A STUDY OF THE RELATIVE EFFECTIVENESS OF MCMANIS TRACTION USED AS AN ADJUNCT TO SPINAL MANIPULATIVE THERAPY

"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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DECLARATION

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

Signed:

Date: May 1995

The work reported in this dissertation was performed in the department of Chiropractic , Technikon Natal, Durban.

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ABSTRACT

Mechanical lower back pain is a common clinical entity which encompasses a spectrum of disorders. Studies show that spinal manipulative therapy is of value in the treatment of mechanical lower back pain, while some chiropractors are of the opinion that McManis traction offers an effective adjunct to spinal manipulative therapy in the treatment of such conditions.

The objective of this study was to evaluate the combination of McManis traction and spinal manipulative therapy in comparison to spinal manipulative therapy alone in the treatment of mechanical lower back pain.

Thirty subjects with mechanical lower back pain were screened and randomly assigned to one of two groups of fifteen. The experimental group received the combination of traction and spinal manipulation, while the control group received spinal manipulation only.

Both the experimental and the descriptive survey methods involving observation and questionnaire design respectively were used to obtain the necessary data. Response to treatment was evaluated in terms of questionnaire results which included scores of the Oswestry Back Disability Index, the Short-Form McGill Pain Questionnaire, the Numerical Pain Rating Scale 101, and spinal range of motion which was measured by a goniometer. The paired t-test, unpaired t-test, Mann Whitney-U, and

Wilcoxon tests were used to analyze statistically the data which would indicate any significant differences within and between the treatment groups.

The unpaired t-tests revealed a statistical significant difference for the range of motion in left lateral flexion ($p<0.05$) was seen only after a one-month post-treatment follow-up period in favour of the experimental group. The results of the paired t-test for the same intervals were not statistically significant. The results of the paired t-test for the range of motion in left and right lateral flexion and forward flexion generally did not support the hypothesis that both the combination of McManis traction and spinal manipulative therapy, and spinal manipulative therapy only used in the treatment of mechanical lower back disorders would significantly alter patient response to treatment. A significant change was surprisingly enough noted in the control group after nine treatments for the range of motion in extension ($p<0.05$). This difference was not seen after the follow-up period which raised further question as to the long-term effect of treatment. Results of the Oswestry Back Disability Index indicated definite improvement in both groups, but no significant differences were seen when comparing the two groups. This was also the case for the Numerical Pain Rating Scale 101. Results of the Short-Form McGill Pain Questionnaire revealed statistical differences ($p<0.05$) seen after nine treatments and one-month post-treatment follow-up for the sensory component in both experimental and control groups.

No statistical significant differences were noted between the groups which did not support the hypothesis that the response of the experimental and control groups to treatment would significantly differ. Statistically significant differences for the affective component was seen within the control group only.

It was concluded that the combination of McManis traction and spinal manipulation is not more effective than spinal manipulative therapy only in the treatment of mechanical lower back conditions as this combination of treatment did not consistently significantly alter the subjects' response to treatment in the experimental group.

UITTREKSEL

Meganiese laerug pyn dek 'n wye spektrum toestande wat epidemiese afmetings aanneem.

Navorsing beklemtoon onombonde die waarde van spinale manipulasie as behandelingsmetode, terwyl daar Chiropraktisyns is wat glo dat McManustraksie 'n baie effektiewe hulpmiddel vir die behandeling van maganiese laerugtoestande bied.

Die hoofdoel van hierdie navorsingstuk was om te bepaal of spinale manipulasie op sigself kan staan teenoor spinale manipulasie met McManustraksie as hulpmiddel.

Dertig pasiente met meganiese laerug pyn is in twee groepe van fyftien elk verdeel, waar die eksperimentele groep beide spinale manipulasie asook traksie ontvang het, teenoor die knotrole groep se manipulasie op sigself. Beide eksperimentele (observasie) en beskrywende steekproefmetodes is bebruik om data to bekom.

Behandelingsuitslae is bekom deur middel van die "Oswestry Back Disability Index"; die "Short-form McGill" pyn vraelys; die "Numerical Pain Rating Scale 101", asook goniometerlesings van spinale gewrigs - beweeglikheid.

Statistieke is bekom deur middel van gepaarde en ongepaarde t-toetse, die "Mann Whitney-U" en Wilcoxontoetse.

Toetsuitslae deur middel van ongepaarde t-toetse het een maand na behandeling (statistiekgewys) 'n geringe verskil getoon ($p<0.05$) in sywaartse buiging na links. Uitslae van die gepaarde t-toets oor dieselfde tydperk het geen noemenswaardige verskille getoon nie. Gepaarde t-toetsuitslae vir sywaartse en vorentoe buiging na nege behandelings en 'n opvolgbesoek na een maand kon geen hipotese stawing vind dat daar 'n noemenswaardige verbetering in die experimentele groep en die kontrole groep te bespeur was nie. Die enigste positiewe verskil is in die kontrolgroep na nege behandelings vir terugwaartse buiging ($p<0.05$) bespeur, maar het na die een maand se opvolgbesoek nie verder verbeter nie.

Bevindings van die "Oswestry Back Disability Index" en die "Numerical Pain Rating Scale 101" wys 'n bepaalde verbetering in beide groepe, maar geen noemenswaardige verskil in uitslae nie, terwyl uitslae van die een komponent van die McGill pyn vraelys (die kontrolegroep) bevoordeel.

Die gevolgtrekking wat dus gemaak kan word is dat die kombinasie van McManustraksie en spinale manipulasie geensins meer effektief as manipulasie op sigself vir meganiese rugpyn is nie. Pasiente sal dus geensins meer baat indien traksie as hulpmiddel by manipulasie bygevoeg word nie.

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ABBREVIATIONS

K-W	Kirkaldy-Willis
IVF	Intervertebral foramen
ROM	Range of motion
SD	Standard deviation
d	Mean difference
CI	Confidence interval
X	Mean
OBDI	Oswestry Back Disability Index
MGPQ	Short-form McGill Pain Questionnaire
ROMFF	Range of motion in right forward flexion
ROME	Range of motion in extension
ROMRLF	Range of motion in right lateral flexion
ROMLLF	Range of motion in left lateral flexion

INTRODUCTION

Immediate background

Professions involved in the health care delivery system have an obligation to explore in a scientific manner, more effective and safer methods of health care.

According to Cox (1990: 23), more than half the patients seen by a chiropractor complain of lower back pain; however, epidemiological studies overall have shown that approximately 35% of all patients seen by chiropractors suffer from lower back pain (Cox 1990: 10). It therefore makes sense to investigate any therapeutic intervention which claims to have a significant influence in the conservative management of this type of condition. Very few studies from within the chiropractic profession have been carried out to compare the relative efficacy of different treatment techniques which have shown empirical benefit and our competency as health care professionals will be questioned if we do not evaluate our treatment skills in a scientific manner.

McManis traction is used in some chiropractic practices as an adjunct to spinal manipulative therapy. Taylor (1978) maintains that such manually-controlled, intermittent, multi-directional traction helps to determine joint fixations and simultaneously provides treatment by restoring functional equilibrium to the vertebral column. He adds that McManis traction is not an approach which replaces chiropractic management, but one which supplements it by restoring functional equilibrium. According to Cox (1992: 503-504), scientific validation of the efficacy of this form of treatment modality is scant, but considerable empirical benefit has been observed.

Need for a solution

According to Golden et al. (1992: 537), most epidemiological studies indicate that lower back pain affects between 60% and 80% of the population at some stage in their lives, while Andersson et al. (1991: 97) conclude from various epidemiological studies that prevalence rates vary from 12%-35%.

In a ten-year industrial study of low back pain, Rowe (1969) reports that low back pain was the second most common reason for work absenteeism where 35% of sitting workers and 47% of workers with physically heavy jobs made visits to the medical department because of low back pain. Of this group, 85% suffered recurrences of lower back pain. According to Andersson et al. (1991: 110), back injuries average 21% of all compensationable work injuries but average 33% of the cost, and as the duration of the disability increases, the total costs accelerate. Thus, there exists a need for a cost-effective management of mechanical lower back pain.

In a study undertaken by Meade et al. (1990), it was found that chiropractic treatment was in the long term more effective than hospital outpatient management, mainly for patients with chronic or severe mechanical lower back pain. The medical profession is becoming increasingly aware of the benefit of spinal manipulative therapy in the treatment of back pain (Coulter in Haldeman 1992: 55,57) . As individual chiropractic techniques are controversial or poorly tested in so far as their relative therapeutic effect is concerned, it is necessary for the chiropractic profession to put its methods of management to the test in order to clarify more precisely the role they have in the management of mechanical lower back pain. A search of the literature failed to reveal a study of the relative effectiveness of spinal adjustment in combination with McManis traction compared with that of manipulative therapy only, in the treatment of mechanical lower back pain.

Description of the solution

A sample of 30 subjects with mechanical lower back pain was required. Subjects were screened for and diagnosed according to the Kirkaldy-Willis model for classifying mechanical lower back pain (Kirkaldy-Willis 1988: 134). Half of the subjects received spinal adjustments only (control group), and the other half (experimental group) received a combination of McManis traction and spinal adjustment.

Nine treatments were given over a period of four weeks where each subject was assessed before the onset of treatment and then after the third, sixth and ninth treatments, and then after a further month, in terms of their perception of pain and disability and their lumbar spine range of motion.

Benefits from solving the problem

- The possibility of determining a more cost-effective solution to the disabling effect of mechanical low back pain.
- A better understanding of McManis traction used as an adjunct to spinal manipulation.
- Further areas for research might be identified.

Feasibility of the solution

- No extra equipment besides the McManis table and a goniometer was necessary. This equipment already existed in the Department of Chiropractic. No extra cost was therefore incurred.
- Literature on diagnosis and classification of mechanical lower back pain was easily obtained from the Technikon Natal library.
- Mechanical lower back pain is a common clinical entity, and so subjects were readily available.
- The Oswestry Disability Index (Appendix X), Short-Form McGill Pain Questionnaire (Appendix U), Numerical Pain Rating Scale 101 (Appendix V) and goniometer measurements were easily implemented and statistically analyzed. The

goniometer used was the Autogon 2 supplied by Smith and Nephew Rolyan Inc. (N93W14475 Whittalou Way, P.O. Box 555, Menomonee Falls WI 53051).

CHAPTER ONE

1. THE PROBLEM AND ITS SETTING

1.1. PROBLEM STATEMENT

The purpose of this investigation was to compare the combination of McManis traction and spinal adjustment with that of spinal adjustment alone, with reference to the subjects' response to treatment, in order to evaluate the relative effectiveness of these techniques used in the management of mechanical lower back disorders.

1.2. SUBPROBLEMS

Subproblem 1

To determine the subjective and objective response to spinal adjustment in subjects suffering from mechanical lower back pain.

Subproblem 2

To determine the subjective and objective response to the combination of spinal adjustment and McManis traction in subjects suffering from mechanical lower back pain.

Subproblem 3

To integrate the data obtained from subproblem one and subproblem two.

