minimal extension should be the more desirable option. In this regard, many chiropractors' preference for the lumbar roll technique has been questioned. (Lewis 1994; Liebenberg 1994; Jones 1995; Till 1993, personal communications.)

An analysis of the literature reviewed that, theoretically at least, extension is an undesirable position for the adjustment of the lumbar spine, and that rotation should be limited to decrease any further trauma to the facet joints and to prevent any further irritation and discomfort to the patient.

If the mechanism of the lumbar roll is analysed, it will be noticed that the adjustment is delivered into an already extended lumbar spine and it also further increases this lordosis momentarily. The knee drop that is so pertinent to the lumbar roll causes rotation throughout the whole of the lumbar spine and even the lower thoracic spine. (Szaraz 1984: 9.1.)

In terms of specificity, the lumbar roll not infrequently results in multiple releases occuring (Till 1993). Even though the spinous push seems theoretically to be more effective in the treatment of facet syndrome, no clear evidence has been found to substantiate this.

Further research is therefore the only acceptable method to determine this, as often logic and common sense are put to shame by experimental findings. Hence the object of this study was to determine as clearly as possible the relative worth of the spinous push technique and the lumbar roll technique in the treatment of facet syndrome.

CHAPTER THREE

MATERIALS AND METHODS

The object of this study was to determine the relative effectiveness of the two chiropractic manipulative techniques, namely the lumbar roll and the spinous push technique in the treatment of facet syndrome in lower back pain.

The patient sample was obtained by means of convenience sampling of patients attending the Chiropractic Clinic at Technikon Natal. The sample size consisted of 30 patients with 15 in the experimental group, treated with the spinous push, and 15 in the control group, treated with the lumbar roll. These patients went through a full clinical examination consisting of a case history, a physical examination and a regional lumbar examination.

Lumbar spine and pelvic x-rays were taken as a diagnostic procedure only, to determine the suitability of the patient for the project, and to exclude serious pathology. X-rays were only considered when deemed necessary for the diagnosis of pathology or to determine the degree of pathology.

3.1 Criteria for this Study

Only those patients who met the criteria determined for this study were included.

The criteria were as follows:

- Only patients diagnosed as having acute or chronic lumbar facet syndrome in terms of Kirkaldy-Willis's model were involved in this study.

- Patients with Maigne's syndrome were excluded. Patients with myofascial pain and dysfunction syndrome or sacro-iliac syndrome co-existing with their facet syndrome were included in this study.
- An audible release was not necessary for a satisfactory adjustment and a patient was still included in this study even when no audible releases were experienced.
- Patients older than 15 years of age and who were literate were included.
- Patients who had undergone lumbar spinal surgery were excluded.
- Only patients attending the Technikon Natal Chiropractic Day Clinic were involved.

For the purpose of this study acute pain was defined as pain suffered by patients who have experienced lower back pain and limitation of activity due to lower back and/or back related symptoms for less than three months' duration (Bigos *et al.* 1994), whereas chronic pain has generally been suffered for more than three months.

3.2 Collection of Data

The data consisted of observational findings (Appendix D) of the patient and questionnaires (Appendices A, B, and C) administered to the patient. The data were collected at the initial consultation, the fifth treatment, the last treatment and also at the one month follow-up consultation. The data were collected at the beginning of the consultation before any treatment had been given.

The primary data were collected over nine treatments for a minimum of four weeks. There was a follow-up consultation with each patient one month after the last treatment treatment nine) to assess the long-term effects of the treatment given. There was no break in the continuity of this process for any of the patients involved.

3.3 Nature of Data Collected

The objective data collected for this study consisted of:

a) An investigation of the range of motion in the lumbar spine as measured with a BROM II goniometer. Forward flexion, extension, lateral flexion and rotation were measured.
b) The application of Kemp's Test for facet syndrome (either positive or negative).
c) Determination of local tenderness on joint challenge as measured with an algometer over the posterior aspect of the lumbar spinous processes.

The objective data were collected by the researcher.

The subjective data collected consisted of:

a) The Oswestry Back Pain and Disability Index (Fairbanks *et al.* 1980).
b) The McGill Pain Questionnaire - short form (Melzack 1975, Melzack 1987).
c) The Numerical Rating Scale (Downie *et al.* 1978).

The subjective data consisted of the above questionnaires completed by the patients and collated by the researcher.

3.4 Delimitations of this Study

This study proposed:

- Not to include any patients who did not comply with the criteria determined for this study;
- Not to treat patients who suffered from myofascial pain and dysfunction syndromes and/or sacro-iliac syndrome with their facet syndrome, for these conditions, otherwise therapeutic co-intervention would take place.

3.5 Assumptions

It was assumed that:

- The patients participating in this study, as instructed, did not receive any other treatment for their lower back pain nor took any medication.
- The soft tissue massage applied to both sample groups, would not influence the outcome of this study as it was applied to both groups and its effect would be equally shared.

3.6 Treatment of Patients

Soft tissue massage was applied to both study groups. Soft tissue massage enabled patients to relax, reducingd muscle hypertonicity which could interfere with the researcher's ability to deliver an effective adjustment. This is a generally used treatment modality in chiropractic practices. (Haldeman 1992: 519-522.)

The patients were adjusted according to motion palpation findings, in other words, into the direction of fixation (Schafer and Faye 1989). Motion palpation was only used at the first consultation, on subsequent visits patients were adjusted according to this initial finding.

The experimental group was adjusted by means of the **lumbar roll** technique (Szaraz 1984: 9.1). The control group was adjusted by means of a **spinous push** technique (Szaraz 1984: 9.6).

3.7 Statistical Application of Data

The statistical data were treated by means of:
1. Mann Whitney-U Test.
2. Wilcoxon Signed Rank Test.

The data were tabled, analysed and interpreted as described by Daniel (1978) and Steyn *et al.* (1994).

The final statistical evaluation integrated the effects of the two treatment protocols for facet syndrome in the lumbar spine in terms of the respective objective and subjective responses of the patients. This was done in order to establish the relative efficacy of both treatment protocols in lumbar facet syndrome.

The data for each method of measurement applied to the experimental group were statistically integrated with the corresponding data of the control group.

All the subjective results and objective results of the experimental group were integrated statistically with those of the control group by means of the Mann Whitney-U Test.

The subjective data and objective data obtained seperately for each group at the first consultation and at the final consultation, were integrated statistically by means of the Wilcoxon Signed Rank Test.

CHAPTER FOUR

THE RESULTS

4.1 Introduction

The experimental group was treated with the spinous push technique and the control group was treated with the lumbar roll technique for nine consecutive treatments. The data collected at the first consultation (before any treatment) and the data collected at the final consultation (one month after the last treatment) were statistically analysed. These data comprised:

A. Objective Data
1. Algometer readings
2. Kemp's Test
3. Ranges of movement as measured with a BROM II goniometer.

B. Subjective Data
1. Numerical Rating Scale
2. McGill's Pain Questionnaire
3. Oswestry Back Pain and Disability Index.

Firstly, the data obtained from the experimental group were compared to those of the control group at the first consultation as well as at the final consultation. Integration of these data was done by means of the Mann Whitney-U Test. Comparison of data obtained at the first consultation was necessary to determine whether the groups were similar and comparable at the beginning of the study.

