DEDICATION

To my parents, who's love, support and guidance throughout my life has been outstanding. You have sacrificed much, in particular during Zimbabwe's recent turmoil, to give me the greatest gift of all- an excellent education and a wonderful profession. I am eternally grateful.

ACKNOWLEDGEMENTS

I would like to thank my supervisor Dr Andrew Jones, not only for accepting my proposal for him to be my supervisor at a time when he was already very busy, but also for his time and guidance he has given generously throughout the compiling of this dissertation. Your help has been much appreciated, especially since I know you would rather be scuba diving on the weekends instead of reading my research!

Thank you, to all the patients that participated in this study, without whom this research project would not have been possible.

A special thank you to the Chiropractic Clinic secretaries Pat, Linda and Mrs Ireland for always being so helpful.

Thank you, Jakes, for your time you gave so generously to help me out with my statistics. It is much appreciated.

To my friends I have made on this course, I can truly say our time together has been filled with many a great time and am grateful we can share some very fond memories- all six and half years worth! I wish you all the very best in your new practices wherever you are in the world.

Last but not least, I would like to thank my Lord and Saviour Jesus Christ, for your unwavering love, support and encouragement especially through the hard times.

ABSTRACT

In recent years, sacroiliac syndrome has been widely accepted by many different health professions as one of the major contributors to mechanical low back pain. Manipulation to effect the relief of the condition has thus far proven to be one of the most effective methods. However, comparatively little research has been done on the different forms of physical therapy that can be used in conjunction with a manipulation so as to maximise its effect. This study focussed on the use of ischaemic compression (a well-accepted technique for the treatment of myofascial trigger points) of the gluteus medius muscle.

According to recent literature, this muscle seems to be strongly associated with mechanical low back pain and more specifically, sacroiliac syndrome. It was postulated that effective treatment of myofascial trigger points within the muscle using ischaemic compression prior to the sacroiliac manipulation, would not only effect relaxation of the muscle, but also allow for a more effective and longer lasting resolution of symptoms.

This comparative, randomised, controlled clinical trial consisted of sixty patients. Once qualified for the research, the sixty patients were randomly allocated to two groups using consecutive sampling. The one group was given a sacroiliac manipulation alone whilst the other group was given a sacroiliac manipulation following ischaemic compression of the gluteus medius trigger points found. Each group was given four treatments within a two-week period with an additional fifth consultation scheduled at the end of the treatment session to complete the assessment of subjective and objective findings.

The Numerical Pain Rating Scale-101 and the Oswestry Low Back Pain Disability Index questionnaires were used to assess the subjective findings whilst the objective measurements were collected from results of algometer readings, an orthopaedic rating scale, and the Myofascial Diagnostic Scale.

Statistical analysis of the data collected was performed using t-tests and the results presented in the form of bar graphs and tables.

Inter-group analysis of both the subjective and objective data did not show any statistically significant difference between the two groups by the final consultation. Therefore it was concluded that both groups improved equally to each of the treatments.

Intra-group analysis of the results indicated that both treatment groups improved significantly (at $\alpha=0.05$, where $p< \alpha$) between the initial and final consultation, for all measures.

It is recommended that this study be repeated with a larger, more homogenous sample population. It is evident that without further research to establish the efficacy of ischaemic compression of gluteus medius trigger points in sacroiliac syndrome, it will be left up to the discretion of the clinician as to whether this form of treatment will be of any additional benefit to the patient.

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DEFINITIONS

Ischaemic Compression

The application of pressure to a trigger point in a muscle with the thumb, finger, knuckle or elbow (depending on the size, depth and thickness of the muscle being compressed) for the treatment of myofascial trigger points (Gatterman, 1990).

Manipulation

A passive manoeuvre in which specifically directed manual forces are applied to vertebral and extra-vertebral articulations of the body, with the object of restoring mobility to restricted areas (Gatterman, 1990).

Motion Palpation

Palpatory diagnosis of passive and active segmental joint ranges of motion (Gatterman, 1990).

Myofascial Trigger Point

A hyperirritable spot, usually within a taut band of skeletal muscle or in the muscle's fascia, that is painful on compression and that can give rise to characteristic referred pain, tenderness, and autonomic phenomena (Travell et al. 1999).

Sacroiliac Syndrome

Pain over one sacroiliac joint in the region of the posterior superior iliac spine, which may be accompanied by referred pain over the buttock, greater trochanter, groin, posterior thigh, knee, and occasionally to the postero-lateral calf, ankle and foot (Kirkaldy-Willis et al. 1992).

Subluxation

Aberrant relationship between two adjacent articular structures, which may have functional or pathological sequelae, causing an alteration in the biomechanical and/or neurophysiological reflexes, their proximal structures, and/ or body systems that may be directly or indirectly affected by them (Gatterman, 1990).

CHAPTER ONE

1.1. INTRODUCTION

According to Burton and Cassidy (1992) 60-90% of the population will suffer from low back pain sometime in their life. According to Njoo and Van der Does (1994), the vast majority of low back pain (80-90%) is classified as non-specific low back pain. The term non-specific low back pain actually represents the lack of medical knowledge about this heterogenous group of patients.

Bernard and Kirkaldy-Willis (1987) performed a study in which it was reported that the sacroiliac joint was the primary source of back pain in 22.5% of 1293 patients presenting with back pain. The syndrome of pain over the sacroiliac joint in the region of the posterior iliac spine is termed sacroiliac syndrome and may be accompanied by referred pain to the buttock, groin and leg. Movement of the joint is usually restricted. (Kirkaldy-Willis et al. 1992). This syndrome is caused by dysfunction or subluxation of the joint wherby an irregular prominence of one articular surface becomes wedged upon the prominence of an opposed articular surface (Hendler et al. 1995)

Mohseni-Bhanpei et al. (1998) reviewed twenty-five randomised controlled trials from 1985-1997 measuring the effect of manipulation in the treatment of low back pain. The results of seventeen trials, in which the authors reported positive effects in favour of manipulation, indicated that manipulation was more effective than any other single intervention in the treatment of low back pain.

It is assumed that many of the non-specific low back pain cases are related to musculo-ligamentous injury (Haanen, 1984: Deyo ,1992). Examples of musculoskeletal pain problems are primary fibromyalgia and myofascial pain (Bennet, 1990).

In an inter-rater reliability study conducted by Njoo and Van Der Does (1994) consting of 124 participants (61 with non specific low back pain and 63 controls), it was found that in both gluteus medius and quadratus lumborum muscles, the occurrence of localised tenderness, jump sign, recognition and palpable bands of trigger points was much higher in patients than in controls.

Cassidy and Mierau (1992) claim that gluteal trigger points often accompany sacroiliac syndrome. According to Travell et al. (1999), myofascial trigger points in the gluteus medius muscle are a commonly over looked source of low back pain. The same authors suggest that sacroiliac joint dysfunction may be associated with gluteus medius trigger points. In addition, displacement of the articular surfaces of the sacroiliac joint can help perpetuate gluteus medius trigger points and, if present, should be corrected for lasting response to therapy. Further more they suggest posterior ilial torsion (often associated with sacroiliac syndrome) is commonly associated with shortening and trigger point activity of the posterior part of the gluteus medius muscle. The patient is unlikely to experience prolonged relief unless trigger points in the gluteus medius muscle are inactivated and the ilial torsion is corrected. (Travell et al.1999). Given that these statements are based only upon the clinical experience of Travell et al. these principles needed to be investigated scientifically.

According to Travell et al. (1999) effective myofascial treatment of gluteus medius trigger points can be achieved with ischaemic compression. Guerriero et al. (1991) conducted a study comparing the effects of manipulation and physical therapy on motion in the cervical spine. They concluded that a treatment program, which consists of manipulation and physical therapy, is significantly more effective in achieving the goal of restoration of normal spinal motion.

This study serves to establish whether the concurrent treatment of gluteus medius trigger points with sacroiliac joint manipulation is a more effective treatment of sacroiliac joint syndrome than the manipulation alone.

1.2. OBJECTIVES OF THE STUDY

The purpose of this study is to investigate the effectiveness of sacroiliac manipulation alone versus sacroiliac manipulation following ischaemic compression of gluteus medius trigger points in terms of subjective and objective clinical findings in the treatment of sacroiliac syndrome.

The first objective is to determine the effectiveness of sacroiliac manipulation alone versus sacroiliac manipulation following ischaemic compression of gluteus medius trigger points in terms of subjective clinical findings.

The second objective is to determine the effectiveness of sacroiliac manipulation alone versus sacroiliac manipulation following ischaemic compression of gluteus medius trigger points in terms of objective clinical findings.

CHAPTER TWO: REVIEW OF THE RELATED LITERATURE

2.1. INTRODUCTION

According to Bernard and Cassidy (1991) sacroiliac joint syndrome is a common but frequently overlooked source of low back pain because of the way it often mimics other well known causes of low back pain. Xiaodong and Yonggang (1994) claim that the pain is severe over the area of the sacroiliac joint and that there is referred pain radiating to the buttock and leg of the affected side and marked limitation to the movement of the joint. They also agree that "its symptoms are easily mixed up" with other similar types of low back pain.

Although the sacroiliac joint may seem to be the source of pain for many sufferers of mechanical low back pain, there is little objective evidence available to substantiate this view. The diagnosis of sacroiliac syndrome or dysfunction is based on subjective clinical findings and no real reliable method of measuring this dysfunction has been developed yet. (Cassidy and Mierau,1992.)

2.2. INCIDENCE AND PREVALENCE OF SACROILIAC SYNDROME

According to Burton and Cassidy (1992), the lifetime prevalence of low back pain is between 60% and 90%. Frymoyer and Cats-Baril (1991) claim that although there are wide ranges the annual incidence of low back pain is 5%, but varies from 1% to 20% in occupational surveys. In 1990 the total cost of worker's compensation in the United States was estimated at $50 billion, of which back care alone represented about $30 billion (Burton and Cassidy 1992).

Van der Meulen (1997) conducted a study among black South Africans and found that the lifetime incidence of low back pain was only 57.6% but the prevalence was 53.1%. On the other hand in a study conducted by Docrat (1999) incidences of low back pain amongst indians and coloureds in South Africa were reported to be between 70% and 80%.

According to Gemmell and Jacobson (1990) it seems that most acute episodes of low back pain start around the age of 25, with a 60% recurrence over 2 years and the highest frequency of symptoms occuring between the ages of 35 and 55.

Risk factors associated with the frequency, severity and resultant disability of low back pain include those individuals in occupations that require more repetitive lifting, pulling, and twisting, as well as having more episodes of anxiety and depression and more stressful life events. Multiparous women and cigarette smokers are also more likely to report low back pain. (Frymoyer et al.1983.)

Later on, Frymoyer and Cats-Baril (1991) stated that people who repetitively lift greater than 40 pounds each day are three times more likely to have low back pain than those who lift less than 10 pounds. In addition they also stated that those individuals who are exposed to industrial and vehicular vibrations are also at increased risk.

Bernard and Kirkaldy-Willis (1987) performed a retrospective study of patients being treated over a12-year period in which it was reported that the sacroiliac joint was the primary source of low back pain in 22.5% of 1293 patients presenting with low back pain. They also stated that sacroiliac joint syndrome and posterior joint syndromes were the most common referred pain syndromes. In addition these referred pain syndromes occurred nearly twice as often and frequently mimicked the clinical presentation of the nerve root compression syndromes.

In a small sample (N=30) of the nursing population in South Africa, 33.3% of nurses with low back pain were diagnosed with sacroiliac syndrome (using the Kirkaldy-Willis model of classification), 6.6% with myofascial syndrome and 60% with a combination of both syndromes (Urli and Till 1995).

In a cross-sectional analytic study conducted by Schwarzer et al. (1995) 43 patients with pain below L5-S1 were investigated with sacroiliac joint blocks under image intensifier using radiographic contrast followed by 2% lignocaine. Using the pain relief induced by the controlled diagnostic blocks as the criterion, the prevalence of sacroiliac joint pain would appear to be at least 13% and perhaps as high as 30%.

Daum (1995) claimed that 40% of patients who presented with back complaints in a care centre had concommitant sacroiliac joint disease. He states further that the most common source of low back pain caused by sacroiliac dysfunction is mechanical instability of the joint resulting in either a fixed subluxation or hypermobility of the joint.

Gemmel and Jacobson (1990) conducted a study on fit college students of which 26.5% of the participants had a history of low back pain and 19.3% were found to have unilateral or bilateral sacroiliac joint dysfunction. In addition, of those students with low back pain who were considered to be of high or average fitness, 27.3% had some degree of sacroiliac joint dysfunction.

In a clinical trial conducted by Sawyer (2000) 170 patients with low back pain were screened for sacroiliac syndrome and then subjected to a series of four orthopaedic tests (Patrick Faber, Gaenslen's, Thigh Thrust, and Yeomann's). Three of the four tests had to be positive to be diagnosed with the condition. 30% of the patients were excluded from the trial as a result of the orthopaedic testing. The results showed that 38% of the low back pain population (N=170), were diagnosed with sacroiliac syndrome.

Laslett (1997) suggests however, that when one uses 3 or 4 positive sacroiliac joint tests in addition to correlating subjective findings, sacroiliac syndrome accounts for only 3.5-6.5% of the low back pain population.

It is the researcher's opinion that questions of Inter-tester reliability for sacroiliac joint tests, together with the lack of any real definitive ways of being able to diagnose sacroiliac syndrome has led to much controversy amongst authors and clinicians alike as to the actual incidence of sacroiliac syndrome.

2.3. ANATOMY OF THE SACROILIAC JOINT

It is logical to assume that the sacroiliac joint could be a source of pain since it is a synovial joint and therefore predisposed to the same inflammatory, infectious, and dysfunctional conditions affecting other synovial joints (Bernard and Cassidy 1991).

However Bernard (1997) later went on to say that the development of the sacroiliac joint has several features that are unique and not shared by other synovial joints. By the time the sacroiliac joint has cavitated (usually by the second trimester) the adjacent ilium has already ossified, so the newly formed sacroiliac joint develops between hyaline cartilage and the newly ossified ilium. This is in contrast to the development of other synovial joints, which develop between two cartilage surfaces. In addition the articular cartilage on the iliac side of the joint is fibro-cartilage while the cartilage covering the opposing sacral surface is hyaline.

The pelvis is made up of three bones, the two ilia on either side of the sacrum, and three joints, two sacroiliac joints and the symphysis pubis. Gatterman (1990) describes the sacroiliac joints as lying within the pelvic ring,

at an oblique angle to the sagital plane. They are "auricular or C-shaped, with a convexity that faces anteriorly and inferiorly." He also suggests that the joints appear in a "multitude of forms", with not only many individual differences but also considerable contra-lateral variations in the same individual.

Bernard and Cassidy (1991) maintain that significant fibrous ankylosis of the sacroiliac joint is more common in males over the age of fifty where age related changes occur at an accelerated rate.

Cassidy and Mierau (1992) suggest that together with the symphysis pubis, the sacroiliac joints provide a limited degree of flexibility to the pelvic ring. This, in part, is due to the series of very strong ligaments that stabilise this weight-bearing joint.

Cassidy (1992) states that although many large and powerful muscles surround the joint, none are known to directly influence its movement.

Wyke (1967) suggests however that although these surrounding muscles do not directly influence the movement of the sacroiliac joint, he does recognize that an arthrokinetic reflex can exist whereby articular mechanoreceptors in the joint can regulate the overlying muscle tone. He maintains that there are two types of articular nerves: a specific type supplying the joint capsule as independent branches of peripheral nerves and non-specific articular branches that are derived from muscles overlying a particular joint.

According to Bernard and Cassidy (1991) the sacroiliac joint is definitely recognized as being a pain sensitive structure. They go on to say that its synovial capsule and overlying ligaments have unmyelinated free nerve endings that transmit pain and thermal sensation and encapsulated and complex unencapsulated nerve endings also exist in the sacroiliac joint capsule providing pressure and position sense information. Further more they suggest that posteriorly, the ligaments and joint capsule are supplied by the lateral branches of the posterior primary rami from L4-S3 and that anterior

innervation is from L2 to S2. They do however state that there is variability in this nerve supply, which is not constant in the same individual.