1.3. HYPOTHESES

Hypothesis 1

Spinal adjustment would alter the subjective and objective response to treatment.

Hypothesis 2

The combination of spinal adjustment and McManis traction would alter the subjective and objective response to treatment.

Hypothesis 3

The subjects' responses to treatment would differ for the group receiving spinal adjustment only and the group receiving the combination of spinal adjustment and McManis traction.

1.4. DELIMITATIONS

- Persons of 145 centimetres height or less were excluded from this study, as McManis traction would be difficult to apply to subjects of such height.

- Owing to lack of a large enough sample size and because of convenience sampling, this study did not take factors such as age, occupation, race and sex into consideration.

- Only those subjects diagnosed with mechanical lower back disorders as defined by Kirkaldy-Willis (1988: 134-154), and who did not present with the outlined contra-indicating features to traction and spinal manipulation, were accepted into the study.

- Subjects developing secondary illness during the treatment period were excluded from the study.

- Subjects with disc herniation were excluded from this study.

- Diversified chiropractic manipulative technique was used to adjust the lumbar spine.

This technique encompasses many procedural options. This study did not distinguish between such spinal manipulative options as the following: lumbar roll, spinous push, spinous hook, sitting spino-carpal, sitting transverso-carpal, and upper and lower sacro-iliac joint adjustment as outlined by Szaraz (1990).

1.5. ASSUMPTIONS

- Spinal adjustments have beneficial objective and subjective effects. These effects were used as a baseline for comparison.

- The diagnostic classification of Kirkaldy-Willis (1988: 134) concerning mechanical lower back pain is valid and reliable.

- Nine treatments given over a four-week period, during which time subjects received 2-3 treatments per week, was sufficient to evaluate the subjects' responses to the treatment techniques administered.

- Subjects would be compliant in attending the clinic for treatment when required to do so.

- Enough subjects would respond to the

advertisement in order to complete this study.

- The presenting disorder was classified , diagnosed and managed correctly.

1.6. DEFINING THE TERMS:

For the purposes of this study the following definitions have been used:

Spinal traction: The application of a drawing or pulling force along the long axis of the spine in order to:

1. stretch soft tissues;
2. separate joint surfaces;
3. separate bony fragments.

(Gatterman, 1990: 365)

Manual distraction: A force applied in a controlled fashion. This can be done by hand or with a moveable sectioned manipulation table that allows all ranges of motion to be applied to a specific joint. (Cox in Haldeman, 1992: 508)

Intermittent Traction: A tractive force applied and withdrawn in relatively short periods. Either manual or mechanized methods are used. (Cox in Haldeman, 1992: 508)

Static Traction: Traction applied and maintained for several minutes or up to several hours, for the purpose of immobilization and soft tissue relaxation. (Gatterman, 1990: 365)

Spinal manipulative therapy: "...the therapeutic application of manual force. Spinal manipulative therapy broadly defined includes all procedures where the hands are used to mobilize, adjust, manipulate, apply traction, massage, stimulate or otherwise influence the spine and paraspinal tissues with the aim of influencing the patient's health." (Grice & Vernon in Haldeman, 1992: 448)

Spinal adjustment: A controlled force applied with a high velocity in a line of drive or specific direction, with regulated depth and magnitude, and delivered by means of a specific contact using muscle power, body weight, or a mechanical apparatus. (Grice & Vernon in Haldeman, 1992: 448)

Mechanical lower back pain: Mechanical lower back pain in the lumbar spine is that which is not due to organic disease and which is associated with degenerative changes in that part of the spine. (Personal definition)

Cox Distraction Manipulation: "Manual controlled distraction which is applied to the intervertebral disc and articular facets with the patient positioned on a table designed (this would include the McManis table) for its application. Under distraction, the facet articulations are manipulated throughout their physiologic ranges of motion." (Cox in Haldeman, 1992: 508)

Note: Cox modified the McManis table and referred to traction administered on his Zenith-Cox table as Cox flexion distraction manipulation; however, the basic traction principles are the same as for McManis traction.

Diversified technique: A wide spectrum of manipulative procedures using short levers, low amplitude, high velocity thrusts applied to the spine or extremities.

Joint dysfunction: Joint mechanics showing area disturbances of function without structural change. It affects the quality and range of joint motion and is diagnosed with the aid of motion palpation, and stress and motion radiography. (Haldeman, 1992: 623)

Joint fixation: The state whereby an articulation has become temporarily immobilized in a position that it may normally occupy during any phase of physiological movement. (Gatterman, 1990:408)

Lesion: Refers to joint fixation or joint dysfunction. (Personal reference term)

CHAPTER TWO

2. **REVIEW OF THE RELATED LITERATURE**

2.1. OVERVIEW

There remains controversy as to the status of chiropractic within the health-care system (Phillips and Mootz in Haldeman 1992: 48). In order for the profession to establish and maintain its identity and independence, it is necessary for the profession to clearly define its existing role as a primary contact, prevention-orientated health care profession. The most acceptable way of achieving this is through scientific validation of its approach.

A comparison of main complaints of patients at six chiropractic college teaching clinics revealed that low back pain represented between 31% and 41% of all complaints (Nyiendo et al. 1989). According to Breen (1977), 53% of all of new patients seen by chiropractors complain of lower back pain. According to Hall (1975), it is evident that patients suffering from lower back pain comprise the second largest diagnostic group seeking care from their general practitioners and make up one third of all orthopaedic outpatient visits. Thus lower back pain is a common condition which requires effective treatment intervention.

A study undertaken by Meade (1986) has shown chiropractic manipulation to be more effective than medicine in treating mechanical lower back pain conditions. Some chiropractors such as Taylor (1978), believe that McManis traction is a very effective adjunct to the chiropractic management of low back pain. Traction is commonly used by physical therapists for treatment of back pain conditions but has had few satisfactory results (Pal et al. 1986). It is therefore worth reviewing the studies and claims regarding traction and investigating the relative effectiveness of McManis traction as an adjunct to spinal manipulation.

2.2. THE MAGNITUDE OF LOW BACK PAIN

According to Andersson et al. in Pope etal.(1991:91), epidemiological research in low back pain is hampered owing to little objective evidence of the cause/s of back pain conditions, and there is therefore no uniformly accepted definition, diagnosis and classification. The intermittent nature of back pain complicates studies on prevalence, and patient recall is often poor, while studies on disability are influenced by legal and socioeconomic factors (Andersson et al. in Pope et al. 1991: 95).

Cassidy and Wedge in Kirkaldy-Willis (1988: 4) state that it is generally accepted that lower back pain affects between 60% and 80% of the population at some stage in their lives, while between 20% and 30% suffer from low back pain at any given time. Rowe (1969) in a study of employees at a plant in New York over a ten-year period, found that lower back pain was second to upper respiratory tract illness in terms of sick leave and that between 35% (sitting workers) and 47% (workers with physically heavy work) of workers had made visits to the medical department because of lower back pain during this study period. Despite the problems of epidemiological research, it is clear that low back pain has a high prevalence and incidence.

Because low back pain carries a negligible risk of mortality and therefore has until fairly recently been awarded relatively less medical concern.

2.3. WORK ABSENTEEISM AND COST

Cassidy and Wedge (1988: 7) refer to industrial studies which show that more than half of the working population will be affected by low back pain at some stage in their working career. In a controlled prospective study, conducted by Bergquist-Ullman and Larsson (1977), of 217 patients with acute or subacute back pain, with special reference to therapy and confounding factors, it was found that the mean duration of back pain in one year was 60 days, whereas the duration of sick-leave following the initial incident for the 184 compliant patients was 21 days, while the mean duration of absence from work in one year due to recurrences in 151 of these patients was 16 days. In a review of the literature, Andersson et al. (1991) found that back injuries accounted for 21% of compensationable work injuries but averaged 33% of the total compensationable cost. Total compensation costs in the United States for low back pain in 1988 were estimated at $4.6-13.4 billion and $6,000 per case, where 25% of cases accounted for 90% of the cost.

Although compensation costs comprise only a small part of the total societal cost of low back pain, it is evident that a small percentage of low back pain patients account for a relatively large proportion of total compensation costs. Education on prevention and effective treatment intervention is necessary for the 25% responsible for the high health expenditure.

2.4. THE HISTORY OF TRACTION AND McMANIS TRACTION

Hippocrates (400BC) used a method of traction where the patient was bound with bands at the head, pelvis, knees and ankles and then stretched. Medieval traction resembled that which was performed by Hippocrates and was used by the Arabs, Turks, French, Italians, Greeks and Eastern nations (Taylor 1978). Traction was and still is successfully used to treat unstable fractures of the cervical spine and to ensure immobilization of any portion of the spine while allowing application of distractive forces as desired (Kekosz et al. 1986). Cervical and lumbo-pelvic traction is commonly prescribed for relief of both neck and low back pain and although scientific validation of the efficacy of traction is scant, considerable empirical benefit has been observed (Kekosz et al. 1986). Traction is most commonly applied either manually, mechanically by means of weights and a pulley system, or assisted by gravity.

McManis, an osteopath, patented a table in 1909 which was designed for many purposes such as surgery, ear/nose and throat examination, gynaecological examination, and manipulation. This table, known as the McManis Table, allows for multi-directional movements, namely forward flexion, lateral flexion, extension, rotation and axial traction of the spine and sacro-iliac joints (Cleveland 1992: 477-478).

In the early 1970s, Cox developed the Zenith-Cox table which was, according to him, a blending of osteopathic and chiropractic principles into one unit and constituted a form of spinal manipulative therapy (Cox 1990:481). This table is seen to be a modern version of the McManis table and is used by some chiropractors for lumbar traction (Cleveland 1992: 477).

2.5. TECHNIQUES OF TRACTION AND McMANIS TRACTION

Cox (1992: 508) lists the following traction techniques: static, constant, continuous, intermittent, gravity traction, manual distraction and Cox-distraction manipulation (alternatively known as McManis traction).

Cox (1990: 488-498, 234-236, 457-458, 603-604 and 574-575) and Taylor (1978) have both advocated similar methods of McManis traction application.

Cox (1992: 510-511) stresses the importance of testing patient tolerance to McManis traction. The patient lies prone on the McManis table. The cuffs are not placed on the patient and a downward tractive force with the caudad section of the table is then applied. This means that the patient's pelvic and lower extremity weight is the major force used to distract the caudal section downward. Each lumbar segment is then tested in straight flexion and lateral flexion. If lower back or lower extremity pain exists, the cuffs are not placed on the patient and the use of this traction technique should be avoided. If no pain is felt using the patient's weight as a tractive force, the doctor proceeds to test left and right spinal distractive tolerance of the facet joints. This is achieved by grasping the right ankle and tractioning the right facets as contact is made with the doctor's hand over the right facet joints. This is repeated on the left side. If no pain exists, treatment may continue. The patient's ankles are strapped to the caudad end in padded cuffs. The patient may either hold onto a bar at the cephalad end of the table or be fastened in the desired position by a breast harness. Flexion-distraction is applied until the doctor feels tautening of the muscles over the area of interest. The doctor applies a thenar contact on the spinous process directly above the involved area, pushing cephalically in a pumping motion. The other hand flexes and pumps the caudad end of the table. Care must be taken to monitor patient tolerance and avoid excessive flexion which may cause tissue injury. Cox (1990: 455) recommends not more than two inches of flexion distraction with the caudal section for the lumbar spine.