Comparison of the data obtained at the final consultation was necessary to determine whether there was a significant difference between the response of the experimental group and the response of the control group to the respective treatments.

Secondly, the data of individuals in both groups were analysed by comparing the data obtained at the first consultation to the data obtained at the final consultation. The data were integrated by means of the Wilcoxon's Signed Rank Test. The results were used to determine whether a particular group showed a statistically significant improvement from the first consultation to the final consultation.

4.2 Statistical Significance of the Mann Whitney-U Test

4.2.1 The Results of the Algometer Readings

4.2.1.A FIRST CONSULTATION

Table 1

Algometer reading at first consultation (n=30)

	z-VALUE	P-VALUE
TEST RESULTS	1.22401	0.220947

The P-value for the Algometer readings was larger than 0.05 and therefore the null hypothesis was accepted. It was therefore concluded that the Algometer readings for both the experimental and control groups were comparable.

4.2.1.B FINAL CONSULTATION

Table 2

Algometer reading at final consultation (n=30)

	z-VALUE	**P-VALUE**
TEST RESULTS	0.438406	0.661088

At the final consultation the P-value was larger than 0.05, and the null hypothesis was accepted. It was therefore concluded that there was no significant difference between the responses of the two groups to the respective treatments.

4.2.2 The Results of Kemp's Test

4.2.2.A FIRST CONSULTATION

Table 3

Kemp's Test at first consultation (n=30)

	z-VALUE	**P-VALUE**
TEST RESULTS	-1.39127	0.164143

At the first treatment the P-value for Kemp's Test was larger than 0.05. The null hypothesis was accepted, and it was therefore concluded that the experimental and control groups were comparable.

4.2.2.B KEMP'S TEST AT FINAL CONSULTATION

Table 4

Kemp's Test at final consultation (n=30)

	z-VALUE	P-VALUE
TEST RESULTS	0	1

The P-value for Kemp's Test was larger than 0.05 and the null hypothesis was accepted. It was therefore concluded that there was no significant difference in response to treatment between the experimental and control groups in terms of Kemp's Test.

4.2.3 The Results of the Numerical Rating Scale

4.2.3.A NUMERICAL RATING SCALE AT FIRST CONSULTATION

Table 5

Numerical Rating Scale at first consultation (n=30)

	z-VALUE	P-VALUE
TEST RESULTS	-1.96549	0.0493557

At the first consultation the P-value was less than 0.05 and the null hypothesis was rejected. This test was the only test in which the null hypothesis was rejected at the first consultation, indicating that the two study groups were not well matched in terms of pain severety.

4.2.3.B NUMERICAL RATING SCALE AT FINAL CONSULTATION

Table 6

Numerical Rating Scale at final consultation (n=30)

	z-VALUE	P-VALUE
TEST RESULTS	0.504229	0.614098

The P-value at the final consultation was larger than 0.05 and therefore the null hypothesis was accepted. It was therefore concluded that the experimental and control group were comparable.

4.2.4 The Results of McGill's Pain Questionnaire

4.2.4.A McGILL'S PAIN QUESTIONNAIRE AT THE FIRST CONSULTATION

Table 7

McGill's Pain Questionnaire at first consultation (n=30)

	z-VALUE	P-VALUE
TEST RESULTS	-0.857193	0.391336

The P-value for McGill's Pain Questionnaire was larger than 0.05 and therefore the null hypothesis was accepted. There was no significant difference between the responses of the experimental and control groups. Thus the experimental and control groups were statistically comparable.

4.2.4.B McGILL'S PAIN QUESTIONNAIRE AT FINAL CONSULTATION

Table 8

McGill's Pain Questionnaire at final consultation (n=30)

	z-VALUE	**P-VALUE**
TEST RESULTS	0.152173	0.879046

At the final consultation the P-value was larger than 0.05 and the null hypothesis was therefore accepted. Thus, there was no significant difference between the responses of the experimental and the control groups at the final consultation. It was therefore concluded that both groups responded similarly to the respective treatments given.

4.2.5 The Results of the Oswestry Back Pain and Disability Index

4.2.5.A OSWESTRY BACK PAIN AND DISABILITY INDEX AT THE FIRST CONSULTATION

Table 9

Oswestry Back Pain and Disability Index at first consultation (n=30)

	z-VALUE	**P-VALUE**
TEST RESULTS	-0.625872	0.531396

The P-value at the first consultation for the Oswestry Back Pain and Disability Index was larger than 0.05 and the null hypothesis was thus accepted. Therefore the experimental and control groups were statistically comparable.

4.2.5.B OSWESTRY BACK PAIN AND DISABILITY INDEX AT FINAL CONSULTATION

Table 10

Oswestry Back Pain and Disability Index at final consultation (n=30)

	z-VALUE	**P-VALUE**
TEST RESULTS	0.901662	0.367235

At the final consultation the P-value for the Oswestry Back Pain and Disability index was larger than 0.05. The null hypothesis was accepted. It was therefore concluded that the experimental and control groups responded similarly to the respective treatments given.

4.2.6 The Results of Forward Flexion Measured with a Goniometer

4.2.6.A FORWARD FLEXION AT THE FIRST CONSULTATION

Table 11

Forward flexion at first consultation (n=30)

	z-VALUE	**P-VALUE**
TEST RESULTS	0.854013	0.393096

The P-value for the Goniometer readings for forward flexion of the lumbar spine was larger than 0.05. The null hypothesis was accepted, and it was therefore concluded that the experimental and control groups were comparable.

4.2.6.B FORWARD FLEXION AT FINAL CONSULTATION

Table 12

Forward flexion at final consultation (n=30)

	z-VALUE	P-VALUE
TEST RESULTS	1.08472	0.278044

At the final consultation the P-value for forward flexion of the lumbar spine was larger than 0.05 and the null hypothesis was accepted. It was therefore concluded that the experimental and control groups responded similarly to the respective treatments given.

4.2.7 The Results of Extension as Measured with a Goniometer

4.2.7.A EXTENSION AT THE FIRST CONSULTATION

Table 13

Extension at first consultation (n=30)

	z-VALUE	P-VALUE
TEST RESULTS	0.0207923	0.983406

At the first consultation the P-value for lumbar extension was larger than 0.05. The null hypothesis was therefore accepted. Thus, it was concluded that the experimental and control groups were comparable.

4.2.7.B EXTENSION AT FINAL CONSULTATION

Table 14

Extension at final consultation (n=30)

	z-VALUE	P-VALUE
TEST RESULTS	0.687685	0.491649

At the final consultation the P-value for lumbar extension was larger than 0.05, and the null hypothesis was accepted. It was therefore concluded that the two groups responded similarly to the respective treatments given.

4.2.8 The Results of Left Lateral Flexion as Measured with a Goniometer

4.2.8.A LEFT LATERAL FLEXION AT FIRST CONSULTATION

Table 15

Left lateral flexion at first consultation (n=30)

	z-VALUE	P-VALUE
TEST RESULTS	-0.170407	0.864685

The P-value at the first consultation for left lateral flexion was larger than 0.05. Thus, the null hypothesis was accepted. It was therefore concluded that the experimental and control groups were comparable.

4.2.8.B LEFT LATERAL FLEXION AT FINAL CONSULTATION

Table 16

Left lateral flexion at final consultation (n=30)

	z-VALUE	P-VALUE
TEST RESULTS	-1.49802	0.134128

At the final consultation the P-value for left lateral lumbar flexion was larger than 0.05, and the null hypothesis was accepted. It was therefore concluded that there was no significant difference between the responses of the experimental and control groups after the respective treatments given.