According to Moore (1992) innervation of the sacroiliac joint is derived from the superior guteal nerves, the sacral plexus, and the dorsal rami of S1 and S2 nerves.This wide range of segmental innervation could account for the large spectrum of somatic referred pain patterns typical of sacroiliac disorders (Cassidy and Mierau 1992).

2.4. BIOMECHANICS OF THE SACROILIAC JOINT

Accurate descriptions of the sacroiliac joints' motions have been difficult to obtain as the planes at which the joint surfaces lie are oblique to the angle of an x-ray beam used to make a standard anterior-posterior radiograph of the pelvis (Norkin and Levangie 1992).

According to Bernard and Cassidy (1991) it is postulated that the function of the sacroiliac joints is to transmit or to dissipate the loading of the upper trunk to the lower extremities. Kirkaldy-Willis et al. (1992) suggest the joints have two functions: to provide elasticity to the pelvic rim and to act as a buffer between the lumbosacral and hip joints.

Although the joint is surrounded by some of the largest and most powerful muscles in the body, none of these cross the joint or are known to have a direct influence on joint motion (Cassidy and Mierau 1992). Miller (1995) however suggests that contraction of the adjacent muscles, such as the erector spinae, psoas, quadratus lumborum, piriformis, abdominal obliques and gluteal muscles, will place shear and moment loads on these joints in proportion to their contraction forces.

According to Hendler et al. (1995) the sacroiliac joint allows for a small amount of antero-posterior rotatory movement around a transverse axis. The predominant motion is x-axis rotation coupled with some degree of z-axis translation (Cassidy and Mierau 1992).

Kirkaldy-Willis et al. (1992) claim that the joint surfaces can rotate 3-5 degrees in the younger symptom free patient while Vleeming et al. (1992) suggest that even in elderly individuals most sacroiliac joints are mobile, allowing for a total of up to 4 degrees rotation. However Hendler et al. (1995) state that fibrous adhesions do tend to occur in middle age and that later in life the joints can become completely fibrosed.

In a study conducted by Peers (1994), six fresh cadaveric pelves were clamped in a specially designed instrument which measured the anterior and posterior x-axis rotation of the innominate via the sacroiliac joint and the symphysis pubis and the forces involved to cause such a movement. He found that the maximum force needed to induce a rotation of 4,5 degrees in each sacroiliac joint in either direction was no more than 130Nm. He also noted that the older cadavers required a greater force to induce the same amount of rotation – even though the oldest cadaver was only thirty years old. This supports Hendler et al's theory of fibrous adhesions tending to occur in middle age. Although the sample size was very small and the specimen age ranges were between only 20 and 30 years old, the system of measurement in the study was accurate.

Bernard and Cassidy (1991) claim that the sacroiliac joint when compared to the lumbar spine is much more susceptible to axial compression and torsion that would stress the weaker anterior capsule and ligaments of the joint. Thus forward bending, lifting and twisting places the sacroiliac joint in a weakened, susceptible position.

According to Cassidy and Mierau (1992) the range of motion is greater in women and increased during pregnancy. Vleeming et al. (1990) add that the

relatively small and flat sacroiliac joints of women, combined with the hormonal weakening of ligaments and symphysis pubis during pregnancy, may lead to unstable sacroiliac joints and pain.

Although the dense strong ligamentous complex, the irregular interlocking joint surface topography, and the magnitude of force required to disrupt the joint suggest that the sacroiliac joint is very stable and capable of only minimal movement, the joint is still likely to play some limited, yet still undefined, role in the biomechanics of the lumbosacral spine (Cassidy and Mierau 1992).

2.5. THE SACROILIAC SYNDROME

The source of chronic mechanical low back pain being attributed to the sacroiliac joint has been a "recurrent subject of controversy throughout this century" (Schwarzer et al. 1995). Most physical therapists, chiropractors and osteopaths believe they can succesfully diagnose and treat sacroiliac joint syndrome as a specific biomechanical category of low back pain, while many allopaths do not (Osterbauer et al. 1993).

These same authors stated that the primary diagnostic criteria relied on have been a) pain in the sacroiliac joint or buttock, b) elicitation of pain in the sacroiliac joint by provocation and c) absence of other factors, such as disc lesion, sciatica, neurological abnormalities etc.

According to Hendler et al. (1995) features of sacroiliac joint problems include local stabbing pain over the joint and referred stabing pain in the groin, posterior thigh, and, occasionally, in the lateral calf. Kirkaldy-Willis et al. (1992) however suggest that the referred pain may extend as far down as the

ankle, foot and toes. In addition Hendler et al. (1995) suggest that radicular pain may also be present if the sacroiliac joint is sufficiently inflamed.

Panzer and Gatterman (1995) claim that sacroiliac joint dysfunction is often as a result of reversible joint blockage (manipulable subluxations) that occur within their limited range of motion, which is more often than not at the extremes of the possible range of motions. They also add that the joints may also become irritated as a result of hypermobility. This they say is often due to adjacent articulations being restricted.

Vleeming et al. (1990) speculate that abnormal loading of the sacroiliac joints with its ridges and depressions could lead to new positions resulting with regard to the articular surfaces. Such an abnormal position could be regarded as a "blocked joint".

According to Gemmell and Jacobson (1990) sacroiliac dysfunctions may be classed as either primary or secondary based on the cause. They state that primary dysfunction normally arises from trauma such as blows, falls on the buttock, or from attempts to prevent falling. Secondary dysfunction comes on slowly and is usually compensatory to scoliosis where there is pelvic tilt or in cases of leg length inequality. Panzer and Gatterman (1995) add that lifting injuries involving torsional stress, stepping off a curb or twisting when getting out of bed are also common causes of sacroiliac syndrome.

On examination there is usually tenderness over the posteriorsuperior iliac spine, and the posterior sacroiliac ligament (Cassidy and Mierau 1992). The same authors also suggest that unilateral lumbar paraspinal muscle spasm and gluteal trigger points often accompany this syndrome. Kirkaldy-Willis et al. (1992) report that tenderness is also found over the buttock and movement of the sacroiliac joint is restricted.

2.6. TESTS FOR SACROILIAC JOINT DYSFUNCTION

According to Cibulka and Koldehoff (1999: 83) most individual sacroiliac joint tests have displayed poor reliability, making confirmation of sacroiliac joint dysfunction difficult. However, according to their study involving 219 patients with and without low back pain, a cluster of sacroiliac joint tests can be useful in identifying sacroiliac joint dysfunction in patients with low back pain. The tests they chose to use were however palpatory and observational in nature. They were as follows: the Standing Flexion Test, the Sitting Posterior-Superior Iliac Spines Palpation, the Supine Long-Sitting Test and the Prone Knee Flexion Test.

Dreyfuss et al. (1994: 1138) examined the usefulness of individual sacroiliac joint tests (seated and standing flexion tests and the Gillet test) in a group of asymptomatic persons and found 20% of asymptomatic patients had signs of sacroiliac joint dysfunction. These authors added that one should not rely solely on these tests to diagnose symptomatic sacroiliac dysfunction.

According to Kirkaldy-Willis et al. (1992: 124) two out of three orthopaedic pain provocation tests (Gaenslen's, Patrick Faber's and Yeomann's) need to be positive in order to make the diagnosis of sacroiliac syndrome. Cassidy and Mierau (1992: 219) claim that these tests are the "most useful" tests in the diagnosis of sacroiliac joint syndrome, but hip pathology must be ruled out beforehand since all of these provocation tests place equal stress on the hip joint. According to Bernard and Cassidy (1991: 2117) Gaenslen's, Patrick Faber's and Yeomann's tests all have a high degree of inter examiner reliability.

Gaenslen's test

Gaenslen's test according to Hendler et al. (1995: 171) is frequently positive in sacroiliac joint disease.

The test is performed as follows:

The patient lies supine on the couch. The examiner flexes the unaffected side of the hip by pushing the flexed knee towards the chest while a downward pressure is exerted on the opposite thigh hyperextending the affected hip side. A positive test elicits pain in the sacroiliac joint on the affected side (Kirkaldy-Willis et al. 1992: 125). According to a study conducted by Laslett and Williams (1994) the Gaenslen's test has an inter-examiner reliability of 88.2%.

Patrick Faber Test

The acronym FABER in the Patrick Faber test described by Panzer and Gatterman (1995: 456) stands for flexion, abduction, external rotation, and extension of the hip, which when the thigh is passively put through these combined movements forms a figure of four. The patient is in a supine position when the test is performed and a positive test is indicated when pain can be localised to either the ipsilateral hip or sacroiliac joints. Broadhurst and Bond (1998) conducted a double-blinded clinical trial on the sensitivity and specificity of three commonly used pain provocation tests for sacroiliac joint dysfunction. Results of the trial found that the Patrick Faber test showed a 77% sensitivity and a 100% specificity.

Yeomann's Test

Panzer and Gatterman (1995: 460) describe Yeomann's test as follows: with the patient lying prone, pain localised to the sacroiliac joint on hyperextension of the ipsilateral thigh indicates a positive test for sacroiliac involvement. Restricted extension of the ipsilateral thigh is commonly noticed when there is a sacroiliac subluxation of the ipsilateral sacroiliac joint. According to the opinions of Kirkaldy-Willis et al. (1992), Yeomann's test is the most specific and reliable test for the diagnosis of sacroiliac syndrome.

Posterior Shear or "Thigh Thrust" Test

This test according to Broadhurst and Bond (1998) is done by flexing the hip to 90° while the patient lies supine, adducting the femur to the midline and then applying an axial pressure along the length of the femur. A positive test is indicated by pain over the sacroiliac joint. In Laslett and Williams' (1994) inter-examiner reliability study, a reliability of 94.1% was shown between therapists for the Thigh Trust test. In the double-blinded clinical trial by Broadhurst and Bond (1998), the Thigh Trust test was found to be 80% sensitive and 100% specific for sacroiliac joint dysfunction. In the clinical trial conducted by Sawyer (2000), the Thigh Thrust test was one of the four orthopaedic tests used in diagnosing that 38% of the low back pain sample (N=170) had sacroiliac syndrome.

According to Bernard and Cassidy (1991: 2117) radiographic evaluation "rarely adds any useful information" in the diagnosis of sacroiliac joint syndrome although it is the procedure of choice for demonstrating infection, inflammation, stress fracture or neoplasm involving the sacroiliac joint.

2.7. THE GLUTEUS MEDIUS MUSCLE

The gluteus medius muscle is a thick fan-shaped muscle that lies deep to the gluteus maximus muscle and superficial to the gluteus minimus muscle on the outer surface of the pelvis. Innervation of the gluteus medius is derived from the inferior branch of the superior gluteal nerve which carries fibres from L4, L5 and SI spinal roots (Travell et al. 1999: 151-153). The gluteus medius muscle is therefore innervated by very similar nerve roots that supply the sacroiliac joint.

Referred pain caused by myofascial trigger points of the gluteus medius muscle is "commonly identified as low back pain or lumbago". Its three trigger point regions (which lie just below the iliac crest in a posterior to anterior sequence), together refer pain and tenderness primarily along the posterior iliac crest, the sacrum, the sacroiliac joint, the posterior and lateral aspects of the buttock and the upper thigh. (Travell et al. 1999: 150.) However according to Kirkaldy-Willis et al. (1992: 127) the referred pain may pass down the back of the thigh and calf almost to the ankle or down the lateral thigh and calf.

The main function of this thigh abductor is stabilization of the pelvis during single-limb stance. (Travell et al. 1999: 150).

Sacroiliac joint dysfunction often accompanies a weak and inhibited gluteus medius and it's associated poor hip abduction movement pattern. (DeFranca, 1996: 217). Travell et al. (1999) state that a muscle affected with trigger points becomes significantly weakened. Schmid (1984: 35) conducted a study between 1978 and 1982 on 457 patients with sacroiliac joint lesions. In his study, up to14 tests were used to diagnose the patient with a sacroiliac joint lesion. One of these was to look for any hypotrophy of the gluteal muscles in the patient combined with any weakness felt in their hip extension and abduction.

In a clinical trial consisting of sixty patients conducted by Paton (2001: 63), the gluteal muscle most commonly found with trigger points in sacroiliac syndrome was the gluteus medius.

Gluteus medius strain and tendonitis was the most common soft tissue problem in a series of 200 hip and pelvic injuries reported by Lloyd-Smith, et al. (1985) comprising 18% of the total. Reid (1992: 659) suggests that the prevalence of such injuries is due to the seesaw tilt action of the pelvis when running, caused by a significant leg length discrepancy, tending to increase the stresses involved in pelvic control and contributing to sacroiliac pain. But

Sola (1985: 683) suggests a leg length discrepancy may be caused simply by pelvic distortion (or subluxation of the sacroiliac joint) which in turn causes trigger points to develop in the gluteus medius muscle and the development of unilateral low back pain.

In an inter-rater reliability study conducted by Njoo and Van Der Does (1994) consisting of 124 participants (61 with non specific low back pain and 63 controls), it was found that in both gluteus medius and quadratus lumborum muscles, the occurrence of localised tenderness, jump sign, recognition and palpable bands of trigger points was much higher in patients with low back pain than in controls. It would therefore seem that there exists a close relationship between the form and function of the gluteus medius muscle and low back pain.

According to Travell et al. (1999), myofascial trigger points in the gluteus medius muscle are a commonly overlooked source of low back pain. The same authors suggest that sacroiliac joint dysfunction may be associated with gluteus medius trigger points. In addition, displacement of the articular surfaces of the sacroiliac joint can help perpetuate gluteus medius trigger points and, if present, should be corrected for lasting response to therapy. Further more they suggest posterior ilial torsion (often associated with sacroiliac syndrome) is commonly associated with shortening and trigger point activity of the posterior part of the gluteus medius muscle. The patient is unlikely to experience prolonged relief unless trigger points in the gluteus medius muscles are inactivated and the ilial torsion is corrected.

Cassidy and Mierau (1992: 219) believe that sacroiliac syndrome is often accompanied by muscle spasm and gluteal trigger points. Kirkaldy-Willis et al. (1992: 123) suggest that although it is possible that minor dysfunction in the sacroiliac joint can lead to pain, it is the pain resulting from sustained contraction of muscle overlying the joint that plays an even more important role. These authors further add that this hypertonicity may accompany dysfunction in the sacroiliac joint and lower lumbar facet joints.

Indahl et al. (1999: 329) conducted an experimental study to determine whether stimulation of nerves in the sacroiliac joint and joint capsule could elicit contractions in porcine gluteal or lumbar spinal muscles. In their results, it was noted that stimulation of nerve elements in the ventral area of the sacroiliac joint produced predominant contractions in the gluteus medius gluteus maximas and quadratus lumborum muscles. They concluded that the sacroiliac joint is involved in activating muscles responsible for overall posture control. This could explain Travell et al.'s (1999) belief that there is a close association between the form and function of the sacroiliac joint and the body's key pelvic stabiliser, the gluteus medius muscle.

2.8. MANIPULATION OF THE SACROILIAC JOINTS

Gatterman (1990: 49) describes a chiropractic manipulation (or adjustment) as a specific short lever technique, which employs a high velocity, controlled amplitude thrust in a particular direction with the aim of restoring mobility to individual articulations.

Bernard and Cassidy (1991: 2126) hypothesize that the high velocity, short amplitude manipulation suddenly forces the hypertonic muscles into a stretch, leading to a barage of afferent impulse signals to the central nervous system. The resultant reflex inhibition of gamma and alpha motor neurons may lead to readjustment of muscle tone and relaxation. The authors therefore summize that the manipulation may also affect the joints by stimulating type I and type II articular mechanoreceptors as well as type III mechanoreceptors in the associated ligaments. This would effectively send afferent signals along medium and large diameter nerve fibres which would then inhibit pain impulses traveling through smaller caliber fibers.

Mohseni-Bandpei et al. (1998) reviewed twenty five randomized controlled clinical trials from 1985-1997 measuring the effect of manipulation in the treatment of low back pain. The results of seventeen trials, in which the authors reported positive effects in favour of manipulation, indicated that manipulation was more effective than other interventions in the treatment of low back pain. Unfortunately this study did not look at any specific type of low back manipulation, and so we do not know how many of these studies used sacroiliac joint manipulation or indeed if there were even any studies on sacroiliac joint syndrome. In addition the reviewer stated that the sample sizes of the study populations were small.

