

**THE INTER-EXAMINER RELIABILITY AND VALIDITY OF
THE MYOFASCIAL DIAGNOSTIC SCALE AS AN
ASSESSMENT TOOL IN THE DIAGNOSIS OF
MYOFASCIAL PAIN SYNDROME**

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IN THE DIAGNOSIS OF MYOFASCIAL PAIN SYNDROME**

BY

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of Technology in partial compliance with the requirements for a
Master's Degree in Technology: Chiropractic

I, Vinesh Vaghmaria, do declare that this dissertation is representative of my own
work in both conception and execution.

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Date

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M.Tech: Chiropractic (TN); CCFC (TN)

Dedication

I would like to dedicate this work to the Almighty Parmatma for giving me the strength and courage to continue and complete this course.

I would also like to dedicate this work to my parents and family who have been continually supportive during my best and worst moments. You have been my pillars of strength throughout this period of study.

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Abstract

The aim of this study was to evaluate the Myofascial Diagnostic Scale, for its inter-examiner reliability and to assess its reliability and validity as an assessment tool in the diagnosis and treatment of Myofascial Pain Syndrome.

The study took the form of a randomized, prospective, inter-examiner reliability study. Sixty outpatients from the Chiropractic Day Clinic were selected at random and examined according to the Myofascial Diagnostic Scale. They ranged in age from 18 to 35. The study incorporated both asymptomatic and symptomatic patients with regards to a neck and/or a low back complaint. This means that the study incorporated patients irrespective of their condition and reason for seeking treatment at the Chiropractic Day Clinic. Symptomatic participants were defined as participants with neck and/or low back pain. Asymptomatic participants were defined as participants who were not suffering with a neck or low back complaint.

Trigger points in the Trapezius and Quadratus Lumborum muscles were initially marked by a standardized marker according to their positions as set out by Travell and Simons (1999). A clinician from the Chiropractic Day Clinic and the researcher then examined the participants according to the Myofascial Diagnostic Scale. The order of examination by the examiners varied with each participant. The examiners were also not aware as to the status of each patient.

The palpation findings of both examiners according to the Myofascial Diagnostic Scale were compared with each other. They were also compared with the Numerical Pain Rating Scale -101 to evaluate the correlation between the participants' perception of pain and the Myofascial Diagnostic Scale.

Statistical analysis revealed that the Kappa scores for agreement between the examiners for soft tissue tenderness, taut band and referred pain ranged from worse than expected by chance to very good. The Numerical Pain Rating Scale -

101 was correlated positively and significantly with the mean scores for a majority of the trigger points.

The trigger points were assessed on the Myofascial Diagnostic Scale according to soft tissue tenderness, local twitch response, the presence of a taut band and referred pain.

In conclusion, according to the overall results, the reliability of the following individual criteria namely soft tissue tenderness, the taut band and referred pain in the Myofascial Diagnostic Scale was found to be moderate to good. The subjective measurements that relied on the participant (the soft tissue tenderness and referred pain examinations) had a better level of reliability than the objective measurements which relied on the examiners findings on examination (the presence of the taut band and the local twitch response). The Myofascial Diagnostic Scale was also found to be an effective assessment tool when it was compared to the participant's pain via the Numerical Pain Rating Scale -101. Therefore the Myofascial Diagnostic Scale was found to be both a reliable and valid assessment tool for the diagnosis of Myofascial Pain Syndrome.

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Chapter 1

Introduction

Myofascial Pain Syndrome is characterized by the presence of trigger points which can become a painful part of nearly everyone's life at one time or another (Travell and Simons, 1999).

It is a regional muscle pain disorder characterized by localized muscle tenderness and pain. It is the most common cause of regional pain such as back, shoulder pain, tension-type headaches and facial pain. As a condition it is overlooked as a common cause of pain following traumatic injuries, whiplash-type injuries, and repetitive strain and other occupational injuries (Fricton, 1994).

According to a review of the related literature, there exists a debate as to the exact diagnostic criteria used in identifying trigger points. This has hampered the objective assessment and treatment of Myofascial Pain Syndrome (Travell and Simons, 1999). It also led to inconsistent findings being reported by various authors due to the lack of a single diagnostic tool.

Chettiar (2001) developed the Myofascial Diagnostic Scale at the Durban Institute of Technology School of Chiropractic as a measurement tool for his study. It is a numerical scale used to assess the severity to which a patient is suffering from myofascial pain syndrome via a rating of the patient's symptoms according to Travell and Simon's 1983 diagnostic criteria. It highlights four critical myofascial trigger point diagnostic criteria: soft tissue tenderness; palpable taut band; local twitch response and referred pain.

The aim of Chettiar's study (2001) was to assess the efficacy of Action Potential Therapy in the treatment of Myofascial Pain Syndrome. Sixty patients were examined for active trigger points and received treatment over a seven to ten

day period. The scale was developed as there were no satisfactory laboratory tests or imaging techniques available to assess the efficacy of his treatment interventions. The result of the study was that Action Potential Therapy was effective in the treatment of Myofascial Pain Syndrome.

Although unpublished, the Myofascial Diagnostic Scale has been used in other subsequent studies and research at the Durban Institute of Technology School of Chiropractic in order to quantify Myofascial Pain Syndrome and as a means of measuring treatment outcomes e.g. Chettiar (2001); Thompson (2002); Prithipal (2003). However, the reliability and validity of the scale has never been determined in a controlled study.

The aim of this investigation was to evaluate the reliability and validity of the Myofascial Diagnostic Scale. It was tested for inter-examiner reliability and its theoretical value as an assessment tool in the diagnosis and treatment of Myofascial Pain Syndrome was assessed. The study took the form of a randomized, prospective, reliability study. It was designed to allow two examiners to assess each patient using the Myofascial Diagnostic Scale for trigger points in the Trapezius and Quadratus Lumborum muscles. The examiners in this study included the researcher and a clinician from the Chiropractic Day Clinic at the Durban Institute of Technology. The participants of the study were sourced from the Chiropractic clinic located at the Durban Institute of Technology.

It is intended that the information obtained from this study will hopefully provide clearer diagnostic criteria as well as aid in the development of a useful tool in the assessment and diagnosis of trigger points in Myofascial Pain Syndrome.

1.1 Statement of Problem

The aim of this study was to evaluate the Myofascial Diagnostic Scale, for its inter-examiner reliability and to assess its reliability and validity as an assessment tool in the diagnosis and treatment of Myofascial Pain Syndrome.

Sub problem 1:

The first sub problem is to evaluate the validity of the Myofascial Diagnostic Scale against an established measure of pain e.g. the Numerical Pain Rating Scale -101(Jenson et al, 1986).

Sub problem 2:

The second sub problem is to assess the correlation between the Numerical Pain Rating Scale-101 and the Myofascial Diagnostic Scale.

Sub problem 3:

The third sub problem is to evaluate the inter-examiner reliability of the Myofascial Diagnostic Scale.

Chapter 2

Literature Review

Myofascial pain syndrome is a regional muscle pain disorder characterized by the presence of trigger points. A trigger point is defined as a hyperirritable spot located in a palpable taut band of skeletal muscle. It is painful on compression and can give rise to characteristic referred pain, referred tenderness and motor dysfunction (Travell and Simons, 1999).

Trigger points may be active or latent. Active trigger points are hypersensitive and display continuous pain in the zone of reference. The zone of reference is defined as the area of perceived pain referred from the irritable trigger point. Latent trigger points display only hypersensitivity to palpation with no continuous pain (Fricton, 1994). The affected muscles also display increased fatigability; stiffness; weakness but with no atrophy; pain on movement and slightly restricted range of motion that is unrelated to joint restriction (Fricton, 1994).

According to Auleciems (1995), Myofascial Pain Syndrome is one of the least understood yet commonly encountered problems in the outpatients setting. It is also a common cause of persistent regional pain such as back pain, shoulder pain, tension-type headaches and facial pain(Fricton,1994) However, it is often unrecognised, misdiagnosed, and mistreated leading to unnecessary pain, suffering, and disability (Auleciems, 1995) .

According to Han and Harrison (1997) the incidence of myofascial pain syndrome with associated trigger points appears to vary between 30% and 85% of the people presenting to pain clinics in America. The condition is more prevalent in women although it is clearly found in both sexes.

Chaiamnuay et al (1998) conducted a study in which they examined and interviewed 2463 rural Thailand subjects and found that 36,2% had musculoskeletal pain of which myofascial pain syndrome was the second most common diagnosis.

According to Jones (1994) no epidemiological or prevalence studies regarding Myofascial Pain Syndrome in South Africa have been carried out. A review of the available literature also confirmed this.

Travell and Simons (1983; 1999) define specific criteria for the diagnosis of trigger points:

1. A palpable firm area of muscle referred to as the taut band.
2. A localised spot of exquisite tenderness to manual pressure on the trigger point that can be isolated within the taut band.
3. A characteristic pattern of pain in response to sustained pressure on the trigger point within the taut band. This pain is referred in patterns that are specific to individual muscles.
4. A local twitch of the taut band of muscle when the trigger band is distorted transversely or through the insertion of a needle in the spot.

According to Friction (1994) the patient's behavioural reaction to firm palpation is a distinguishing characteristic of myofascial pain and is termed a 'jump sign'. This reaction may include withdrawal of the head, wrinkling of the face or forehead, or a verbal response such as "That's it" or "Oh yes".

Friction (1994) also states that myofascial pain syndrome can be found throughout the body. The diagnostic criteria therefore needs to be broad enough to allow for application to different regional muscle groups and to distinguish them from systemic disorders affecting muscle such as fibromyalgia. Their study involved the examination of 62 patients; 31 of who had masticatory myofascial pain and the other half being normal. The rater who examined the patients, was

blinded as to the status of each patient. They assessed the scope of tenderness (i.e. the percentage of tender muscle sites) presence of taut bands within each muscle site, the twitch response of the muscle, and pain radiation in masticatory muscles. They found that the scope of tenderness was the most valid predictor of the presence of myofascial pain. The twitch response and pain radiation with palpation was predictive but not to the same extent as the scope or degree of tenderness.

Hsieh et al (2000) reported that the myofascial diagnosis is usually based on the patient's subjective symptoms and the presence of some of the other objective characteristics. These include characteristic referred pain, palpable taut band, a local twitch response and motor dysfunction. They question the clinical usefulness of trigger point examination because of poor reliability obtained in previous studies like that of Nice et al, 1992; Njoo et al, 1994; Gerwin et al, 1997. Hsieh et al (2000) aimed to assess inter-examiner reliability of palpation of three characteristics in low back muscles. These characteristics included the presence of a taut band, local twitch response and referred pain in the muscles. They also assessed if the training of the examiners in the study would improve the reliability of the examinations. The conclusion reached by Hsieh et al (2000) was that it was extremely difficult to obtain an absolute standard for clinical palpation. The local twitch response of the muscles had the lowest inter-examiner reliability whereas spot tenderness or tenderness of the trigger point in the muscle being examined had a higher inter-examiner reliability than referred pain.

Fishbain et al (1986) examined 283 chronic pain patients according to American Psychiatric Association, Diagnostic and Statistical Manual of Mental Disorders (DSM-III). These diagnoses were made independently and were determined through a review of medical history, previous and current diagnostic test results and physical examination. They noted a 95% congruency between neurosurgeons and physiatrists with regards to organic diagnoses

(eg.myofascial pain; radiculopathy; degenerative diseases of the spine etc) of patients. Eighty five percent of those diagnoses were myofascial pain syndrome, which was assessed using the soft tissue findings as described by Travell and Simons (1983).

Since 1992, three studies (Nice et al, 1992; Njoo et al, 1994; Gerwin et al, 1997) evaluated the reliability of various Myofascial trigger point examination techniques and criteria. Nice et al (1992) assessed inter-tester reliability for the presence of trigger points in patients with lower back pain using Travell and Simon's (1983) method of examination. The trigger points were marked as either present or absent. Specific criteria of trigger points were not assessed in their study. Fifty patients with low back pain were examined by 12 full-time physical therapists that routinely examined and treated patients with low back pain. The result of this study was that the intertester reliability for the presence of trigger points was poor. The major problems arising out of this study were that the patients were incorrectly positioned and the examiners used incorrect palpation techniques. Also, the force of the palpation used in the examination varied amongst the examiners. However, the examiners had varying degrees of clinical experience and training in trigger point examination, which could account for the poor intertester reliability.

Njoo et al (1994) conducted a study in which they aimed at identifying clearer criteria for the diagnosis of trigger points by investigating the occurrence and inter-rater reliability of the trigger point signs or diagnostic criteria. Five observers working in pairs examined 61 non-specific low back pain patients and 63 control subjects. The signs or diagnostic criteria evaluated included: localised tenderness, referred pain, palpable band, twitch response, limited stretch range, jump sign, and pain recognition where the patient recognises the pain as his or her pain. The characteristics were scored as either absent or present. This study suggested localised tenderness, jump sign, and pain recognition to be clinically useful and with a good inter-rater reliability. However, it is a very subjective

examination as the localised tenderness, jump sign and pain recognition rely on the patient's reaction or interpretation to the doctor's examination. The objective signs that require the doctors or examiners interpretation like the twitch response, palpable band and referred pain were not found to be reliable. However, they concluded that the criteria of localised tenderness and the presence of either the jump sign or patients' pain recognition could be clinically useful as diagnostic criteria for the presence of trigger points.

Gerwin et al (1997) evaluated the following myofascial criteria: tenderness, taut band, referred pain, twitch response, reproduction of subject's symptomatic pain, and a global or overall assessment regarding the presence of the trigger points was made. Four physicians (two physiatrists and two neurologists) examined 25 subjects. The findings were graded as either present or absent. Their study looked at the ability of examiners to agree on the presence of particular signs in particular muscles. They found certain characteristics of trigger points were very common in some muscles and others were not so common. It was dependent on the muscle being examined. For example, the identification of the taut band in the infraspinatus muscle was less certain than in the sternocleidomastoid muscle. Also, the local twitch response was easily identified in the extensor digitorum muscle but the reliability of identification in the other muscles (sternocleidomastoid; trapezius; infraspinatus and the latissimus dorsi) differed. This leads to the suggestion by Gerwin et al (1997) that studies need to be done focusing on muscles and evaluating them individually for the presence of diagnostic criteria or the myofascial signs.