Taylor (1978) bases his technique on the presenting lesion, the type of lumbar curve, the disc space and other factors which will determine into which category the patient's clinical condition fits for the initial caudad-axial line of traction: A) level or horizontal; B) above the horizontal (5-25°) and C) below the horizontal (5-35°). All movements which follow are done under stretch around the above mentioned angles. Patients classified into group A) exhibit signs of lumbar spine degenerative spondyloarthrosis as seen on X-Ray. According to Taylor the elderly with or without arthrosis, where there has been a loss of normal joint play derive great benefit from this type of mobilization. Patient classified into group B) exhibit parallel endplates and enlarged intervertebral foramina as seen on X-ray. The nucleus palposus is "off-centred" posteriorly predisposing to a posterior or postero-lateral disc bulge or herniation. Patients classified into group C) commonly have hyperextended lumbar spines associated with facet subluxation and spinous impingement accompanied by arthrosis.

The distal half of the table is hinged so as to allow also for lateral flexion and/or rotational movements. Taylor has designed this method for the different effects that the initial line of traction has on the lumbar spine. Taylor, however, does not test patient tolerance but does recommend that the patient lie on the table for a while before getting off so as to reduce any adverse effects from a stretch reflex.

2.6. DURATION OF TRACTION APPLICATION

According to Saunders (1983) the time of spinal traction should be kept short, as intradiscal pressure drops under traction. This decrease in pressure is maintained for short periods only after which the osmotic forces equalize pressure with that of surrounding tissue. This halts the suctioning effect, and a continuation of traction might have a detrimental effect as according to Kessler (1979) this may stimulate absorption of additional fluid by the nucleus, and subsequent development of high intradiscal pressure as the distractive force is released, which could result in increased symptoms, and the suctioning effect on a disc protrusion could be lost. It is found that a treatment time of less that ten minutes or sustained treatment less than eight minutes has no detrimental effect.

McElhannon (1985) is of the opinion that the patient must receive static traction for three consecutive days at the beginning of care, followed by intermittent traction three times per week until the desired effect has been achieved, holding for 30 seconds and releasing for 10 seconds. He maintains that initial static traction given allows the muscles and ligaments to adapt to the force. This is the treatment of choice in acute disc herniations with severe muscle spasm and acute radiculitis. This is in contrast to what Saunders (1983) and Kessler, believe especially when treating an acute disc herniation, but McElhannon (1985) does state that an increased radicular pain or soreness may be felt after the initial treatment. Saunders (1983) advocates longer hold-rest periods of intermittent traction (60-second hold, 20-second rest) for disc protrusions and shorter hold-rest periods of intermittent traction for joint dysfunction and degenerative disc conditions.

Cox (1990: 488,234,575) commonly suggests an application of up to three 20-second sets of flexion-distraction where five-six pumping actions are performed for disc protrusions, sacroiliac joint syndromes and spondylolisthesis. The duration of treatment application for a facet syndrome depends on the fixation or the normal range of mobility elicited by the doctor as he or she performs the manipulation. Once a feeling of free flexion motion has been achieved, other ranges of motion are applied to specific levels (Cox 1990: 457). Taylor (1978) recommends that traction be given for not longer than four minutes as spasm commences resulting in a delayed pain experienced by the patient. Taylor advocates four to six treatments given twice a week. In Cox and Shreiner's study (1984) of 576 patients using McManis traction, 50% relief of pain was seen after 14,4 days and 9,5 treatments. Maximum improvement was seen after 42,8 days and 18,6 treatments. This study was, however, an observational pilot study to compile statistics on diagnosis, treatment and response of 576 consecutive patients presenting with low back pain and/or leg pain. Back pain was primarily mechanical in origin. Of the 576 patients, 283 conditions were acute or traumatic, while 246 complained of pain of insidious onset and 47 could not describe the pain in the given terminology. No controls were used.

It is evident from the literature that there is no uniform agreement as to the length of time that traction should be given for treatment purposes; however, shorter intervals of traction are possibly of greater benefit.

2.7. SOME CLAIMS REGARDING TRACTION AND McMANIS TRACTION

According to Cox (1990: 481), the Zenith-Cox table is used as a form of spinal manipulative therapy which exhibits tractive effects. This is a form of McManis traction which exhibits the same basic principles.

McElhannon (1985) believes that traction, in general, of the lumbar spine has basically four capabilities:

1) enlargement of the intervertebral disc space;
2) tautening of the posterior longitudinal ligament to create a centripetal force on the annulus fibrosis;
3) separation of the apohyseal joints; and
4) enlargement of the intervertebral foramina.

According to Cailliet (1988: 130) traction applied to a flexed lumbar spine increases the size of the intervertebral foramina, decreases the compressive forces on the facet joints, thereby maximizing patient comfort, and elongates the erector spinae muscle while relaxing the psoas muscle.

Cox (1992: 503) refers to traction in general as a multi-level traction force applied to the spine, while distraction is a doctor-controlled tractive force applied to a specific level of the spine. Thus the benefit of McManis traction over other forms of traction, is that it appears to be more specific. Mechanized forms of static or intermittent traction applied by means of weights and a pulley system to a non-uniform structure such as the spine results in the weakest joints receiving the greatest tractive, stretch thereby inflicting greater stress to an already hypermobile segment, while failing to produce motion at a hypomobile site. Cox (1990: 481) claims the following effects from Mcmanis traction:

a) an increase in the intervertebral disc height which will remove annular distortion on the peripheral pain-sensitive annular fibres;
b) it allows the nucleus pulposus to assume a more central position within the annulus and thus relieves irritation on the pain sensitive annular fibres;
c) it restores vertebral joints to their physiological relationships of motion and
d) creates a state of well-being by improving posture, locomotion and body functions while relieving pain.

Cox does not offer any evidence to support these claims.

Taylor (1978) is of the opinion that traction exerts the following effects:

a) freeing of longitudinal adhesions by stretching the paraspinal muscles;
b) ligaments are stretched and exercised thereby increasing the tensile strength;
c) freeing of articular facet fixations and increasing the range of movement

between adjacent vertebrae;

d) reduction of the hydrostatic pressure within the nucleus pulposus, thereby reducing the bulging of the annulus fibrosis;

e) improves blood supply and fluid interchange of tissues and thus aids in nutrition to the surrounding structures;

f) redistributes fragments of the disc which may be irritating the nerve root; and

g) re-establishes normal movement of the dural root sleeve where it has become fibrotic or adherent to part of the nerve complex.

The McManis table used in this study offers a straight caudad-axial stretch and movement in the vertical and horizontal planes. Combinations of these movements can be achieved so that circumductory movements are possible. These multi-axial joint movements made possible by the swinging leaf are available for the restoration of "joint play", which is necessary for efficient biomechanical function (Taylor 1978). Taylor also emphasises the varying effects of McManis traction given from different angles on a normal lumbo-sacral curve. Traction from the horizontal level only slightly opens the intervertebral foramen (IVF), reduces the lumbar curve and mildly stretches the apophysial joints. Traction beginning at 5-20° above the horizontal increases the lumbar curve, closes the IVF, the apophysial joints slightly override, and the nucleus pulposus moves anteriorly and away from the IVF. Traction beginning at 5-35° below the horizontal significantly reduces the lumbar curve and opens the IVF and apophysial joints, while the nucleus pulposus moves posterior and towards the IVF. When the swinging section with the desired caudad-axial extension is swung to the left, the right articulating facets diverge, while the left articulating facets converge. There is movement of the nucleus pulposus to the right, while the left IVF reduces in size and the right IVF opens. The opposite occurs when the swinging section of the table is swung to the right. Taylor does not give evidence in support of these claims.

Cox (1979) achieved excellent results in 82% of 67 subjects with lumbar disc lesions and spinal stenosis using Cox flexion-distraction and range of motion techniques. Cox and Shreiner (1984) conducted an uncontrolled observational pilot study of 576 patients with low back and/or leg pain using Cox flexion-distraction. Response to treatment was as follows: 50% showed an excellent outcome, 14% very good, 11% good, 6% fair, 4% poor and 3% underwent surgery, while 10% stopped or did not start treatment, and 1% were not treated based on contraindicating examination findings. They did not account for the other 1%.

2.8. THE RELATIVE EFFECTIVENESS OF OTHER FORMS OF TRACTION

McManis traction is a manually controlled form of intermittent traction applied to specific levels of the lumbar spine with the patient positioned on a table designed for its application. Other forms of traction differ from this form in that they are generally mechanized forms of static, continuous, intermittent or gravity-assisted forms of traction applied non-specifically to, for example, the cervical spine or lumbar spine for longer time periods than even the intermittent form of mechanized traction.

According to Mathews and Hickling (1975), traction is given for many thousands of patient-hours annually at considerable cost in time and inconvenience to both patients and physiotherapists. They undertook a small double-blind control study for sciatica where traction was given to the experimental group for 30 minutes daily, five days a week for three consecutive weeks. The control group received the same routine except that the traction force applied did not exceed 9,1 kgs, an amount insufficient to overcome the inherent friction of the system used. No statistically significant difference was demonstrated between the groups.

Pal et al. (1986) found that in a controlled trial of continuous lumbar traction for the treatment of back pain and sciatica, both treated and control groups showed similar improvements. These findings question the justification of continuous static traction.

Van der Heijden et al. (1995) conducted a systematic analysis of the literature to assess the efficacy of traction for neck and back pain. Due to methodological flaws and small sample sizes conclusions could not be drawn about wether a specific traction modality for back or neck pain is effective, or more effective than other conservative care. There are no clear indications that traction is an ineffective therapy for back and neck pain. (Van der Heijden et al. 1995)

2.9. THE EFFECTIVENESS OF SPINAL MANIPULATION

Conclusions drawn by reviewers of the twenty five prospective randomized clinical trials of assessing the efficacy of spinal manipulative therapy for the treatment of low back pain have not been unanimous. Nevertheless, there is relative agreement that spinal manipulative therapy is a fairly safe therapeutic approach that in many cases offers more immediate relief than other forms of conservative therapy. it is generally agreed that long-term benefits of spinal manipulative therapy have not yet been conclusively demonstrated. (Bronfort in Haldeman 1992: 420) In a study undertaken by Meade et al. (1990) it was found that chiropractic treatment was in the long term more effective than hospital outpatient management, mainly for patients with chronic or severe mechanical lower back pain.

Cox (1990) referred to a controlled clinical trial carried out by Rupert et al. The goal was to evaluate the efficacy of chiropractic adjustments in the treatment of low back pain in 148 Egyptian workers. Subjects were randomly assigned to one of three treatment regimens - chiropractic adjustments, drugs and bed rest, and placebo. Chiropractic treatment was associated with the greatest improvement.