Efficacy of Sacroiliac Joint Manipulation

Bernard and Cassidy (1991: 2125) suggest that with a sacroiliac joint manipulation there is a re-establishment of normal muscle tone and joint kinematics. This "rebalancing of the arthrokinetic reflex" of sacroiliac joint dysfunction, pain and muscle dysfunction (with each individual component exacerbating the other) the cycle of pain is broken.

Bernard and Kirkaldy-Willis (1987: 271) in their retrospective review of 1293 cases of low back pain treated over a 12-year period revealed that in 258 patients who were manipulated for sacroiliac joint syndrome, 206 achieved excellent results with 39 attaining good results and only 13 responding poorly.

In another study conducted by Osterbauer et al. (1993: 85) 10 patients meeting the study criteria for sacroiliac joint syndrome and who had all had the condition for greater than 6 months received only manipulation of spinal and pelvic segments three times per week over a 5 week period. All but two of the patients reported subjective relief from low back pain by the end of the treatment period. Of the original 10 patients, 6 responded to a 1-year follow-up questionnaire. Five rated themselves as much better and one felt the same compared to the beginning of the study.

According to Hendler et al. (1995) manipulation provides "dramatic relief in cases of subluxation" of the sacroiliac joint.

In an analysis of clinical material gathered from a non randomised uncontrolled study of one hundred cases (34 males and 66 females between the ages of 21 and 72) treated for subluxation of the sacroiliac joint by manipulation, it was found that there was a 100% cure rate after 4 treatments (Xiaodong and Yonggang 1994). The study did however contain more females (only 34 were male), and the treatment did not only consist of manipulation, but also considerable pre-manipulation massage, (kneading and rolling of the surrounding muscles); post manipulation soft-tissue work in the area; and strapping around the pelvis with an elastic bandage (10cm in width and wrapped around the waist twice).In addition the patient was instructed to have as much bed rest as possible after the treatment. Thus with all these different interventions that were employed many variables were introduced into the study. The long-term effects of the treatments were not assessed as no follow up consultations were scheduled.

Cassidy and Mierau (1992: 221) state that although there are many different techniques available to manipulate the sacroiliac joint, the side posture method is considered the most effective way to mobilize a stiff or fixated joint.

2.9. CONTRA-INDICATIONS TO MANIPULATION

According to Wyatt (1992: 199-200) contraindications to spinal manipulative therapy must be considered before attempting to adjust a patient. He goes on to say that these contraindications can be divided up into absolute and relative contraindications, where absolute contraindications exclude the

patient altogether from all dynamic high force manipulation, and relative contra-indications dictate that the type and/or force of manipulation must be altered to prevent serious injury to the patient.

The absolute contra-indications according to Wyatt (1992: 200) are as follows:

For the entire spine

1. Benign bone tumours
2. Cord tumour
3. Dislocation
4. Fracture (acute)
5. Inflammatory arthritis (acute)
6. Infection (osteomyelitis/septic discitis)
7. Instability
8. Haematoma (cord or intracellular)
9. Malignancy
10. Meningeal tumour
11. Myelopathy
12. Radiculopathy (with atrophy/severe muscle weakness)

Those specifically pertaining to the lumbar spine

13. Aortic aneurysm (dissecting type)
14. Cauda equina syndrome

The relative contra-indications according to Wyatt (1992: 201-202) are as follows:

1. Anti-coagulant therapy
2. Benign bone tumours (non-aggressive types)
3. Fibrous dysplasia

4. Haemangioma

5. Cerebrovascular accident (history of)

6. Clotting/bleeding disorders

7. Spinal canal stenosis

8. Intervertebral foraminal stenosis

9. Fracture (healed injury without instability)

10. Lateral recess stenosis

11. Osteoporosis

12. Pregnancy

13. Seizures

14. Spondylolisthesis (progressive unstable types)

15. Syringomyelia

2.10. MYOFASCIAL TRIGGER POINT THERAPY OF THE GLUTEUS MEDIUS USING ISCHAEMIC COMPRESSION

Gatterman (1990) describes the technique of ischaemic compression in the treatment of myofascial trigger points as follows:

On isolation of the trigger point, pressure is applied with the thumb, finger, knuckle or elbow depending on the size, depth and thickness of the muscle being compressed. Care is taken not to exceed the subjects tolerance, and if the patient tenses or pulls away, then a lighter pressure is applied. Pressure is sustained for ten to twenty seconds and gradually released as the trigger point releases. A thumb or finger from the other hand may be used for reinforcement. Pressure is most effective when applied straight into the trigger point.

Travell et al. (1999) however, state that to effectively inactivate the trigger point the process should be continued up to one minute gradually exerting up

to as much as 8 - 12 kgs of pressure and if the trigger point tenderness persists, the process should be repeated.

Oschman (2000) suggests that the application of pressure to a trigger point brings about a "rapid solation and rehydration to the gel-like cytoplasmic matrix of the surrounding fascia". Removal of the pressure allows the system to rapidly re-gel but in the process the tissue is transformed, both in it's water content and in it's ability to conduct energy and movement. The ground substance (or matrix component of the fascia) becomes more porous, a better medium for the diffusion of nutrients, oxygen, waste products of metabolism and the enzymes and "building blocks" involved in the metabolic regeneration processes. In addition another effect of the "gel-to-sol and return to gel transitions", is the release of toxins and metabolic waste products that have been trapped in the sponge-like interstices of the ground substance.

Oschman (2000) also believes that the application of pressure to the myofascial trigger points, produces "piezo-electric fields" and "streaming potentials" that stimulate the surrounding cells. He says the strength of these fields depend on the angle with which the pressure is applied. These principles however, are based upon his opinion.

Hanten et al. (200: 997) conducted a randomised controlled study consisting of 40 volunteer subjects who had one or more trigger points in the neck or upper back and concluded that ischaemic pressure and stretching is effective treatment for myofascial trigger points.

Travell et al. (1999: 161) claim that effective myofascial treatment of gluteus medius trigger points can be achieved with ischaemic compression. De Franca (1996: 353) confirms the efficacy of ischaemic compression used in the myofascial treatment of gluteus medius trigger points.

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2.11. SUMMARY OF THE LITERATURE REVIEW

The most common problem brought to chiropractic doctors is that of low back pain (Gemmel and Jacobson 1990: 63). In the United States the total yearly estimate of covering the direct and indirect costs of low back pain is $60 billion. This according to Burton and Cassidy (1992: 1) is the "single greatest and most inefficient expenditure of health care resources in our society today".

Njoo and Van De Does (1994: 317) state that the vast majority of low back pain (80-90%) is classified as non-specific low back pain - a term used to describe the lack of medical knowledge about this "heterogenous" group of patients. However it is assumed that many of the non-specific low back pain cases are related to musculo-ligamentous injury (Haanen 1984 and Deyo 1992).

Frymoyer et al. (1991: 2114) believe that sacroiliac joint syndrome is a "common but frequently overlooked source of low back pain".

The study conducted by Urli and Till (1995) on a small nursing population in South Africa found that 33.3% of the nurses suffering with low back pain were diagnosed with sacroiliac syndrome and that 60% had a combination of both sacroiliac syndrome and myofascial syndrome. This study together with the opinions of many other authors suggest that myofascial dysfunction and sacroiliac syndrome normally occur concurrently.

Travell et al. (1999) believe that the presence of gluteus medius trigger points is often associated with sacroiliac joint dysfunction and that the two should both be corrected for lasting response to therapy. However these statements are based only upon the clinical experience of Travell et al. and so these principles need to be investigated scientifically.

Based upon the many controlled clinical trials recorded in the literature including Mohseni-Bhampei <u>et al.'s</u> (1998) review of twenty five randomised controlled trials, it is now widely accepted that manipulation is an effective conservative treatment for low back pain. Cassidy and Mierau (1992: 221) and many other authors agree that manipulation of the sacroiliac joint should be the first line of treatment for sacroiliac syndrome.

With regard to treatment of gluteus medius trigger points, both De Franca (1996: 217) and Travell <u>et al</u>. (1999: 161) agree that ischaemic compression is effective.

Guerriero <u>et al.</u> (1991) conducted a controlled, blinded study on 45 subjects on the comparative effects of manipulation and physical therapy on motion in the cervical spine. The result was that those subjects who received cervical spinal manipulation, ischaemic compression of myofascial trigger points, proprioceptive neuromuscular facilitation and interferential therapy, showed a significantly greater increase in cervical range of motion than those who received a manipulation alone. They concluded that a treatment program, which consists of manipulation and physical therapy, is significantly more effective in achieving the goal of restoration of normal spinal motion.

However even with this and the other aforementioned studies in mind, there is a lack of research into the efficacy of using a combination of manipulation and ischaemic compression in the treatment of mechanical low back pain.

In the twenty-five trials reviewed by Mohseni-Bhanpei <u>et al.</u> (1998: 190) none of the trials compared manipulation with manipulation following some form of muscle or soft tissue therapy. The treatment of the muscular component to enhance the efficacy of the manipulation has by in large, been overlooked.

The lack of scientific evidence into the effectiveness of combining these two techniques creates a need for further research into this area so as to establish the most effective method of treatment for sacroiliac joint syndrome.

CHAPTER THREE: MATERIALS AND METHODS

3.1. INTRODUCTION

This chapter discusses the design, the sample, the method, the primary and secondary data and the interventions used within each study group. A brief mention of the methods of statistical analysis and the evaluation methods are also outlayed.

The study design chosen was a prospective randomised controlled trial involving two treatment groups: group 1 and group 2.

3.2. THE SAMPLE

The study was conducted on patients from the greater Durban metropolitan area who responded to advertisements requesting participation in a clinical trial on low back pain. The advertisements were placed on notice boards of Technikon Natal Berea Campus, the University of Natal Durban Campus, local sports clubs, pharmacies, health shops, gyms and in the local newspapers. Fliers were also delivered to postboxes in the surrounding suburbs. Patients who presented at the Technikon Natal Chiropractic Day Clinic with mechanical low back pain were considered for the study. The study was, however, limited to patients with sacroiliac joint syndrome. Sixty participants were consecutively selected from the respondent's providing they complied with the inclusion and exclusion criteria for the study. Respondents were not excluded from the study based upon gender race, occupation, chronicity or severity of the condition. Given the fact that this study was a pilot study on this type of treatment intervention for sacroiliac joint syndrome, the convenience sampling method was considered sufficient. Patients were randomly allocated into two equal sized groups of 30 patients each. Thirty cards were inscribed with the letter M (representing the sacroiliac joint manipulation alone) and thirty cards were inscribed with the letter MI (representing the sacroiliac joint manipulation following ischaemic compression). The identical cards were then folded and placed in a container and shaken. As each card was drawn out, the letters "M" or "MI" would then be written next to the corresponding number in which that card was drawn. For example the tenth patient accepted for the clinical trial was given the treatment corresponding to the number ten. In this way, each of the patients accepted onto the study were assigned to their respective treatment group.

Group 1 was the control group and received sacroiliac joint manipulation alone, while group 2 was the experimental group and received ischaemic compression of any gluteus medius muscle trigger points found followed by sacroiliac joint manipulation.

3.3. THE METHOD

An initial screening consultation was conducted in order to make a diagnosis of sacroiliac syndrome. This was done by means of a case history (Appendix A), physical examination (Appendix B) and regional low back examination (Appendix C). Once the diagnosis of sacroiliac syndrome was confirmed, both groups underwent a series of four treatment sessions within a two week period. According to the study discussed by Xiadong and Yonggang (1994), in all 100 cases full recovery from sacroiliac subluxation was obtained after 4 treatments. A fifth consultation, within a week following the last treatment session, was conducted to assess objective and subjective measures. The participants were requested not to change their lifestyle (i.e. exercise, smoking etc) or receive any other treatment for the duration of the trial in order to minimize sources of variation.

Subjective measurements included the Numerical Pain Rating Scale 101 (Jensen et al. 1986) (Appendix D) and the Oswestry Low Back Pain Disability Questionnaire (Fairbank et al. 1980) (Appendix E). Both of these were completed before the first treatment, at the beginning of the second treatment and at the fifth consultation.

Objective measurements included Gaenlen's, Yeomann's and Patrick Faber's orthopaedic tests (Kirkaldy-Willis et al. (1992: 124) and the posterior shear or "Thigh Trust" test (Broadhurst and Bond 1998). These tests were then used in the formation of an orthopaedic rating scale. Measurements were also collected from results of algometer readings taken on the most tender of the gluteus medius muscle trigger points and on the more tender of he two posterior superior iliac spines. In addition the Myofascial Diagnostic Scale (Chettiar 2001) (Appendix F) was used to record the severity of the trigger points. These measurements were recorded before the first treatment at the beginning of the second treatment and in the fifth consultation.

If a patient's condition worsened dramatically as a result of treatment, their condition was re-evaluated before continuing treatment, and if necessary the patient was excluded from the study.

3.4.   ETHICS

Prior to the patients being given any treatment, a letter of information (Appendix G) detailing the nature and the intent of the study was given to the patients to read. Each patient was made aware of the fact that they had a 50% chance of being in either the control or experimental group. They were given the opportunity to ask any questions they had relating to the study which were then answered as clearly as possible.

The patients were informed that they could withdraw from the study at any time they wished without having to give any particular reason. All patient information was treated confidentially. An informed consent form (Appendix H) was then given to the patients to sign stating that they were willing to participate in the study and that they were aware of the implications of such a study.

3.5.   INCLUSION AND EXCLUSION CRITERIA

3.5.1. Inclusion Criteria

a)   Patients only between the ages of 18 and 50 years old were accepted into the study in order to limit degeneration (Myburgh, 2001) and complete fibrosis (Hendler <u>et al</u>. 1995).

b)   Patients had to test positive for at least three out of the following five signs.   Tenderness over the PSIS, positive Gaenslen's test, Yeomann's test and Patrick Faber's test (Kirkadly-Willis et al 1992); and the Posteriorshear or "Thigh Thrust" test evaluated favourably by Laslett and Williams (1994) and Broadhurst (1997) for inter-examiner reliability, sensitivity and specificity.

c)   Myofascial trigger points in either or both of the gluteus medius muscles had to be present. Criteria used to establish evidence for the presence of such trigger points was based upon the following signs:

   1.   localised tenderness
   2.   Jump sign
   3.   Patient recognition
   4.   Palpable band
        (Njoo and Van der Does, 1994: 320)

d)   Other Secondary, concomitant conditions to the sacroiliac syndrome (e.g. other myofascial involvement and/or lumbar facet syndrome) did not exclude patients from the study, although these conditions were not treated.

3.5.2. Exclusion Criteria

Patients were excluded from the study if they had any of the following:

a)   Low back pain attributable to neoplastic lesions of the spine, ribs or pelvis.

b)   Low back pain attributable to inflammatory, infectious, metabolic or vascular causes.

c)   Visceral referred pain.

d)   Any patient suspected of having a condition which would be contraindicated for spinal manipulation.   Absolute and relative contraindications to spinal manipulation are discussed in chapter two by Wyatt (1992: 201-202).

e)   Contraindications of ischaemic compression based on the same contraindications as for friction massage, including a compromised nutritional status of the skin; impaired vascular response as in patients on high dose steroid drug therapy and patients with known peripheral vascular disease (Hertling and Kessler 1990: 143).

3.6.   LOCATION OF THE DATA

3.6.1. The Primary Data

This was obtained from the Numerical Pain Rating Scale 101 (Jensen et al. 1986) and the Oswestry Low Back Disability questionnaire (Fairbank et al. 1980). The Wagner FDK 2O Force Dial Algometer was used to measure the patients pressure threshold and the results of the 4 orthopaedic sacroiliac joint stress tests were used in the form of an orthopaedic rating scale. The Myofascial Diagnostic Scale was used to record the severity of the gluteus medius trigger points.

3.6.2. The Secondary Data

This was obtained from books, journal articles, Medline and the Internet. Most of this data was obtained through the Technikon Natal Library.

3.7. MEASUREMENTS

Both subjective and objective measurements were recorded. All measurements were recorded prior to the first treatment at the beginning of the 2nd treatment and in the fifth consultation.