4.2.9 The Results of Right Lateral Flexion as Measured with a Goniometer

4.2.9.A RIGHT LATERAL FLEXION AT FIRST CONSULTATION

Table 17

Right lateral flexion at first consultation (n=30)

	z-VALUE	P-VALUE
TEST RESULTS	-0.612431	0.54025

At the first treatment the P-value for right lateral lumbar flexion was larger than 0.05. The null hypothesis was therefore accepted. It was concluded that the experimental and control groups were comparable.

4.2.9.B RIGHT LATERAL FLEXION AT FINAL CONSULTATION

Table 18

Right lateral flexion at final consultation (n=30)

	z-VALUE	**P-VALUE**
TEST RESULTS	-1.6713	0.094614

At the final consultation the P-value for right lateral lumbar flexion was larger than 0.05. The null hypothesis was thus accepted. It was therefore concluded that there was no significant difference between the responses of the experimental and control groups.

4.2.10 The Results of Left Rotation as Measured with a Goniometer

4.2.10.A LEFT ROTATION AT THE FIRST CONSULTATION

Table 19

Left rotation at first consultation (n=30)

	z-VALUE	**P-VALUE**
TEST RESULTS	-0.125287	0.900291

At the first treatment the P-value for left lumbar rotation was larger than 0.05. Therefore the null hypothesis was accepted. It was therefore concluded that the experimental and control groups were comparable.

4.2.10.B LEFT ROTATION AT FINAL CONSULTATION

Table 20

Left rotation at final consultation (n=30)

	z-VALUE	P-VALUE
TEST RESULTS	0.611725	0.54071

At the final consultation the P-value for left lumbar rotation was larger than 0.05. The null hypothesis was accepted. It was therefore concluded that there was no significant difference between the responses of the experimental and control groups.

4.2.11 The Results of Right Rotation as Measured with a Goniometer

4.2.11.A RIGHT ROTATION AT THE FIRST CONSULTATION

Table 21

Right rotation at first consultation (n=30)

	z-VALUE	P-VALUE
TEST RESULTS	-0.438753	0.660837

At the first consultation the P-value for right lumbar rotation was larger than 0.05. The null hypothesis was accepted. It was therefore concluded that the experimental and control groups were comparable.

4.2.11.B RIGHT ROTATION AT FINAL CONSULTATION

Table 22

Right rotation at final consultation (n=30)

	z-VALUE	**P-VALUE**
TEST RESULTS	1.28851	0.197567

At the final consultation the P-value for right lumbar rotation was larger than 0.05, and the null hypothesis was accepted. It was therefore concluded that there was no significant difference between the responses of the experimental and control groups to the different treatments given.

4.3 The Statistical Significance of the Wilcoxon's Signed Rank Test

THE EXPERIMENTAL GROUP

4.3.1 The Results of the Algometer readings

Table 23

Results of Algometer reading (n=15)

z-VALUE	1.54919
P-VALUE	0.0606675

The P-value for the Algometer readings was larger than 0.05 and the null hypothesis was accepted. It was therefore concluded that there was no significant improvement in the Algometer readings of the experimental group from the first consultation to the last consultation.

4.3.2 The Result of Kemp's Test

Table 24

Results of Kemp's Test (n=15)

z-VALUE	2.47487
P-VALUE	0.0066641

The P-value for Kemp's test was less than 0.05 and the null hypothesis was rejected. It was therefore concluded that there was a statistically significant improvement for the experimental group, according to Kemp's Test, from the first consultation to the last consultation.

4.3.3 The Results of the Numerical Rating Scale

Table 25

The results of the Numerical Rating Scale (n=15)

z-VALUE	3.61478
P-VALUE	0.0001503

The P-value for the Numerical Rating Scale was less than 0.05 and the null hypothesis was rejected. It was therefore concluded that there was a significant improvement in the experimental group, with regards to this questionnaire, from the first consultation to the final consultation.

4.3.4 The Results of the McGill Pain Questionnaire

Table 26

Results of McGill Pain Questionnaire (n=15)

z-VALUE	2.93987
P-VALUE	0.0016417

The P-value for the McGill Pain Questionnaire was less than 0.05 and the null hypothesis was rejected. It was therefore concluded that there was a statistically significant improvement in the experimental group from the first consultation to the final consultation.

4.3.5 The Results of the Oswestry Back Pain and Disability Index

Table 27

Results of Oswestry Back Pain and Disability Index (n=15)

z-VALUE	2.58199
P-VALUE	0.0049116

The P-value for the Oswestry Back Pain and Disability Index was less than 0.05 and the null hypothesis was rejected. It was therefore concluded that there was a statistically significant improvement in the experimental group from the first consultation to the last consultation.

4.3.6 The Results of the Ranges of Movement of the Lumbar Spine as Measured with a Goniometer

4.3.6.A THE RESULTS OF FORWARD FLEXION

Table 28

Results of forward flexion (n=15)

z-VALUE	1.54919
P-VALUE	0.0605667

The P-value for forward flexion of the lumbar spine as measured with a goniometer was larger than 0.05 and the null hypothesis was accepted. It was therefore concluded that there was no significant improvement in forward flexion of the lumbar spine in the experimental group from the first consultation to the final consultation.

4.3.6.B <u>THE RESULTS OF EXTENSION</u>

Table 29

Result of extension (n=15)

z-VALUE	2.06559
P-VALUE	0.0194334

The P-value for lumbar extension was less than 0.05 and the null hypothesis was rejected. It was therefore concluded that there was a statistically significant improvement in the range of lumbar extension from the first consultation to the final consultation in the experimental group.

4.3.6.C <u>THE RESULTS OF LEFT LATERAL FLEXION</u>

Table 30

Results of left lateral flexion (n=15)

z-VALUE	2.58199
P-VALUE	0.0049116

The P-value for left lateral lumbar flexion was less than 0.05 and the null hypothesis was rejected. It was therefore concluded that there was a statistically significant improvement in the range of left lateral lumbar flexion from the first consultation to the final consultation in the experimental group.

4.3.6.D THE RESULTS OF RIGHT LATERAL FLEXION

Table 31

Results of right lateral flexion (n=15)

z-VALUE	1.1094
P-VALUE	0.133628

The P-value for right lateral lumbar flexion was larger than 0.05 and the null hypothesis was accepted. It was therefore concluded that there was no significant improvement in the range of right lateral lumbar flexion from the first consultation to the final consultation in the experimental group.

4.3.6.E THE RESULTS OF LEFT ROTATION

Table 32

Results of left rotation (n=15)

z-VALUE	1.0328
P-VALUE	0.150849

The P-value for left lumbar rotation was larger than 0.05 and the null hypothesis was accepted. It was therefore concluded that there was no significant improvement in the range of left lumbar rotation from the first consultation to the final consultation in the experimental group.

4.3.6.F THE RESULTS OF RIGHT ROTATION

Table 33

Results of right rotation (n=15)

z-VALUE	0.801784
P-VALUE	0.211338

The P-value for right lumbar rotation was larger than 0.05 and the null hypothesis was accepted. It was therefore concluded that there was no significant improvement in the range of right lumbar rotation from the first consultation to the final consultation in the experimental group.