Hsieh et al (2000) assessed the interexaminer reliability of palpation of three characteristics viz (taut band, local twitch response and referred pain) and also whether training would improve reliability. They examined 26 patients with subacute low back pain and 26 control subjects. The subjects were first examined by an expert and then randomly by four physicians. The physicians consisted of four licensed chiropractors and four licensed physiatrists. They

were then divided into trained and untrained groups. The trained group underwent three 2-hour lectures and practical sessions regarding myofascial pain, trigger point position, diagnostic criteria and examination techniques. Their results showed that it is extremely difficult to obtain an absolute standard for clinical palpation. The local twitch response had the lowest interexaminer reliability whereas spot tenderness displayed the highest. The jump sign, pain recognition and taut band had conflicting results.

Njoo et al (1994) got unsatisfactory results using inexperienced examiners who had undergone training in trigger point examination. Gerwin et al (1997) demonstrated better results when they used experienced examiners who had also undergone training in trigger point examination. Hsieh et al (2000) suggests that clinical experience may play a more vital role in myofascial examination than training in obtaining reliability.

The majority of more recent studies on Myofascial Pain Syndrome (Fricton, 1994; Gerwin et al,1997; Njoo et al,1994; Nice et al,1992 ; Hsieh et al, 2000) have used the diagnostic criteria of Travell and Simons(1983 , 1999) However, according to Njoo et al (1994), Travell and Simons(1983,1999) have not tested their diagnostic criteria of trigger points in a controlled study.

Travell and Simons (1999) report that a combination of spot tenderness in a palpable band and patient recognition of pain are the minimum acceptable diagnostic criteria and also that a consensus document that establishes official diagnostic criteria for the definition of trigger points or myofascial pain is in urgent need.

Simons (1996) claims that looking for or isolating spot tenderness is the easiest examination to perform. However it is sensitive but not specific because it is also characteristic of fibromyalgia and enthesopathy. The jump sign is a more objective indicator. Pain recognition is also easy to perform and is the most

useful single diagnostic test but it is also not specific as it is also found in fibromyalgia. Taut bands are also required for diagnosis but they may also be found in normal muscles. Referred pain is a non-specific finding and therefore of limited diagnostic value unless in combination with other findings. However, the combination of spot tenderness and/or jump sign in a palpable taut band is highly indicative of trigger points

According to a survey of the literature there is currently no diagnostic tool that can be used in the diagnosis of Myofascial Pain Syndrome. This led to Chettiar (2001) developing the Myofascial Diagnostic Scale for use as an objective tool in his study. It is a scale using the signs of a myofascial trigger point as indicators to assess the extent to which the patient suffers from Myofascial Pain Syndrome. The scale uses numerical grading of the indicators and not merely representing them as present or absent. The signs used were based on Travell and Simons (1983) criteria and include: referred pain in the zone of reference, local twitch response, palpable taut band, and focal or spot tenderness.

Spot tenderness or soft tissue tenderness consisted of five grades or indicators: grade 0 - no tenderness = 0, grade 1 - tenderness to palpation without grimace or flinch = 1, grade 2 - tenderness with grimace and/or flinch to palpation = 2, grade 3 - tenderness with withdrawal = 3, grade 4 - withdrawal to non-noxious stimuli = 4. The presence of a local twitch response and the presence of a palpable taut band were indicated by a score of 4 on the scale. The presence of referred pain was indicated by a score of 5. A total score of 9 or more was indicative of active trigger points. This scale had however not been tested to verify its validity and inter-rater reliability.

Figure 2.1 The Myofascial Diagnostic Scale

Trigger Point Signs:

1. Soft Tissue Tenderness

<u>Grade:</u>	0	No Tenderness	0
	I	Tenderness to palpation WITHOUT grimace or flinch	1
	II	Tenderness to palpation WITH grimace or flinch	2
	III	Tenderness with WITHDRAWAL (+ Jump sign)	3
	IV	Withdrawal (+ Jump sign) to non-noxious stimuli (i.e. Superficial palpation, gentle percussion)	4
		2. Snapping palpation of the trigger point evokes a local twitch response	4
		3. The trigger point is found in a palpable taut band.	4
		4. Moderate, sustained pressure on the trigger point causes or intensifies pain in the reference zone.	5
		<u>Total out of 17</u>	

The aim of this study was to evaluate the inter-examiner reliability and validity of the Myofascial Diagnostic Scale. The muscles examined in this study included the Trapezius and the Quadratus Lumborum muscles. These muscles were chosen, as they are common causes of head; neck and low back pain respectively. Also, they represented different regions i.e. the upper and lower trunk. It also represented differing depths of the trigger points. The trigger points located in the Quadratus Lumborum muscle encompassed both superficial and deep trigger points.

The paired Trapezius muscle forms a diamond shape. Its proximal attachments are to the medial third of the superior nuchal line; external occipital protuberance, ligamentum nuchae and spinous processes of C7-T12 vertebrae.

The distal attachments are to the lateral third of the clavicle, acromion, and spine of the scapula (Moore, 1996). The Trapezius muscle is divided into upper, middle and lower fibres. Trigger points 1 and 2 are both located in the upper fibres of the Trapezius muscle was examined. (Travell and Simons, 1999)

The Quadratus Lumborum muscle is a commonly overlooked source of low back pain (Travell and Simons, 1999). It is attached superiorly to the medial half of the inferior border of the 12th rib and tips of the lumbar transverse processes. The inferior attachments are to the iliolumbar ligament and internal lip of the iliac crest (Moore, 1996). It has four trigger points. Two of the trigger points are superficial and have a more lateral position. These were called trigger points 1 and 4 in the scale. Trigger point 1 was palpable just below and close to the 12th rib and trigger point 4 was located just above the iliac crest. The other two had a deeper and more medial position and were located close to the transverse processes of the lumbar vertebrae. These two were called trigger points 2 and 3 on the scale (Travell and Simons, 1999).

When establishing validity, one is determining the degree to which a particular tool reflects reality (Mouton, 1996). This process is vital in order to ensure that future research utilising the particular tool is accurate (Bernard, 2000).

Therefore, when the scale is used as an assessment tool in research, the scale would need to fulfil certain requirements and these would include the concepts of face validity; content validity; construct validity; criterion validity and external validity.

The definitions of these concepts of validity and how they are addressed follows (definitions taken from Bernard, 2000 unless otherwise stated):

1. *Face validity*, the simplest type of validity, is determined by agreement between researchers and those with a vested interest in the scale,

that 'on the face of it' the tool seems valid (Bernard, 2000:49).

2. The instrument has *content validity* when the content of the scale is considered effective and well rounded enough to be able to assess a particular concept.
3. *Construct validity* measures how accurately answers to questions in a scale reflect theoretical predictions of a particular construct (in this case Trapezius and Quadratus Lumborum muscle pain).
4. *Criterion validity* is measured when a particular tool produces similar results when compared with another tool already known to be trustworthy. This is also called *concurrent validity* by Mouton (1996). *Predictive validity* falls under this category as well. If a tool can predict a future situation accurately it has predictive validity (Mouton, 1996).

In this study, construct validity will be used to determine the ability and degree to which the myofascial diagnostic scale reflects its theoretical components or diagnostic criteria as displayed by the scale. Concurrent validity will be established when the two measurements or grading according to the myofascial diagnostic scale are taken at the same time by the two examiners involved in the study. Reliability is the extent to which a measurement is consistent. Thereby testing the inter-examiner reliability of the Myofascial Diagnostic Scale, its consistency amongst examiners, as well as the factors within the scale, will be measured (Portney and Watkins, 1993).

The evaluation criteria of myofascial trigger points, as set out by previous examiners, needed to be reassessed and not assessed merely as present or absent but more specifically. It is hoped that the results and observations from this study will add to the pool of knowledge regarding myofascial pain syndrome and trigger points.

Chapter 3

3.1 Research Design

The study was a randomized, prospective, inter-examiner reliability study.

3.2 Sample

The study incorporated 60 participants.

3.3 Recruitment

- The participants were outpatients from the Chiropractic Day Clinic at the Durban Institute of Technology and were at various stages of treatment in the clinic.
- The study was not open to the senior students of the Durban Institute of Technology chiropractic department, as they would have been biased due to their knowledge of the topic in question.

3.4 Inclusion criteria

1. Participants were between 18 and 35 years old. Esenyel et al (2000) suggested a relatively young population of patients to minimize pain that can be caused by accompanying degenerative disc or joint disease
2. The study incorporated both asymptomatic and symptomatic patients with regards to a neck and/or a low back complaint. This means that the study incorporated patients irrespective of their condition and reason for seeking treatment at the Chiropractic Day Clinic. Symptomatic participants were defined as participants with neck and/or low back pain. Asymptomatic participants were defined as participants who were not suffering with a neck or low back complaint. The examiners were not aware as to the status of each patient.

3.5 Exclusion criteria

1. All participants who did not fall within the recommended age limit.
2. All participants who declined to partake in the study.

3.6 Background to Data Collection Tool

- The Myofascial Diagnostic Scale was developed by Chettiar (2001).The validity of the scale had not been tested.
- A focus group was therefore held to determine the face validity of the Myofascial Diagnostic Scale.
- It consisted of a statistician, 3 chiropractors and 3 chiropractic students of varying years of study and clinical experience.
- Physiotherapists were invited to participate but were unavailable.
- The scale was deemed valid but suggestions were made to improve the research study.

These suggestions include:

1. The use of a muscle from different regions i.e. the upper trunk and the lower trunk.
 2. The use of 5th, 6th year students and a clinician as examiners and the use of the same set of examiners for inter-examiner reliability.
- It was decided at the focus group to assess the trapezius and quadratus lumborum muscles, as this would cover both superficial and deep muscle trigger points.
 - It was later decided to use two examiners in the study. This closely resembles an actual clinical situation and therefore represents the best possible situation (Njoo et al, 1994). The examiners used in this study

included the researcher and a clinician from the Chiropractic Day Clinic at the Durban Institute of Technology.

3.7 Measurement tool

- The Myofascial Diagnostic Scale is a scale formulated to assess the severity of the patient's suffering from myofascial pain syndrome, via a rating of patients symptoms, according to Travell and Simon's (1983) diagnostic criteria (Chettiar,2001).
- **These criteria include:**
 1. Palpable firm area of muscle referred to as the taut band.
 2. Within the taut band, a localised spot of exquisite tenderness to manual pressure on the trigger point.
 3. A characteristic pattern of pain in response to sustained pressure on the trigger point within the taut band. This pain is referred in patterns that are specific to individual muscles.
 4. A local twitch of the taut band when the trigger band is distorted transversely or through needling of the tender spot.

According to Friction (1994) the patient's behavioral reaction to firm palpation is a distinguishing characteristic of myofascial pain and is termed a 'jump sign'. This reaction may include withdrawal of the head, wrinkling of the face or forehead, or a verbal response such as "That's it" or "Oh yes".

Referred pain in this study was defined as any pain that the participant felt away from the area of palpation (Hsieh et al; 2000).

3.8 Data Collection

- Prior to the beginning of the study a two-hour practice session was held during which the details of the study, the scale and positions for examination were explained and agreed upon.
- The participants were all regular outpatients at the Durban Institute of Technology Chiropractic Clinic.
- The participants were all approached to participate and were examined during their treatment time at the clinic.
- A standardized marker was used to mark all the relevant trigger points according to their positions as set out by Travell and Simons (1999). The markers were a group of students who marked the trigger points on the participants. The group was selected from the 5th and 6th year chiropractic students and all had clinical experience. This was done to ensure that the two examiners were examining the same areas. These trigger points included Trapezius trigger points 1 and 2 and both the deep and superficial trigger points in the Quadratus Lumborum muscles. The superior superficial trigger point of the Quadratus Lumborum muscle was designated as trigger point 1. The inferior superficial trigger point of the Quadratus Lumborum muscle was designated as trigger point 4. The superior deep trigger point was designated as trigger point 2 and the inferior deep one was designated as trigger point 3.
- The examiners included a clinician from the Chiropractic Day clinic and the researcher.
- The participants all had the study explained to them and were free to ask any questions. They all signed an informed consent form.
- The order of examination by the examiners varied with each participant.
- During the examinations only two questions were allowed to be asked. these included:

“Is it tender?” with regards to the tenderness of the trigger point and “is the pain going anywhere?” with regards to the pain referral. Referred pain was defined as any pain the individual felt away from the area under palpation (Hsieh et al, 2000).

- After the examinations by either of the examiners the participant was asked to rate their pain of the areas examined according to Numerical Pain Rating Scale-101.
- The results were collected after each examination by the clinician as this kept the researcher blinded as to how the study was progressing.
- On completion of participant examinations, the results were collated and underwent statistical analysis.

3.9 Background to Statistical Analysis

GraphPad software was used to calculate Kappa for inter-rater agreement (© GraphPad Software Inc. <http://graphpad.com/quickcalcs/Kappa2.cfm>). SPSS version 11.5 (SPSS Inc, Chicago, Ill, USA) was used for Spearman’s correlation analysis, intraclass correlation coefficient analysis and frequency tabulations. The statistical evaluation was aimed at measuring for an agreement beyond chance between the two examiners involved in the study.

3.9.1 Kappa Statistics

Inter rater agreement was assessed for binary or ordinal variables using Kappa statistics. There are two possible uses of kappa namely: as a method to test rater *independence* (i.e. as a test statistic), and as a method to quantify the *level of agreement* (i.e. as an effect-size measure). The first use involves testing the null hypothesis that there is no more agreement than might occur by chance given random guessing. In the second use, that of quantifying agreement, Kappa's calculation uses a term called the proportion of chance (or expected) agreement. This is interpreted as the proportion of times raters would agree by

chance alone. The Kappa statistic indicates the strength of agreement. A Kappa statistic of 1 would equate to perfect agreement between examiners whereas a Kappa statistic of 0 would equate to chance agreement. An interpretation of this agreement is shown in table 3.1(Viera; 2005). In this study, the Kappa statistic was used to quantify the *level of agreement*. It was used to assess for a correlation between the two examiners for the diagnostic criteria in the Myofascial Diagnostic Scale. These diagnostic criteria included soft tissue tenderness; local twitch response, taut band and referred pain. After analysis, if the Kappa statistic is closer to 1, then the agreement or correlation between the examiners with regards to the diagnostic criteria in question is good.