3.7.1. Subjective Measurements

These measurements were taken from the Numerical Pain Rating Scale 101 (Jensen et al. 1986) and the Oswestry Low Back Pain Disability Index questionnaire (Fairbank et al. 1980), which the patients filled out at each of the above allocated recording sessions.

The Numerical Pain Rating Scale-101

This was used to measure the patients subjective pain intensity. Jensen et al. (1986) conducted a comparative study in which six methods of evaluating pain were investigated. The results of the study indicated that it was superior to the other measures due to its simple and practical method of administering and scoring. Bolton and Wilkinson (1998) also suggested that the NRS pain rating scale was found to be the most responsive form of scale in a study they conducted on 79 new chiropractic patients, comparing the NRS with the VAS (Visual Analogue Scale) and the VRS, (verbal rating scale). They recommended the NRS for most types of outcome studies. The questionnaire instructs the patient to rate their pain when it is at its worst by indicating on a scale of zero to one hundred, where zero indicates "no pain at

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all" and one hundred indicates "pain as bad as it could be". The mean value is then calculated by adding the value of the patients worst pain score to the value of their least pain score and dividing this value by two (Jensen et al. 1986).   This mean value was recorded at each of the allocated recording sessions and was used for statistical analysis.

The Oswestry Low Back Pain Disability Index Questionnaire

This was used to give the researcher an indication of how the low back pain affects the patient's ability to manage in everyday life. Tibbles et al. (1998) considers the functional status of the patient the most desirable outcome measure for both clinical use and research. Fairbank et al. (1980) conducted a study on 25 patients with primary low back pain and confirmed that the questionnaire was both valid and reliable. This questionnaire consists of ten sections each containing six questions. Each question is scored ranging from minimum of zero to a maximum of five.   When the questionnaire was completed the scores for each section were added up to give a maximum possible score of fifty.   The final score was then multiplied by two to give a percentage which was then used in the statistical analysis.

3.7.2. Objective Measurements

These were obtained from algometer readings and the four orthopaedic sacroiliac joint stress tests or pain provocation tests, namely Gaenslen's, Yeomann's and Patrick Faber's tests (Kirkaldy-Willis et al. 1992: 124) and the Posterior Shear or "Thigh Trust" test (Broadhurst and Bond, 1998).   In addition the Myofascial Diagnostic Scale used by Chettiar (2001) was used to record the severity of the trigger points.

The Algometer

This was used to record the pressure threshold, which Fischer (1987) described as the minimum pressure or force that induces pain or discomfort. In this way the degree of myofascial dysfunction of the gluteus medius muscle and the degree of tenderness over the posterior superior iliac spine could be measured. The algometer used in this trial was the Wagner FDK20 Force Dial (Wagner Instruments, P.O. Box 1217, Greenwich, CT, 06836 USA, tel. 2038699861). The force readings were measured in kilograms per square centimetre.

According to Fischer (1987), this method has been proven to be useful for diagnosis of tender spots and trigger points and their clinical management, particularly in the assessment of treatment results. The author concluded that changes in the threshold of pressure obtained under standard clinical conditions could be regarded as reliable objective data. In a study conducted on 24 men and 26 women, the reproducibility and validity of pressure threshold measurements on muscles afflicted with trigger points were excellent (Fischer,1986). In addition he confirmed that the algometer was particularly useful in objectively evaluating manipulative intervention and that it could be used to quantify the patient's response to manipulation.

Measurements were taken by applying the force dial to the most tender tipper point in either of the gluteus medius muscles. As the pressure was gradually increased the patient was instructed to say "now" at the point when they first felt the pressure change to a feeling of pain. At this point a reading was taken. With each recording session, the algometer could therefore be used to quantify the response to the myofascial treatment of ischaemic compression.

Tenderness over the most tender of the two posterior superior iliac spines was measured in much the same way. This was used to assess the degree of improvement of the patients sacroiliac syndrome over the treatment course.

Orthopaedic tests and the Orthopaedic Rating Scale

Four orthopaedic tests were used to confirm the diagnosis of sacroiliac syndrome and these were also used to develop an orthopaedic assessment rating scale. They included the Gaenslen's, Yeomann's, Patrick Faber's and the Posterior Shear or "Thigh Trust" tests and were correlated with the other subjective and objective measures for concurrent validity.

1)   Gaenslen's Test

This was performed with the patient supine. The examiner flexed the patients left knee and hip towards the chest, while pressing downward over the right thigh to hyperextend the right hip. Pain over the region of the right sacroiliac joint was considered a positive test (Kirkaldy-Willis et al. 1992: 125). Likewise the test was then done on the opposite side and the results recorded.

2)   Yeomann's Test

This was performed with the patient prone. The examiner placed one hand under the right thigh above the knee on the affected side, to extend the right hip. The examiner's other hand pressed downward over the posterior aspect of the right iliac crest. A positive test was recorded in this position elicited pain over the right sacroiliac joint region (Panzer and Gatterman 1995: 460). Likewise the test was then performed on the opposite side and the results recorded.

3)   Patrick Faber Test (Flexion Abduction and External Rotation)

This test was performed with the patient supine and the examiner stabilizing the pelvis with one hand whilst the distal end of the opposite femur was used as a lever to move the ilium anteriorly. This was done by pacing the right ankle over the left thigh above the knee whilst the examiners left hand pushed downward on the medial aspect of the right knee. Pain over the right sacroiliac joint whilst in this position indicated a positive test (Broadhurst and

Bond 1998). Likewise the test was then performed on the opposite side and the results recorded.

4)   Posterior Shear or "Thigh Thrust" Test

This test was done with the patient in the supine position and the hip flexed to 90°. The femur was adducted to the midline and then an axial pressure was applied along the length of the femur. A positive test was indicated by pain over the sacroiliac joint (Broadhurst and Bond 1998). Likewise the test was then performed on the opposite side and the results recorded.

The four provocation/stress tests were used to evaluate the patient's initial presentation and the progress made throughout the treatment. The tests were performed bilaterally and could score a possible maximum of ten points. The Kirkaldy-Willis (1992: 123-125) model of tests each scored one point if they induced pain over either sacroiliac joint area, while the Posterior Shear or "Thigh Thrust" tests apparent reliability scored two points if pain was induced over the sacroiliac joint area. If pain was reported in the lumber spine, hip, anterior thigh or any other inapplicable site, zero points were given. The score was obviously inflated in subjects with bilateral symptoms but it was necessary to emphasize that the score was not an indication of paint intensity, but was to be used rather as an objective marker for any change that took place over the treatment course.

Broadhurst and Bond (1998) suggest that in order for the orthopaedic tests to show a high predictive value for pain arising from the sacroiliac joint, they need to be combined with other measurements. Hence in this study, they have been correlated with the Oswestry Low Back Pain Disability Index questionnaire for concurrent validity.

The Myofascial Diagnostic Scale (Appendix F)

This was first used by Chettiar (2001) and consists of five indicators. The first four indicators are the signs of a myofascial trigger point, which according to Travell et al. (1999) are the following; referred pain in the zone of reference, local twitch response, palpable taught band, and focal tenderness. Referred pain is the strongest indicator of an active trigger point (Travell et al. 1999) and thus was weighted more.

Soft tissue tenderness (or focal tenderness) was further subdivided into four grades, with the highest grade weighted the same as the presence of a twitch response and a palpable taught band. The latter two are associated signs of equal importance, and were therefore given the same value. The signs could total a possible maximum of 17 points. In each of the recording sessions the scores were added up and used to establish intra-group and inter-group change in terms of these clinical signs.

3.8. INTERVENTIONS

3.8.1. Motion Palpation

With the diagnosis of sacroiliac syndrome confirmed, the site of the manipulable lesion was pre-assessed using the orthopaedic tests and then established by using motion palpation. According to Herzog et al.'s (1989: 86) evaluating of two studies conducted on the reliability of the Gillet test (considered to be one of the most reliable forms of motion palpation) they concluded that some of the results were contradictory. There is much debate in the literature as to the accuracy and reliability of motion palpation especially when it comes to interexaminer reliability. However Alley (1983: 99) suggests that if one simply chooses to qualitate mobility as to less than or greater than expected, there seems to be evidence to support the use of motion palpation in sacroiliac joint procedures.

The motion palpation procedure used in this study was a modification of the method described by Gillet and Liekans (1981:9). They developed a method of monitoring the movement of the sacroiliac joints using palpation with the back of the hand to challenge the end-feel. The patient was seated while the examiner stressed the end feel in the upper, and lower aspects of the sacroiliac joints - all the while comparing the relative end feel with the contra-lateral side when the end feel felt hard or blocked a joint restriction at that level was noted. If there was still uncertainty as to the exact location of the manipulable lesion, a modification of the motion palpation procedure described by Bergman (1993) was used:

1)   The patient was asked to stand whilst holding onto a support for balance.

2)   The researcher stood behind the patient and placed a thumb

contact on the patients posterior superior iliac spine (PSIS) and the second or fourth sacral tubercle - depending on whether the joint restriction was suspected in the upper or lower aspect of the sacroiliac joint.

3) The patient was then asked to raise the ipsilateral leg to approximately 90° thereby flexing the hip and sacroiliac joint.

4) With normal movement the examiners thumbs approximated as the PSIS moved posteriorly and inferiorly relative to the stationery sacral tubercle.

5) A flexion restriction was suspected when the thumbs did not approximate.

3.8.2. Manipulation

The manipulation used in this study was based upon the Diversified technique as described by Schafer and Faye (1989: 282-283). The patient was placed in the lateral recumbent position with the involved ilium facing upward. The patient's uppermost knee was flexed to the maximum. The patient's lumbar spine and shoulders were maintained in a neutral position, while the active hand contacted the PSIS of the involved joint and the patient's shoulders were supported by the stablising hand. The posterior aspect of the sacroiliac joints were opened by applying a downward pressure against the patients flexed knee with the researchers knee, and an impulse thrust with a body drop was delivered with the active hand to the area of fixation to adjust the joint. With restrictions noted in the lower sacroiliac joint, the active hand contacted the ischium of the involved joint instead of the PSIS.

3.8.3. Ischaemic Compression

Ischaemic compression was applied to all the gluteus medius trigger points found (based upon the criteria used by Njoo and Van der Does (1994: 320). The technique was performed as follows:

On isolation of the trigger point(s), whilst the patient lay prone, pressure was applied with the thumb, finger or knuckle depending on the size, depth and thickness of the muscle being compressed. Care was taken not to exceed the subjects tolerance, and if the patient tensed or pulled away, a lighter pressure was applied. As the patient felt the trigger point ease, more pressure was gradually applied until the trigger point eased again. The process was continued for up to one minute with as much as 8-12 kgs of pressure being applied. If trigger point tenderness persisted, the process was repeated. The technique described above was based upon the method used by Travell et al. (1999).

3.9.   STATISTICAL ANNALYSIS OF THE DATA

The SPSS based 9.0 statistical package (SPSS Inc. 444N. Michigan Avenue, Chicago, Illinois, 60611, USA) was used for analysis of the subjective and objective data and the results were presented in the form of bar graphs and tables. The null hypothesis was rejected at the $\alpha =0.05$ level of significance if $p < \alpha$ where p was the observed significance level or probability value. The null hypothesis was otherwise accepted at the same level. Parametric tests , namely the paired t-test and unpaired t-test, were used to analyze the data collected from the Numerical Pain Rating Scale, the Oswestry Low Back Pain Disability Index questionnaire, the digital algometer readings, the Myofascial Diagnostic Scale and the Orthopaedic Rating Scale. The statistical evaluation was aimed at measuring whether significant changes had occurred between the initial and second consultation, the initial and final consultation as well as the second and the final consultation, within each study group and between the respective groups.

3.9.1. Unpaired T-Test (Inter-Group)

Unpaired t-test was used to determine whether there was any difference between the two groups at the time of the initial, second and final consultation. This parametric test was used as the sample size was greater than or equal to 30 ($n \geq 30$).

Ho: There is no difference between the two groups.

Ha: There is a difference between the two groups.

$\alpha=0.05$

Decision Rule :

If $p < \alpha$, reject Ho.

If $p \geq \alpha$, accept Ho.

Where p is the reported p- value.

3.9.1. Paired T-Test (Intra-Group)

Paired t-test was used to determine whether any improvement occurred within group 1 and group 2. This was done between the initial and second consultation, initial and final consultation and between the second and final consultation for each group. This parametric test was used as the sample size was greater than or equal to 30 (n≥30).

Ho: There is no improvement between the consultations.

Ha: There is an improvement between the consultations.

α=0.05

Decision Rule:

If p < α, reject Ho.

If p ≥α, accept Ho.

(i)   p= reported p-value   If Ha is of form > and z is positive

           2   If Ha is of form < and z is negative

(i)   p= 1- (reported p-value)   If Ha is of form > and z is negative

           2   If Ha is of form < and z is positive

(The reported p-value is the SPSS print out value of p).

Descriptive statistics including mean, standard deviation and standard error were used to further interpret the results.

The central tendency was found by calculating the mean value. This was done in order to provide a practical quantitative summary of each group's characteristics.

The standard deviation (s.d.) was calculated from the data in order to measure the variation of the data from the mean values acquired.

Standard error (s.e.) of measurement was used to indicate the response stability within the measured data. If one were to administer a test to one individual an infinite number of times, one could assume that the response would vary from trial to trial. These differences would be a function of random measurement error. If a graph could be drawn to plot these responses, the distribution would represent a normal curve, with the mean equal to the true score and errors falling above and below the mean.

This distribution of measurement errors is a theoretical distribution that represents the population of all possible measurement errors that could occur for that variable. Errors would be smaller and the distribution would be less variable with a more reliable measurement.

Therefore, the standard deviation of the measurement errors, called the standard error of measurement reflects the reliability of the response.

The results obtained from these tests were then used to establish whether there was any statistical difference between the two treatment groups, from which any discussions and conclusions were drawn up.

3.9.3. General Hypothesis

The null hypothesis (Ho) for objective one stated that within each group there was no improvement of the patient's condition in terms of subjective clinical findings.

The alternative hypothesis (Ha) for objective one stated that within each group there was an improvement of the patient's condition in terms of subjective clinical findings.

The null hypothesis (Ho) for objective two stated that there was no difference between group one and two in terms of objective clinical findings.

The alternative hypothesis (Ha) for objective two stated that there was a difference between group one and two in terms of objective clinical findings.

CHAPTER FOUR: THE RESULTS

4.1. INTRODUCTION

This study was limited to 60 patients, 30 in group 1 and 30 in group 2. Group 1 received sacroiliac manipulation alone whilst group 2 received ischaemic compression of the gluteus medius trigger points followed by sacroiliac manipulation. Given that the sample sizes were greater than 30 (n≥30), and the variables continuous, the parametric tests of unpaired t-tests and paired t-tests were used to analyze the data obtained from the following measurement criteria:

*Numerical Pain Rating Scale-101

*Oswestry Low Back Pain Disability Index questionnaire

*Algometer readings on the appropriate PSIS and Gluteus Medius

*Myofascial Diagnostic Scale

*Orthopaedic Rating Scale

The results from the inter-group and intra-group analysis were represented in tables. The tabulated statistical results included the level of significance (p-value). The descriptive data was represented in bar and pie charts, including age, gender and race distribution.

The two-sample unpaired t-test was used as an inter-group comparison, to determine whether any differences occurred between the two groups at the initial, second and final consultation. In each of these tests, the null hypothesis stated that there was no difference between group 1 and group 2, with regards to which variable was being compared at the $\alpha= 0.05$ level of significance. The alternative hypothesis stated that there was a difference between the two groups being compared (Fischer and Van Belle 1993:315-319).

The two-sample paired t-test was used for intra-group comparison, to determine whether any change had occurred between:

- the initial and second consultation
- the initial and final consultation
- the second and final consultation.

In each of these tests the null hypothesis stated that there was no improvement between the two samples being compared at the $\alpha= 0.05$ level of significance. The alternative hypothesis stated that there was improvement between the two samples being compared (Fischer and Van Belle 1993:315-319).