THE CONTROL GROUP

4.3.7 The Results of the Algometer Readings

Table 34

Results of Algometer readings (n=15)

z-VALUE	1.87083
P-VALUE	0.0306842

The P-value for the Algometer readings was less than 0.05 and the null hypothesis was rejected. It was therefore concluded that there was a significant improvement in the Algometer readings of the control group from the first consultation to the final consultation.

4.3.8 The results of Kemp's Test

Table 35

Results of Kemp's Test (n=15)

z-VALUE	2.04124
P-VALUE	0.0206133

The P-value for Kemp's Test was less than 0.05 and the null hypothesis was rejected. It was therefore concluded that there was a significant improvement in Kemp's Test of the control group from the first consultation to the final consultation.

4.3.9 The Results of the Numerical Rating Scale

Table 36

Results of Numerical Rating Scale (n=15)

z-VALUE	2.58199
P-VALUE	0.0049116

The P-value for the Numerical Rating Scale was less than 0.05 and the null hypothesis was rejected. It was therefore concluded that there was a significant improvement in the Numerical Rating Scale of the control group from the first consultation to the final consultation.

4.3.10 The Results of the McGill Pain Questionnaire

Table 37

Results of McGill Pain Questionnaire (n=15)

z-VALUE	2.2188
P-VALUE	0.01325

The P-value for the McGill Pain Questionnaire was less than 0.05 and the null hypothesis was rejected. It was therefore concluded that there was a significant improvement in the outcome of this questionnaire for the control group from the first consultation to the final consultation.

4.3.11 The Results of the Oswestry Back Pain and Disability Index

Table 38

Results of Oswestry Back Pain and Disability Index (n=15)

z-VALUE	2.40535
P-VALUE	0.0080784

The P-value for the Oswestry Back Pain and Disability Index was less than 0.05 and the null hypothesis was rejected. It was therefore concluded that there was a significant improvement in the outcome of this questionnaire for the control group from the first consultation to the final consultation.

4.3.12 The Results of the Ranges of Movement of the Lumbar Spine as Measured with a Goniometer

4.3.12.A THE RESULTS OF FORWARD FLEXION

Table 39

Results of forward flexion (n=15)

z-VALUE	1.54919
P-VALUE	0.0606675

The P-value for lumbar spine forward flexion was larger than 0.05 and the null hypothesis was accepted. It was therefore concluded that there was no significant improvement in the range of forward flexion for the control group from the first consultation to the final consultation.

4.3.12.B THE RESULTS OF EXTENSION

Table 40

Results of extension (n=15)

z-VALUE	2.02073
P-VALUE	0.0216539

The P-value for lumbar spine extension was less than 0.05 and the null hypothesis was rejected. It was therefore concluded that there was a significant improvement in the range of extension for the control group from the first consultation to the final consultation.

4.3.12.C THE RESULTS OF LEFT LATERAL FLEXION

Table 41

Results of left lateral flexion (n=15)

z-VALUE	0.801784
P-VALUE	0.211338

The P-value for left lateral lumbar flexion was larger than 0.05 and the null hypothesis was accepted. It was therefore concluded that there was no significant improvement in the range of left lateral lumbar flexion for the control group from the first consultation to the final consultation.

4.3.12.D THE RESULTS OF RIGHT LATERAL FLEXION

Table 42

Results of right lateral flexion (n=15)

z-VALUE	0.603023
P-VALUE	0.2732455

The P-value for right lateral lumbar flexion was larger than 0.05 and the null hypothesis was accepted. It was therefore concluded that there was no significant improvement in the range of right lateral lumbar flexion for the control group from the first consultation to the final consultation.

4.3.12.E THE RESULTS OF LEFT ROTATION

Table 43

Results of left rotation (n=15)

z-VALUE	1.6641
P-VALUE	0.048046

The P-value for left lumbar rotation was less than 0.05 and the null hypothesis was rejected. It was therefore concluded that there was a significant improvement in the range of left lumbar rotation for the control group from the first consultation to the final consultation.

4.3.12.F THE RESULTS OF RIGHT ROTATION

Table 44

Results of right rotation (n=15)

z-VALUE	2.40535
P-VALUE	0.0080784

The P-value for right lumbar rotation was less than 0.05 and the null hypothesis was rejected. It was therefore concluded that there was a significant improvement in the range of right lumbar rotation for the control group from the first consultation to the final consultation.

4.4 Means and Standard Deviation

Examination of the means and standard deviations of all the variables did not reveal any trends that were not already identified by the "p" values.

Table I.a - Control Group (Lumbar Roll)

	Algometer			*Kemp's Test*			*Numerical Rating Scale*			*McGill Shortform*			*Oswestry*		
	Before	**After**	**Follow Up**	**Before**	**After**	**Follow Up**	**Before**	**After**	**Follow Up**	**Before**	**After**	**Follow Up**	**Before**	**After**	**Follow Up**
	83.2	77.6	82.8	1	1	1	30	25	20	5	2	0	14	8	4
	88	100	100	1	0	0	50	0	15	3	0	0	10	4	2
	91.2	91.6	100	1	0	0	45	35	5	6	2	2	16	14	6
	92.4	100	89.6	1	0	1	50	35	20	2	1	0	16	6	4
	80.8	82.4	92.8	1	1	0	45	10	20	2	1	1	14	2	2
	32	78	91.2	1	0	0	40	15	5	8	3	3	38	6	8
	84	100	100	1	0	0	50	0	0	6	0	0	38	0	0
	88	81.6	83.6	1	1	1	40	40	15	6	5	3	8	10	10
	67.2	82	68.8	1	1	1	70	60	65	12	14	18	40	38	42
	44.4	80	90.8	1	1	1	55	20	20	9	6	6	20	6	10
	70.8	68	80	1	1	1	20	10	15	19	5	6	7	2	4
	64.8	66.4	72.4	1	0	0	65	5	15	4	15	4	20	14	4
	38	67.2	62	1	0	0	50	25	0	11	0	0	6	4	2
	68.4	100	100	1	1	0	50	0	0	6	0	0	4	0	0
	77.6	84.4	74.4	1	0	1	60	40	15	15	8	0	10	8	6
Min	**32**	**66.4**	**62**	**1**	**0**	**0**	**20**	**0**	**0**	**2**	**0**	**0**	**4**	**0**	**0**
Max	**92.4**	**100**	**100**	**1**	**1**	**1**	**70**	**60**	**65**	**19**	**15**	**18**	**40**	**38**	**42**
Mean	**71.386667**	**83.946667**	**85.893333**	**1**	**0.4666667**	**0.4666667**	**48**	**21.333333**	**15.333333**	**7.6**	**4.1333333**	**2.8666667**	**17.4**	**8.1333333**	**6.9333333**
Std.	**19.413613**	**12.056881**	**12.353338**	**0**	**0.5163978**	**0.5163978**	**12.649111**	**17.97485**	**15.751039**	**4.8667971**	**4.8824272**	**4.7187569**	**11.998809**	**9.3340136**	**10.194303**
	Before	**After**	**Follow Up**	**Before**	**After**	**Follow Up**	**Before**	**After**	**Follow Up**	**Before**	**After**	**Follow Up**	**Before**	**After**	**Follow Up**
	Algometer			*Kemp's Test*			*Numerical Rating Scale*			*McGill Shortform*			*Oswestry*		
Significant	**Intra comparison**		**YES**	**Intra comparison**		**YES**	**Intra comparison**		**YES**	**Intra comparison**		**YES**	**Intra comparison**		**YES**