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

Kirkaldy-Willis and Cassidy (1988: 294) completed a prospective observational study where they treated 283 subjects who presented with chronic lower back and leg pain and concluded that manipulation is of considerable value in carefully selected subjects. They emphasise the need for an accurate diagnosis which includes defining the clinical lesion and the phase in which the clinical lesion presents. The most definite indication is to treat mechanical conditions presenting in the phase of dysfunction. Most of the 283 cases were treated for dysfunction, and no subjects were made worse by manipulation.

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

Kirkaldy-Willis (1988: 294) is of opinion that it is more convenient to identify categories in which manipulation is clearly and definitely the treatment of choice, and those in which it is less clearly indicated, and classify the diagnosis accordingly. He concludes that manipulation is of considerable value in carefully selected subjects.

2.10. CONTRA-INDICATIONS OF SPINAL MANIPULATIVE THERAPY

Triano et al in Haldeman (1992) refers to the absolute contra-indications as being vertebral malignancy, Tuberculosis of the spine, osteomyelitis, infectious arthritis acute vertebral fracture, extreme osteoporosis and extensive disc prolapse with evidence of severe nerve damage. They refer to relative contra-indications as being some cases of osteoarthritis, disk prolapse, spondylolisthesis, hypermobility, severe scoliosis, vertebral insufficiency, haemangioma, metabolic bone disease, diabetic neuropathy.
Cassidy et al. in Kirkaldy-Willis and Burton (1993) refer to the relative contra-indications as being osteopenia, spondyloarthropathies, bleeding disorders and psychological overlay where a modification of technique or more gentle mobilizing procedure should be employed. The absolute contra-indications include destructive lesions of the spine, ribs and pelvis,

healing fracture and dislocation of the spine, cauda equina syndrome, large abdominal aneurysm, visceral referred pain.

2.11. INDICATIONS AND CONTRA-INDICATIONS OF TRACTION AND McMANIS TRACTION

2.11.1. Indications

Cox (1992: 510-511) lists the following as indications for flexion-distraction:

Intervertebral disc herniation with postero-lateral disc protrusion (medial protrusions are contra-indicated);

Facet subluxation complexes

- Degenerative disc disease
- Facet hyperextension subluxation with facet imbrication
- Stenosis in which the lateral recess is narrowed by hypertrophic facet arthrosis
- Spondylolisthesis
- Retrolisthesis subluxation

Hinterbuchner in Basmajian (1985: 189) is of the opinion that chronic lumbago and lumbago with sciatica are indications for traction but fails to define these terms.

Cyriax (1984) states that post-surgical return of pain is an indication for traction.

Finally, Kekosz et al. (1986) includes degenerative disc disease with or without nerve root irritation and paravertebral muscle spasm and comments that traction increases the vertical and sagittal diameter of the intervertebral foramina which relieves nerve root compression.

McManis traction is indicated for the restoration of joint play movements of the spine and sacroiliac joints which have been impaired (Taylor 1978).

2.11.2. Contra-indications

Cox (1992: 511) emphasises the importance of an adequate investigation, pointing out that the following conditions should not be subjected to traction: acute traumatic injuries (soft tissue, fractures); instability; increased pain on testing patient tolerance; and increased pain after long periods of relaxation.

According to Kekosz et al. (1986), the

following must be considered:

spinal malignancy;

severe cardiovascular disease (angina, atherosclerosis - vascular insufficiency of the lower extremity);

rheumatoid arthritis;

spondylitis which includes ankylosing spondylitis, psoriatic arthritis and Reiter's syndrome;

osteoporosis;

spinal infection;

large central disc protrusion and/or cord compression;

aortic aneurysm;

pregnancy;

involuntary head and neck movements;

uncooperative subjects.

According to Cox (1992: 511), McManis traction can be applied to the lumbar spine with the woman lying in the side posture.

Cyriax (1984) maintains that lumbago with severe pain on movement should not be treated with traction.

Hinterbuchner in Basmajian (1985: 191,192) is of the opinion that old age and cord compression are contra-indicated.

Taylor (1978) adds that menopausal trophoblastic syndrome, abdominal hernias, recent abdominal operations, recent spinal operations, osteoporosis and radical structural scoliosis are contra-indications for traction. He states that young children seldom need traction, while the elderly require careful and exact application.

Till (1993) in a personal communication suggests that persons on anti-coagulant therapy should be included in a list of contra-indications.

Cox (1992: 484) states that where the patient is aware of back or extremity pain on testing patient tolerance to flexion distraction, minimal flexion should be given to the lumbar spine.

2.12. COMPLICATIONS OF McMANIS TRACTION

According to Cox (1990: 489), the patients might have a feeling of weakness or lower back discomfort when swollen or irritated tissues have been tractioned. Taylor (1978) is of opinion that when McManis traction has been administered for longer than the recommended four minutes, this introduces "fatigue" into the muscular ligamentous structures and often exacerbates the existing symptoms which may persist for 48 hours before remission of the pain occurs. Personal communication with Till (1994) revealed that the patient may feel stiff or sore for a few days following treatment.

2.13. AN OUTLINE OF THE KIRKALDY-WILLIS DIAGNOSTIC CLASSIFICATION

The dysfunction phase:

- Posterior facet syndrome
- Sacroiliac syndrome
- Maigne's syndrome
- Myofascial syndromes of which the following muscles will be included: gluteus maximus, gluteus medius, gluteus minimus, quadratus lumborum, piriformis, tensor fasciae latae and hamstring
- Disc herniation.

The unstable phase:

- Disc herniation
- Facet and disc degeneration

- Lateral stenosis
- Central stenosis

The phase of Stabilization:

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

(Kirkaldy-Willis 1988:134)

Kirkaldy-Willis and Cassidy (1988: 294-296), in their prospective uncontrolled observational study of 283 subjects who were treated for chronic lower back and leg pain, noted that the best results were obtained in subjects with dysfunction due to posterior joint or sacroiliac syndrome and that the most definite indication is to treat phase of dysfunction. It is therefore imperative to make an accurate diagnosis of the presenting mechanical disorder. This includes defining the clinical lesion and the phase in which the clinical lesion presents.

2.14. SUMMARY

Studies such as those done by Meade et al. (1990), Kirkaldy-Willis and Cassidy (1988: 294-296), and Phillip (1992) would indicate that spinal manipulative therapy is of value in the treatment of mechanical lower back pain.

A review of the literature on traction reveals that there seems to be little scientific evidence as to what effect traction has physically on the spine or clinically on pain, although according to Kekosz (1986) much empirical benefit has been observed.
It would appear that traction of the lumbar spine in a flexed position is effective and that short traction periods given intermittently are safe and possibly of greater value than prolonged periods of traction. Both these principles are fundamental to McManis traction.

Indications and contra-indications to traction are clearly described and as the principles of traction are fundamental to McManis traction, these indications/contra-indications can be applied to Mcmanis traction. Review of the related literature reveals that no clinically controlled studies pertaining to the effectiveness of McManis traction have been done, although the uncontrolled clinical studies done by Cox (1979), Cox and Shreiner (1984) and Taylor (1978) would indicate that it is of value in the treatment of mechanical lower back conditions.

CHAPTER THREE

3. MATERIALS AND METHODS

3.1. THE DATA:

The data used were of two kinds: primary and secondary data.

3.1.1. The primary data

The primary data included:

a) the case history, physical examination and radiographic findings of subjects used in the study;

b) the response of the experimental group to manipulation and McManis traction in terms of pain and disability scores;

c) goniometer readings of all lumbar spine ranges of motion except rotation;

d) the response of the control group to manipulation only, in terms of disability and pain scores, and range of motion;

e) and questionnaires pertaining to pain and disability (Appendix X, U & V)

3.1.2. The secondary data

The secondary data included the Kirkaldy-Willis model for classification of mechanical lower back disorders (see literature review).

3.2. CRITERIA GOVERNING THE ADMISSIBILITY OF THE DATA

Mechanical lower back pain conditions were screened for by means of a comprehensive case history, physical examination and regional examination as taught at Technikon Natal, while radiographic findings helped to confirm the diagnosis and identify contra-indicating features as referred to in the literature review. The above-mentioned procedures were monitored by a supervising clinician.

The mechanical conditions were diagnosed in terms of the Kirkaldy-Willis model of classification of mechanical lower back disorders (Kirkaldy-Willis 1988: 134).

The Oswestry Back Disability Index (Appendix X), Short Form McGill Pain Questionnaire (Appendix U) and Numerical Pain Rating Scale 101 (Appendix V), which were used for the assessment of the subjective response to treatment, are universally accepted as being relatively valid and reliable. (McDowell and Newell 1987: 239-240,245-249).

X-Rays were taken by a radiographer and analyzed by the author under supervision of a chiropractor and medical radiologist.

3.3. METHODOLOGY AND MATERIALS USED

The object of this study was to evaluate the relative effectiveness of techniques used in managing mechanical lower back disorders. An advertisement was placed in the *Natal Mercury* for free treatment of subjects experiencing lower back pain who would be willing to participate in a research programme. Applicants were screened for after which successful applicants had the research protocol explained to them and were then required to sing an informed consent form (Appendix W). They were screened by means of a case history, a physical examination and a radiographic examination for the phase of dysfunction as outlined by Kirkaldy-Willis. Successful applicants were immediately assigned to either the experimental or control group by a pre-established random sampling method. This involved assigning a number 1 to 6 to six groups all with varying orders of treatment. By rolling a dice prior to the study the author was able to select randomly the treatment that the patients would undergo. There were two groups of fifteen subjects each where the control group received spinal adjustment and the experimental group spinal adjustment in combination with McManis traction.

Both the experimental and the descriptive survey method, respectively involving observation and questionnaire design, were the methods used to obtain the necessary data. The experimental method involved a single variable design where forward flexion, right and left lateral flexion and extension of the lumbar spine was measured at the onset of treatment and then after the third, sixth, ninth and a one month follow-up by a goniometer : Autogon 2 supplied by Smith and Nephew Rolyan Inc. (N93W14475 Whittalou Way, P.O. Box 555, Menomonee Falls WI 53051).

Patient disability was measured by the Oswestry Low Back Disability Questionnaire, while the nature and extent of pain was measured by the Short-Form McGill Pain Questionnaire and a Numerical Pain Rating Scale 101 at the above-mentioned intervals.

The indicated level for spinal adjustment was identified by motion palpating the lumbar spine and sacroiliac joints for a lack of joint play or abnormal vertebral motion, radiographic findings such as vertebral malposition and associated soft tissue findings such as muscle spasm or localized tenderness. The involved area was adjusted according to these findings using the diversified technique (Szaraz 1990). The type of adjustment (see definition of terms: diversified technique) decided upon was determined according to the mechanical dysfunction with which the subject presented. When the author found difficulty adjusting the subject, she was assisted by the supervising clinician. In the experimental group McManis traction followed spinal adjustment.

This order might or might not have made a difference to the treatment outcome; however, it was reasoned that the purpose of this study was to investigate whether McManis traction made a difference to the outcome of chiropractic spinal manipulative therapy and therefore that McManis traction was given after the spinal adjustment.