DEMOGRAPHICS

Key For Graphs

Group 1 = Manipulation only

Group 2 = Ischaemic compression + manipulation

Age Distribution
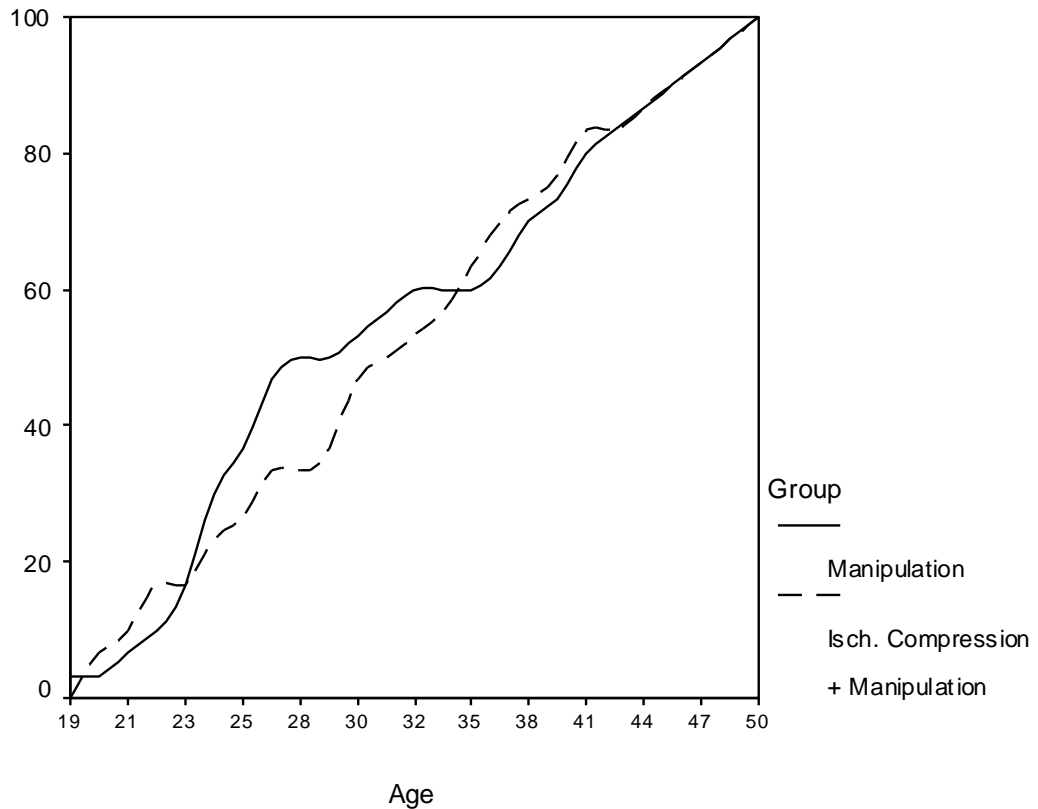
Figure A

The above line graph shows an even distribution of ages between the two groups. The mean age distribution for group 1 was 32,2 years, and for group 2 it was 32,7 years. 30 of the 60 patients were between the ages of 18 and 30. Only 24 of the patients were between 31 and 45 years old. This is not in keeping with Burton and Cassidy's (1992) statement that low back pain reaches a maximal frequency during middle age, since more patients were between the ages of 18 and 30.

Height Distribution
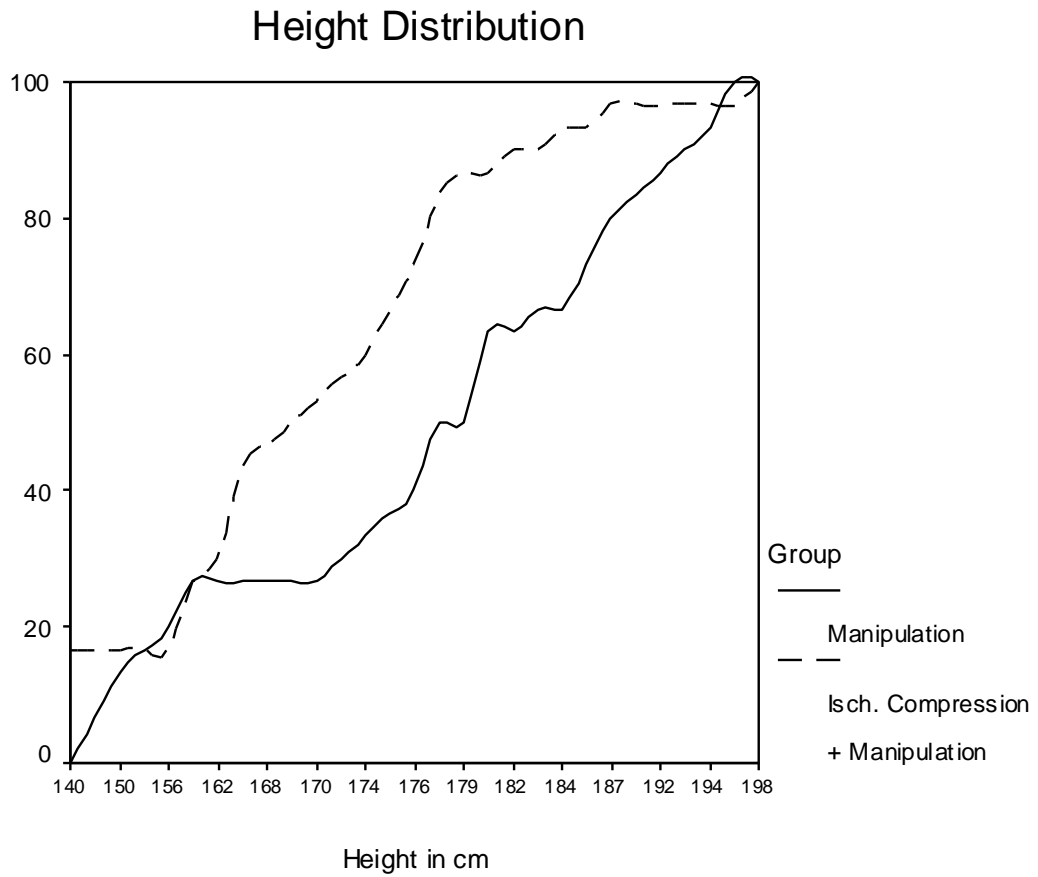
Figure B

The above line graph indicates that group I was slightly taller. The mean height for group 1 was 175,2cm, whilst group 2 had a mean height of 167,4cm.

Gender Distribution
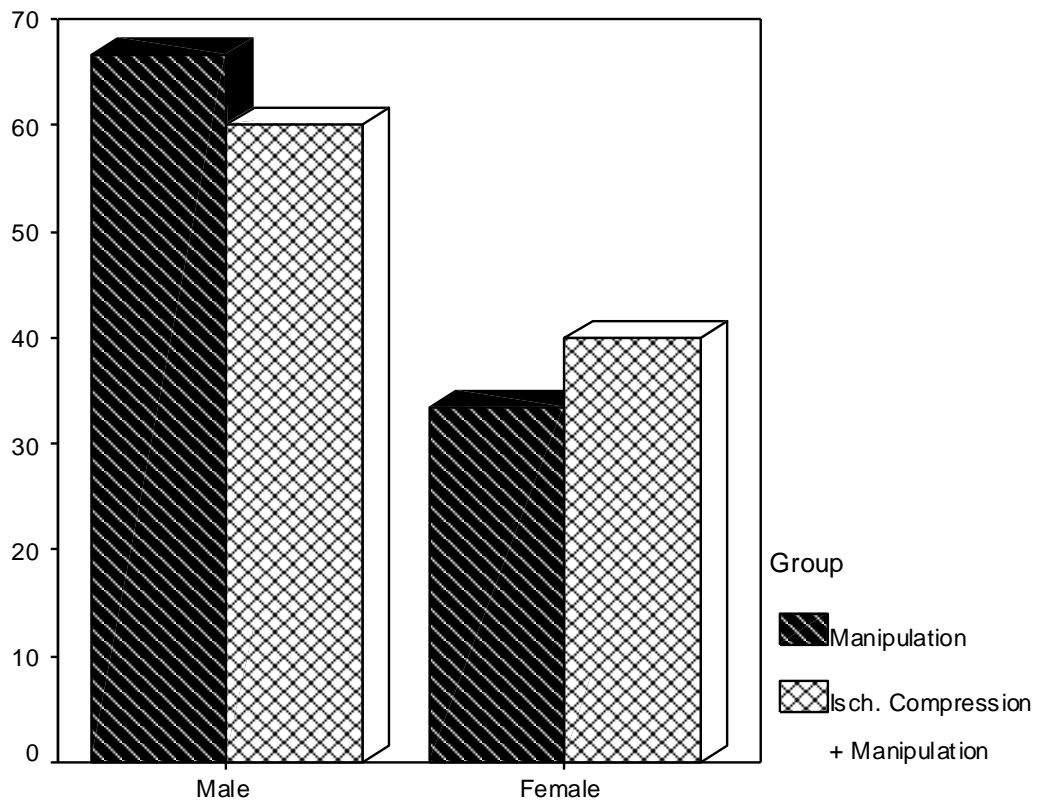
Figure D

The above bar graph shows that there were more males than females in both groups. Males made up 67% of group 1 and 60% of group 2.

Side of Sacroiliac Syndrome Distribution
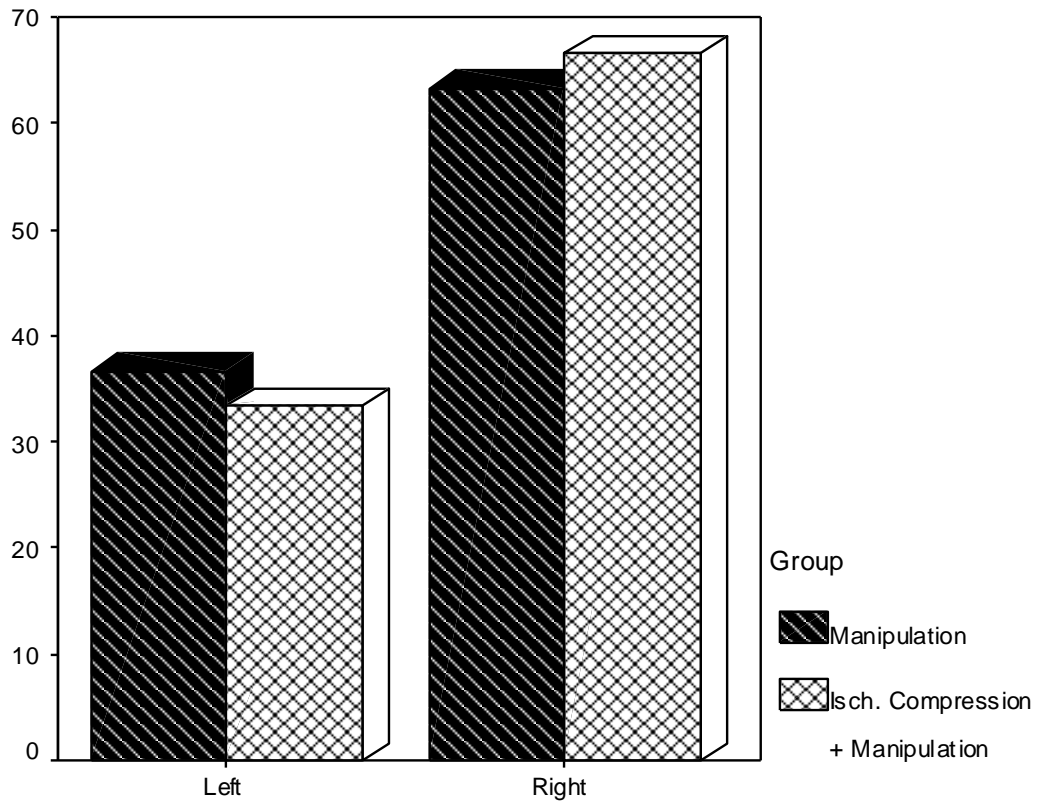
Figure F

The bar graph above indicates that in both groups the right Sacroiliac joint was more commonly involved. In all patients, one side was always worse than the other at the beginning of the study.

4.2. PARAMETRIC INTER-GROUP ANALYSIS

4.2.1. Analysis of the subjective data

Table 4.1. Comparison of the subjective data for groups 1 and 2 at the initial consultation using the unpaired t-test

	TREATMENT GROUP 1 (MANIP.) INITIAL CONSULT.		P-VALUE	TREATMENT GROUP 2 (ISCH. + MANIP.) INITIAL CONSULT.	
	Mean	S.D.		Mean	S.D.
NRS-101	42.167	17.415	**0.670**	40.333	15.746
OSWESTRY	18.07	12.01	**0.242**	21.60	11.13

The null hypothesis is accepted according to the defined decision rule for both the NRS-101 and the Oswestry questionnaires indicating that there was no difference at the time of the initial consultation between group 1 and group 2. This suggests that each group was similarly matched regarding the severity of their sacroiliac syndrome at the onset of the study.

Table 4.2. Comparison of the subjective data for groups 1 and 2 at the second consultation using the unpaired t-test

	TREATMENT GROUP 1 (MANIP.) SECOND CONSULT.		P-VALUE	TREATMENT GROUP 2 (ISCH. + MANIP.) SECOND CONSULT.	
	Mean	S.D.		Mean	S.D.
NRS-101	38.200	18.233	**0.084**	30.567	15.242
OSWESTRY	15.67	12.27	**0.786**	14.87	10.35

The null hypothesis is accepted according to the defined decision rule for both the NRS-101 and the Oswestry questionnaires indicating that there was no difference at the time of the second consultation between group 1 and group 2.

Table 4.3. Comparison of the subjective data for groups 1 and 2 at the final consultation using the unpaired t-test

	TREATMENT GROUP 1 (MANIP.) FINAL CONSULT.		P-VALUE	TREATMENT GROUP 2 (ISCH. + MANIP.) FINAL CONSULT.	
	Mean	S.D.		Mean	S.D.
NRS-101	18.067	16.843	**0.856**	17.267	17.166
OSWESTRY	8.53	10.34	**0.698**	9.53	9.54

The null hypothesis is accepted according to the defined decision rule for both the NRS-101 and the Oswestry questionnaires indicating that there was no difference between group 1 and 2 at the final consultation.

Figure 4.1.

Mean values of the NRS-101 at the initial, second and final consultations, comparing groups 1 and 2.
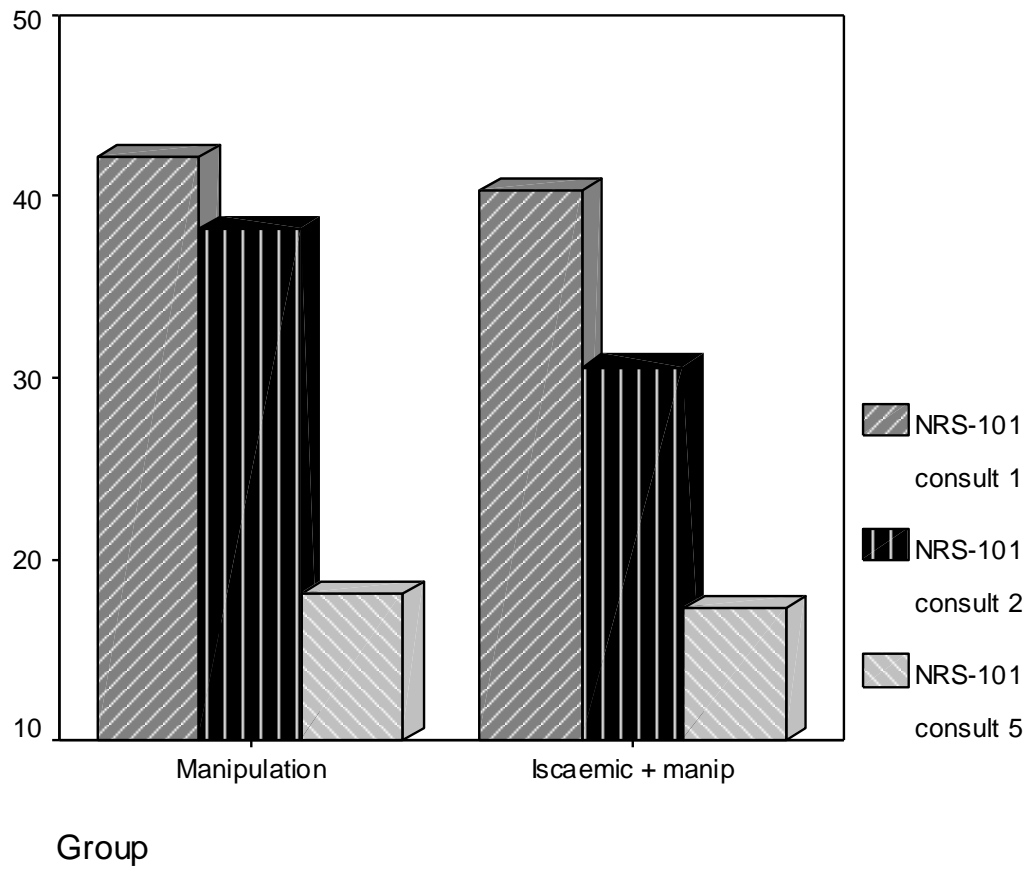
Figure 4.2.