Figure 3.1 Interpretation of Kappa (Viera, 2005)

Kappa	Agreement					
< 0	Less than chance agreement					
0.01–0.20	Slight agreement					
0.21– 0.40	Fair agreement					
0.41–0.60	Moderate agreement					
0.61–0.80	Substantial agreement					
0.81–0.99	Almost perfect agreement					

	Poor	Slight	Fair	Moderate	Substantial	Almost perfect
Kappa	0.0	0.20	0.40	0.60	0.80	1.0

3.9.2 Cronbach’s Alpha Coefficients and Intraclass Correlation Coefficient

For continuous variables (i.e. total scores for each trigger point) two-way random intraclass correlation coefficients and Cronbach’s alpha coefficients were calculated. The Intraclass Correlation Coefficient (ICC) assesses rating reliability by comparing the variability of different ratings of the same subject to the total variation across all ratings and all subjects. The interpretation of the Intraclass Correlation Coefficient as the proportion of total variance accounted for by within-subject variation. The Intraclass Correlation Coefficient will approach 1.0 when there is no variance or disagreements within raters i.e. indicating perfect

inter rater reliability. Cronbach's alpha is a coefficient of reliability or consistency. It ranges from 0 to 1 with values close to 1 indicating high reliability. This was used to assess the reliability between the two examiners for the total score of the criteria rated.

3.9.3 Spearman's Correlation

The Spearman Rank Correlation Coefficient is used to discover the strength of a link between two sets of data

(<http://www.zephyrus.demon.co.uk/geography/home.html>, 1999).

The correlation coefficient is usually a number between -1.0 and $+1.0$. A positive correlation coefficient close to 1.0 indicates a good correlation between the two sets of data. A negative correlation coefficient indicates little or no correlation between the two sets of data (Hinkle, 1998; Heiman, 2000). Spearman's correlation between outcomes was achieved by using the mean rating of the two raters. Participants were classified as having possible Myofascial Pain Syndrome if they had a score of ≥ 9 in any of the trigger points tested. It assessed for a correlation between the mean rating of the total scores of both examiners on the Myofascial Diagnostic Scale and the average score of the Numerical Pain Rating Scale. The participants represented their pain on a scale of 0 – 100. An average from the pain scale was taken as the scale represents the participants' pain at its worst and at its least.

Chapter 4

Results

In this chapter, the results of the data collection and statistical analysis are represented. The results for each criterion in the Myofascial Diagnostic Scale are discussed individually.

4.1 Demographics

4.1.1 Age Distribution

Table 4.1: Descriptive statistics for the age distribution

Mean	24.6833
Std. Deviation	4.05259
Minimum	19.00
Maximum	35.00

Sixty participants took part in the study. Table 4.1 reflects that the mean age of the participants was 24.7 years with a standard deviation of 4.1 years. The youngest participant was 19 years old. The oldest was 35 years old. This was acceptable as it fell within the limits of the inclusion criteria of the study.

4.1.2 Gender Distribution

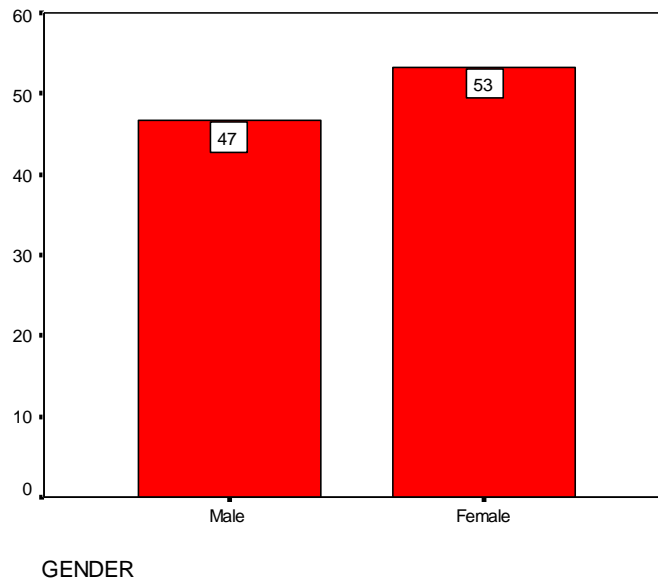


Figure 4.1: Gender distribution of study participants

Figure 4.1 reveals that there were 28 males and 32 females in the study. This amounted to 46.7% and 53.3% of the total sample respectively.

4.2 Soft tissue tenderness

Table 4.2a: Inter-rater agreement for soft tissue tenderness

Trigger point and location	n (%) agreement between raters	Kappa (95% CI)	p value	Classification of agreement
Trapezius 1 right	39 (65%)	0.405 (0.199-0.610)	<0.001*	Moderate
Trapezius 1 left	32 (53.33%)	0.218 (0.006-0.429)		Fair
Trapezius 2 right	36 (60%)	0.258 (0.029-0.488)		Fair
Trapezius 2 left	23 (38.33%)	0.005 (-0.194-0.203)	0.953	Poor
Quadratus 1 right	40 (66.67%)	0.463 (0.271-0.655)		Moderate
Quadratus 1 left	33 (55%)	0.251 (0.042-0.461)	0.006*	Fair
Quadratus 2 right	34 (56.67%)	0.277 (0.068-0.487)		Fair
Quadratus 2 left	33 (55%)	0.343 (0.160-0.527)	<0.001*	Fair
Quadratus 3 right	39 (65%)	0.390 (0.180-0.601)		Fair
Quadratus 3 left	32 (53.33%)	0.237 (0.031-0.443)	0.013*	Fair
Quadratus 4 right	39 (65%)	0.429 (0.233-0.626)	<0.001*	Moderate
Quadratus 4 left	37 (61.67%)	0.374 (0.173-0.575)	<0.001*	Fair

* statistically significant at the 0.05 level

From table 4.2a; it is evident that there was generally a fair or moderate level of agreement between the two raters in terms of soft tissue tenderness. Soft tissue tenderness is the presence of tender muscle sites. In the Myofascial Diagnostic Scale, the presence of tender muscle sites as well as its severity or degree of tenderness was examined. Trapezius trigger point 2 on the left had a poor level of agreement, with only 38.3% concurrence. Quadratus lumborum trigger point 1 on the right had the highest level of agreement (Kappa 0.463, 66.67% agreement). Moderate agreements were also seen in Trapezius trigger point 1

on the right (65%) and Quadratus Lumborum trigger point 4 on the right (61.67%). Most of the other trigger points had a fair level of agreement between 50 – 60 %.

Table 4.2a shows the kappa statistics and level of agreement between the two raters per trigger point assessed. Statistical significance or probability values (p value) could not be computed for some trigger points where the number of categories in the two rates on the scale did not match i.e. where examiner 1 had used 4 out of the 5 criterion whereas examiner 2 had used only 3 out of the 5 criterion.

Table 4.2b: Most common category of soft tissue tenderness rated for each trigger point

Trigger point and location	Rater 1	Rater 2
Trapezius 1 right	Tenderness to palpation without grimace or flinch	Tenderness to palpation without grimace or flinch
Trapezius 1 left	Tenderness to palpation without grimace or flinch	Tenderness to palpation without grimace or flinch
Trapezius 2 right	Tenderness to palpation without grimace or flinch	Tenderness to palpation without grimace or flinch
Trapezius 2 left	Tenderness to palpation without grimace or flinch	Tenderness to palpation without grimace or flinch
Quadratus 1 right	Tenderness to palpation without grimace or flinch	Tenderness to palpation without grimace or flinch
Quadratus 1 left	Tenderness to palpation without grimace or flinch	Tenderness to palpation without grimace or flinch
Quadratus 2 right	Tenderness to palpation without grimace or flinch	Tenderness to palpation without grimace or flinch
Quadratus 2 left	Tenderness to palpation without grimace or flinch	Tenderness to palpation without grimace or flinch
Quadratus 3 right	No tenderness	No tenderness
Quadratus 3 left	Tenderness to palpation without grimace or flinch	No tenderness
Quadratus 4 right	No tenderness	No tenderness
Quadratus 4 left	Tenderness to palpation without grimace or flinch	No tenderness

The most common category of soft tissue tenderness (the mode) for each trigger point is shown in Table 4.2b. For most trigger points, both raters most commonly recorded tenderness to palpation without grimace or flinch. This means, that the area of examination was tender to the touch but not to the extent that it initiated

a physical response from the participant. The other categories included: no tenderness to palpation; tenderness to palpation with grimace or flinch; tenderness with withdrawal (+ jump sign) and withdrawal (+jump sign) to non-noxious stimuli (i.e. superficial palpation and gentle percussion).

4.3 Local twitch response

Table 4.3: Inter-rater agreement for local twitch response

Trigger point and location	n (%) agreement between raters	Kappa (95% CI)
Trapezius 1 right	60 (100%)	Cannot be computed
Trapezius 1 left	60 (100%)	Cannot be computed
Trapezius 2 right	60 (100%)	Cannot be computed
Trapezius 2 left	60 (100%)	Cannot be computed
Quadratus 1 right	60 (100%)	Cannot be computed
Quadratus 1 left	60 (100%)	Cannot be computed
Quadratus 2 right	60 (100%)	Cannot be computed
Quadratus 2 left	60 (100%)	Cannot be computed
Quadratus 3 right	60 (100%)	Cannot be computed
Quadratus 3 left	59 (98.33%)	Cannot be computed
Quadratus 4 right	60 (100%)	Cannot be computed
Quadratus 4 left	60 (100%)	Cannot be computed

The local twitch response is described by Travell and Simons (1999) as a transient contraction of a group of tense muscle fibres that traverse a trigger point. None of the subjects displayed any local twitch response according to both raters for most of the trigger points that were assessed. Thus, from table

4.3 it is evident that agreement was perfect and Kappa statistics could not be computed. There was a twitch response noted in Quadratus Lumborum trigger point 3 on the left by one rater only, thus for this trigger point the agreement was 98.33%. Thus the absence of a local twitch response was rated almost perfectly by both raters (Table 4.3).

4.4 Taut band

Table 4.4: Inter-rater agreement for taut band

Trigger point and location	n (%) agreement between raters	Kappa (95% CI)	P value	Classification of agreement
Trapezius 1 right	37 (61.67%)	0.278 (0.047-0.510)	0.015*	Fair
Trapezius 1 left	36 (60%)	0.211 (-0.034-0.455)	0.091	Fair
Trapezius 2 right	32 (53.33%)	-0.098 (-0.395-0.199)	0.133	Worse than expected by chance alone
Trapezius 2 left	43 (71.67%)	0.215 (-0.100-0.531)	0.021*	Fair
Quadratus 1 right	41 (68.33%)	0.336 (0.089 to 0.583)	0.009*	Fair
Quadratus 1 left	39 (65%)	0.308 (0.069 to 0.546)	0.014*	Fair
Quadratus 2 right	32 (53.33%)	0.082 (-0.166 to 0.330)	0.511	Poor
Quadratus 2 left	44 (73.33%)	0.452 (0.222 to 0.682)	<0.001*	Moderate
Quadratus 3 right	42 (70%)	0.287 (0.011 to 0.562)	0.026*	Fair
Quadratus 3 left	40 (66.67%)	0.207 (-0.076 to 0.491)	0.107	Fair
Quadratus 4 right	39 (65%)	0.123 (-0.180 to 0.425)	0.342	Poor
Quadratus 4 left	42 (70%)	0.289 (0.015 to 0.564)	0.023*	Fair

* statistically significant at the 0.05 level

The taut band is a group of tense muscle fibres that extend from the trigger point to the muscle attachments. (Travell and Simons; 1999). It is evident from table 4.4 that the level of agreement for the presence of a taut band was at best moderate (Quadratus Lumborum trigger point 2 on the left) and at worst, worse than expected by chance alone (Trapezius trigger point 2 on the right). Quadratus Lumborum trigger point 2 on the left had a 73.33% level of agreement (Kappa 0.452). Trapezius trigger point 2 on the right had a level of agreement of 53.33 % (Kappa -0.098). Most of the other trigger points had a level of agreement of between 60 – 70%. The probability or p values of Trapezius trigger point 1 on the left Trapezius trigger point 2 on the right; Quadratus Lumborum trigger point 2 and 4 on the right, and Quadratus Lumborum trigger point 3 on the left were not statistically significant. Thus the level of agreement for this characteristic was not very high.

4.5 Referred pain

Table 4.5: Inter-rater agreement for referred pain

Trigger point and location	N (%) agreement between raters	Kappa (95% CI)	p value	Classification of agreement
Trapezius 1 right	52 (86.67%)	0.608 (0.355-0.861)	<0.001*	Good
Trapezius 1 left	53 (88.33%)	0.649 (0.400-0.893)	<0.001*	Good
Trapezius 2 right	50 (83.33%)	0.634 (0.427-0.841)	<0.001*	Good
Trapezius 2 left	49 (81.67%)	0.618 (0.414-0.822)	<0.001*	Good
Quadratus 1 right	57 (95%)	0.812 (0.606 to 1.019)	<0.001*	Very good
Quadratus 1 left	50 (83.33%)	0.574 (0.334 to 0.815)	<0.001*	Moderate
Quadratus 2 right	49 (81.67%)	0.523 (0.268 to 0.778)	<0.001*	Moderate
Quadratus 2 left	50 (83.33%)	0.648 (0.449 to 0.847)	<0.001*	Good
Quadratus 3 right	54 (90%)	0.611 (0.316 to 0.906)	<0.001*	Good
Quadratus 3 left	48 (80%)	0.376 (0.060 to 0.692)	0.003*	Fair
Quadratus 4 right	49 (81.67%)	0.247 (-0.156 to 0.649)	0.056	Fair
Quadratus 4 left	49 (81.67%)	0.247 (-0.156 to 0.649)	0.056	Fair

* statistically significant at the 0.05 level

Referred pain is defined by Travell and Simons (1999) as a pain that arises in a trigger point but is felt at a distant site. Table 4.5 reveals that agreement for referred pain was generally fairly high. For the Trapezius trigger points there was good agreement between the two raters (80 - 90%), and for the Quadratus Lumborum trigger points this ranged from very good (Quadratus Lumborum trigger point 1 on the right = 95%) to fair (Quadratus Lumborum trigger point 3 on the left =80% and trigger point 4 on the right and left=81.67%) (Table 4.5). All were statistically significant except for Quadratus Lumborum trigger point 4 on the right and left.