The Astro McManis AH from the Loyd Table Company (101-102 W. Main Street, Lisbon, Iowa 52253-0899) was used for this study (plate 1). This table consists of a head section, middle section or chest cushion, a lumbar cushion, a pelvic cushion and an ankle rest pad. The head section involves two split-leaf cushions with an adjustable opening for the face, and can be angled superiorly, inferiorly and/or at an angle with respect to the horizontal. The middle section or chest cushion is designed to accommodate large and small abdomen patients along with the versatility of being a stationary or floating cushion and this cushion has the ability to be tilted up or down. This section incorporates an I-Frame extension-retraction facility so as to adjust the table for the patient's height. A narrow lumbar cushion also allows for length adjustment of the table and can be extended, retracted or removed for tall or short patients. The pelvic cushion is designed with the capability of rotation, lateral and anterior flexion. The ankle rest can be adjusted in the superior and horizontal directions and is fitted with ankle straps which aid in holding the patient in position during traction. A T-bar is fitted between the pelvic cushion and ankle rest and is used to give the doctor leverage during the procedure of manual spinal flexion and circumduction.

Starting at the horizontal line of traction, three sets of five to six vertical flexion-distractions were given to each lumbar segment (plate 2) in slow succession with each set lasting 20 seconds, followed by a set of lateral flexion-distraction to the left and right sides.

Plate I: The McManis Table used in this study

Plate 2: McManis flexion-distraction administered to a subject

This set involved three motions of left lateral flexion-distraction and three motions of right lateral flexion-distraction. Where mild to moderate pain was experienced to one side more than the other, a slight reduction in the swing leaf movement to that specific side was indicated; that is, to patient tolerance. Where severe pain was experienced, the lateral flexion motion was used only in the direction of no pain. This sequence of McManis traction was given to every patient in order to ensure consistency throughout the experimental group. The author admits that McManis traction might have been given to the involved segment/s only for the same reason that spinal adjustment was administered to only the involved segment/s.

Screening of the disability questionnaire was done to determine whether all sections were completed. For each section the total possible score was 5. If the first statement was marked, the section score was equal to 0. If the last (or sixth) statement was marked, the score was 5, and if the fourth statement was marked the score was 3. If all sections were completed, the score was calculated out of 50 and converted to a percentage. If one section was incomplete, then the score was calculated out of 45 and converted to a percentage. A high score indicated severe disability, while a lower score indicated relatively less disability. Scores were collected at each interval but the author was specifically interested in the progression over the first, last and follow-up consultations. Therefor, the average percentage score for each group before the onset of treatment, after nine treatments and after one-month post-treatment follow-up was calculated and compared within and between each group using the paired and unpaired T-Tests respectively.

The average of the sensory, affective and total pain scores for the Short-Form McGill Pain Questionnaire was calculated for each group for before the onset of treatment, after nine treatments, and for after the one-month post-treatment follow-up. A comparison was made within and between the groups for these intervals. The method used to score this questionnaire was to total the individual marks allocated to each description of sensory pain, affective pain and total pain score. The averages of these scores were then calculated for each group at the above-mentioned intervals and compared between and within the two groups using the Mann-Whitney U-test and Wilcoxon test for matched pairs.

For the Numerical Pain Rating Scale 101 the patient was asked to write on a line how bad the pain was when it was at its least and on another line how bad the pain was when it was at its worst, with zero meaning "no pain at all" and one hundred meaning "pain as bad as it could be". An average of the two scores was calculated and totalled up for each group and then divided by fifteen to obtain an average score for each group at the specified intervals.

These averages were compared within and between each group using the paired and unpaired T-Tests respectively.

The subject's initial ROM was used as a baseline with which further readings were compared. The average reading before the onset of treatment, after nine treatments and after one-month post-treatment follow-up was calculated and compared within and between each group using the paired and unpaired T-Tests respectively. Statistical analysis of the data was used to determine any significant differences between the measurements of the two groups, and in this way conclusions were drawn as to the relative effectiveness of the treatment given.

This clinical trial had a total of four "dropouts"; two owing to illness, and two who were non-compliant.

Confidentiality of data: Information derived from subjects in this study was dealt with in the same manner as information derived from any usual patient attending the Technikon Natal Chiropractic Clinic.

3.4. THE SPECIFIC TREATMENT OF THE DATA OF SUBPROBLEMS ONE AND TWO

3.4.1. Data needed and secured

The data needed for testing the hypotheses of subproblem one and two were the response of subjects to the disability and pain questionnaires (Appendix X,U & V) and goniometer measurements of the lumbar spine range of motion as taken by the author.

The questionnaires were completed under the author's supervision and collected by the author.

3.5. THE SPECIFIC TREATMENT OF THE DATA OF SUBPROBLEM THREE

The integration of the data obtained from subproblems one and two (see discussion and recommendations).

CHAPTER FOUR

4. **RESULTS**

4.1. RESULTS OF THE UNPAIRED T-TESTS

Table 1: A comparison of the mean (X) and standard deviation (SD) of the initial results of the experimental and control groups, before treatment commenced for the Oswestry Back Disability Index (OBDI)

	O B D I		
	X	SD	95 % CI
Experimental	17.3107	9.88385	-4.31814 , 11.6301
Control	20.9667	11.3805	-4.31814 , 11.6301

Comparison of the initial OBDI results between the experimental and control groups indicated no significant statistical difference (p=0.35557).

Table 2: A comparison of the mean (X) and standard deviation (SD) of the results after nine treatments of the experimental and control groups, for the Oswestry Back Disability Index (OBDI)

	O B D I		
	X	SD	95 % CI
Experimental	11.5773	10.2066	-9.34291 , 4.78824
Control	9.3	8.61436	-9.34291 , 4.78824

Comparison of the OBDI results after nine treatments between the experimental and control groups indicated no significant statistical difference (p=0.514403).

Table 3: Comparison of the mean (X) and standard deviation (SD) of the results after one-month post-treatment follow-up of the experimental and control groups for the Oswestry Back Disability Index (OBDI)

	O B D I		
	X	SD	95 % CI
Experimental	11.8	9.50338	-7.41545 , 6.54878
Control	11.2667	18.88391	-7.41545 , 6.54878

Comparison of the OBDI results after one-month post-treatment follow-up between the experimental and control groups once again indicated no significant statistical difference (p=0.874982).

Table 4: Comparison of the mean (X) and standard deviation (SD) of the initial readings of the experimental and control groups for the range of motion in forward flexion (ROMFF)

	R O M F F		
	X	SD	95 % CI
Experimental	116.067	29.5501	-24.5139 , 19.6406
Control	113.6	29.5485	-24.5139 , 19.6406

Comparison of the initial ROMFF readings between the experimental and control groups indicated no significant statistical difference (p=0.82083).

Table 5: Comparison of the mean (X) and standard deviation (SD) of the experimental and control group readings after nine treatments for the range of motion in forward flexion (ROMFF)

	R O M F F		
	X	SD	95 % CI
Experimental	125.067	21.5289	-23.8533 , 7.58661
Control	116.933	20.4816	-23.8533 , 7.58661-

Comparison of the ROMFF readings after nine treatments between the experimental and control groups indicated no significant statistical difference (p=0.29817).

Table 6: Comparison of the mean (X) and standard deviation (SD) of the experimental and control group readings after one-month post-treatment follow-up for the range of motion in forward flexion (ROMFF)

	R O M F F		
	X	SD	95 % CI
Experimental	125.933	15.4062	-19.2437 , 5.77707
Control	119.2	17.9412	-19.2437 , 5.77707

Comparison of the ROMFF readings after one-month post-treatment follow-up between the experimental and control groups once again indicated no significant statistical difference (p=0.279524).

Table 7: Comparison of the mean (X) and standard deviation (SD) of the initial readings of the experimental and control groups for the range of motion in right lateral flexion (ROMRLF)

	ROMRLF		
	X	SD	95 % CI
Experimental	18.1333	7.3277	-3.095 , 7.13429
Control	16.0667	6.16982	-3.095 , 7.13429

Comparison of the initial ROMRLF readings between the experimental and control groups indicated no significant statistical difference (p=0.410468).

Table 8: Comparison of the mean (X) and standard deviation (SD) readings of the experimental and control groups after nine treatments for the range of motion in right lateral flexion (ROMRLF)

	R O M R L F		
	X	SD	95 % CI
Experimental	19.2667	5.39135	-2.43729 , 5.77062
Control	17.6	5.57082	-2.43729 , 5.77062

Comparison of the ROMRLF readings after nine treatments between the experimental and control groups indicated no significant statistical difference (p=0.412405).

Table 9: Comparison of the mean (X) and standard deviation (SD) of the experimental and control groups readings after one-month post-treatment follow-up for the range of motion in right lateral flexion (ROMRLF)

	ROMRLF		
	X	SD	95 % CI
Experimental	19.667	5.62731	-19.9768 , 8.9101
Control	25.2	26.716	-19.9768 , 8.9101

Comparison of the ROMRLF readings after one-month post-treatment follow-up between the experimental and control groups once again indicated no significant statistical difference (p=0.439082).

Table 10: Comparison of the mean (X) and standard deviation (SD) of the initial readings of the experimental and control groups for the range of motion in left lateral flexion (ROMLLF)

	R O M L L F		
	X	SD	95 % CI
Experimental	23.9333	12.9861	-13.0094 , 1.80935
Control	18.4444	5.24631	-13.0094 , 1.80935

Comparison of the initial ROMLLF readings between the experimental and control groups indicated no significant statistical difference (p=0.132719).

Table 11: Comparison of the mean (X) and standard deviation (SD) of the readings of the experimental and control groups after nine treatments for the range of motion in left lateral flexion (ROMLLF)

	ROMLLF		
	X	SD	95 % CI
Experimental	21.8667	5.46243	-4.74852 , 2.61519
Control	20.08	4.31277	-4.74852 , 2.61519

Comparison of the ROMLLF readings after nine treatments between the experimental and control groups indicated no significant statistical difference ($p=0.132719$).

Table 12: Comparison of the mean (X) and standard deviation (SD) of the experimental and control groups readings after one-month post-treatment follow-up for the range of motion in left lateral flexion (ROMLLF)

	ROMLLF		
	X	SD	95 % CI
Experimental	23.8667	7.19987	-9.47682 , -0.389849
Control	18.9333	4.68229	-9.47682 , -0.389849

Comparison of the ROMLLF readings after one-month post-treatment follow-up between the experimental and control groups indicated a statistical difference (p=0.0343367).

Table 13: Comparison of the mean (X) and standard deviation (SD) of the initial readings of the experimental and control groups for the range of motion in extension (ROME)

	R O M E		
	X	SD	95 % CI
Experimental	32.4667	12.6427	-5.54723 , 10.3472
Control	34.8667	8.11407	-5.54723 , 10.3472

Comparison of the initial ROME readings between the experimental and control groups indicated no significant statistical difference (p=0.541084).