Table I.b - Control Group (Lumbar Roll)

	Forward Flexion			*Extension*			*Left Lateral Flexion*			*Right Lateral Flexion*			*Left Rotation*			*Right Rotation*		
	Before	**After**	**Follow Up**	**Before**	**After**	**Follow Up**	**Before**	**After**	**Follow Up**	**Before**	**After**	**Follow Up**	**Before**	**After**	**Follow Up**	**Before**	**After**	**Follow Up**
	28	36	34	18	15	22	42	35	50	40	38	50	20	30	45	28	35	40
	36	40	40	6	15	14	30	30	32	30	30	32	19	22	30	22	30	30
	30	35	35	15	15	17	40	40	35	40	50	35	25	20	30	20	25	30
	32	30	27	18	15	16	30	36	25	32	40	30	25	25	20	30	30	30
	40	40	48	13	20	16	40	40	50	40	40	50	20	30	35	20	30	30
	65	50	40	5	4	10	30	40	35	40	40	40	25	20	10	10	22	25
	36	70	35	40	20	20	17	40	40	20	40	40	10	20	15	10	20	15
	22	30	42	18	13	19	32	35	36	40	40	36	19	25	20	23	18	20
	20	20	22	15	8	5	20	22	30	25	22	30	13	15	30	20	15	30
	35	35	45	20	25	25	38	40	42	38	40	40	25	30	35	25	30	35
	32	40	40	16	24	17	45	55	50	50	55	48	45	45	30	55	45	22
	35	30	33	8	9	12	30	40	40	40	32	40	40	20	30	40	25	30
	35	35	40	5	15	10	30	30	35	35	30	40	15	15	25	22	15	20
	35	34	40	10	18	22	30	40	40	35	40	40	30	18	20	30	20	20
	41	39	45	20	22	25	32	31	35	30	32	34	25	22	30	22	25	28
Min	**20**	**20**	**22**	**5**	**4**	**5**	**17**	**22**	**25**	**20**	**22**	**30**	**10**	**15**	**10**	**10**	**15**	**15**
Max	**65**	**70**	**48**	**40**	**25**	**25**	**45**	**55**	**50**	**50**	**55**	**50**	**45**	**45**	**45**	**55**	**45**	**40**
Mean	**34.8**	**37.6**	**37.733333**	**15.133333**	**15.866667**	**16.666667**	**32.4**	**36.933333**	**38.333333**	**35.666667**	**37.933333**	**39**	**23.733333**	**23.8**	**27**	**25.133333**	**25.666667**	**27**
Std.	**10.171388**	**11.153475**	**6.9123768**	**8.7085071**	**5.9023805**	**5.7776252**	**7.6699786**	**7.3432833**	**7.4033454**	**7.3743442**	**8.0929128**	**6.491753**	**9.3232939**	**7.6550637**	**8.8236695**	**11.147496**	**8.0237742**	**6.5900358**
	Before	**After**	**Follow Up**	**Before**	**After**	**Follow Up**	**Before**	**After**	**Follow Up**	**Before**	**After**	**Follow Up**	**Before**	**After**	**Follow Up**	**Before**	**After**	**Follow Up**
	Forward Flexion			*Extension*			*Left Lateral Flexion*			*Right Lateral Flexion*			*Left Rotation*			*Right Rotation*		
Significant	**Intra comparison**		**NO**	**Intra comparison**		**YES**	**Intra comparison**		**NO**	**Intra comparison**		**NO**	**Intra comparison**		**YES**	**Intra comparison**		**YES**

Table II.a - Experimental Group (Spinal Push)

	Algometer			*Kemp's Test*			*Numerical Rating Scale*			*McGill Shortform*			*Oswestry*		
	Before	After	Follow Up	Before	After	Follow Up	Before	After	Follow Up	Before	After	Follow Up	Before	After	Follow Up
	76.8	81.2	81.2	1	0	0	35	0	0	0	0	0	0	0	0
	86	76	90	0	0	0	15	5	5	8	0	3	10	6	8
	85.2	83.6	77.6	1	1	1	12	5	45	6	2	2	30	40	20
	91.2	98.4	100	1	1	0	50	30	20	5	3	0	14	8	2
	65.6	98.4	100	1	0	0	65	0	0	8	0	0	20	2	4
	84.4	95.2	100	1	1	1	40	10	20	3	2	2	12	2	4
	86.8	98.4	92.4	1	0	1	45	5	30	5	3	6	20	4	24
	74	81.2	89.2	1	1	0	45	20	10	5	2	2	2	4	14
	73.2	71.6	73.2	1	1	1	70	30	45	6	6	3	30	27	18
	76	98.4	98.4	1	1	1	45	50	40	3	3	12	10	8	8
	68	89.6	79.2	1	1	1	35	15	40	3	2	3	10	10	8
	92.8	100	84.8	1	1	1	20	5	10	7	0	0	10	2	2
	81.6	93.6	90.8	1	0	0	40	5	0	11	8	0	13	13	4
	88.4	91.2	84.8	1	0	0	30	40	15	5	2	0	22	18	11
	85.2	86	92.4	0	0	0	30	15	10	12	12	6	2	0	0
Min	**65.6**	**71.6**	**73.2**	**0**	**0**	**0**	**12**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Max	**92.8**	**100**	**100**	**1**	**1**	**1**	**70**	**50**	**45**	**12**	**12**	**12**	**30**	**40**	**24**
Mean	**81.013333**	**89.52**	**88.933333**	**0.8666667**	**0.5333333**	**0.4666667**	**38.466667**	**15.666667**	**19.333333**	**5.8**	**3**	**2.6**	**13.666667**	**9.6**	**8.4666667**
Std.	**8.2916366**	**9.1291683**	**8.6621234**	**0.3518658**	**0.5163978**	**0.5163978**	**16.308922**	**15.337474**	**16.676188**	**3.121355**	**3.3380918**	**3.3123147**	**9.2556289**	**11.172671**	**7.5106274**
	Before	**After**	**Follow Up**	**Before**	**After**	**Follow Up**	**Before**	**After**	**Follow Up**	**Before**	**After**	**Follow Up**	**Before**	**After**	**Follow Up**
	Algometer			**Kemp's Test**			**Numerical Pain Rating**			**McGill Shortform**			**Oswestry**		
Significant	**Intra comparison**		**NO**	**Intra comparison**		**YES**	**Intra comparison**		**YES**	**Intra comparison**		**YES**	**Intra comparison**		**YES**

Table II.a - Experimental Group (Spinal Push)