Mean values of the Oswestry Low Back Pain Disability Index Questionnaire at the initial, second and final consultations, comparing groups 1 and 2.
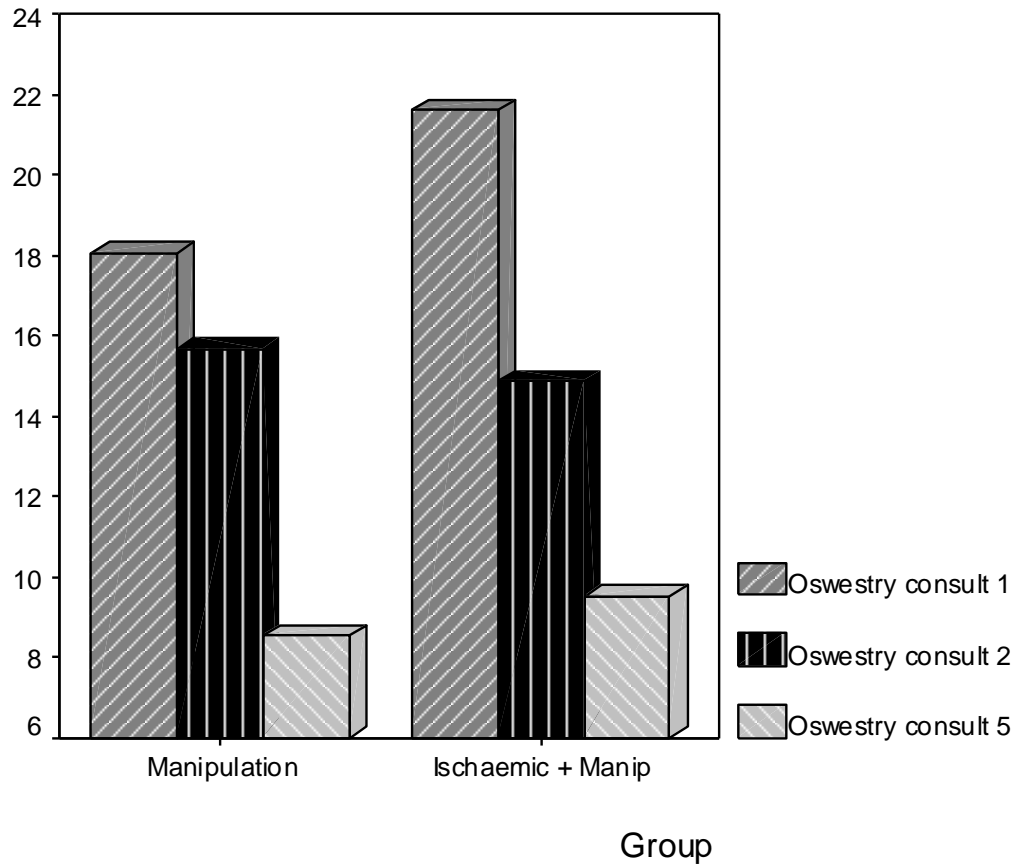
4.2.2. Analysis of the objective Data

Table 4.4. Comparison of the objective data for groups 1 and 2 at the initial consultation using the unpaired t-test

	TREATMENT GROUP 1 (MANIP.) INITIAL CONSULT.		P-VALUE	TREATMENT GROUP 2 (ISCH. + MANIP.) INITIAL CONSULT.	
	Mean	S.D.		Mean	S.D.
PSIS Algometer	5.503	1.894	**0.450**	5.147	1.739
Glut. Algometer	5.373	1.749	**0.062**	4.490	1.851
Myofascial Diagnostic Scale	9.00	2.59	**0.005**	10.80	2.14
Orthopaedic Rating Scale	5.43	2.24	**1.000**	5.43	2.14

The null hypothesis is accepted according to the defined decision rule for the algometer readings and Orthopaedic Rating Scale results, indicating no difference existed at the initial consultation for those measures. However the null hypothesis was rejected according to the decision rule for the Myofascial Diagnostic Scale results, indicating that a difference existed between group 1 and 2 at the initial consultation. This suggests that although the two groups were similarly matched according to the algometer and Orthopaedic Rating Scale measures, group 2 seemed to have more myofascial involvement at the start of the study according to the Myofascial Diagnostic Scale.

Table 4.5. Comparison of the objective data for groups 1 and 2 at the second consultation using the unpaired t-test

	TREATMENT GROUP 1 (MANIP.) SECOND CONSULT.		P-VALUE	TREATMENT GROUP 2 (ISCH. + MANIP.) SECOND CONSULT.	
	Mean	S.D.		Mean	S.D.
PSIS Algometer	5.850	2.067	**0.385**	5.410	1.820
Glut. Algometer	5.157	2.232	**0.475**	4.797	1.593
Myofascial Diagnostic Scale	8.23	2.84	**0.260**	9.03	2.61
Orthopaedic Rating Scale	3.70	2.63	**0.508**	3.27	2.41

The null hypothesis is accepted according to the defined decision rule for the algometer readings, Myofascial Diagnostic Scale and Orthopaedic Rating Scale results, indicating no difference existed between group 1 and group 2 at the second consultation.

Table 4.6. Comparison of the objective data for groups 1 and 2 at the final consultation using the unpaired t-test

	TREATMENT GROUP 1 (MANIP.) FINAL CONSULT.		P-VALUE	TREATMENT GROUP 2 (ISCH. + MANIP.) FINAL CONSULT.	
	Mean	S.D.		Mean	S.D.
PSIS Algometer	6.703	1.934	**0.449**	6.303	2.129
Glut. Algometer	6.103	2.075	**0.790**	6.243	1.984
Myofascial Diagnostic Scale	7.47	3.00	**0.231**	6.43	3.58
Orthopaedic Rating Scale	1.57	1.74	**0.771**	1.43	1.79

The null hypothesis is accepted according to the defined decision rule for the algometer readings, Myofascial Diagnostic Scale and Orthopaedic Rating

Scale results, indicating no difference existed between group 1 and group 2 at the final consultation.

Figure 4.3.

Mean values of the PSIS Algometer Readings at the initial, second and final consultations, comparing groups 1 and 2.
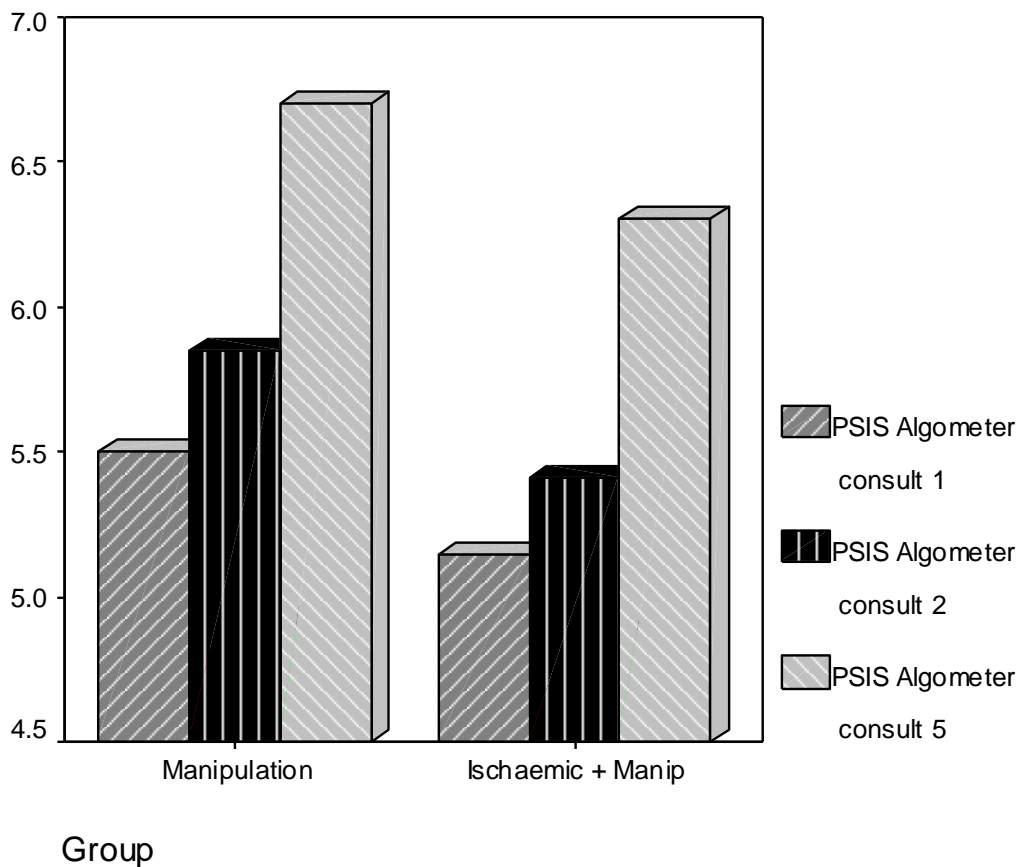
Figure 4.4.

Mean values of the Gluteus Medius trigger point Algometer

Readings at the initial, second and final consultations, comparing groups 1 and 2.
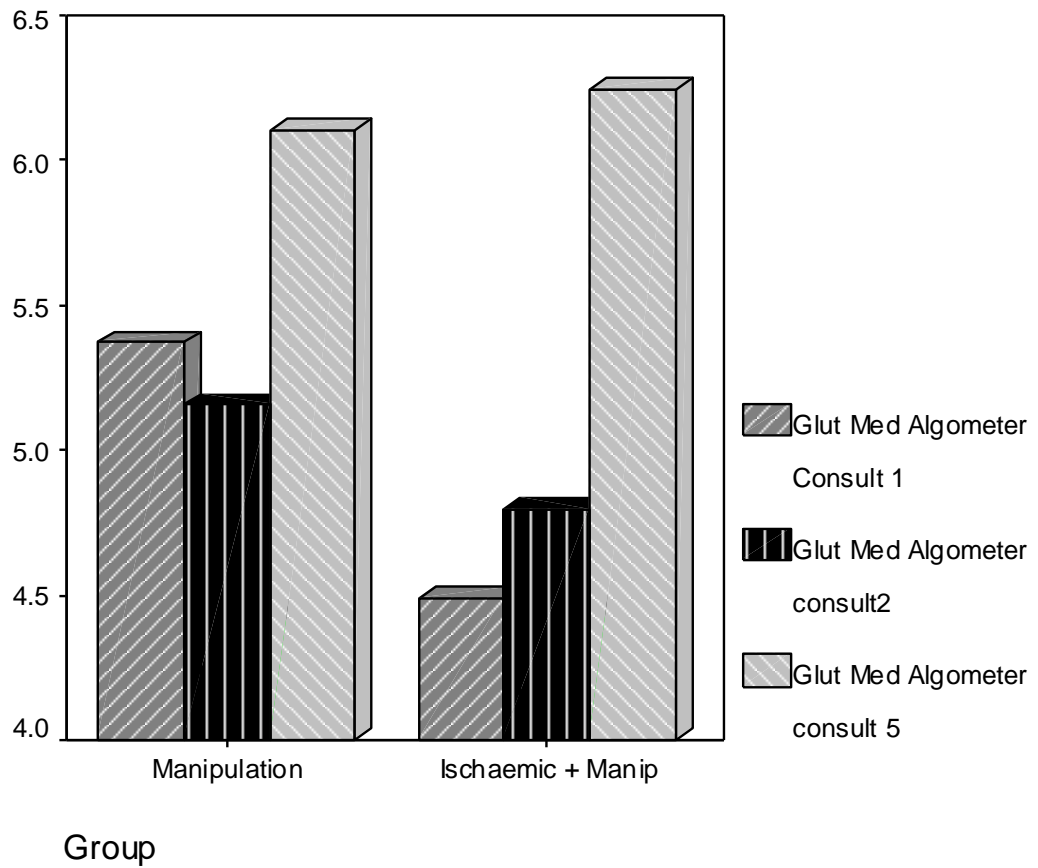
Figure 4.5.

Mean scores of the Myofascial Diagnostic Scale at the initial,
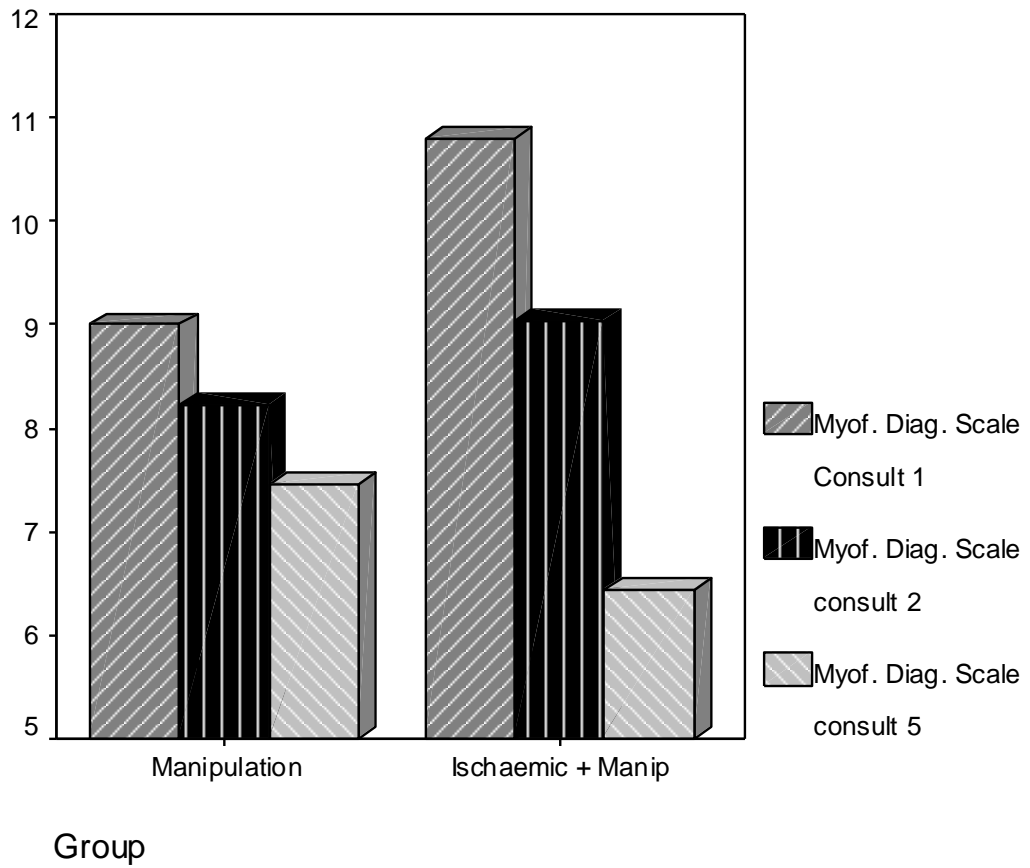
Figure 4.6.