4.6 Total score

Table 4.6: Inter-rater reliability for total score

Trigger point and location	ICC (95% CI)	Alpha (95% CI)	P
Trapezius 1 right	0.517 (0.307 to 0.6806)	0.6819 (0.4674 to 0.8100)	<0.001*
Trapezius 1 left	0.5828 (0.3877 to 0.7279)	0.7364 (0.5587 to 0.8426)	<0.001*
Trapezius 2 right	0.5363 (0.3287 to 0.6945)	0.6982 (0.4947 to 0.8197)	<0.001*
Trapezius 2 left	0.5029 (0.2872 to 0.6700)	0.6692 (0.4463 to 0.8024)	<0.001*
Quadratus 1 right	0.6046 (0.4159 to 0.7434)	0.7536 (0.5874 to 0.8528)	<0.001*
Quadratus 1 left	0.5159 (0.3032 to 0.6796)	0.6806 (0.4653 to 0.8092)	<0.001*
Quadratus 2 right	0.3800 (0.1414 to 0.5768)	0.5507 (0.2478 to 0.7316)	0.0013*
Quadratus 2 left	0.6053 (0.4168 to 0.7439)	0.7541 (0.5883 to 0.8531)	<0.001*
Quadratus 3 right	0.5266 (0.3165 to 0.6874)	0.6899 (0.4809 to 0.8148)	<0.001*
Quadratus 3 left	0.4269 (0.1959 to 0.6130)	0.5984 (0.3276 to 0.7601)	0.0003*
Quadratus 4 right	0.2124 (-0.0419 to 0.4409)	0.3504 (-0.0876 to 0.6120)	0.0502
Quadratus 4 left	0.3637 (0.1229 to 0.5641)	0.5334 (0.2189 to 0.7213)	0.0020*

* statistically significant at the 0.05 level

The total score was the score of all the individual diagnostic criteria of the Myofascial Diagnostic Scale added up. It was representative of the severity of the trigger point. A total score of ≥ 9 was indicative of an active myofascial trigger point. These are trigger points that are hypersensitive and can display continuous pain. In order to achieve a score of ≥ 9 on the Myofascial Diagnostic Scale; two or more of the criteria need to be present.

Table 4.6 shows the Intraclass Correlation Coefficient (ICC), Cronbach's alpha and p values for reliability for total scores at each trigger point. Intraclass Correlation Coefficient's were generally relatively low, although statistically significant. Intraclass Correlation Coefficient was especially low for Quadratus

Lumborum trigger point 4 on the right (0.2124), and not quite statistically significant ($p = 0.0502$). Cronbach's alpha and the p values however showed that the agreements were moderate. A value closer to 1 indicates a high reliability according to Cronbach's alpha. Quadratus Lumborum trigger point 1 on the right (0.7536); Quadratus Lumborum trigger point 2 on the left (0.7541) and Trapezius trigger point 1 on the left (0.7364) all showed good reliability or agreement.

4.7 Correlations

Table 4.7: Spearman correlations between NRS - 101 mean and mean rater scores for each trigger point

		NRS - 101 mean
Mean score Trapezius 1 Right	Correlation Coefficient	.365(*)
	Sig. (2-tailed)	.004
Mean score Trapezius 1 Left	Correlation Coefficient	.235
	Sig. (2-tailed)	.070
Mean score Trapezius 2 Right	Correlation Coefficient	.122
	Sig. (2-tailed)	.351
Mean score Trapezius 2 Left	Correlation Coefficient	.318(*)
	Sig. (2-tailed)	.013
Mean score Quadratus 1 Right	Correlation Coefficient	.346(*)
	Sig. (2-tailed)	.007
Mean score Quadratus 1 Left	Correlation Coefficient	.353(*)
	Sig. (2-tailed)	.006
Mean score Quadratus 2 Right	Correlation Coefficient	.337(*)
	Sig. (2-tailed)	.009
Mean score Quadratus 2 Left	Correlation Coefficient	.224
	Sig. (2-tailed)	.085
Mean score Quadratus 3 Right	Correlation Coefficient	.170
	Sig. (2-tailed)	.194
Mean score Quadratus 3 Left	Correlation Coefficient	.260(*)
	Sig. (2-tailed)	.045
Mean score Quadratus 4 Right	Correlation Coefficient	.260(*)
	Sig. (2-tailed)	.045
Mean score Quadratus 4 Left	Correlation Coefficient	.195
	Sig. (2-tailed)	.136

* Correlation is significant at the 0.05 level (2-tailed).

The mean of the total scores of the two raters of the Myofascial Diagnostic Scale were correlated with Numerical Pain Rating Scale - 101's (NRS - 101) mean score. There was a significant positive correlation between the score for Trapezius trigger point 1 on the right side and NRS - 101 ($Rho^* = 0.365$, $p = 0.004$). Trapezius trigger point 2 on the left was significantly positively correlated with NRS - 101 ($Rho^* = 0.318$, $p = 0.013$). Quadratus Lumborum trigger point 1 on the right ($Rho^* = 0.346$, $p = 0.007$) and left ($Rho^* = 0.353$, $p = 0.006$), trigger point 2 on the right ($Rho^* = 0.337$, $p = 0.009$), and trigger point 3 on the left ($Rho^* = 0.260$, $p = 0.45$) and trigger point 4 on the right ($Rho^* = 0.260$, $p = 0.45$) were also significantly positively correlated with mean NRS - 101 score. All correlations, however, were positive but weak (Table 4.7).

* Rho = Spearman's correlation coefficient

4.8 Myofascial pain syndrome

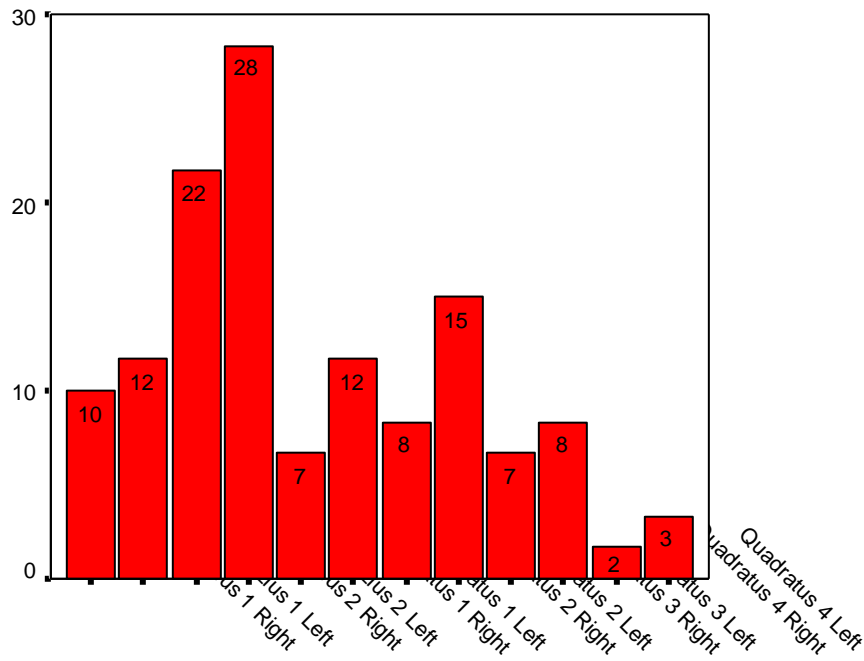


Figure 4.2: percentage of subjects positive for myofascial pain syndrome per trigger point

Figure 4.2 reveals the percentages of the subjects that were classified as having Myofascial Pain Syndrome. These trigger points were considered to be active if they had a score of ≥ 9 . From the results, Trapezius trigger point 2 on the left was the most prevalent where 28% or 17 of the 60 subjects had active trigger points. This was followed by Trapezius trigger point 2 on the right (22%, $n=13$). The other trigger points had much lower percentages of positive subjects. These are shown in Figure 4.2. Overall 52% ($n=31$) of the subjects were positive for Myofascial Pain Syndrome at one or more trigger point. The number of trigger points classified as being active per individual subject ranged from 0 to 7 with a median of 1.

4.9 Summary of results

Agreement between the two raters or examiners was calculated for a variety of subjective and objective measurements. The subjective measurements were those where the result was reliant on the participant's answers to the examination (i.e. the examination for soft tissue tenderness and referred pain). The objective measurement was what the examiners found on the participants during the examinations (i.e. the local twitch response and the taut band). The measurements which relied on the rater perception (e.g. taut band) seemed to give less reliable results than those that relied on the subject (e.g. referred pain). These objective results were still however reliable even though it was reliable to a lesser degree than the subjective results. Overall, there was a range of agreement between the examiners from worse than expected by chance to very good for all the criteria.

The Numerical Pain Rating Scale - 101 was correlated positively and significantly with the mean scores for a majority of the trigger points. Thus, the scores were a good indication of the amount of self-reported pain for Trapezius trigger point 1 on the right and trigger point 2 on the left, for Quadratus Lumborum trigger point 1 on the right and left, trigger point 2 on the right, and Quadratus Lumborum trigger point 3 on the left and trigger point 4 on the right (Table 4.7).

There was a relatively high prevalence of Myofascial Pain Syndrome in Trapezius trigger point 2 on the right and left, and in Quadratus Lumborum trigger point 2 on the left. Quadratus Lumborum trigger point 4 on the left and right had the least prevalence with only 2% and 3% of subjects with a mean score of ≥ 9 respectively. However, the interrater reliability for the total score of these trigger points was low (Intraclass Correlation Coefficient = 0.212 and 0.364 respectively) (Figure 4.2).

Chapter 5

Discussion of Results

The aims of this study were to determine if there was a correlation in the data found between the two examiners and thus determine the validity of the Myofascial Diagnostic Scale. The data presented in chapter four analyzed each criterion presented on the Myofascial Diagnostic Scale individually. It also compares the total scores of the assessments of the trigger points to the Numerical Pain Rating Scale - 101. Chapter four also assessed the number of participants who were found to have active trigger points according to the scale.

5.1 Soft Tissue Tenderness

Soft tissue tenderness is the presence of tender muscle sites. In the Myofascial Diagnostic Scale, the presence of tender muscle sites as well as its severity or degree of tenderness was examined. Soft tissue tenderness was found to have a moderate agreement between the examiners. In terms of the definition of the Kappa statistic, this is a good agreement. Trapezius trigger point 1 on the right had an agreement of $\kappa = 0.405$ whereas the Quadratus Lumborum trigger point 1 on the right had an agreement of $\kappa = 0.463$. The Quadratus Lumborum trigger point 4 on the right had an agreement of $\kappa = 0.429$ which all indicate a moderate to good agreement (Table 4.2a). The examination for soft tissue tenderness is supposed to be the easiest of the evaluations according to Simons (1996) however it does depend on the response of the patient. Friction (1993; 1994) found scope of tenderness or tender muscle sites to be a reliable and valid indicator in Myofascial Pain Syndrome in his study. The results of this study could have been affected by different responses of the participant to each rater's examination. Also, ischemic compression or trigger point pressure release is a recognized form of treatment (Travell and Simons; 1999). It occurs as soon as pressure is placed on the trigger point and can occur

during the examination. This, therefore, could have affected the results of the second examiner. By effecting a treatment on the trigger point, the actual trigger point and the severity of the signs and symptoms that it produced are affected.

The most common category of soft tissue tenderness according to the scale found by both examiners was “tenderness to palpation without a grimace or flinch” (Table 4.2b). This means that the majority of participants were tender to palpation but it was not that severe in that it did not initiate a physical response. This could be attributed to the nature of the examination or the uncomfortable feeling of someone pushing and prodding into the muscle as the examiners assess it.

5.2 The Local Twitch Response

The local twitch response is described by Travell and Simons (1999) as a transient contraction of a group of tense muscle fibres that traverse a trigger point. This contraction is usually in response to stimulation like snapping palpation or the insertion of a needle. It is considered by Simons (1996) to be the most difficult sign to find in a trigger point via palpation. The trigger point also has to be found in a taut band and also be in a superficial and easily accessible muscle. Examiners that are highly skilled in myofascial examination usually see it. It is more commonly seen when a needle penetrates the trigger point during dry needling therapy. Due to the highly complex nature of this sign, very few twitch responses were found on the examinations by both examiners. This led to almost perfect agreement (100%) and therefore Kappa statistic could not be computed (Table 4.3). The local twitch response finding also concurred with the Nice et al (1992) and Hsieh et al (2000) studies who also found it to have poor reliability. The Simons (1996) review article also concurred that the local twitch response was a difficult sign to find.

5.3 Taut Band

The taut band is a group of tense muscle fibres that extend from the trigger point to the muscle attachments (Travell and Simons; 1999). The percentage agreement for the presence of the taut band between the examiners per muscle was relatively high (60-73.33%) however, the Kappa statistic or agreement was moderate (Quadratus Lumborum trigger point 2 on the left; kappa= 0.452) to fair with a Kappa of between 0.21-0.40 (Table 4.4). This was seen in the Trapezius trigger points 1 bilaterally and the Quadratus Lumborum trigger points 1 and 3 bilaterally. The taut band finding also concurred with Njoo et al (1994) and Gerwin et al (1997) who found it to have moderate reliability. This differed from Hsieh et al (2000) who found the taut band to have insufficient or conflicting results. However, according to Simons (1996), the taut band is an ambiguous sign as it is also seen in normal subjects. The taut band is also affected by compression as seen in ischemic compression or trigger point pressure release. The ischemic compression or trigger point pressure release occurs as soon as pressure is placed on the trigger point and can occur during the examination. It affects the trigger point by releasing the tension within the muscle fibres comprising the taut band (Travell and Simons; 1999). This could also have affected the results and therefore placed the examiner examining second at a disadvantage.

5.4 Referred Pain

Referred pain or pain emanating from a trigger point but felt at a distant site to the trigger point was found to have the highest level of agreement (Quadratus Lumborum trigger point on the left kappa=0.812) between the examiners. The Kappa statistic or agreement was good and ranged from 0.608 (Trapezius trigger point 1 on the right) to 0.649 (Trapezius trigger point 1 on the left) (Table 4.5). This finding concurred with Gerwin et al (1997) who had good agreement

for referred pain in their study. It however differed from Njoo et al (1994) and Hsieh et al (2000) who found that referred pain had marginal or poor reliability. The high agreement in this study could be attributed to the fact that the classical referred pain patterns as set out by Travell and Simons (1983 and 1999) were not used. An approach similar to Hsieh et al (2000) was used where if the pain was felt anywhere away from the trigger point being examined, it was considered to be referred pain. According to Njoo et al (1994), the descriptions of the pain referral patterns vary in different publications. This places limitations on the value of referred pain as a criterion in Myofascial Pain Syndrome.