	Forward Flexion			*Extension*			*Left Lateral Flexion*			*Right Lateral Flexion*			*Left Rotation*			*Right Rotation*		
	Before	After	Follow Up	Before	After	Follow Up	Before	After	Follow Up	Before	After	Follow Up	Before	After	Follow Up	Before	After	Follow Up
	35	40	40	25	20	30	50	50	40	50	50	40	30	30	28	30	30	28
	78	73	74	30	25	30	26	24	20	24	21	25	15	17	18	12	14	20
	40	44	55	15	18	15	30	45	40	30	40	40	20	20	20	20	12	20
	70	45	74	17	15	18	40	30	50	45	40	50	25	30	30	20	30	35
	25	36	30	12	15	12	25	30	30	30	30	30	30	30	28	30	30	35
	66	63	67	31	26	30	31	24	40	28	33	40	19	18	30	18	19	30
	40	45	35	14	13	16	50	40	35	42	40	30	31	20	26	33	30	28
	25	27	37	14	10	18	22	30	25	23	30	30	10	10	20	11	12	25
	15	24	20	7	10	12	20	30	24	18	20	30	10	10	25	12	10	25
	40	45	45	10	15	12	30	40	35	40	30	30	15	25	30	20	20	30
	25	40	41	14	17	12	30	28	22	30	25	22	32	25	32	23	28	30
	38	34	30	8	18	20	30	30	35	35	40	35	30	40	45	30	40	40
	32	40	50	8	12	18	30	28	34	30	28	35	22	35	35	28	40	40
	34	35	35	12	12	17	42	40	35	40	40	40	12	30	40	12	40	38
	48	45	42	20	25	25	40	45	40	40	45	40	28	18	45	32	20	40
Min	**15**	**24**	**20**	**7**	**10**	**12**	**20**	**24**	**20**	**18**	**20**	**22**	**10**	**10**	**18**	**11**	**10**	**20**
Max	**78**	**73**	**74**	**31**	**26**	**30**	**50**	**50**	**50**	**50**	**50**	**50**	**32**	**40**	**45**	**33**	**40**	**40**
Mean	**40.733333**	**42.4**	**45**	**15.8**	**16.733333**	**19**	**33.066667**	**34.266667**	**33.666667**	**33.666667**	**34.133333**	**34.466667**	**21.933333**	**23.866667**	**30.133333**	**22.066667**	**25**	**30.933333**
Std.	**17.938254**	**12.391241**	**16.21287**	**7.5988721**	**5.3112639**	**6.6975475**	**9.2925982**	**8.2675499**	**8.1911683**	**8.9655425**	**8.8144902**	**7.2689817**	**8.0929128**	**8.7330789**	**8.3312378**	**8.0130845**	**10.535654**	**6.860515**
	Before	**After**	**Follow Up**	**Before**	**After**	**Follow Up**	**Before**	**After**	**Follow Up**	**Before**	**After**	**Follow Up**	**Before**	**After**	**Follow Up**	**Before**	**After**	**Follow Up**
	Forward Flexion			*Extension*			*Left Lateral Flexion*			*Right Lateral Flexion*			*Left Rotation*			*Right Rotation*		
Significant	**Intra comparison**		**NO**	**Intra comparison**		**YES**	**Intra comparison**		**YES**	**Intra comparison**		**NO**	**Intra comparison**		**NO**	**Intra comparison**		**NO**

4.5 Age Distribution

Table 45

Prevalence of age (n=30)

AGE INTERVALS	EXPERIMENTAL GROUP	CONTROL GROUP
20 - 29	3 (20%)	5 (33%)
30 - 39	4 (27%)	0 (0%)
40 - 49	5 (33%)	2 (13%)
50 - 59	2 (13%)	4 (27%)
60 - 69	1 (7%)	2 (13%)
70 - 79	0 (0%)	2 (13%)

Most of the patients (33%) in the experimental group were in the age interval of 40-49 years. The second largest group of patients (27%) was in the age interval of 30-39 years, and the smallest group of patients (7%) was in the age interval of 60-69 years.

Conversely, most of the patients (33%) in the control group were in the age interval of 20-29 years. The second largest group (27%) was in the age interval of 50-59 years, while the rest of the patients were fairly equally divided amongst the other age groups.

The two groups were not well matched in terms of age distribution.

4.6 Gender Distribution

Table 46

Distribution of gender (n=30)

GENDER	EXPERIMENTAL GROUP	CONTROL GROUP
MALES	12 (80%)	7 (47%)
FEMALES	3 (20%)	8 (53%)

The male to female ratio was closer to equal in distribution in the control group, comprising seven males and eight females, than in the experimental group, which comprised twelve males and three females. There were considerably more males (80%) than females in the experimental group.

Therefore, the two groups were not well matched in terms of gender distribution.

4.7 Severity of Pain

Table 47

Severity of pain (n=30)

SEVERITY OF PAIN	EXPERIMENTAL GROUP	CONTROL GROUP
ACUTE	3 (20%)	3 (20%)
CHRONIC	12 (80%)	12 (80%)

Both groups were identical with regards to severity of pain distribution. But, the intra-group ratio for both groups was not equal. There were more chronic sufferers (80%) than acute sufferers (20%) in both study groups.

4.8 Distribution of Patient Diagnosis

Table 48

Prevalence of diagnosed conditions (n=30)

DIAGNOSIS	EXPERIMENTAL GROUP	CONTROL GROUP
UNCOMPLICATED FACET SYNDROME	5 (33%)	6 (40%)
ACTIVE MYOFASCIAL TP's	6 (40%)	4 (27%)
LATENT MYOFASCIAL TP's	3 (20%)	2 (13%)
SACRO-ILIAC SYNDROME	1 (7%)	3 (20%)

All patients included in this study suffered from facet syndrome. However, only five patients (33%) in the experimental group and six patients (40%) in the control group suffered from this ailment alone.

Sixty percent of the patients in the experimental group and 40% of those in the control group also suffered from myofascial involvement. Of these, 40% of the patients in the experimental group had active myofascial trigger points, and 27% in the control group had active myofascial trigger points.

Twenty percent of the patients in the experimental group had latent trigger points, and 13% of those in the control group had latent trigger points. The distribution of patients in the two groups with latent trigger points was therefore fairly equal.

In the experimental group there was one patient (7%) with sacro-iliac syndrome and in the control group there were three patients (20%) with sacro-iliac syndrome. The two groups were not well matched in terms of the prevalence of sacro-iliac syndrome.

In the experimental group 33% of the patients had uncomplicated facet syndrome, and 67% had other mechanical conditions accompanying the facet syndrome.

In the control group 40% of the patients was diagnosed with uncomplicated facet syndrome and 60% was diagnosed with other mechanical conditions accompanying the facet syndrome.

Overall, both groups seemed to be fairly well matched in terms of diagnosis.

CHAPTER FIVE

DISCUSSION

5.1 Introduction

This study intended to determine whether the spinous push technique was any better than another more commonly used adjustment, namely the lumbar roll, in the treatment of facet syndrome in the lumbar spine. It was hypothesised that, on a biomechanical basis, the spinous push should be the better treatment technique.

Spinal manipulation has been shown to be effective in the treatment of lower back pain (Meade *et al.* 1990; Dillon 1981) and improvement was expected in both groups. However, neither the experimental group nor the control group showed any significant improvement over the other after the respective treatments.

5.2 Inter-group Comparisons

5.2.1 The Mann Whitney-U Test

The results of the Mann Whitney-U test indicated no statistically significant differences between the experimental and control groups for the algometer readings, Kemp's Test, McGill Pain Questionnaire, Oswestry Back Pain and Disability Index and the different ranges of movement of the lumbar spine as measured with a BROM II goniometer.

5.2.2 The Numerical Rating Scale

For the Numerical Rating Scale, the Mann Whitney-U test indicated a statistically significant difference between the two groups at the first consultation. This was the only instance where findings at first consultation were not in accordance with other findings at this stage. This can be attributed to the unequal matching of the groups in terms of pain severity.