Table 14: Comparison of the mean (X) and standard deviation (SD) of the experimental and control group readings after nine treatments for the range of motion in extension (ROME)

	ROME		
	X	SD	95 % CI
Experimental	33.2667	14.2052	-6.69235 , 10.959
Control	35.4	8.5404	-6.69235 , 10.959

Comparison of the ROME readings after nine treatments between the experimental and control groups indicated no significant statistical difference (p=0.292485).

Table 15: Comparison of the mean (X) and standard deviation (SD) of the experimental and control group readings after one-month post-treatment follow-up for the range of motion in extension (ROME)

	R O M E		
	X	SD	95 % CI
Experimental	33.2667	14.3052	-6.69235 , 10.959
Control	35.4	8.58404	-6.69235 , 10.959

Comparison of the ROME readings after one-month post-treatment follow-up indicated no significant statistical difference (p=0.495255).

Table 16: Comparison of the mean (X) and standard deviation (SD) of the initial scores of experimental and control groups for the Numerical Pain Rating Scale 101 (NRS)

	N R S		
	X	SD	95 % CI
Experimental	38.375	19.5895	-11.4009 , 19.6943
Control	48.1476	21.9086	-11.4009 , 19.6943

Comparison of these initial readings between the groups indicated no significant statistical difference (p=0.589082).

Table 17: Comparison of the mean (X) and standard deviation (SD) of the results of the experimental and control groups after nine treatments for the Numerical Pain Rating Scale 101 (NRS)

	N R S		
	X	SD	95 % CI
Experimental	32.3333	28.2405	-23.5945 , 13.5945
Control	27.3333	20.9265	-23.5945 , 13.5945

Comparison of the results of the NRS after nine treatments between the groups indicated no significant statistical difference (p=0.586044).

Table 18: Comparison of the mean (X) and standard deviation (SD) of the results of the experimental and control groups after one-month post-treatment follow-up for the Numerical Pain Rating Scale 101 (NRS)

	N R S		
	X	SD	95 % CI
Experimental	28.6667	21.6273	-12.9343 , 19.601
Control	32	21.8599	-12.9343 , 19.601

Comparison of the results of the NRS after one-month post-treatment follow-up between the experimental and control groups indicated no significant statistical difference (p=0.677815).

4.2. RESULTS OF THE MANN-WHITNEY U-TEST

Table 19: The average rank of the initial scores of the experimental and control groups for sensory component of the Short Form McGill Pain Questionnaire (MGPQ)

MGPQ	AVERAGE RANK	n
Experimental	14.7	15
Control	16.3	15

Comparison of the initial results for the two groups for the sensory component of the MGPQ revealed no significant statistical difference (p=0.63141).

Table 20: The average rank of the scores after nine treatments of the experimental and control groups for the sensory component of the Short Form McGill Pain Questionnaire (MGPQ)

MGPQ	AVERAGE RANK	n
Experimental	15.2667	15
Control	15.733	15

Comparison of the two groups after nine treatments for the sensory component of the MGPQ again revealed no significant statistical difference (p=0.899897).

Table 21: The average rank of the scores after one-month post-treatment follow-up of the experimental and control groups for the sensory component of the Short Form McGill Pain Questionnaire (MGPQ)

MGPQ	**AVERAGE RANK**	**n**
Experimental	12.4	15
Control	18.6	15

Comparison of the two groups after one-month post-treatment follow-up for the MGPQ indicated no significant statistical difference ($p=0.0518946$).

Table 22: The average rank of the initial scores of the experimental and control groups for the affective component of the Short Form McGill Pain Questionnaire (MGPQ)

MGPQ	**AVERAGE RANK**	**n**
Experimental	14.9333	15
Control	16.0667	15

Comparison of the two groups for the affective component of the MGPQ revealed no significant statistical difference ($p=0.727425$).

Table 23: The average rank of the affective scores after nine treatments of the experimental and control groups for the Short Form McGill Pain Questionnaire (MGPQ)

MGPQ	AVERAGE RANK	n
Experimental	15.3667	15
Control	15.6333	15

Comparison of the two groups after nine treatments for the affective component of the MGPQ indicated no significant statistical difference (p=0.929033).

Table 24: The average rank of the scores after one-month post-treatment follow-up of the experimental and control groups for the affective component of the Short Form McGill Pain Questionnaire (MGPQ)

MGPQ	AVERAGE RANK	n
Experimental	15	15
Control	16	15

Comparison of the two groups after one-month post-treatment follow-up for the affective component of the MGPQ indicated no significant statistical difference ($p=0.0695232$).

Table 25: The average rank before the onset of treatment of the experimental and control groups for the total Short Form McGill Pain Questionnaire (MGPQ)

MGPQ	**AVERAGE RANK**	**n**
Experimental	15.4	15
Control	15.6	15

Comparison of the two groups for the total MGPQ revealed no significant statistical difference (p=0.966724).

Table 26: The average rank of the scores after nine treatments of the experimental and control groups for the total Short Form McGill Pain Questionnaire (MGPQ)

MGPQ	AVERAGE RANK	n
Experimental	14.4667	15
Control	16.5333	15

Comparison of the two groups after nine treatments for the total MGPQ indicated no significant statistical difference (p=0.530469).

Table 27: The average rank of the scores after one-month post-treatment follow-up of the experimental and control groups for the total Short Form McGill Pain Questionnaire (MGPQ)

MGPQ	**AVERAGE RANK**	**n**
Experimental	12.3333	15
Control	18.6667	15

Comparison of the two groups after one-month post-treatment follow-up for the total MGPQ indicated a significant statistical difference (p=0.0470292).

4.3. RESULTS OF THE WILCOXON RANK TEST

Table 28: The number of positive and negative differences and the number of tied pairs within the experimental and control groups respectively for the sensory component of the Short Form McGill Pain Questionnaire (MGPQ) for before the onset of treatment until after the ninth treatment

MGPQ	NO. POSITIVE DIFFERENCES	NO.NEGATIVE DIFFERENCES	NO. OF TIED PAIRS	n
Experimental	12	3	0	15
Control	12	2	1	15

Comparison of the scores for the sensory component of the MGPQ revealed a significant statistical difference within both the control (p=0.0131503) and the experimental groups (p=0.0287677).

Table 29: The number of positive and negative differences and the number of tied pairs within the experimental and control groups respectively for the sensory component of the Short Form McGill Pain Questionnaire (MGPQ) for before the onset of treatment until after one-month post-treatment follow-up

MGPQ	NO. POSITIVE DIFFERENCES	NO.NEGATIVE DIFFERENCES	NO. OF TIED PAIRS	n
Experimental	14	1	0	15
Control	13	0	2	15

Comparison of the scores for the sensory component of the MGPQ revealed a significant statistical difference within both the control (p=0.001301575) and the experimental groups (p=0.00975981).

Table 30: The number of positive and negative differences and the number of tied pairs within the experimental and control groups respectively for the affective component of the Short Form McGill Pain Questionnaire (MGPQ) for before the onset of treatment until after the ninth treatment

MGPQ	**NO. POSITIVE DIFFERENCES**	**NO. NEGATIVE DIFFERENCES**	**NO. OF TIED PAIRS**	**n**
Experimental	7	1	7	15
Control	8	0	7	15

Comparison of the scores for the affective component of the MGPQ revealed a significant statistical difference within the control group (p=0.0095832), but not within the experimental group (p=0.141482).

Table 31: The number of positive and negative differences and the number of tied pairs within the experimental and control groups respectively for affective component of the Short Form McGill Pain Questionnaire (MGPQ) for before the onset of treatment until after one-month post-treatment follow-up

MGPQ	NO. POSITIVE DIFFERENCES	NO.NEGATIVE DIFFERENCES	NO. OF TIED PAIRS	n
Experimental	8	2	5	15
Control	7	0	8	15

Comparison of the scores for the affective component of the MGPQ revealed a significant statistical difference within the control group (p=0.014248), but not within the experimental group (p=0.102917).

<u>Table 32</u>: The number of positive and negative differences and the number of tied pairs within the experimental and control groups respectively for the total Short Form McGill Pain Questionnaire (MGPQ) for before the onset of treatment until after the ninth treatment

MGPQ	**NO. POSITIVE DIFFERENCES**	**NO.NEGATIVE DIFFERENCES**	**NO. OF TIED PAIRS**	**n**
Experimental	12	3	0	15
Control	11	3	1	15

Comparison of the scores for the total MGPQ revealed a significant statistical difference within both the control (p=0.0413266) and the experimental groups (p=0.0198779).

Table 33: The number of positive and negative differences and the number of tied pairs within the experimental and control groups respectively for the total Short Form McGill Pain Questionnaire (MGPQ) for before the onset of treatment until after one-month post-treatment follow-up

MGPQ	NO. POSITIVE DIFFERENCES	NO.NEGATIVE DIFFERENCES	NO. OF TIED PAIRS	n
Experimental	14	1	0	15
Control	13	0	2	15

Comparison of the scores for the total MGPQ revealed a significant statistical difference within both the control (p=0.00130575) and the experimental groups (p=0.00975981).

4.4. RESULTS OF THE PAIRED T-TEST

Table 34: Mean change (d) and standard deviation (SD) of OBDI scores for the experimental and the control groups respectively after nine treatments

	O B D I		
	d	SD	95 % CI
Experimental	-5.7333	9,824981	-11.1756 , 0.291105
Control	-11.6667	9.43903	-16.8951 , 6.43819

When comparing the initial scores with the scores after nine treatments for the experimental group, a statistical difference (p=0.0402804) was noted. A statistical difference was also found for the control group scores (p=0.000289546).

Table 35: Mean change (d) and standard deviation (SD) of OBDI scores within the experimental and control groups respectively for the period between the initial treatment and one-month post-treatment

	O B D I		
	d	SD	95 % CI
Experimental	-5.51067	8.5472	-10.245 , 0.776193
Control	-9.7	8.42573	-14.3672 , -5.03281

When comparing the initial scores with the scores after one-month post-treatment follow-up for the experimental group, a significant statistical difference (p=0.0256125) was noted. Similarly a statistical difference was found for the control group scores (p=0.000540283).

Table 36: Mean change (d) and standard deviation (SD) of range of motion in forward flexion (ROMFF) for the experimental and control groups respectively after nine treatments

	ROMFF		
	d	SD	95 % CI
Experimental	9	25.0998	-4.90331 , 22.9033
Control	3.33333	24.4151	-10.1907 , 16.8574

When comparing the initial readings with the readings after nine treatments for the experimental group, no significant statistical difference (p=0.186613) was noted. The control group readings also indicated no significant statistical difference (p=0.605248).

Table 37: Mean change (d) and standard deviation (SD) of the range of motion in forward flexion (ROMFF) for the experimental and control groups respectively for the period between the initial treatment and one-month post-treatment follow-up

	ROMFF		
	d	SD	95 % CI
Experimental	9.86667	30.7033	-7.14057 , 26.8739
Control	5.6	27.671	-9.72757 , 20.9276

When comparing the initial readings with the readings after one-month post-treatment follow-up for the experimental group, no significant statistical difference (p=0.233711) was noted. Similarly, no significant statistical difference was found for the control group readings (p=0.446213).