Referred pain together with soft tissue tenderness both had good reliability. Both those factors were dependent on the response of the patient to a question during the examination (“Is it tender?” with regards to the tenderness of the trigger point and “is the pain going anywhere?” with regards to the pain referral.) The answers that were given by the participants assisted the examiners in the rating of the trigger points according to the Myofascial Diagnostic Scale. Therefore, the questioning and answers to those questions during the examination is an important adjunct to the diagnosis of Myofascial Pain Syndrome.

5.5 Total Score

The total scores were the score of all the individual criteria in the Myofascial Diagnostic Scale added up. It was representative of the severity of the trigger point. A total score of ≥ 9 out of 17 was indicative of an active myofascial trigger point. The total scores were found to have a fairly moderate agreement between the examiners with the Intraclass Correlation Coefficient analysis (0.5029 – 0.653). It was however still statistically significant. The Cronbach’s alpha and p values show that the agreement between raters was moderate (0.6692 – 0.7541) (Table 4.6). The results or values indicated are close to 1 and according

to both Cronbach's alpha and the Intraclass Correlation Coefficient; values close to 1 indicate good reliability. The total score is dependent on the findings of the other criteria in the Myofascial Diagnostic Scale and how each examiner interpreted them. Therefore, if examiner A found more criteria than examiner B, the results or total score would differ. This makes the Myofascial Diagnostic Scale a good scale as the users would have to be competent in the criteria of trigger points as well as Myofascial Pain Syndrome.

5.6 Total Score vs. Numerical Pain Rating Scale – 101

The participants were asked to rate their pain overall on a scale of 0 – 100 for the areas examined. This was compared with the total scores on the Myofascial Diagnostic Scale to see if those total trigger point scores were representative of the pain felt by the participants. On statistical analysis (Spearman's rank correlation) it was found that there was a positive correlation between the two. This positive correlation can be seen at Trapezius trigger point 1 on the right that had a Spearman's correlation coefficient or Rho of 0.365. Quadratus Lumborum trigger point 1 on the right (Rho* = 0.346) and left (Rho* =0.353) were also positively correlated with mean Numerical Pain Rating Scale - 101 (NRS - 101) score (Table 4.7). This shows that the Myofascial Diagnostic Scale is a good representative of pain and may be a useful tool in the examination and treatment of Myofascial Pain Syndrome.

*Rho = Spearman's correlation coefficient

5.7 Myofascial Pain Syndrome

A participant with a rating of ≥ 9 on the Myofascial Diagnostic Scale was found to have Myofascial Pain Syndrome. In order to achieve a score of ≥ 9 ; two or more criteria on the Myofascial Diagnostic Scale must be present e.g. a participant

with a taut band (4) and referred pain (5) will have a score of ≥ 9 according to the scale. This participant in a clinical setting would require treatment. Fifty two percent of the sixty participants were found to be suffering from Myofascial Pain Syndrome. The Trapezius trigger points were found to be the most common. Trapezius trigger point 2 on the left had the highest prevalence of subjects with active trigger points (28%, n=17) (Figure 4.2).

The use of the degree of tenderness of muscle sites; the taut band and referred pain with the exclusion of the local twitch response would make for a better Myofascial Diagnostic Scale. The combination of these criteria has been advocated as a set of diagnostic criteria for Myofascial Pain Syndrome by Hsieh et al (2000); Simons (1996) and Njoo et al (1994). The local twitch response is usually seen in treatment i.e. when a needle penetrates the trigger point during dry needling therapy. The local twitch response can be a confirmatory diagnostic criterion. Therefore if the local twitch response is seen during the treatment, it would confirm the diagnosis of Myofascial Pain Syndrome. This, in addition to the other criteria (degree of tenderness of muscle sites; the taut band and referred pain), which would have been noticed during the examination, would confirm the diagnosis of Myofascial Pain Syndrome.

According to the overall results, the reliability of the individual criteria (soft tissue tenderness; the taut band and referred pain) in the Myofascial Diagnostic Scale was good. This can be seen by the consistent good levels of agreement between the examiners according to the Kappa statistic. The subjective measurements that relied on the participant (the soft tissue tenderness and referred pain examinations) had a better level of reliability than the objective measurements. The objective measurements relied on the examiners findings on examination (the presence of the taut band and the local twitch response). There was a difference in the levels of reliability according to the results however they were both still reliable. The Myofascial Diagnostic Scale was also found to be an effective assessment tool when it was compared to the

participant's pain. The participant's pain was assessed using the Numerical Pain Rating Scale - 101. A positive correlation according to Spearman's correlation coefficient was found between the total scores of the Myofascial Diagnostic Scale and the Numerical Pain Rating Scale - 101. Therefore the Myofascial Diagnostic Scale was found to be both a reliable and valid assessment tool for the diagnosis of Myofascial Pain Syndrome.

Chapter 6

Conclusion

This randomized inter-examiner reliability study comprised a sample of sixty subjects. Each participant underwent a once-off myofascial examination separately by two examiners in order to determine the reliability and validity of the Myofascial Diagnostic Scale.

Analysis of the data revealed that individually; the criteria used in the scale had a moderate to good reliability. When all the criteria were assessed as a whole i.e. in the scale format; the reliability was still moderate to good. The scale also compared well with the patients perception of pain (Numerical Pain Rating Scale or NRS). This indicates that the scale is a reliable indicator of Myofascial Pain Syndrome or active myofascial trigger points.

One of the shortcomings of the Myofascial Diagnostic Scale is that in its original format, only one trigger point can be assessed at a time. It does not allow for the numerous trigger points within a muscle to be assessed globally.

The Myofascial Diagnostic Scale is a valuable tool in the assessment and treatment of Myofascial Pain Syndrome.

6.1 Factors that could have affected the study

- Ischemic compression - it is the application of pressure in an attempt to de-activate a trigger point. It is also a recognized form of treatment. (Travell and Simons; 1999) This could have affected the study in the sense that the second examiner was disadvantaged due to the palpation or pressure applied on the trigger point by the first examiner.

- The difference in force of the palpation - some patients felt that force used by one of the examiners was greater than the other examiner. This could have altered the perception of pain experienced by the participant and lead to a difference in results.

6.2 Recommendations

The following recommendations are made for future studies:

- The use of two separate Numerical Pain Rating Scale -101 or NRS -101 scales. In the case of this study, one for both the upper and lower back was used. It is recommended to use one for the upper back and another for the lower back. This is important as two different areas of the body are being examined. This would allow for a closer comparison between the scale and the area being examined e.g. the rating of the Trapezius muscle trigger points and the rating of the participant's perception of pain in the upper back or neck region.
- The use of a longer training session and standardizing the pressure or amount of force used in the examinations. By standardizing the amount of pressure; the chance of altering the perception of pain experienced by the participant is reduced and thereby cannot lead to a difference in results. The use of a longer training session is to familiarize the examiners with the Myofascial Diagnostic Scale; its contents and the procedures of examination. This will allow for a uniformity of definitions of the terminology and examination procedures.
- Altering the Myofascial Diagnostic Scale to exclude the local twitch response. The local twitch response is more commonly seen when a needle penetrates the trigger point during dry needling therapy (Simons;

1996). It is therefore more likely to be seen during therapy or treatment than during the assessment. The Myofascial Diagnostic Scale is an assessment tool and therefore the local twitch response which is evident primarily during treatment only, should be excluded from the scale. It could be used to confirm the diagnosis. The scoring system of the scale would then be altered from a total of 17 to a total of 13. The rest of the Myofascial Diagnostic Scale would remain unaltered.

List of References

Auleciems, L.M. 1995: Myofascial Pain Syndrome: A multidisciplinary approach. *Nurse-practitioner*, **2** (4): 18-2.

Bernard, H.R. 2000. *Social Research Methods: Qualitative and Quantitative Approaches*. California, Sage Publications, Inc. ISBN: 0-7619-1403 X

Chaiamnuay, P; Darmawan, J.; Muirden, K.D.and Assawatanabodee, P.1998: Epidemiology of rheumatic disease in rural Thailand: a WHO-ILAR COPCORD study. *Journal of Rheumatology*, **25**:1382-1387.

Chettiar, A. 2001: The therapeutic efficacy of action potential therapy in the treatment of myofascial pain syndrome. Masters Diploma Dissertation, Technikon Natal, Durban.

Esenyel, M; Caglar, N and Aldemir, T.2000: Treatment of myofascial pain. *American Journal of Physical Rehabilitation*, **79** (11): 48-52.

Fishbain, D.A; Goldberg, M; Meagher, B.R.; Steele, R. and Rosomoff, H.1986: Male and female chronic pain patients categorized by DSM-III Psychiatric diagnostic criteria. *Pain*, **26**: 181-197.

Fricton, J.R. 1993: Myofascial pain. *Journal of Musculoskeletal Pain*, **1** (3-4): 37-47.

Fricton, J.R. 1994: Myofascial pain. *Balliere's Clinical Rheumatology*, **8** (4): 858-880.

Gerwin, R.D.; Shannon, S.; Hong, C.; Hubbard, D.; and Gevirtz, R. 1997: Interrater reliability in myofascial trigger point examination. *Pain*, **69**: 65-73.

Han, S.C; Harrison, P.1997: Myofascial Pain Syndrome and Trigger-Point Management. *Regional Anesthesia*, **22**(1):89-101.

Heiman, G.W. 2000 *Basic Statistics for the Behavioral Sciences*. Boston, Houghton Mifflin Company ISBN: 0-395-96251-X

Hinkle, D.E; Wiersma, W; Jurs, S.G. 1998 *Applied Statistics for the Behavioral Sciences*. Boston, Houghton Mifflin Company ISBN: 0-395-87411-4

Hsieh, C-Y.J.; Hong, C- Z; Adams, A.H.; Platt, K.J.; Danielson,C.D.;Hoehler,F.K.;Tobis,J.S.2000:Interexaminer reliability of the palpation of trigger points in the trunk and lower limb muscles. *Archives of Physical Medicine and Rehabilitation*, **81**:258-264.

Jones, A.D. 1994: The effectiveness of myofascial trigger point therapy on myofascial pain syndrome trigger points. Masters Diploma Dissertation, Technikon Natal, Durban.

Jenson, M.P; Karoly, P. and Braver, S.1986.The measurement of clinical pain intensity: A comparison of six methods. *Pain*, **27**:117-126.

Moore, K.L; Agur, A.M.R.1996.*Essential Clinical Anatomy*. Baltimore, Williams and Wilkins ISBN: 0-683-06128-3.

Mouton, J. 1996. *Understanding Social Research*. Pretoria, J.L. van Schaik Publishers. ISBN: 0-627-02163-8.

Nice, D.A.; Riddle, D.L.; and Lamb, R.L. 1992: Intertester reliability of judgements of the presence of trigger points in patients. *Archives of Physical Medicine and Rehabilitation*, **73**: 893 – 898.

Njoo, K.H.; and Van der Does, E. 1994: The occurrence and interrater reliability of myofascial trigger points in the quadratus lumborum and gluteus medius: A prospective study in non-specific low back pain patients and controls in general practice. *Pain*, **58**: 317 – 323.

Prithipal, A.2003: The effectiveness of myofascial trigger point therapy in the treatment of episodic tension-type headache in adults: a comparison of 3 manual interventions applied to the posterior cervical musculature. Masters Diploma Dissertation, Durban Institute of Technology.

Portney, L.G and Watkins, M.P.1993: *Foundations of Clinical Research-Applications to Practice*.Connecticut.Appleton and Lange. ISBN: 0-8385-1065-5

Simons, D.G.1996: Clinical and etiological update of myofascial pain from trigger points. *Journal of Musculoskeletal Pain*, **4**(1/2):93-121.

Thompson, N. 2002: The effectiveness of sacro-iliac manipulation alone versus sacro-iliac manipulation following ischaemic compression of the gluteus medius trigger points in the treatment of sacro-iliac syndrome. Masters Diploma Dissertation, Technikon Natal, Durban.

Travell, J.G.; Simons, D.G.; and Simons, L.S. 1983: *Myofascial Pain and Dysfunction: The Trigger Point Manual*. Baltimore, Williams and Wilkins ISBN: 0-683-08366-X

Travell, J.G.; Simons, D.G.; and Simons, L.S. 1999: *Myofascial Pain and Dysfunction: The Trigger Point Manual*. Baltimore, Williams and Wilkins ISBN: 0-683-08366-X

Viera, A.J; Garrett, J.M.2005: Understanding interobserver agreement: the Kappa statistic. *Family Medicine*, **37**(5):360-3 [online] Available from: <http://www.stfm.org/fmhub/fm2005/May/Anthony360.pdf> [Accessed on 1 August 2005].

<http://www.zephyrus.demon.co.uk/geography/home.html>, 1999. [Accessed on 1 August 2005].

Appendix A

The inter-examiner reliability and validity of the Myofascial Diagnostic Scale as an assessment tool in the diagnosis of myofascial pain syndrome.

Dear Participant

You have been invited to participate in this research study, which has been designed to assess the reliability and validity of the Myofascial Diagnostic Scale. The scale is currently used to assess the severity of the myofascial or muscle pain complaint. The results will be used to increase the efficiency and effectiveness of assessment and treatment of patients with myofascial pain syndrome.

You will be required to rate the pain according to a numerical scale. I, the researcher, will then examine you. After which you will be examined by a clinician. Each examiner will examine alone and they will not be allowed to discuss their findings with each other. The results obtained will then be used to assess the inter-examiner reliability of the Myofascial Diagnostic Scale

The consultation and treatment is free of charge and your participation is voluntary.

You are free to leave the study at any time with no consequences. The results will be used for research purposes only. Although confidentiality will be maintained, the clinician, research supervisor and the research ethics representative however may inspect the tests records.

If you have any questions, please feel free to contact the researcher or the supervisor at the contact numbers listed below.

I thank you for participation in this study.