5.2.3 The Algometer Findings

The algometer findings related to the Mann Whitney-U Test did not reveal statistically significant difference between the two study groups. It is assumed that, by pushing on one lumbar spinous process at a time (posteriorly to anteriorly), the algometer increased the pressure in both the facet joints. This could also be a means of assessing the degree of local tenderness over the spinous processes or of the facet joints.

Difficulty in determining the exact anatomical location of the facet joints is the reason that pressure was applied on the spinous processes rather than on the facet joints. Moreover, pain over a facet joint may also be caused by soft tissue injuries at the site of contact of the algometer or the close proximity of a myofascial trigger point in the spinal musculature. It is very difficult to differentiate between pain due to facet joint involvement or pain due to other structures, such as the musculature or spinal ligament. Further studies may be of great value in this respect.

It was observed in this study that, when the algometer was used, a patient with facet syndrome experienced pain at low pressure, whereas higher pressure was recorded before pain was experienced as the patient recovered from the facet syndrome. However, it should be borne in mind that when enough pressure is applied, even a normal subject might experience pain.

Because both groups diagnosed with facet syndrome showed no statistically significant difference with regards to the algometer, it was concluded that both groups responded similarly to the two treatment protocols and that there is no difference in the effectiveness of the two techniques in this regard.

5.2.4 The Short-Form McGill Pain Questionnaire and the Oswestry Back Pain and Disability Index

For both the Short-Form McGill Pain Questionnaire and the Oswestry Back Pain and Disability Index, there was no significant difference after treatment between the experimental and control groups after treatment.

5.2.5 The Goniometer Findings

The ranges of motion of the lumbar spine as measured with a goniometer into forward flexion, lateral flexion, rotation, and extension revealed no statistically significant differences after treatment. These measurements are objective, but user dependent.

5.2.6 Conclusion

Based on the findings of this study, it is concluded that no significant difference exists in the outcome of the two chiropractic manipulative techniques, namely the lumbar roll and spinous push. It is suggested, that the benefit of spinal manipulation is less dependant on the specific direction of the adjustive thrust and more on the mobilisation of the fixated facet joint. This seems to be true even when the joint is adjusted in a close-pack position.

5.3 Intra-group Comparisons

5.3.1 The Wilcoxon Signed Rank Test

The Wilcoxon's Signed Rank Test for the data of the experimental group showed a statistically significant difference in improvement in patients from the first to the final treatment for the Kemp's Test, the Numerical Rating Scale, McGill's Pain Questionnaire, the Oswestry Back Pain and Disability Index, lumbar spine extension and left lateral lumbar flexion.

5.3.2 The Goniometer Findings

The increase in left lateral flexion experienced by the experimental group was not in accordance with the absence of improvement experienced by them in the other ranges of motion measured. This finding is in contrast with that of the control group. A possible explanation for this might be that the patients, in the experimental group, adjusted with a spinous push received an adjustment of a larger amplitude with a faster velocity. This may be because they were lying in a side posture position with the fixated side of the spine closest to the table and the researcher adjusted with his right hand as the contact hand, which is his dominant side.

This implies that a forceful adjustment due to the dominance of the adjuster's right hand, may have been the reason for the increase in left lateral flexion in this group.

No other explanation for the increased left lateral flexion could be identified in this study. Moreover, these findings are not supported by the biomechanical behaviour of facet joints after adjustment. Left lateral lumbar flexion, according to White and Panjabi (1990: 109-112), is a combination of spinous process rotation to the left (concave side of the spine) and lateral flexion of the vertebral body tilting inferiorly on the left (concave side of the spine), suggesting that the increase of spinal movement after manipulation is of a temporary nature. A further investigation into this phenomenon is therefore suggested.

5.3.3 The Control Group

The control group showed a statistically significant improvement from the first consultation to the final consultation for the algometer readings, Kemp's Test, the Numerical Rating Scale, Mc Gill's Pain Questionnaire, Oswestry's Back Pain and Disability Index, lumbar spine extension, left lumbar rotation and right lumbar rotation.

The increase in the range of movement of the lumbar spine in left-and right rotation was not in accordance with the other goniometer findings for the control group. The lumbar roll adjustment required the use of large hand contact (pisiform) by the adjuster, and the more powerful pectoral and tricep muscles were utilised, exerting similar bilateral forces. This may be a possible reason for the increase in both left- and right lumbar rotation in the control group.

5.3.4 General

On viewing of the data the patients with myofascial trigger points did not seem to respond to adjustments as well as patients with uncomplicated facet syndrome.

5.3.5 Conclusion

The findings of this study with regards to intra-group comparisons support the effectiveness of spinal manipulation in the treatment of lumbar facet syndrome, but according to the findings based on statistical analyses in terms of inter-group comparisons, there seems to be no more benefit in the spinous push technique than in the lumbar roll technique.

5.4 Patient Demographic and Diagnostic Distribution

5.4.1 Age Distribution

The average age of patients treated in chiropractic private practice and in teaching clinics ranges between 32 and 43 years of age (Sawyer and Stewart 1984, Phillips and Butler 1982). The age range of greatest utilization for both teaching clinics and private practice is 20-59 years (Sawyer and Stewart 1984). The age group of greatest utilization for all sample groups in private practice is 20-39 years (Walsh and Jamison 1992).

According to Forbes *et al* (1985), the majority of patients treated by chiropractors is between 25 and 44 years of age, with an average age of 38.

Thus, the experimental group's age interval distribution was similar to that seen in private practice and in teaching clinics.
Whereas age interval distribution of the control group did not correspond to that seen in private practice and in teaching clinics.

Therefore, the age distribution of the experimental group was more representative of the actual chiropractic experience than that of the control group.

5.4.2 Gender Distribution

In chiropractic teaching clinics, the male to female ratio is about equal, sometimes favouring females (Nyiendo *et al.* 1989; Sawyer and Ramlow 1989).

A summary of the 1990 American Chiropractic Association (ACA) Department of Satistics Survey revealed that more females (57,9%) than males (42,1%) are seen by chiropractors in private practice (ACA Department of Statistics 1991).

Therefore, in terms of gender distribution, the control group was more representative of actual private practice than the experimental group. The overall male to female ratio in this study did not compare well to the ratio seen in private practice and in teaching institutions (ACA Department of Statistics 1991), but since these distributions have not been established in South Africa, no direct correlation could be made.

5.4.3 Severety of Pain Distribution

In private chiropractic practice (Phillips 1981) as well as at teaching clinics (Nyiendo *et al.* 1989; Sawyer and Stewart

1984 an Sawyer and Ramlow 1984) about two thirds of the patients seen are chronic, and one fifth to one third are acute . Therefore, the intra-group ratio between acute and chronic patients was representative of actual private practice and teaching clinics.

This may have influenced the outcome of this study to some extent because chronic patients may require more treatments than acute patients before they experience improvement.

5.4.4 Distribution of Patient Diagnoses

In a specific diagnosis of 1293 patients over a twelve-year period at the Royal University Hospital Low Back Pain Clinic in Saskatoon, the following incidences were observed:

Well known causes:

- 14% of the patients had herniated nucleus palposis;
- 13% had lateral spinal stenosis;
- 5% had central spinal stenosis;
- 9% had spondylolisthesis;
- 4% had segmental instability.