Table 38: Mean change (d) and standard deviation (SD) of range of motion in forward flexion (ROMFF) for the experimental and control groups respectively, for the period of the first nine treatments

	ROMRLF		
	d	SD	95 % CI
Experimental	-1.13333	9.81884	-6.5622 , 4.30553
Control	2-1.53333	5.54033	-4.60224 , 1.53557

When comparing the initial readings with the readings after nine treatments for the experimental group, no significant statistical difference (p=0.661686) was noted. The control group readings similarly indicated no significant statistical difference (p=0.30194).

Table 39: Mean change (d) and standard deviation (SD) of range of motion in forward flexion (ROMFF) for the experimental and the control groups respectively for the period between the initial treatment and one-month post-treatment follow-up period

	ROMRLF		
	d	SD	95 % CI
Experimental	-1.53333	8.33981	-6.15293 , 3.08626
Control	-9.13333	29.3206	-25.3756 , 7.10795

When comparing the initial readings with the readings after one-month post-treatment follow-up for the experimental group, no significant statistical difference (p=0.48815) was noted. Similarly, no significant statistical difference was found for the control group readings (p=0.247643).

<u>Table 40</u>: Mean change (d) and standard deviation (SD) of range of motion in forward flexion (ROMFF) for the experimental and the control groups after nine treatments

	R O M L L F		
	d	SD	95 % CI
Experimental	-2.06667	12.1448	-8.79391 , 4.66058
Control	2.46667	7.5391	-1.7094 , 6.64274

When comparing the initial readings with the readings after nine treatments for the experimental group, no significant statistical difference (p=0.520549) was noted. The control group readings similarly indicated no significant statistical difference (p=0.225767).

Table 41: Mean change (d) and standard deviation (SD) of range of motion in forward flexion (ROMFF) for the experimental and the control group after one-month post-treatment follow-up

	R O M L L F		
	d	SD	95 % CI
Experimental	-2.06667	13.6406	-7.6225 , 7.48917
Control	0.6	6.13887	-2.80045 , 4.00045

When comparing the initial readings with the readings after one-month post-treatment follow-up for the experimental group, no significant statistical difference (p=0.985165) was noted. Similarly, no significant statistical difference was found for the control group readings (p=0.71071).

Table 42: Mean change (d) and standard deviation (SD) of the range of motion in extension (ROME) for the experimental and control groups respectively, within the period of the first nine treatments

	ROME		
	d	SD	95 % CI
Experimental	5.2	28.1455	-10.3904 , 20.7904
Control	-4.86667	7.45335	-8.99523 , -0.738099

When comparing the initial readings with the readings after nine treatments for the experimental group, no significant statistical difference (p=0.486033) was noted. However, a significant statistical difference was noted for the control group (p=0.0240838).

Table 43: Mean change (d) and standard deviation (SD) of the scores of the range of motion in extension (ROME) for the experimental and control groups respectively for the period between the initial treatment and one-month post-treatment follow-up periods

	R O M E		
	d	SD	95 % CI
Experimental	0.8	13.7592	-6.82149 , 8.42149
Control	0.533333	7.55803	-3.65322 , 4.71989

When comparing the initial readings with the readings after one-month post-treatment follow-up for the experimental group, no significant statistical difference (p=0.825087) was noted. Similarly, no significant statistical difference was found for the control group readings (p=0.788615).

Table 44: Mean change (d) and standard deviation (SD) of the scores of the Numerical Pain Rating Scale 101 (NRS) for the experimental and control groups respectively, within the period of the first nine treatments

	N R S		
	d	SD	95 % CI
Experimental	-11.6667	21.2474	-23.4361 , 0.102726
Control	-20.813	26.5726	-35.5324 , -6.09422

When comparing the initial scores with the scores after nine treatments for the control group, a significant statistical difference (p=0.00893644) was noted. No significant statistical difference was found for the experimental group readings (p=0.0517191).

Table 45: Mean change (d) and standard deviation (SD) of the Numerical Pain Rating Scale 101 (NRS) scores, for the experimental and control groups respectively, for the treatment period up to the one-month post-treatment follow-up period.

	N R S		
	d	SD	95 % CI
Experimental	-5.3333	21.5652	-27.2788 , -3.38789
Control	-16.1467	23.1032	-28.9442 , -3.34931

When comparing the initial scores with the scores after one-month post-treatment follow-up for the experimental group, a significant statistical difference (p=0.0155295) was noted. Similarly, a significant statistical difference was found for the control group readings (p=0.0170283).

4.5. TABULATED RESULTS OF THE SHORT-FORM McGILL PAIN QUESTIONNAIRE

Table 46: Scores before the initial treatment for the control group and experimental group respectively

Number ofquestionnaires	15	15
Number of valid questionnaires	15	15
Total score of affective descriptors	138	18
Mean score of affective descriptors	9.2	1.2
Total score of sensory descriptors	24	79
Mean score of sensory descriptors	1.6	5.2
Total affective descriptors used	17	16
Mean affective descriptors used	1.13	1.07
Total sensory descriptors used	66	59
Mean sensory descriptors used	4.4	4.26

Table 47: Scores after the ninth treatment for the control group and experimental group respectively

Number of questionnaires	15	15
Number of valid questionnaires	15	15
Total score of affective descriptors	15	11
Mean score of affective descriptors	1	0.73
Total score of sensory descriptors	71	53
Mean score of sensory descriptors	4.73	3.5
Total affective descriptors used	9	7
Mean affective descriptors used	0.6	0.46
Total sensory descriptors used	37	37
Mean sensory descriptors used	2.46	2.33

Table 48: Scores after the one-month follow-up for the control group and the experimental group respectively

Number of questionnaires	15	15
Number of valid questionnaires	15	15
Total score of affective descriptors	14	12
Mean score of affective descriptors	0.93	0.8
Total score of sensory descriptors	49	48
Mean score of sensory descriptors	3.26	3.2
Total affective descriptors used	9	6
Mean affective descriptors used	0.6	0.2
Total sensory descriptors used	44	35
Mean sensory descriptors used	2.93	2.33

CHAPTER FIVE

DISCUSSION AND RECOMMENDATIONS

The results of the unpaired t-tests revealed no statistically significant differences between the experimental and control groups for the Oswestry Back Disability Index, the Numerical Pain Rating Scale 101 and the spinal range of motion measured in forward flexion, extension and right lateral flexion. These results therefore did not support hypothesis three that the subjects' response to treatment would differ between the two groups. However, a statistically significant difference (Table 12) was noted for the range of motion in left lateral flexion ($p<0.05$) in favour of the experimental group which was seen only after the one-month post-treatment follow-up period and not before. Nevertheless, this finding did not correlate with the overall treatment outcome but could have been due to a relatively poor reliability of the goniometer used in this study. This goniometer was reliant on examiner placement of the lever arms on anatomical landmarks so that placement might have varied slightly for the respective consultations.

The results of the paired t-test for the range of motion in extension (Table 42) revealed a significant difference ($p<0.05$) in favour of the control group after nine treatments; however, no statistically significant differences were apparent within either the experimental and control groups for the ranges of motion in: forward flexion, right lateral flexion and left lateral flexion. These latter results are difficult to explain and do not tie in with hypotheses one and two that spinal adjustment and the combination of spinal adjustment and McManis traction would alter the subjective and objective response to treatment.

Mellin (1985) conducted a study into physical therapy for chronic lower back pain on 151 men where spinal mobility in forward and lateral flexion, rotation, before and two months after the last treatment was measured. A significant increase was noted for lateral flexion and rotation, but not for forward flexion. Mellin reasoned that in daily life there are few activities which require extreme lateral bending and rotation, but maximum forward bending is a common movement. He argued that stiffness in lateral flexion easily remains after an attack of back pain, and that physical therapy may have a better chance of improving this motion. Mellin did not measure or comment on extension. This could explain the significant difference seen in extension within control group noted immediately after the nine treatments but does not account for the experimental group which was subjected to relatively more motion than the control group.

Results of the paired t-test for the OBDI (Table 34 and 35) indicated a statistically significant difference within each of the experimental and control groups seen after nine treatments and the follow-up period which tied in with hypotheses one and two which held that the treatment given in both groups would alter the subjective and objective response to treatment.

The results of the paired t-test for the Numerical Pain Rating Scale 101 (Tables 44 and 45) revealed statistically significant differences in favour of treatment in both the experimental and control groups seen after the follow-up period, while only the control group revealed a significant statistical difference in favour of treatment after nine treatments, which supports hypothesis one that spinal manipulative therapy will significantly alter the patients response to treatment but questions the effectiveness of McManis traction used as an adjunct to spinal manipulative therapy. This does not tie in with hypothesis two and three.

The results of the Mann-Whitney U-test revealed no statistically significant differences between the experimental and control groups for the sensory and affective components of the McGill Pain Questionnaire. However, a statistically significant difference was seen after the one-month post-treatment follow-up for the sum of the sensory and affective components (Table 27)in favour of the experimental group. On analysing the changes that had taken place within each group using the Wilcoxon test for matched pairs, the test revealed statistically significant differences after nine treatments and after the follow-up period for both the sensory and the total component of the Short-Form McGill Pain questionnaire in support of hypotheses one and two that both the combination of treatment and spinal manipulative therapy only would significantly alter the patient response to treatment. Interestingly enough, the only significant differences noted for the affective component were seen in the control group (Tables 30 and 31) which might have accounted for the overall difference seen between the groups after the one-month follow-up period. This finding is not in support of the second hypothesis and again raises a question as to the effectiveness of McManis traction, as implemented in this study, as an adjunct to spinal manipulative therapy. Factors such as age, sex, occupation and chronicity of the condition treated might have had bearing on these results but due to a very small sample size were not taken into account.

The many results showed variations between and within the groups but on the whole did not favour the response of the experimental group over the response of the control group. On the contrary, results within the control group seemed to differ more significantly than results within the experimental group and with little difference when comparing the two groups. The findings generally do not support hypotheses two and three.

The phase of dysfunction, according to the Kirkaldy-Willis model (1988:133-154) for categorizing mechanical lower back pain, encompasses several diagnoses which were all accepted into this study. The possibility of treating one specific diagnosis only should be considered in future studies as this might affect treatment outcome.

The reliability of the goniometer: Autogon 2 supplied by Smith and Nephew Rolyan Inc. (N93W14475 Whittalou Way, P.O. Box 555, Menomonee Falls WI 53051), used for measuring spinal range of motion in this study is questionable as this particular goniometer was subject to manual adjustments of the lever arms which formed the angle for measurement at the end range of motion. Anatomical landmarks used for placement of the lever arms were "eyeballed" by the author which further questions the reliability of such measurement.

Statistical inquiry using a larger sample size might reveal more significant results. Factors such as subject age, sex occupation, and onset or chronicity of the mechanical condition might be considered more closely in future studies as these variables could all affect the treatment outcome.