Yours sincerely,

V. Vaghmaria
(Researcher)
Tel: 2042205

Dr. A. Docrat
(Research Supervisor)
Tel: 2042589

Appendix B



D U R B A N
INSTITUTE of
TECHNOLOGY

INFORMED CONSENT FORM

(To be completed by patient / subject)

Date:

Title of research project	: The inter-examiner reliability and validity of the Myofascial Diagnostic Scale as an assessment tool in the diagnosis of Myofascial Pain Syndrome
Name of supervisor	: Dr. A. Docrat
Telephone	: 031-2042589
Name of research student	: Vinesh Vaghmaria
Telephone	: 031-2095105

Please circle the appropriate answer

YES / NO

1. Have you read the research information sheet? Yes No
2. Have you had an opportunity to ask questions regarding this study? Yes No
3. Have you received satisfactory answers to your questions? Yes No
4. Have you had an opportunity to discuss this study? Yes No
5. Have you received enough information about this study? Yes No
6. Do you understand the implications of your involvement in this study? Yes No
7. Do you understand that you are free to withdraw from this study?
at any time without having to give any a reason for withdrawing, and
without affecting your future health care. Yes No
8. Do you agree to voluntarily participate in this study Yes No
9. Who have you spoken to? _____

If you have answered NO to any of the above, please obtain the necessary information before signing

Please Print in block letters:

Focus Group Member: _____

Signature: _____

Parent/ Guardian: _____

Signature: _____

Witness Name: _____

Signature: _____

Research Student Name: _____

Signature: _____

Appendix D

Numerical Rating Scale - 101 Questionnaire

Date: _____ **File no:** _____ **Visit no:** _____

Patient name: _____

Please indicate on the line below, the number between 0 and 100 that best describes

the pain you experience **when it is at its worst**. A zero (0) would mean “no pain at

all”, and one hundred (100) would mean “pain as bad as it could be”.

Please write only **one** number.

0 _____ 100

Please indicate on the line below, the number between 0 and 100 that best describes

the pain you experience **when it is at its least**. A zero (0) would mean “no pain at all” and one hundred (100) would mean “pain as bad as it could be”.

Please write only **one** number.

0 _____ 100

Appendix E

The focus group consisted of 6 individuals. It was aimed at involving all those with an interest and a clinical background in Myofascial Pain Syndrome. The individuals invited included both students and professionals involved in the treatment of Myofascial Pain Syndrome. Copies of the Myofascial Diagnostic Scale were handed to all the individuals and they were asked to comment on the scale. The purpose of the focus group was to validate the use of the Myofascial Diagnostic Scale as an assessment tool in the treatment of Myofascial Pain Syndrome. The meeting was held on the 12 February 2004 and was captured on video tape. The group consisted of:

3 Chiropractors: Dr. A. Jones (Private practice)

Dr. C. Korporaal (Durban Institute of Technology)

Dr. A. Docrat (Durban Institute of Technology)

4 Students (Chiropractics): S. Hunter

D. Weyer-Henderson

I. Adamson

(Statistics) J. Nienaber

Physiotherapists were invited but were unable to attend.

Based on the results of the focus group, the appropriate changes were made to the study and the Myofascial Diagnostic Scale to ensure its validity and reliability.

Appendix F

Letter of Information - Focus Group

Dear Participant

Welcome to the focus group of my study. Thank you for your interest.

The title of my research project is: The inter-examiner reliability and validity of the Myofascial Diagnostic Scale as an assessment tool in the diagnosis of Myofascial Pain Syndrome.

Name of Supervisor: Dr. A Docrat (M.Tech. Chiropractic ; C.C.F.C)

Name of Research Student: Vinesh Vaghmaria

Name of Institution: Durban Institute of Technology

The purpose of this focus group is to validate the use of the Myofascial Diagnostic Scale as an assessment tool in the treatment of Myofascial Pain Syndrome.

Your participation is much appreciated and it is assured that your comments and contributions will remain confidential. You are at any point permitted to disagree, however if this is the case, please give reasons for this, as it will assist in the research process. The results of this focus group will only be used for research purposes.

Thank you for your participation.

Vinesh Vaghmaria

APPENDIX G

IMPORTANT NOTICE: THIS FORM IS TO BE READ AND FILLED IN BY EVERY MEMBER PARTICIPATING IN THE FOCUS GROUP, BEFORE THE FOCUS GROUP MEETING CONVENES.

CONFIDENTIALITY STATEMENT – FOCUS GROUP DECLARATION

1. All information contained in the research documents and any information discussed during the focus group meeting will be kept private confidential. This is especially binding to any information that may identify any of the participants in the research process.
2. The patient files will be coded and kept anonymous in the research process.
3. None of the information shall be communicated to any other individual or organisation outside of this specific focus group as to the decisions of this focus group.
4. The information from this focus group will be made public in terms of a journal publication, which will in no way identify any participants of this research.

Once this form has been read and agreed to, please fill in the appropriate information below and sign to acknowledge agreement.

Please Print in block letters:

Focus Group Member: _____ Signature: _____

Witness Name: _____ Signature: _____

Researcher's Name: _____ Signature: _____

Supervisor's Name: _____ Signature: _____

APPENDIX H

CODE OF CONDUCT

This form needs to be completed by every member of the Focus Group prior to the commencement of the focus group meeting.

As a member of this committee I agree to abide by the following conditions:

1. All information contained in the research documents and any information discussed during the focus group meeting will be kept private and confidential. This is especially binding to any information that may identify any of the research process.
2. None of the information shall be communicated to any other individual or organisation outside of this specific focus group as to the decisions of this focus group.
3. The information from this focus group will be made public in terms of a journal publication, which will in no way identify any participants of this research.

Member represents	Member's Name	Signature	Contact Details

Appendix I

INFORMED CONSENT FORM

(To be completed by the participants of the focus group)

Date:

Title of research project	: The inter-examiner reliability and validity of the Myofascial Diagnostic Scale as an assessment tool in the diagnosis of Myofascial Pain Syndrome
Name of supervisor	: Dr. A. Docrat
Telephone	: 031-2042589
Name of research student	: Vinesh Vaghmaria
Telephone	: 031-2095105

Please circle the appropriate answer

	YES / NO	
10. Have you read the research information sheet?	Yes	No
11. Have you had an opportunity to ask questions regarding this study?	Yes	No
12. Have you received satisfactory answers to your questions?	Yes	No
13. Have you had an opportunity to discuss this study?	Yes	No
14. Have you received enough information about this study?	Yes	No
15. Do you understand the implications of your involvement in this study?	Yes	No
16. Do you understand that you are free to withdraw from this study? at any time without having to give any a reason for withdrawing, and without affecting your future health care.	Yes	No
17. Do you agree to voluntarily participate in this study	Yes	No
18. Who have you spoken to? _____		

If you have answered NO to any of the above, please obtain the necessary information before signing

Please Print in block letters:

Focus Group Member: _____ Signature: _____

Parent/ Guardian: _____ Signature: _____

Witness Name: _____ Signature: _____

Research Student Name: _____ Signature: _____

The inter-examiner reliability and validity of the Myofascial Diagnostic Scale as an assessment tool in the diagnosis and treatment of Myofascial Pain Syndrome.

Vinesh Vaghmaria (M.Tech: Chiropractic)

Department of Chiropractic; Durban Institute of Technology

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Grant from Durban Institute of Technology; South Africa

Research Article

The inter-examiner reliability and validity of the Myofascial Diagnostic Scale as an assessment tool in the diagnosis and treatment of Myofascial Pain Syndrome.

Vaghmaria, Vinesh; Docrat, Aadil.

Department of Chiropractic; Faculty of Health; Durban Institute of Technology

Objectives: To evaluate the Myofascial Diagnostic Scale, for its inter-examiner reliability and assess its reliability and validity as an assessment tool in the diagnosis and treatment of Myofascial Pain Syndrome.

Design: Interexaminer reliability study.

Setting: Chiropractic Day Clinic; Durban Institute of Technology

Participants: Sixty random outpatients from the Chiropractic Day Clinic were selected and examined according to the Myofascial Diagnostic Scale.

Intervention: Trigger points in the Trapezius and Quadratus Lumborum muscles were initially marked by a standardized marker according to their positions as set out by Travell and Simons (1999). A clinician from the Chiropractic Day clinic and the researcher then examined the participants according to the Myofascial Diagnostic Scale.

Main Outcome Measures: Palpation findings

Results: Kappa scores for agreement between examiners for soft tissue tenderness, taut band and referred pain were 0.46; 0.45 and 0.81 respectively.

Conclusion: The trigger points were assessed on the scale according to soft tissue tenderness, local twitch response, the presence of a taut band and referred pain. According to the overall results; the reliability of the individual criteria (soft tissue tenderness; the taut band and referred pain) in the Myofascial Diagnostic Scale was moderate to good.

Key Words: Myofascial Pain Syndrome; Myofascial trigger point; Myofascial Diagnostic Scale; Interexaminer reliability; Assessment

Introduction

Myofascial Pain Syndrome is characterized by the presence of trigger points that can become a painful part of nearly everyone's life at one time or another. (Travell and Simons, 1999).

It is a regional muscle pain disorder characterized by localized muscle tenderness and pain. It is the most common cause of regional pain such as back, shoulder pain, tension-type headaches and facial pain. As a condition it is overlooked as a common cause of pain following traumatic injuries, whiplash-type injuries, and repetitive strain and other occupational injuries. (Fricton, 1994)

According to a review of the related literature, there exists a debate as to the exact diagnostic criteria used in identifying trigger points. This has hampered the objective assessment and treatment of Myofascial Pain Syndrome. (Travell and Simons, 1999) It also led to inconsistent findings being reported by various authors due to the lack of a single diagnostic tool.

The majority of more recent studies on Myofascial Pain Syndrome (Fricton, 1994; Gerwin et al,1997; Njoo et al,1994; Nice et al,1992 ; Hsieh et al, 2000) have used the diagnostic criteria of Travell and Simons(1983 , 1999) However, according to Njoo et al (1994), Travell and Simons(1983,1999) have not tested their diagnostic criteria of trigger points in a controlled study.

According to a survey of the literature there is currently no diagnostic tool that can be used in the diagnosis of Myofascial Pain Syndrome. This lead to Chettiar (2001) developing the Myofascial Diagnostic Scale for use as an objective tool in his study at the Durban Institute of Technology school of Chiropractic. It is a scale using the signs of a myofascial trigger point as indicators to assess the extent to which the patient suffers from Myofascial Pain Syndrome. The scale uses numerical grading of the indicators and not merely representing them as present or absent. The signs used were based on Travell and Simons (1999)

criteria and include: referred pain in the zone of reference, local twitch response, palpable taut band, and focal or spot tenderness.

Spot tenderness or soft tissue tenderness consisted of five grades or indicators: grade 0 - no tenderness = 0, grade 1 - tenderness to palpation without grimace or flinch = 1, grade 2 - tenderness with grimace and/or flinch to palpation = 2, grade 3 - tenderness with withdrawal = 3, grade 4 - withdrawal to non-noxious stimuli = 4. The presence of a local twitch response and the presence of a palpable taut band were indicated by a score of 4 on the scale. The presence of referred pain was indicated by a score of 5. A total score of 9 or more was indicative of active trigger points. This scale had, however, not been tested to verify its validity and inter-rater reliability.

Figure.1: The Myofascial Diagnostic Scale

Trigger Point Signs:

1. Soft Tissue Tenderness

<u>Grade:</u>	0	No Tenderness	0
	I	Tenderness to palpation WITHOUT grimace or flinch	1
	II	Tenderness to palpation WITH grimace or flinch	2
	III	Tenderness with WITHDRAWAL (+ Jump sign)	3
	IV	Withdrawal (+ Jump sign) to non-noxious stimuli (ie. Superficial palpation, gentle percussion)	4

2. Snapping palpation of the trigger point evokes a local twitch response 4

3. The trigger point is found in a palpable taut band. 4

4. Moderate, sustained pressure on the trigger point causes or intensifies pain in the reference zone. 5

Total out of 17

Materials and Methods

Sample Population

The study incorporated 60 outpatients from the Chiropractic Day Clinic at the Durban Institute of Technology.

Inclusion criteria

1. Participants were between 18 and 35 years old. Esenyel (2000) suggested a relatively young population of patients to minimize pain that can be caused by accompanying degenerative disc or joint disease.

Exclusion criteria

1. All participants who did not fall within the recommended age limit.
2. All participants who declined to partake in the study.

Measurement tool

- The Myofascial Diagnostic Scale is a scale formulated to assess the severity to which a patient is suffering from Myofascial Pain Syndrome via a rating of patients symptoms according to Travell and Simon's (1983) diagnostic criteria.(Chettiar,2001)
- These criteria include:
 1. Palpable firm area of muscle referred to as the taut band.
 2. Within the taut band, a localised spot of exquisite tenderness to manual pressure on the trigger point.
 3. A characteristic pattern of pain in response to sustained pressure on the trigger point within the taut band. This pain is referred in patterns that are specific to individual muscles.
 4. A local twitch of the taut band when the trigger band is distorted transversely or through needling of the tender spot.

According to Friction (1994) the patient's behavioral reaction to firm palpation is a distinguishing characteristic of myofascial pain and is termed a 'jump sign'. This reaction may include withdrawal of the head, wrinkling of the face or forehead, or a verbal response such as "That's it" or "Oh yes".

Referred pain in this study was defined as any pain that the participant felt away from the area of palpation. (Hsieh et al; 2000)

Data Collection

- Prior to the beginning of the study a two-hour practice session was held during which the details of the study, the scale and positions for examination were explained and agreed upon.
- The participants were all regular outpatients at the Durban Institute of Technology Chiropractic Clinic.
- A standardized marker was used to mark all the relevant trigger points according to their positions as set out by Travell and Simons (1999). The markers were a group of students who marked the trigger points on the participants. The group was selected from the 5th and 6th year chiropractic students and all had clinical experience. This was done to ensure that the two examiners were examining the same areas. These trigger points included Trapezius trigger points 1 and 2 and both the deep and superficial trigger points in the Quadratus Lumborum muscles. The superior superficial trigger point of the Quadratus Lumborum muscle was designated as trigger point 1. The inferior superficial trigger point of the Quadratus Lumborum muscle was designated as trigger point 4. The superior deep trigger point was designated as trigger point 2 and the inferior deep one was designated as trigger point 3.
- The examiners included a clinician from the Chiropractic Day clinic and the researcher.
- The order of examination by the examiners varied with each participant.
- During the examinations only two questions were allowed to be asked. These included:

- “Is it tender?” with regards to the tenderness of the trigger point and “is the pain going anywhere?” with regards to the pain referral. Referred pain was defined as any pain the individual felt away from the area under palpation (Hsieh et al, 2000).
- After the examinations by either of the examiners the participant was asked to rate their pain of the areas examined according to Numerical Pain Rating Scale - 101.
- The results were collected after each examination by the clinician as this kept the researcher blinded as to how the study was progressing.
- On completion of participant examinations, the results were collated and underwent statistical analysis.