Less well known causes:

- 22% of the patients had facet syndrome;
- 23% had sacro-iliac syndrome;
- 6% had muscle syndromes;
- less than 1% had Maigne's syndrome;
- 6% had muscle syndromes.

Remaining causes:

3% of the patients had

- Pseudoarthrosis;
- Postfusion stenosis;
- Inflammatory;
- Neoplasm;
- Arachnoiditis;
- Lateral femoral nerve entrapment;
- Nonspecific causes.

(Kirkaldy-Willis 1992)

In this current study, 36,6% of the patients had facet syndrome only, 13.33% had sacro-iliac syndrome with their facet syndrome and 50% of the patients had myofascial involvement together with their facet syndrome.

This is not in accordance with the observations in a study done by Kirkaldy-Willis (1992). In a larger sample size there might have been a more similar patient distribution to that of the study done by Kirkaldy-Willis.

5.5 Limitations of this Study

From the onset of the study, patients that had facet syndrome, with or without other mechanical causes for their lower back pain, were accepted. This may have favoured the incidence of facet syndrome above some of the other diagnoses made. The high incidence of myofascial trigger points can be explained due to the high prevalence of its perpetuating factors.

A review of the literature failed to reveal any studies to which the data of this study in terms of the specific effects of different adjustment techniques in facet syndrome in the lumbar spine could be compared.

Some of the weaknesses of this study included the following:

- too small a sample size (possible Type II error);
- convenience sampling resulting in inadequate matching of the groups in terms of age, gender and pain severity;
- the involvement of both chronic and acute patients. There were more chronic patients than acute patients; twelve patients were chronic and three patients were acute in both groups. There was an uneven intra-group ratio between chronic and acute patients but this is also a reflection of the real world;
- the follow-up period for treatment of patients may have been too short.
- a shortage of patients with uncomplicated facet syndrome. Many patients also had other causes of mechanical lower back pain associated with facet syndrome, such as sacro-iliac syndrome, and myofascial pain and dysfunction syndrome of various lumbar spine muscles (see Table 49). This may have confounded the outcome.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

Both groups responded well to the respective treatments given. There was no significant difference between the control group and the treatment group according to the objective and subjective results. In other words, the spinous push technique seems to be as effective as the lumbar roll technique in the treatment of facet syndrome in the lumbar spine.

Future studies concerning the effects of different lumbar adjustment procedures with a larger sample size and a better distribution of patients regarding age, gender and pain severety may generate further valuable information.

The ratio of chronic to acute patients in this study was not equal. There were very few acute patients compared to chronic patients, which was in accordance with the ratio seen in private practice. In future seperate studies for chronic and acute lower back pain sufferers may help to establish the response of chronic patients compared to that of acute patients to manipulative treatment.

There should be stricter entrance criteria in terms of the diagnoses in future. Patients who had facet syndrome were accepted into this study as long as they had facet syndrome, regardless of whether they had other mechanical causes of lower back pain.

These other mechanical conditions may have affected the outcome of this study in some way. An investigation into facet syndrome as a separate entity without other mechanical conditions will allow for a more accurate study.

Future studies on the effectiveness of spinal manipulation in the treatment of myofascial trigger points may be very rewarding.

With regards to the lumbar ranges of motion, the experimental group showed improvement only in terms of lumbar extension and left lateral flexion after treatment. The control group, on the other hand, experienced improvement in terms of lumbar extension as well as left and right lumbar rotation. The fact that improvement into extension occured for both groups is understandable because facet syndrome is known to result in decreased lumbar extension, and the respective techniques are applied to relieve this condition. However, the reason for improvement into left lateral flexion for the experimental group, and left and right rotation for the control group, is not clear. Further studies may provide a better understanding of these phenomenon.

The validity of the algometer as used in this study can be questioned because pain produced over the spinous process with application of the algometer could have been due to conditions other than facet syndrome. Applying the algometer directly over a facet joint can also be difficult due to the deep location of the joints and the close proximity of other pain-sensitive structures, for instance lumbar muscles. Future studies could perhaps give consideration to this problem.

Motion palpation was done only at the initial consultation to determine the fixated facet joints. Thereafter, the same joints were adjusted at each consecutive treatment. In the future investigations, it may be better to do motion palpation at each visit and to adjust according to these findings. It is possible that fixations in acute patients may vary from day to day, whereas in chronic patients the fixations may be more consistent. This implies that it would be clinically more correct to motion palpate at each consultation.

It appears that very few studies have been done regarding the effects of different adjustments in the treatment of lower back pain. Further studies on the specific effects of different adjustment techniques on various mechanical lower back pain disorders are not only desirable, but necessary in order to determine more cost-effective forms of managing mechanical low back pain.

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APPENDIX A

NUMERICAL RATING SCALE

Patient name:__________ File No. :____ Date:_______

	10	Worst pain ever
	9	
	8	
	7	
	6	
Numerical Rating Scale	5	
	4	
	3	
	2	
	1	
	0	No pain at all

APPENDIX B

THE OSWESTRY BACK PAIN AND 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 exta 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 C

SHORT-FORM Mc GILL PAIN QUESTIONNAIRE

by Ronald Melzack

Patient's name: ______________________ 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-crual	0)___	1)___	2)___	3)___

Descriptors 1-11 represents sensory dimension of pain experience and 12-15 represents the affective dimension. Each descriptor is ranked on an intensity scale of 0 = none, 1 = mild, 2 = moderate, 3 = severe.

APPENDIX D

RESEARCH PROJECT - Lumbar spine facet syndrome

Patient's name: ______________________ File number: _________

1. INITIAL CONSULTATION

Date: ___________

(1) Goniometer:
Forward flexion _____
Extension _____
R-lateral flexion _____
L-lateral flexion _____
R-rotation _____
L-rotation _____

(2) Algometer:
L1 - _____
L2 - _____
L3 - _____
L4 - _____
L5 - _____

(3) Kemp's test:
L1 - _____
L2 - _____
L3 - _____
L4 - _____
L5 - _____

2. TREATMENT 5

Date: ___________

(1) Goniometer:
Forward flexion _____
Extension _____
R-lateral flexion _____
L-lateral flexion _____
R-rotation _____
L-rotation _____

(2) Algometer:
L1 - _____
L2 - _____
L3 - _____
L4 - _____
L5 - _____

(3) Kemp's test:
L1 - _____
L2 - _____
L3 - _____
L4 - _____
L5 - _____

3. TREATMENT 9

Date: __________

(1) Goniometer:

Forward flexion	_____
Extension	_____
R-lateral flexion	_____
L-lateral flexion	_____
R-rotation	_____
L-rotation	_____

(2) Algometer:

L1 - _____
L2 - _____
L3 - _____
L4 - _____
L5 - _____

(3) Kemp's test:

L1 - _____
L2 - _____
L3 - _____
L4 - _____
L5 - _____

4. ONE MONTH FOLLOW-UP

Date: __________

(1) Goniometer:

Forward flexion	_____
Extension	_____
R-lateral flexion	_____
L-lateral flexion	_____
R-rotation	_____
L-rotation	_____

(2) Algometer:

L1 - _____
L2 - _____
L3 - _____
L4 - _____
L5 - _____

(3) Kemp's test:

L1 - _____
L2 - _____
L3 - _____
L4 - _____
L5 - _____