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OBDIE

no	tx0	tx3	tx6	tx9	txP
1	16	42	37.5	36.66	16
2	6	8	2	4	12
3	14	0	0	2	4
4	0	0	0	0	0
5	16.66	13.33	4	6	4
6	20	16	18	16	12
7	8	0	0	2	2
8	20	10	8	6	10
9	20	26	20	16	25
10	18	22	24	24	20
11	30	16	28	18	34
12	35	20	20	15	10
13	6	4	2	2	2
14	32	30	24	18	18
15	18	26	140	8	8

OBDIC **B**

no.	tx0	tx3	tx6	tx9	txP
1	40	30	26	24	22
2	12	8	12	10	8
3	17.5	10	7.5	7.5	5
4	28	18	22	14	10
5	12	2	2	2	0
6	35	24	18	0	10
7	20	12.5	17.5	0	0
8	12	12	8	4	12
9	10	8	4	6	4
10	14	10	16	10	12
11	24	20	0	0	18
12	10	10	4	6	6
13	32	32	30	24	32
14	40	30	36	24	22
15	8	4	6	8	8

C

MGPQE (SENSORY)

no.	tx0	tx9	txP
1	7	0	0
2	6	0	1
3	5	1	0
4	7	0	0
5	5	7	5
6	6	8	0
7	10	3	1
8	7	1	2
9	13	2	3
10	6	5	5
11	2	17	14
12	2	1	1
13	4	2	2
14	6	4	2
15	12	2	2

MGPQC(SENSORY)

D

no.	tx0	tx9	txP
1	27	33	23
2	9	9	5
3	2	4	2
4	8	3	6
5	7	1	2
6	3	0	2
7	1	0	2
8	22	2	3
9	3	1	2
10	3	1	2
11	4	0	4
12	9	2	1
13	7	6	6
14	22	5	5
15	11	4	6

MGPQE(AFFECTIVE)

E

no.	tx0	tx9	txP
1	0	0	0
2	3	0	0
3	0	0	1
4	0	0	0
5	0	0	0
6	1	1	0
7	2	0	0
8	0	0	0
9	4	2	2
10	2	0	0
11	0	8	11
12	0	0	0
13	1	0	0
14	2	0	0
15	3	0	0

MGPQC(AFFECTIVE)

F

no.	tx0	tx9	txP
1	11	9	8
2	2	2	2
3	0	0	0
4	4	0	0
5	0	0	0
6	0	0	0
7	0	0	0
8	2	0	0
9	0	0	0
10	1	0	0
11	1	0	1
12	2	0	0
13	0	0	0
14	9	4	3
15	1	0	0

MGPQC(DESCRIPTORS)

G

no.	tx0	tx9	txP
1	14	14	14
2	5	6	4
3	1	2	1
4	9	2	5
5	4	1	2
6	1	0	1
7	1	0	0
8	11	2	2
9	1	1	2
10	3	1	1
11	4	0	2
12	6	2	1
13	4	4	4
14	12	7	6
15	7	4	5

MGPQE(DESCRIPTORS) **H**

no.	tx0	tx9	txP
1	4	0	0
2	5	15	15
3	3	1	1
4	5	0	0
5	4	3	1
6	5	6	0
7	6	2	1
8	5	1	2
9	15	4	5
10	7	5	5
11	1	15	15
12	1	1	1
13	4	2	2
14	4	2	2
15	11	1	1

MGPQC(TOTAL)

I

no.	tx0	tx9	txP
1	38	32	31
2	11	11	7
3	2	4	2
4	12	3	6
5	7	1	2
6	3	0	2
7	1	0	0
8	24	2	3
9	3	1	2
10	4	15	2
11	5	0	5
12	11	2	1
13	7	5	6
14	31	9	8
15	12	15	6

MGPQE(TOTAL)

J

no.	tx0	tx9	txP
1	7	0	0
2	9	0	1
3	5	1	1
4	7	0	0
5	6	7	5
6	7	9	0
7	12	3	1
8	7	1	2
9	17	4	5
10	15	5	5
11	2	25	25
12	2	1	1
13	5	2	2
14	8	4	2
15	15	2	2

NRSC

K

no.	tx0	tx9	txP
1	87.2	70	70
2	25	20	10
3	40	35	25
4	35	7.5	5
5	100	0	20
6	45	0	0
7	25	20	10
8	60	35	45
9	40	30	40
10	52.5	47.5	65
11	25	0	15
12	30	35	40
13	50	45	50
14	50	50	50
15	57.5	15	35

NRSE

L

no.	tx0	tx9	txP
1	50	12.5	2.5
2	25	0	20
3	35	50	40
4	30	15	15
5	40	67.5	75
6	40	50	42.5
7	45	35	30
8	30	6	10
9	50	15	25
10	47.5	50	50
11	100	100	62.5
12	50	50	10
13	12.5	6.5	5
14	45	12.5	12.5
15	60	15	30

no.	tx0	tx3	tx6	tx9	txP
1	99	112	120	121	142
2	127	138	120	113	124
3	120	88	85	125	92
4	26	110	117	82	115
5	129	110	90	100	104
6	152	137	130	127	119
7	149	143	142	131	154
8	117	99	80	113	122
9	109	135	130	129	131
10	110	86	99	117	123
11	128	122	132	124	123
12	103	100	116	119	127
13	136	126	147	169	138
14	131	139	159	158	138
15	105	144	139	148	137

ROMFFC **N**

no.	tx0	tx3	tx6	tx9	txP
1	123	117	137	122	119
2	98	91	93	90	92
3	117	106	120	113	102
4	105	102	104	108	96
5	137	142	143	158	159
6	124	110	118	112	112
7	82	82	82	86	108
8	118	149	156	145	127
9	135	118	134	134	140
10	136	133	121	139	128
11	22	93	90	99	116
12	128	116	113	102	106
13	123	116	133	119	120
14	122	126	130	103	124
15	134	125	137	124	139

ROMEE

o

no.	tx0	tx3	tx6	tx9	txP
1	33	16	28	21	20
2	55	48	33	36	54
3	22	32	26	17	29
4	21	25	25	18	23
5	24	35	23	27	15
6	25	29	28	126	41
7	54	32	41	44	42
8	37	35	37	41	34
9	34	37	25	24	36
10	29	24	41	27	31
11	30	29	32	37	13
12	19	42	39	39	59
13	29	21	28	31	34
14	20	18	20	27	17
15	55	32	37	50	51

ROMEC

no.	tx0	tx3	tx6	tx9	txP
1	30	23	18	32	27
2	18	15	11	12	19
3	46	42	47	49	42
4	34	36	33	39	42
5	26	30	33	27	31
6	33	29	31	31	24
7	39	42	25	32	29
8	46	30	45	31	35
9	39	19	31	20	35
10	30	34	27	27	36
11	41	26	44	37	49
12	44	57	37	32	39
13	32	15	22	20	37
14	26	26	40	31	36
15	39	27	39	30	5

ROMRLFE

Q

no.	tx0	tx3	tx6	tx9	txP
1	18	13	19	21	25
2	22	26	20	11	17
3	26	19	18	23	19
4	14	18	33	18	15
5	17	14	15	19	23
6	17	21	14	20	20
7	12	18	23	15	15
8	16	24	20	20	22
9	4	11	11	12	15
10	13	17	15	16	18
11	17	12	18	12	12
12	10	13	11	10	19
13	22	16	21	17	18
14	8	8	13	18	121
15	25	27	34	32	19

ROMRLFC

R

no.	tx0	tx3	tx6	tx9	txP
1	15	20	17	22	22
2	18	17	17	18	15
3	21	22	29	26	14
4	19	19	20	26	22
5	36	27	24	15	22
6	25	21	17	13	14
7	10	9	16	18	13
8	10	17	27	30	25
9	12	15	16	15	16
10	18	16	24	21	34
11	8	12	17	11	16
12	26	20	20	14	15
13	18	11	18	18	18
14	22	19	18	23	23
15	14	20	25	19	16

ROMLLFE

S

no.	tx0	tx3	tx6	tx9	txP
1	23	22	32	30	25
2	30	30	25	24	33
3	26	21	17	22	20
4	27	22	29	12	23
5	17	14	10	14	17
6	67	23	15	27	22
7	21	25	32	24	32
8	20	23	26	24	23
9	15	14	21	20	18
10	16	18	14	19	14
11	16	14	15	26	20
12	19	36	25	16	34
13	23	28	27	26	34
14	12	10	20	16	13
15	27	16	43	28	30

ROMLLFC

T

no.	tx0	tx3	tx6	tx9	txP
1	22	16	20	23	24
2	14	16	15	18	16
3	26	26	24	20	19
4	22	26	21	12	17
5	24	23	16	18	18
6	26	17	27	28	20
7	12	16	14	23	11
8	10	23	31	28	23
9	20	14	17	19	21
10	16	22	26	20	25
11	14	11	13	26	14
12	14	30	29	22	21
13	23	17	15	19	25
14	15	17	19	17	20
15	17	21	24	19	10

THE SHORT-FORM MCGILL PAIN QUESTIONNAIRE

Please indicate the exact nature of your pain by ticking the relevant intensity associated with each description of pain.

	None	Mild	Moderate	Severe
Throbbing	0) ______	1) ______	2) ______	3) ______
Shooting	0) ______	1) ______	2) ______	3) ______
Stabbing	0) ______	1) ______	2) ______	3) ______
Sharp	0) ______	1) ______	2) ______	3) ______
Cramping	0) ______	1) ______	2) ______	3) ______
Gnawing	0) ______	1) ______	2) ______	3) ______
Hot-burning	0) ______	1) ______	2) ______	3) ______
Aching	0) ______	1) ______	2) ______	3) ______
Heavy	0) ______	1) ______	2) ______	3) ______
Tender	0) ______	1) ______	2) ______	3) ______
Splitting	0) ______	1) ______	2) ______	3) ______
Tiring-exhausting	0) ______	1) ______	2) ______	3) ______
Sickening	0) ______	1) ______	2) ______	3) ______
Fearful	0) ______	1) ______	2) ______	3) ______
Punishing-cruel	0) ______	1) ______	2) ______	3) ______

THE NUMERICAL PAIN RATING SCALE 101 **V**

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

____

Please indicate on the line below the number between 0 and 100 that best describes the pain of your major problem 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.

____

PATIENT INFORMED CONSENT FORM

W

Dear patient

Your participation in this research study will require certain personal details e.g. age, address and telephone number. You will be questioned extensively as to your low back condition and your general health. A thorough physical examination will be undertaken which will include an X-Ray examination. Your inclusion in this study will require that you undergo nine treatments given at stipulated intervals over a three week period after which one-month post-treatment follow-up will be necessary.

We assure you that information will be kept confidential.

Date : ______________

I the undersigned my consent to be questioned, examined, X-rayed and treated for research purposes at Technikon Natal Chiropractic Day Clinic, 11 Ritson Road, Berea, Durban 4001.

____________________ ____________________

Printed Name Signature

INFORMED CONSENT PERTAINING TO MINORS

Date : ______________

I the undersigned, as parent/guardian give my consent for

____

to be questioned, examined, X-rayed and treated for research purposes at Technikon Natal Chiropractic Day Clinic, 11 Ritson Road, Berea, Durban 4001.

0____________________ ____________________

Printed Name Signature