Results

Table 1: Descriptive statistics for the age distribution

Mean	24.6833
Std. Deviation	4.05259
Minimum	19.00
Maximum	35.00

Sixty participants took part in the study. Table one reflects that the mean age of the participants was 24.7 years with a standard deviation of 4.1 years. The youngest participant was 19 years old. The oldest was 35 years old.

4.1.2 Gender Distribution

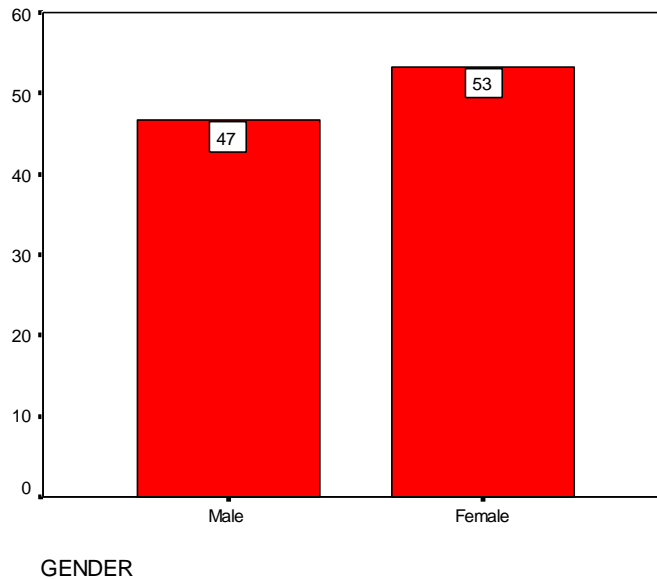


Figure 2: Gender distribution of study participants

Figure 2 reveals that there were 28 males and 32 females in the study. This amounted to 46.7% and 53.3% of the total sample respectively

4.2 Soft tissue tenderness

Table 2: Inter-rater agreement for soft tissue tenderness

Trigger point and location	n (%) agreement between raters	Kappa (95% CI)	p value	Classification of agreement
Trapezius 1 right	39 (65%)	0.405 (0.199-0.610)	<0.001*	Moderate
Trapezius 1 left	32 (53.33%)	0.218 (0.006-0.429)		Fair
Trapezius 2 right	36 (60%)	0.258 (0.029-0.488)		Fair
Trapezius 2 left	23 (38.33%)	0.005 (-0.194-0.203)	0.953	Poor
Quadratus 1 right	40 (66.67%)	0.463 (0.271-0.655)		Moderate
Quadratus 1 left	33 (55%)	0.251 (0.042-0.461)	0.006*	Fair
Quadratus 2 right	34 (56.67%)	0.277 (0.068-0.487)		Fair
Quadratus 2 left	33 (55%)	0.343 (0.160-0.527)	<0.001*	Fair
Quadratus 3 right	39 (65%)	0.390 (0.180-0.601)		Fair
Quadratus 3 left	32 (53.33%)	0.237 (0.031-0.443)	0.013*	Fair
Quadratus 4 right	39 (65%)	0.429 (0.233-0.626)	<0.001*	Moderate
Quadratus 4 left	37 (61.67%)	0.374 (0.173-0.575)	<0.001*	Fair

*statistically significant at the 0.05 level

From table 2a; it is evident that there was generally a fair or moderate level of agreement between the two raters in terms of soft tissue tenderness. Soft tissue tenderness is the presence of tender muscle sites. In the Myofascial Diagnostic Scale, the presence of tender muscle sites as well as its severity or degree of tenderness was examined. Trapezius trigger point 2 on the left had a poor level of agreement, with only 38.3% concurrence. Quadratus Lumborum trigger point 1 on the right had the highest level of agreement (Kappa 0.463, 66.67% agreement). Moderate agreements were also seen in Trapezius trigger point 1 on the right (65%) and Quadratus Lumborum trigger point 4 on the right (61.67%). Most of the other trigger points had a fair level of agreement between 50 – 60 %.

Statistical significance or probability values (p value) could not be computed for some trigger points in table 2a where the number of categories in the two rates on the scale did not match i.e. where examiner 1 had used 4 out of the 5 criterion whereas examiner 2 had used only 3 out of the 5 criterion.

Local twitch response

Table 3: Inter-rater agreement for local twitch response

Trigger point and location	n (%) agreement between raters	Kappa (95% CI)
Trapezius 1 right	60 (100%)	Cannot be computed
Trapezius 1 left	60 (100%)	Cannot be computed
Trapezius 2 right	60 (100%)	Cannot be computed
Trapezius 2 left	60 (100%)	Cannot be computed
Quadratus 1 right	60 (100%)	Cannot be computed
Quadratus 1 left	60 (100%)	Cannot be computed
Quadratus 2 right	60 (100%)	Cannot be computed
Quadratus 2 left	60 (100%)	Cannot be computed
Quadratus 3 right	60 (100%)	Cannot be computed
Quadratus 3 left	59 (98.33%)	Cannot be computed
Quadratus 4 right	60 (100%)	Cannot be computed
Quadratus 4 left	60 (100%)	Cannot be computed

The local twitch response is described by Travell and Simons (1999) as a transient contraction of a group of tense muscle fibres that traverse a trigger point. None of the subjects displayed any local twitch response according to both raters for most of the trigger points that were assessed. Thus, from table 3 it is evident that agreement was perfect and Kappa statistics could not be computed.

There was a twitch response noted in Quadratus Lumborum trigger point 3 on the left by one rater only, thus for this trigger point the agreement was 98.33%. Thus the absence of a local twitch response was rated almost perfectly by both raters (Table 3).

4.4 Taut band

Table 4: inter-rater agreement for taut band

Trigger point and location	n (%) agreement between raters	Kappa (95% CI)	P value	Classification of agreement
Trapezius 1 right	37 (61.67%)	0.278 (0.047-0.510)	0.015*	Fair
Trapezius 1 left	36 (60%)	0.211 (-0.034-0.455)	0.091	Fair
Trapezius 2 right	32 (53.33%)	-0.098 (-0.395-0.199)	0.133	Worse than expected by chance alone
Trapezius 2 left	43 (71.67%)	0.215 (-0.100-0.531)	0.021*	Fair
Quadratus 1 right	41 (68.33%)	0.336 (0.089 to 0.583)	0.009*	Fair
Quadratus 1 left	39 (65%)	0.308 (0.069 to 0.546)	0.014*	Fair
Quadratus 2 right	32 (53.33%)	0.082 (-0.166 to 0.330)	0.511	Poor
Quadratus 2 left	44 (73.33%)	0.452 (0.222 to 0.682)	<0.001*	moderate
Quadratus 3 right	42 (70%)	0.287 (0.011 to 0.562)	0.026*	Fair
Quadratus 3 left	40 (66.67%)	0.207 (-0.076 to 0.491)	0.107	Fair
Quadratus 4 right	39 (65%)	0.123 (-0.180 to 0.425)	0.342	Poor
Quadratus 4 left	42 (70%)	0.289 (0.015 to 0.564)	0.023*	Fair

* statistically significant at the 0.05 level

The taut band is a group of tense muscle fibres that extend from the trigger point to the muscle attachments. (Travell and Simons; 1999). It is evident from table 4 that the level of agreement for the presence of a taut band was at best

moderate (Quadratus Lumborum trigger point 2 on the left) and at worst, worse than expected by chance alone (Trapezius trigger point 2 on the right). Quadratus Lumborum trigger point 2 on the left had a 73.33% level of agreement (Kappa 0.452). Trapezius trigger point 2 on the right had a level of agreement of 53.33% (Kappa -0.098). Most of the other trigger points had a level of agreement of between 60 – 70%. The probability or p values of Trapezius trigger point 1 on the left; Trapezius trigger point 2 on the right; Quadratus Lumborum trigger point 2 and 4 on the right; and Quadratus Lumborum trigger point 3 on the left were not statistically significant. Thus, the level of agreement for this characteristic was not very high.

4.5 Referred pain

Table 5: Inter-rater agreement for referred pain

Trigger point and location	n (%) agreement between raters	Kappa (95% CI)	p value	Classification of agreement
Trapezius 1 right	52 (86.67%)	0.608 (0.355-0.861)	<0.001*	Good
Trapezius 1 left	53 (88.33%)	0.649 (0.400-0.893)	<0.001*	Good
Trapezius 2 right	50 (83.33%)	0.634 (0.427-0.841)	<0.001*	Good
Trapezius 2 left	49 (81.67%)	0.618 (0.414-0.822)	<0.001*	Good
Quadratus 1 right	57 (95%)	0.812 (0.606 to 1.019)	<0.001*	Very good
Quadratus 1 left	50 (83.33%)	0.574 (0.334 to 0.815)	<0.001*	Moderate
Quadratus 2 right	49 (81.67%)	0.523 (0.268 to 0.778)	<0.001*	Moderate
Quadratus 2 left	50 (83.33%)	0.648 (0.449 to 0.847)	<0.001*	Good
Quadratus 3 right	54 (90%)	0.611 (0.316 to 0.906)	<0.001*	Good
Quadratus 3 left	48 (80%)	0.376 (0.060 to 0.692)	0.003*	Fair
Quadratus 4 right	49 (81.67%)	0.247 (-0.156 to 0.649)	0.056	Fair
Quadratus 4 left	49 (81.67%)	0.247 (-0.156 to 0.649)	0.056	Fair

* statistically significant at the 0.05 level

Referred pain is defined by Travell and Simons (1999) as a pain that arises in a trigger point but is felt at a distant site. Table 5 reveals that agreement for referred pain was generally fairly high. For the Trapezius trigger points there was good agreement between the two raters (80 - 90%), and for the Quadratus

Lumborum trigger points this ranged from very good (Quadratus Lumborum trigger point 1 on the right = 95%) to fair (Quadratus Lumborum trigger point 3 on the left =80% and trigger point 4 on the right and left=81.67%) (Table 5). All were statistically significant except for Quadratus Lumborum trigger point 4 on the right and left.

4.6 Total score

Table 6: Inter-rater reliability for total score

Trigger point and location	ICC (95% CI)	Alpha (95% CI)	P
Trapezius 1 right	0.517 (0.307 to 0.6806)	0.6819 (0.4674 to 0.8100)	<0.001*
Trapezius 1 left	0.5828 (0.3877 to 0.7279)	0.7364 (0.5587 to 0.8426)	<0.001*
Trapezius 2 right	0.5363 (0.3287 to 0.6945)	0.6982 (0.4947 to 0.8197)	<0.001*
Trapezius 2 left	0.5029 (0.2872 to 0.6700)	0.6692 (0.4463 to 0.8024)	<0.001*
Quadratus 1 right	0.6046 (0.4159 to 0.7434)	0.7536 (0.5874 to 0.8528)	<0.001*
Quadratus 1 left	0.5159 (0.3032 to 0.6796)	0.6806 (0.4653 to 0.8092)	<0.001*
Quadratus 2 right	0.3800 (0.1414 to 0.5768)	0.5507 (0.2478 to 0.7316)	0.0013*
Quadratus 2 left	0.6053 (0.4168 to 0.7439)	0.7541 (0.5883 to 0.8531)	<0.001*
Quadratus 3 right	0.5266 (0.3165 to 0.6874)	0.6899 (0.4809 to 0.8148)	<0.001*
Quadratus 3 left	0.4269 (0.1959 to 0.6130)	0.5984 (0.3276 to 0.7601)	0.0003*
Quadratus 4 right	0.2124 (-0.0419 to 0.4409)	0.3504 (-0.0876 to 0.6120)	0.0502
Quadratus 4 left	0.3637 (0.1229 to 0.5641)	0.5334 (0.2189 to 0.7213)	0.0020*

* statistically significant at the 0.05 level

The total score was the score of all the individual diagnostic criteria of the Myofascial Diagnostic Scale added up. It was representative of the severity of the trigger point. A total score of ≥ 9 was indicative of an active myofascial trigger point. These are trigger points that are hypersensitive and can display continuous pain. In order to achieve a score of ≥ 9 on the Myofascial Diagnostic Scale; two or more of the criteria need to be present.

Table 6 shows the Intraclass Correlation Coefficient (ICC), Cronbach's alpha and p values for reliability for total scores at each trigger point. Intraclass Correlation Coefficient's were generally relatively low, although statistically

significant. Intraclass Correlation Coefficient was especially low for Quadratus Lumborum trigger point 4 on the right (0.2124), and not quite statistically significant ($p = 0.0502$). Cronbach's alpha and the p values however showed that the agreements were moderate. Quadratus Lumborum trigger point 1 on the right (0.7536); Quadratus Lumborum trigger point 2 on the left (0.7541) and Trapezius trigger point 1 on the left (0.7364) all showed good reliability or agreement.

4.7 Correlations

Table 7: Spearman correlations between NRS - 101 mean and mean rater scores for each trigger point

		NRS - 101 mean
Mean score Trapezius 1 Right	Correlation Coefficient	.365(*)
	Sig. (2-tailed)	.004
Mean score Trapezius 1 Left	Correlation Coefficient	.235
	Sig. (2-tailed)	.070
Mean score Trapezius 2 Right	Correlation Coefficient	.122
	Sig. (2-tailed)	.351
Mean score Trapezius 2 Left	Correlation Coefficient	.318(*)
	Sig. (2-tailed)	.013
Mean score Quadratus 1 Right	Correlation Coefficient	.346(*)
	Sig. (2-tailed)	.007
Mean score Quadratus 1 Left	Correlation Coefficient	.353(*)
	Sig. (2-tailed)	.006
Mean score Quadratus 2 Right	Correlation Coefficient	.337(*)
	Sig. (2-tailed)	.009
Mean score Quadratus 2 Left	Correlation Coefficient	.224
	Sig. (2-tailed)	.085
Mean score Quadratus 3 Right	Correlation Coefficient	.170
	Sig. (2-tailed)	.194
Mean score Quadratus 3 Left	Correlation Coefficient	.260(*)
	Sig. (2-tailed)	.045
Mean score Quadratus 4 Right	Correlation Coefficient	.260(*)
	Sig. (2-tailed)	.045
Mean score Quadratus 4 Left	Correlation Coefficient	.195
	Sig. (2-tailed)	.136

* Correlation is significant at the 0.05 level (2-tailed).