Mean scores of the Orthopaedic Rating Scale at the initial,

second and final consultations, comparing groups 1 and 2.
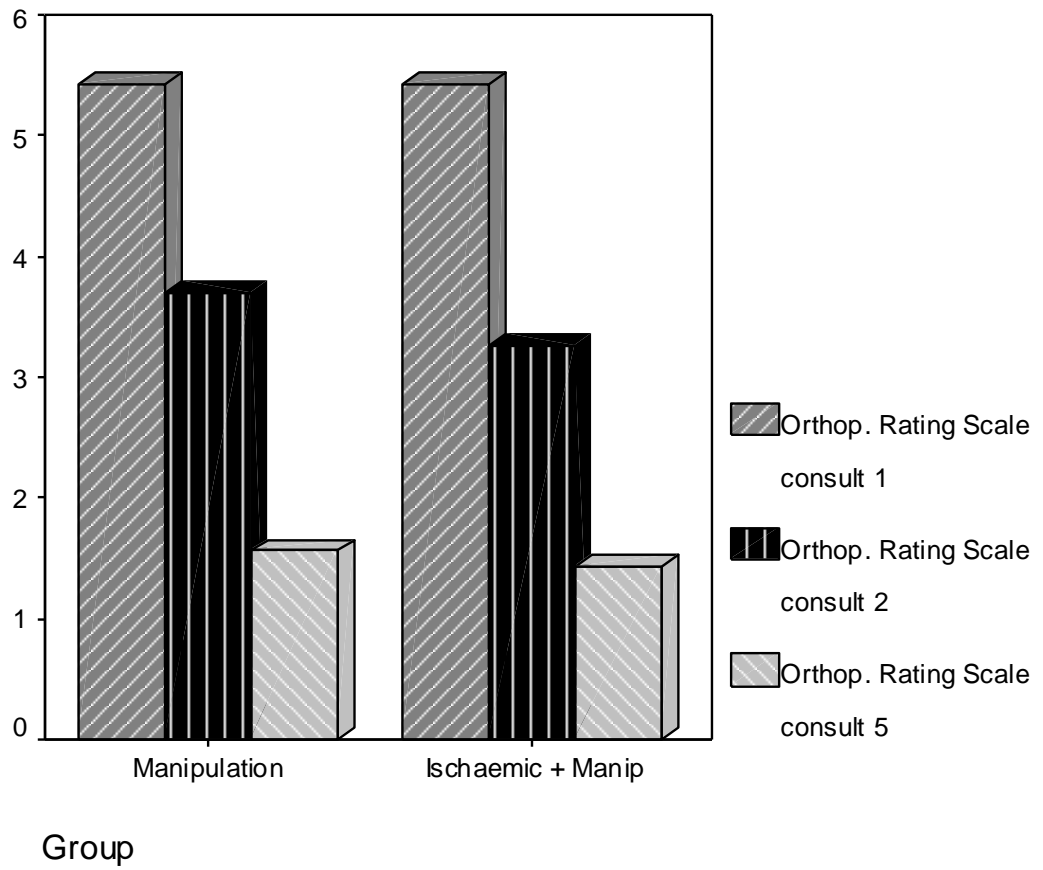
4.3.   PARAMETRIC INTRA-GROUP ANALYSIS FOR GROUP 1 (MANIPULATION ALONE)

4.3.1. Analysis of the subjective data

Table 4.7. Comparison of the subjective data between the initial and second consultations using the paired t-test

	TREATMENT GROUP 1 (MANIP.) INITIAL CONSULT.		P-VALUE	TREATMENT GROUP 1 (MANIP.) SECOND CONSULT.	
	Mean	S.D.		Mean	S.D.
NRS-101	42.167	17.415	**0.082**	38.200	18.233
OSWESTRY	18.07	12.01	**0.073**	15.67	12.27

The null hypothesis is accepted according to the defined decision rule for both the NRS-101 and the Oswestry Questionnaires, which indicates that there was no difference between the initial and second consultations within group 1.

Table 4.8. Comparison of the subjective data between the initial and final consultations using the paired t-test

	TREATMENT GROUP 1 (MANIP.) INITIAL CONSULT.	P-VALUE	TREATMENT GROUP 1 (MANIP.) FINAL CONSULT.

	Mean	S.D.		Mean	S.D.
NRS-101	42.167	17.415	**0.000**	18.067	16.843
OSWESTRY	18.07	12.01	**0.000**	8.53	10.34

The null hypothesis is rejected according to the defined decision rule for both the NRS-101 and the Oswestry Questionnaires, which indicates that an improvement took place between the initial and final consultations within group 1.

Table 4.9. Comparison of the subjective data between the second and final consultations using the paired t-test

	TREATMENT GROUP 1 (MANIP.) SECOND CONSULT.		P-VALUE	TREATMENT GROUP 1 (MANIP.) FINAL CONSULT.	
	Mean	S.D.		Mean	S.D.
NRS-101	38.200	18.233	**0.000**	18.067	16.843
OSWESTRY	15.67	12.27	**0.000**	8.53	10.34

The null hypothesis is rejected according to the defined decision rule for both the NRS-101 and the Oswestry Questionnaires, which indicates that an improvement took place between the second and final consultations within group 1.

4.4. PARAMETRIC INTRA-GROUP ANALYSIS FOR GROUP 2 (ISCHAEMIC COMPRESSION +MANIPULATION)

4.4.1. Analysis of the subjective data

Table 4.10. Comparison of the subjective data between the initial and second consultations using the paired t-test

	TREATMENT GROUP 2 (ISCH. + MANIP.) INITIAL CONSULT.		P-VALUE	TREATMENT GROUP 2 (ISCH. + MANIP.) SECOND CONSULT.	
	Mean	S.D.		Mean	S.D.
NRS-101	40.333	15.746	**0.000**	30.567	15.242
OSWESTRY	21.60	11.13	**0.000**	14.87	10.35

The null hypothesis is rejected according to the defined decision rule for both the NRS-101 and the Oswestry Questionnaires, which indicates that an improvement took place between the initial and second consultations within group 2.

Table 4.11.   Comparison of the subjective data between the initial and final consultations using the paired t-test

	TREATMENT GROUP 2 (ISCH. +MANIP.) INITIAL CONSULT.		P-VALUE	TREATMENT GROUP 2 (ISCH. + MANIP.) FINAL CONSULT.	
	Mean	S.D.		Mean	S.D.
NRS-101	40.333	15.746	**0.000**	17.267	17.166
OSWESTRY	21.60	11.13	**0.000**	9.53	9.54

The null hypothesis is rejected according to the defined decision rule for both the NRS-101 and the Oswestry Questionnaires, which indicates that an improvement took place between the initial and final consultations within group 2.

Table 4.12.   Comparison of the subjective data between the second and final consultations using the paired t-test

	TREATMENT GROUP 2 (ISCH. +MANIP.) SECOND CONSULT.		P-VALUE	TREATMENT GROUP 2 (ISCH. + MANIP.) FINAL CONSULT.	
	Mean	S.D.		Mean	S.D.
NRS-101	30.567	15.242	**0.000**	17.267	17.166
OSWESTRY	14.87	10.35	**0.000**	9.53	9.54

The null hypothesis is rejected according to the defined decision rule for both the NRS-101 and the Oswestry Questionnaires, which indicates that an improvement took place between the second and final consultations within group 2.

4.5. PARAMETRIC INTRA-GROUP ANALYSIS FOR GROUP 1 (MANIPULATION ALONE)

4.5.1. Analysis of the objective data

Table 4.13. Comparison of the objective data between the initial and second consultations using the paired t-test

	TREATMENT GROUP 1 (MANIP.) INITIAL CONSULT.		P-VALUE	TREATMENT GROUP 1 (MANIP.) SECOND CONSULT.	
	Mean	S.D.		Mean	S.D.
PSIS Algometer	5.503	1.894	**0.158**	5.850	2.067
Glut Algometer	5.373	1.749	**0.324**	5.157	2.232
Myofascial Diagnostic Scale	9.00	2.59	**0.003**	8.23	2.84
Orthopaedic Rating Scale	5.43	2.24	**0.000**	3.70	2.63

The null hypothesis is accepted according to the defined decision rule for both the algometer readings, indicating that there was no difference between the initial and second consultations within group 1. However the null hypothesis is rejected according to the defined decision rule for both the Myofascial Diagnostic Scale and Orthopaedic Rating Scale results indicating an improvement between the initial and second consultations within group 1.

Table 4.14.   Comparison of the objective data between the initial and final consultations using the paired t-test

	TREATMENT GROUP 1 (MANIP.) INITIAL CONSULT.		P-VALUE	TREATMENT GROUP 1 (MANIP.) FINAL CONSULT.	
	Mean	S.D.		Mean	S.D.
PSIS Algometer	5.503	1.894	**0.000**	6.703	1.934
Glut Algometer	5.373	1.749	**0.015**	6.103	2.075
Myofascial Diagnostic Scale	9.00	2.59	**0.001**	7.47	3.00

| | Orthopaedic Rating Scale | 5.43 | 2.24 | **0.000** | 1.57 | 1.74 |

The null hypothesis is rejected according to the defined decision rule for both the algometer readings and the Myofascial Diagnostic Scale and Orthopaedic Rating Scale results, indicating an improvement between the initial and final consultations within group 1.

Table 4.15. Comparison of the objective data between the second and final consultations using the paired t-test

	TREATMENT GROUP 1 (MANIP.) SECOND CONSULT.		P-VALUE	TREATMENT GROUP 1 (MANIP.) FINAL CONSULT.	
	Mean	**S.D.**		**Mean**	**S.D.**
PSIS Algometer	5.850	2.067	**0.014**	6.703	1.934
Glut Algometer	5.157	2.232	**0.001**	6.103	2.075
Myofascial Diagnostic Scale	8.23	2.84	**0.102**	7.47	3.00
Orthopaedic Rating Scale	3.70	2.63	**0.000**	1.57	1.74

The null hypothesis is accepted according to the defined decision rule for the Myofascial Diagnostic Scale, indicating that there was no difference between the second and final consultations within group 1. However the null hypothesis is rejected according to the defined decision rule for both the algometer readings and Orthopaedic Rating Scale results indicating an improvement between the second and final consultations within group 1.

4.6. PARAMETRIC INTRA-GROUP ANALYSIS FOR GROUP 2 (ISCHAEMIC COMPRESSION + MANIPULATION)

4.6.1. Analysis of the objective data

Table 4.16. Comparison of the objective data between the initial and second consultations using the paired t-test

	TREATMENT GROUP 2 (ISCH. +MANIP.) INITIAL CONSULT.		P-VALUE	TREATMENT GROUP 2 (ISCH. + MANIP.) SECOND CONSULT.	
	Mean	S.D.		Mean	S.D.
PSIS Algometer	5.147	1.739	**0.315**	5.410	1.820
Glut Algometer	4.490	1.851	**0.242**	4.797	1.593
Myofascial Diagnostic Scale	10.80	2.14	**0.000**	9.03	2.61
Orthopaedic Rating Scale	5.43	2.14	**0.000**	3.27	2.41

The null hypothesis is accepted according to the defined decision rule for both the algometer readings, indicating that there was no difference between the initial and second consultations within group 2. However the null hypothesis is rejected according to the defined decision rule for both the Myofascial Diagnostic Scale and Orthopaedic Rating Scale results indicating an improvement between the initial and second consultations within group 2.

Table 4.17. Comparison of the objective data between the initial and final consultations using the paired t-test

	TREATMENT GROUP 2 (ISCH. +MANIP.) INITIAL CONSULT.		P-VALUE	TREATMENT GROUP 2 (ISCH. + MANIP.) FINAL CONSULT.	
	Mean	S.D.		Mean	S.D.

	Mean	S.D.		Mean	S.D.
PSIS Algometer	5.147	1.739	**0.000**	6.303	2.129
Glut Algometer	4.490	1.851	**0.000**	6.243	1.984
Myofascial Diagnostic Scale	10.80	2.14	**0.000**	6.43	3.58
Orthopaedic Rating Scale	5.43	2.14	**0.000**	1.43	1.79

The null hypothesis is rejected according to the defined decision rule for both the algometer readings, Myofascial Diagnostic Scale and Orthopaedic Rating Scale results indicating an improvement between the initial and final consultations within group 2.

Table 4.18. Comparison of the objective data between the second and final consultations using the paired t-test

	TREATMENT GROUP 2 (ISCH. +MANIP.) SECOND CONSULT.		P-VALUE	TREATMENT GROUP 2 (ISCH. + MANIP.) FINAL CONSULT.	
	Mean	**S.D.**		**Mean**	**S.D.**
PSIS Algometer	5.410	1.820	**0.002**	6.303	2.129
Glut Algometer	4.797	1.593	**0.000**	6.243	1.984
Myofascial Diagnostic Scale	9.03	2.61	**0.000**	6.43	3.58
Orthopaedic Rating Scale	3.27	2.41	**0.000**	1.43	1.79

The null hypothesis is rejected according to the defined decision rule for both the algometer readings, Myofascial Diagnostic Scale and Orthopaedic Rating Scale results indicating an improvement between the second and final consultations within group 2.

CHAPTER FIVE : DISCUSSION

This chapter will discuss all the subjective and objective results as recorded from the Numerical Pain Rating Scale-101 (NRS-101), the Oswestry Low Back Pain Disability Index questionnaire, algometer readings, the Myofascial Diagnostic Scale and the Orthopaedic Rating Scale, all of which have been presented in chapter four.

Data was obtained at the beginning of the initial and after the second and final consultations. Statistical analysis was performed on this data in order to compare the initial and second consultation, the initial and final consultation and lastly the second and final consultation in order to determine the efficacy of the two different treatments given for the sacroiliac syndrome.

5.1. INTER- GROUP ANALYSIS

There was no statistical evidence to show that ischaemic compression of gluteus medius trigger points prior to sacroiliac manipulation was more effective than sacroiliac manipulation alone in the treatment of sacroiliac syndrome. It is also the researcher's opinion that there seemed to be no difference between the two groups by the fifth consultation in terms of clinical evidence.

There was no statistically significant difference between the two groups at the initial consultation except for the Myofascial Diagnostic Scale results which were found to be significantly higher in group 2. However data taken after the second and final consultation did not show a statistically significant difference between the two groups for any of the outcome measures.

In conclusion, at a 95% level of confidence, no additional benefit provided by the ischaemic compression could be demonstrated for the treatment of sacroiliac syndrome in this study.

5.1.1. Analysis of the subjective data

Inter-group group analysis for the subjective data (NRS-101 and Oswestry) can be found in tables 4.1. to 4.3.

The Initial consultation showed no statistically significant pain levels or disability differences between group 1 and 2 (Table 4.1.).

Although the NRS-101 mean value for group 2 appeared much lower than its corresponding value for group 1 at the second consultation, the difference was not great enough to be statistically significant. This may well have been as a result of the perceived superior treatment the patients of group 2 were

receiving as compared to the treatment that they knew group 1 was receiving. (Both groups knew what treatment the other group was receiving and so patients in group 2 may have been influenced into thinking that they should be responding better since they were receiving an additional form of treatment.) However, both the second and final consultation showed no statistically significant difference between the two groups for the Oswestry results and no statistically significant difference was found at the final consultation for the NRS-101 (Tables 4.2. and 4.3).

5.1.2. Analysis of the objective data (Tables 4.4. to 4.6.)

The initial consultation showed no statistical significant difference between the two groups for both the algometer readings and the Orthopaedic Rating Scale results. However, the Myofascial Diagnostic Scale indicated that there was a statistically significant difference in terms of the degree of myofascial involvement of the gluteus medius muscles between the two groups. (Group 2 appeared to have more myofascial involvement to begin with than group 1.) This could be attributed to a type I error whereby there is a significant difference between the two groups where there should not be, most likely as a result of the small sample size and the heterogeneity that existed in the samples. Another possible reason for this anomaly may be because the Myofascial Diagnostic Scale is not as valid or reliable as one would expect. (There has still been no study on the validity and reliability of this scale.)

It is however interesting to note that despite the fact that group 2 appeared to have more myofascial involvement initially, after having received only one treatment of ischaemic compression of their trigger points and sacroiliac joint manipulation, the myofascial involvement of their gluteus medius muscle was no longer significantly worse than group 1. This may suggest that in terms of the Myofascial Diagnostic Scale, group 2 improved proportionately more than group 1 between the initial and second consultation.

The second and final consultations showed no statistical significant difference between the two groups in terms of the objective data.

5.2. INTRA-GROUP ANALYSIS

Intra-group comparison of the subjective and objective data showed that both group 1 and 2 experienced improvement in their subjective pain intensity levels; disability due to their low back pain; objective orthopaedic testing; degree of myofascial involvement; and pain threshold levels.

5.2.1. Subjective data (Tables 4.7. to 4.12.)

Group 1

No statistically significant improvement was found between the initial and second consultation for the NRS-101 and the Oswestry results. However there was a statistically significant improvement between the initial and final consultation and the second and final consultation (Tables 4.8 and 4.9). This seems to indicate that in terms of subjective findings, the effectiveness of sacroiliac joint manipulation appears more obvious after several days and a few more manipulations. Whether this significant improvement is merely as a result of more time needed for the joint dysfunction to recover after the first manipulation, or that more than one manipulation is needed, the researcher is unable to say. It is, however, possible that although patients may have experienced some pain relief from their original low back pain, they may have felt a little bruised and tender a day or two after the first manipulation when most patients had their second treatment scheduled. (This bruising affect may have been more pronounced in group 1 as no ischaemic compression was

done to relax the muscles prior to the manipulation.) This may have affected the subjective results, particularly at the second consultation, since further manipulations would eventually ease the myofascial component of the sacroiliac syndrome, resulting in more relaxed muscles and less discomfort by the final consultation.

Group 2

For both the NRS-101 and the Oswestry results, a statistically significant improvement was found between the initial and second, initial and final and the second and final consultations (Tables 4.10 to 4.12). This would indicate that group 2, in terms of subjective data, appeared to improve more between the initial and second consultation than group 1. This again may well have been as a result of the perceived superior treatment the patients of group 2 were receiving as compared to the treatment that they knew group 1 was receiving. These results may also have occurred due to the possible short-term pain relief the ischaemic compression may have given in terms of contributing to muscle relaxation and decreased myofascial pain associated with the sacroiliac syndrome. However, the degree of improvement between the initial and final and second and final consultations was much the same as in group 1, reinforcing the idea that the myofascial component of the sacroiliac syndrome eventually subsides even if only the joint dysfunction is corrected.

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5.2.2. Objective data (Tables 4.13. to 4.18.)

Group 1

Although both the algometer readings found no statistically significant improvement between the initial and second consultation, both the Myofascial

Diagnostic Scale and the Orthopaedic Rating Scale showed a statistically significant improvement between the initial and second consultation (Table 4.13). Again this may have been due to the bruising affect the first manipulation had. All four objective measurements indicated a significant improvement between the initial and final consultation (Table 4.14), however only three of the four indicated significant improvements between the second and final consultations (Table 4.15). The Myofascial Diagnostic Scale showed no significant improvement. Once again the validity and reliability of this scale is questioned.

Group 2

Although both the algometer readings found no statistically significant improvement between the initial and second consultation, both the Myofascial Diagnostic Scale and the Orthopaedic Rating Scale showed a statistically significant improvement between the initial and second consultation (Table 4.16). It is not understood why there was no improvement in the PSIS algometer readings between the initial and second consultations, but post ischaemic compression tenderness may well have been the reason for no statistically significant improvement for the gluteus medius algometer readings at the second consultation. (Most patients in group 2 at the second consultation complained of some degree of bruising in their trigger points that had undergone ischaemic compression in their initial treatment.) All four objective measurements indicated a significant improvement between the initial and final consultation and the second and final consultation (Table 4.17 and 4.18). This would indicate that group 2 seemed to improve significantly more than group 1 in terms of the degree of myofascial involvement between the second and final consultations. The researcher does not understand why, as this seems to contradict earlier suggestions that group1's myofascial

component seemed to improve with time when looking at the subjective measures.

5.3. DISCUSSION OF THE DEMOGRAPHIC DATA

In all of the demographic data following, no statistically significant differences was noted between the two groups. Thus any differences highlighted are minimal.

The age distribution (Figure A), showed an even distribution between the two groups. However most of the patients were between the 20 and 30-year age group, not the normal age for low back pain to reach its maximal frequency, (this normally occurs at middle age according to Burton and Cassidy, 1992). This could be attributed not only to the small sample size of the study but also due to the fact that the research was conducted in a tertiary institution and therefore a large portion of the patients were students younger than 25.

Both the height and weight distributions (Figure B and C) were slightly different. Group 1 patients proved to be slightly taller and heavier.

The study consisted of more males than females (Figure D). Males made up 67% of group 1 and 60% of group 2. These results are in contrast to the study conducted by Gemmel and Jacobson (1990) on 83 fit college students, in which they found that it was females who predominantly reported having a history of low back pain.

The race distribution (Figure E), indicated that whites were the dominant race group in both group 1 and group 2. However there were proportionately more indians and blacks in group 1 than in group 2. In the study conducted by Gemmel and Jacobson (1990) they also noted that it was whites who predominantly reported having a history of low back pain. Van der Meulen (1997) noted that the lifetime incidence of low back pain was only 57.6% in black South Africans. However, Docrat (1999) found that the lifetime incidence of low back pain in South African indians and coloureds was between 70% and 80%, which falls well within the norm established by Burton and Cassidy (1992) of 60-90% for a predominantly white American population. Thus the unbalanced results of the race distribution in this study may have been due to the lack of chiropractic awareness amongst the black, coloured and indian communities.

The side of the sacroiliac joint most commonly involved in this study was the right (Figure F) and was the case in both groups, (63% in group 1 and 67% in group 2.) This confirms Bernard and Cassidy's (1991) statement that sacroiliac joint syndrome usually has a right-sided predominance. Given that most people are right handed it is not surprising that a right-sided sacroiliac syndrome is more common. Such a relationship, if there is one, needs to be investigated further.

Interesting to note was that the most common site for the gluteus medius trigger points in both groups was also on the right, more specifically trigger point 2 (Figure G). This could confirm the notion that sacroiliac joint dysfunction is intimately related with the development of muscle spasm in the nearby gluteus medius muscle.

5.4. STUDY LIMITATIONS

The overall results of the study suggest that both groups improved in terms of the subjective and objective data with no statistically significant difference in outcome measures between the two groups.

Certainly one of the biggest problems with the research was its relatively small sample size, which may have influenced the results. Indeed, the difference in the initial Myofascial Diagnostic Scale results between group 1 and 2 most likely was as a result of the small sample size. A large sample size is more accurate as it reduces the chances of incorrectly accepting or rejecting the null hypothesis and thus serves to improve the validity of the study.

Ideally, when conducting such a study as this, homogeneity amongst the patients accepted onto the study should be strictly adhered to by the researcher. However, due to the study design and time constraints, distributing the patients equally in terms of age, sex, race, height, weight, occupation etc. would have been extremely difficult. Although the age distribution amongst the two groups was equal, the sex, height, weight and race distributions were not.

As both sacroiliac joint tenderness and motion palpation were used to determine the side of the sacroiliac joint to be manipulated, each manipulation the patient received was not always on the same side and in many cases the manipulation was performed on both sides. This approach may certainly have introduced some degree of variation, which in a study like this, is not ideal.

Although each patient was instructed not to partake in any other treatment program, or commence any new activity or lifestyle during the course of the study which might otherwise have affected the outcome results, policing such an instruction was very difficult. It is unknown if this may have altered the outcome of the study or not.

As the patients were informed that they were participating in a study, their behaviour and response to the treatment may have been significantly influenced, (the Hawthorne effect). Ideally a similar study needs to be performed where the two groups do not know that they are being compared.

The reason there was no significant difference in improvement between the two groups could be explained by Korr's theory of joint fixation: When a chiropractic manipulation is used to restore normal joint motion, there is a stretching of the hypertonic muscles responsible for the restricted movement. This causes a rapid stretch of the muscle spindles generating "an immense barrage of afferent impulses" to the central nervous system, which in turn reduces the effects of the gamma efferents, normalizing the gamma gain and therefore returning the muscle to normal tonus (Blunt et al. 1995: 214). This explains why a manipulation alone can be as, if not more effective, than other treatment methods for hypertonic muscles in the restoration of normal muscle tone.

There was no blinding in the study, leading to the possibility of practitioner bias and the influencing of results.

There were also problems with the accurate capturing of the subjective and objective data:

Subjective Data

Most patients found it difficult to describe the intensity of their pain when answering the Numerical Pain Rating Scale-101. Despite this, however, as mentioned before, research indicates that this is the best of the pain rating scales available, and until a more reliable one is designed, it is still in the researchers opinion, the scale of choice for such a study. In addition, many patients found that not enough options were available to them when answering the Oswestry Low Back Pain Disability Index questionnaire and they found themselves having to agree to options that were not really

accurate for their condition at the time. This was mainly due to the fact that the Oswestry Low Back Pain Disability Index questionnaire is more appropriate to assess patients with moderate to severe chronic low back pain (Beurskens et al. 1995). Most patients in this study however, only had minor disability and therefore it would have been more appropriate if the Revised Oswestry questionnaire had been used.

Objective Data

With regards to the objective data, the validity and sensitivity of the Orthopaedic tests used in the Rating Scale have been established, however the validity and sensitivity of the Rating Scale and the Myofascial Diagnostic Scale have yet to be investigated. Furthermore, variations due to human error in the exact positioning of the algometer, although only slight, may have significantly influenced pain threshold levels. It must also be added that all the available algometers did not have adequate rubber stoppers on the ends of the instruments. This may have significantly altered readings since the patient may have felt pain rather as a result of the instrument not being sufficiently padded, instead of the tenderness due to the increasing amounts of pressure.

5.5.   COMPARISON WITH OTHER STUDIES

The results of this study have been compared to other similar studies in order to determine if there are any similarities which could serve to further validate the results of this study.

Broughton and Kretzmann (2000) conducted a study in which spinal manipulation was compared with spinal manipulation and low back strapping

for the treatment of low back pain. As in this study, sixty patients with a similar race distribution were divided up into two groups of thirty, each receiving one of the two treatment methods. The study differed in that non-specific low back pain was looked at, and the study consisted of six treatment sessions and not four. In addition the age of the patients ranged from 18-65 years old and there was an equal ratio of male to female patients. In their study, like this one, no statistically significant difference was noted between the two groups by the final consultation.

Ranwell (2001) performed a study on sacroiliac syndrome in which sacroiliac manipulation alone was compared with a combination of PNF stretching of the piriformis muscles and sacroiliac joint manipulation. Sixty patients, with a similar gender distribution to this study were divided into two groups of thirty and treated four times over a two week period. The patients were however between the ages of 18 and 60 with an average age of about 41. The results of the study also noted no statistically significant difference between the two groups by the final consultation.

Payton (2001) conducted a study on sacroiliac syndrome in which sacroiliac joint manipulation combined with detuned ultrasound was compared with sacroiliac joint manipulation combined with proprioceptive neuromuscular facilitation (PNF) stretching of the gluteal musculature. Sixty patients, between the ages of 18 and 50 with an average age of about 35 and of an even gender distribution, were divided into two groups of thirty patients each, and were treated four times over a two week period. Results similar to this study were recorded as no statistically significant difference between the two groups was noted.

It appears that treatment modalities such as low back strapping, PNF stretching and ischaemic compression do not seem to provide any additional benefit when combined with manipulation for the treatment of low back pain.

CHAPTER SIX

6.1.   RECOMMENDATIONS

Sample Size

The sample size of this study was limited to sixty patients. Although this allowed for parametric testing to be performed in the statistical analysis, a larger sample size would make for a much more accurate study as this would reduce the chance of a type 1 or 2 error occurring.

Homogeneity

With regards to the inclusion and exclusion criteria, strict adherence to the use of matched pairs with respect to age, sex, race, height, weight, occupation and extent of pain and disability, would greatly enhance the strength of the study. It is therefore recommended that future studies include stratification to ensure homogeneity within the two groups. In addition, if the patient is diagnosed with a right or left sided sacroiliac joint syndrome, homogeneity in terms of the side to be manipulated should be maintained throughout all the treatments.

Blinding

There was no blinding in the study, leading to the possibility of practitioner bias and the influencing of the results. Although it was not possible for the researcher to be blinded due to the nature of the treatment, in future, observer bias could be eliminated by allowing a third person to collect and collate the objective data without knowing which group the patient belonged to.

Treatment Frequency

In this study, a standard treatment frequency of four treatments was given and as a result the optimum number of visits it would require for a full recovery was not addressed or at least whether further relief could be obtained with additional treatments. It is therefore recommended that a study with more treatments over a longer period of time be carried out. The inclusion of at least one more follow-up consultation, one or even six months later, would be useful to determine the long- term efficacy of the two treatment programs, as it is the researcher's opinion that the muscle spasm of the gluteus medius, if not adequately addressed, may contribute to the chronicity and/or recurrence of the sacroiliac syndrome.

Scheduled Treatments

Each treatment should be scheduled as strictly as possible so as to make for a more reliable and valid study. In this study four treatments were given within a period of two weeks with a follow-up consultation within a week of the last treatment session. There was no specification of when each treatment was to be administered. For example some patients received three treatments in the first week and only one in the second whereas others had only one treatment in the first week and three in the second. This may have significantly affected the readings of the second consultation and indeed even of the final consultation, especially if the frequency of treatments initially, affected the over-all rate of improvement.

Mathews (1995 : 91) conducted a randomized clinical trial consisting of thirty patients diagnosed with lumbar facet syndrome, sacroiliac syndrome or both. The average age of the patients was about 43 years with 18 patients male and 12 patients female. The patients were divided into two groups of 15, one group receiving three treatments per week and the other group one treatment per week. Both groups received treatment for a maximum of three weeks. The results indicated that the different frequencies of treatments were equally effective. He did however warn that the results obtained could not be generalized to other populations or treatment frequencies.

Use of the Revised Oswestry questionnaire

In future, studies conducted on patients with minor disability, the Revised Oswestry questionnaire should be used. This will make for more sensitive and accurate results.

Measurement Error

Variation in the placement of the algometer due to human error could be limited if a Henna marker is used to make a mark on the site of the original measurement location, so that subsequent measurements are taken on the same mark.

Orthopaedic Rating Scale and Myofascial Diagnostic Scale

These assesment tools have not yet been validated, and therefore future studies are recommended to investigate their validity and sensitivity. Certainly with the Orthopaedic Rating Scale, the tests need to be rated as mild, moderate or strongly positive, not just whether they are positive or negative.

With regards to the validity and sensitivity of the orthopaedic tests, based upon the clinical experience gained by the study, it is the researcher's opinion

that the Posterior Shear or "Thigh Thrust" test was the most predictive test for sacroiliac syndrome and therefore should certainly be one of the first tests to be validated in future research.

6.2.   CONCLUSION

The results of this study suggest that both groups improved significantly both subjectively and objectively in terms of their sacroiliac syndrome.

Although the intra-group annalysis for the subjective measurements indicated that the ischaemic compression group had significantly improved between the initial and second consultation while the manipulation group had not, the rest of the results indicate that there was no significant difference between the two groups by the final consultation.

Based upon the results of this and other similar studies, I have been led to the following conclusion. It is not so much the muscle hypertonicity around the sacroiliac joint that causes the joint dysfunction initially, but it is the joint dysfunction that results from the patients poor posture and aggravating factors in his or hers lifestyle, that by way of the arthrokinetic reflex, causes the development of secondary reflex protective muscle spasm of the surrounding muscles, in particular the body's key pelvic stabilizer, the gluteus medius muscle. This in time leads to the development of extensive trigger points and possible shortening and weakening of the muscle, thereby exacerbating the nearby sacroiliac joint dysfunction resulting in more pain and therefore more protective muscle spasm, and so continuing the cycle. Therefore, even if only the joint kinematics are improved by way of manipulation, there is an automatic re-establishment of normal muscle tone in the surrounding area and a "rebalancing of the arthrokinetic reflex" (Bernard and Cassidy 1991: 2125). This would explain why the manipulation group responded just as well as the ischaemic compression group.

Further research is needed in order to determine the efficacy of ischaemic compression or indeed any of the other forms of myofascial therapy, in the treatment of sacroiliac syndrome. Until then, the clinician will have to decide based upon his or hers own clinical experience as to whether this treatment modality will be of any benefit to the patient.

To conclude, this study has served to demonstrate that sacroiliac joint manipulation alone is as effective as ischaemic compression of the gluteus medius trigger points followed by sacroiliac joint manipulation in the treatment of sacroiliac syndrome.

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