The mean of the total scores of the two raters of the Myofascial Diagnostic Scale were correlated with Numerical Pain Rating Scale - 101's (NRS - 101) mean score. There was a significant positive correlation between the score for Trapezius trigger point 1 on the right side and NRS - 101 ($Rho^* = 0.365$, $p = 0.004$). Trapezius trigger point 2 on the left was significantly positively correlated with NRS - 101 ($Rho^* = 0.318$, $p = 0.013$). Quadratus Lumborum trigger point 1 on the right ($Rho^* = 0.346$, $p = 0.007$) and left ($Rho^* = 0.353$, $p = 0.006$), trigger point 2 on the right ($Rho^* = 0.337$, $p = 0.009$), and trigger point 3 on the left ($Rho^* = 0.260$, $p = 0.45$) and trigger point 4 on the right ($Rho^* = 0.260$, $p = 0.45$) were also significantly positively correlated with mean NRS - 101 score. All correlations, however, were positive but weak (Table 7).

*Rho = Spearman's correlation coefficient

4.8 Myofascial pain syndrome

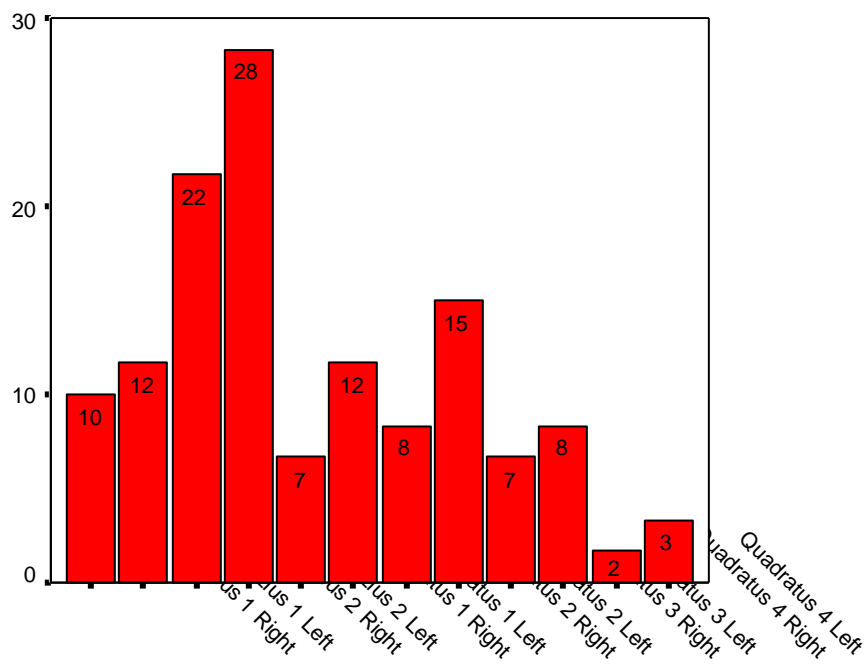


Figure 3: percentage of subjects positive for myofascial pain syndrome per trigger point

Figure 3 reveals the percentages of the subjects that were classified as having Myofascial Pain Syndrome. These trigger points were considered to be active if they had a score of ≥ 9 . From the results, Trapezius trigger point 2 on the left was the most prevalent where 28% or 17 of the 60 subjects had active trigger points. This was followed by Trapezius trigger point 2 on the right (22%, n=13). The other trigger points had much lower percentages of positive subjects. Overall 52% (n=31) of the subjects were positive for Myofascial Pain Syndrome at one or more trigger point. The number of trigger points classified as being active per individual subject ranged from 0 to 7 with a median of 1.

Summary of results

Agreement between the two raters or examiners was calculated for a variety of subjective and objective measurements. The subjective measurements were those where the result was reliant on the participant's answers to the examination (i.e. the examination for soft tissue tenderness and referred pain). The objective measurements were what the examiners found on the participants during the examinations (i.e. the local twitch response and the taut band). The measurements that relied on the rater perception (e.g. taut band) seemed to give less reliable results than those that relied on the subject (e.g. referred pain). These objective results were still however reliable even though it was reliable to a lesser degree than the subjective results. Overall there was a range of agreement between the examiners from worse than expected by chance to very good for all the criteria.

The Numerical Pain Rating Scale - 101 was correlated positively and significantly with the mean total scores for a majority of the trigger points. Thus the total scores on the Myofascial Diagnostic Scale were a good indication of the amount of self-reported pain by the participants.

Discussion

Soft Tissue Tenderness

Soft tissue tenderness is the presence of tender muscle sites. In the Myofascial Diagnostic Scale, the presence of tender muscle sites as well as its severity or degree of tenderness was examined. Soft tissue tenderness was found to have a moderate agreement between the examiners. In terms of the definition of the Kappa statistic, this is a good agreement. The examination for soft tissue tenderness is supposed to be the easiest of the evaluations according to Simons (1996) however it does depend on the response of the patient. Friction (1993) found scope of tenderness or tender muscle sites to be a reliable and valid indicator in Myofascial Pain Syndrome in his study. The results of this study could have been affected by different responses of the participant to each rater's examination. Also, ischemic compression or trigger point pressure release is a recognized form of treatment (Travell and Simons; 1999). It occurs as soon as pressure is placed on the trigger point and can occur during the examination. This therefore, could have affected the results of the second examiner. By effecting a treatment on the trigger point, the actual trigger point and the severity of the signs and symptoms that it produced are affected.

The Local Twitch Response

The local twitch response is described by Travell and Simons (1999) as a transient contraction of a group of tense muscle fibres that traverse a trigger point. This contraction is usually in response to stimulation like snapping palpation or the insertion of a needle. It is considered by Simons (1996) to be the most difficult sign to find in a trigger point via palpation. The trigger point also has to be found in a taut band and also be in a superficial and easily accessible muscle. Examiners that are highly skilled in myofascial examination usually see it. It is more commonly seen when a needle penetrates the trigger point during dry needling therapy. Due to the highly complex nature of this sign, very few twitch responses were found on the examinations by both examiners. This led to almost perfect agreement (100%) and therefore Kappa statistic could not be

computed (Table 3). The local twitch response finding also concurred with the Nice et al (1992) and Hsieh et al (2000) studies who also found it to have poor reliability. The Simons (1996) review article also concurred that the local twitch response was a difficult sign to find.

Taut Band

The taut band is a group of tense muscle fibres that extend from the trigger point to the muscle attachments. (Travell and Simons; 1999) The percentage agreement for the presence of the taut band between the examiners per muscle was relatively high (60-73.33%) however the Kappa statistic or agreement was moderate (Quadratus Lumborum trigger point 2 on the left; kappa= 0.452) to fair with a Kappa of between 0.21-0.40 (Table 4). The taut band finding also concurred with Njoo et al (1994) and Gerwin et al (1997) who found it to have moderate reliability. This differed from Hsieh et al (2000) who found the taut band to have insufficient or conflicting results. However according to Simons (1996) the taut band is an ambiguous sign as it is also seen in normal subjects. The taut band is also affected by compression as seen in ischemic compression or trigger point pressure release. The ischemic compression or trigger point pressure release occurs as soon as pressure is placed on the trigger point and can occur during the examination. It affects the trigger point by releasing the tension within the muscle fibres comprising the taut band (Travell and Simons; 1999). This could also have affected the results and therefore placed the examiner examining second at a disadvantage.

Referred Pain

Referred pain or pain emanating from a trigger point but felt at a distant site to the trigger point was found to have the highest level of agreement between the examiners. The Kappa statistic or agreement was good and ranged from 0.608 (Trapezius trigger point 1 on the right) to 0.649 (Trapezius trigger point 1 on the left) (Table 5). This finding concurred with Gerwin et al (1997) who had good agreement for referred pain in their study. It however differed from Njoo et al (1994) and Hsieh et al (2000) who found that referred pain had marginal or poor

reliability. The high agreement in this study could be attributed to the fact that the classical referred pain patterns as set out by Travell and Simons (1983 and 1999) were not used. An approach similar to Hsieh et al (2000) was used where if the pain was felt anywhere away from the trigger point being examined, it was considered to be referred pain. According to Njoo et al (1994), the description of the pain referral patterns vary in different publications. This places limitations on the value of referred pain as a criterion in Myofascial Pain Syndrome.

Referred pain together with soft tissue tenderness both had good reliability. Both those factors were dependent on the response of the patient to a question during the examination (“Is it tender?” with regards to the tenderness of the trigger point and “is the pain going anywhere?” with regards to the pain referral.)The answers that were given by the participants assisted the examiners in the rating of the trigger points according to the Myofascial Diagnostic Scale.

Total Score

The total scores were the score of all the individual criteria in the Myofascial Diagnostic Scale added up. It was representative of the severity of the trigger point. A total score of ≥ 9 out of 17 was indicative of an active myofascial trigger point. The total scores were found to have a fairly moderate agreement between the examiners with the Intraclass Correlation Coefficient analysis (0.5029 – 0.653). It was however still statistically significant. The Cronbach’s alpha and p values show that the agreement between raters was moderate (0.6692 – 0.7541) (Table 6). The total score is dependent on the findings of the other criteria in the Myofascial Diagnostic Scale and how each examiner interpreted them. Therefore, if examiner A found more criteria than examiner B, the results or total score would differ.

Total Score vs. Numerical Pain Rating Scale - 101

The participants were asked to rate their pain overall on a scale of 0 – 100 for the areas examined. This was compared with the total scores on the Myofascial

Diagnostic Scale to see if those total trigger point scores were representative of the pain felt by the participants. On statistical analysis (Spearman's rank correlation), it was found that there was a positive correlation between the mean Numerical Pain Rating Scale - 101 (NRS - 101) score and the mean total scores on the Myofascial Diagnostic Scale (Table 7). This shows that the Myofascial Diagnostic Scale is a good representative of pain and may be a useful tool in the examination and treatment of Myofascial Pain Syndrome.

Myofascial Pain Syndrome

A participant with a rating of ≥ 9 on the Myofascial Diagnostic Scale was found to have Myofascial Pain Syndrome. In order to achieve a score of ≥ 9 ; two or more criteria on the Myofascial Diagnostic Scale must be present e.g. a participant with a taut band (4) and referred pain (5) will have a score of ≥ 9 according to the scale. Fifty two percent of the sixty participants were found to be suffering from Myofascial Pain Syndrome. The Trapezius trigger points were found to be the most common. Trapezius trigger point 2 on the left had the highest prevalence of subjects with active trigger points (28%, n=17) (Figure 3).

Conclusion

The use of the degree of tenderness of muscle sites; the taut band and referred pain with the exclusion of the local twitch response would make for a better Myofascial Diagnostic Scale. The combination of these criteria has been advocated as a set of diagnostic criteria for Myofascial Pain Syndrome by Hsieh et al (2000); Simons (1996) and Njoo et al (1994). The local twitch response is usually seen in treatment i.e. when a needle penetrates the trigger point during dry needling therapy. The local twitch response can be a confirmatory diagnostic criterion and if it was seen during the treatment, it would confirm the diagnosis of Myofascial Pain Syndrome. This, in addition to the other criteria (degree of tenderness of muscle sites; the taut band and referred pain), which would have

been noticed during the examination, would confirm the diagnosis of Myofascial Pain Syndrome.

According to the overall results; the reliability of the individual criteria (soft tissue tenderness; the taut band and referred pain) in the Myofascial Diagnostic Scale was good. This can be seen by the consistent good levels of agreement between the examiners according to the Kappa statistic. The subjective measurements that relied on the participant (the soft tissue tenderness and referred pain examinations) had a better level of reliability than the objective measurements that relied on the examiners findings on examination (the presence of the taut band and the local twitch response). There was a difference in the levels of reliability according to the results however they were both still reliable. The Myofascial Diagnostic Scale was also found to be an effective assessment tool when it was positively correlated to the Numerical Pain Rating Scale – 101 which was indicative of the participants' self-reported pain. Therefore the Myofascial Diagnostic Scale was found to be both a reliable and valid assessment tool for the diagnosis of Myofascial Pain Syndrome.

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References

1. Travell, J.G.; Simons, D.G.; and Simons, L.S. 1999: *Myofascial Pain and Dysfunction: The Trigger Point Manual*. Baltimore, Williams and Wilkins ISBN: 0-683-08366-X
2. Friction, J.R. 1994: Myofascial pain. *Balliere's Clinical Rheumatology*, **8** (4): 858-880
3. Gerwin, R.D.; Shannon, S.; Hong, C.; Hubbard, D.; and Gevirtz, R. 1997: Interrater reliability in myofascial trigger point examination. *Pain*, **69**: 65-73
4. Njoo, K.H.; and Van der Does, E. 1994: The occurrence and interrater reliability of myofascial trigger points in the quadratus lumborum and gluteus medius: A prospective study in non-specific low back pain patients and controls in general practice. *Pain*, **58**: 317 – 323.
5. Nice, D.A.; Riddle, D.L.; and Lamb, R.L. 1992: Intertester reliability of judgements of the presence of trigger points in patients. *Archives of Physical Medicine and Rehabilitation*, **73**: 893 – 898.
6. Hsieh, C-Y.J.; Hong, C- Z; Adams, A.H.; Platt, K.J.; Danielson, C.D.; Hoehler, F.K.; Tobis, J.S. 2000: Interexaminer reliability of the palpation of trigger points in the trunk and lower limb muscles. *Archives of Physical Medicine and Rehabilitation*, **81**: 258-264
7. Travell, J.G.; Simons, D.G.; and Simons, L.S. 1983: *Myofascial Pain and Dysfunction: The Trigger Point Manual*. Baltimore, Williams and Wilkins ISBN: 0-683-08366-X
8. Chettiar, A. 2001: The therapeutic efficacy of action potential therapy in the treatment of myofascial pain syndrome. Masters Diploma Dissertation, Technikon Natal, Durban.
9. Esenyel, M; Caglar, N and Aldemir, T. 2000: Treatment of myofascial pain. *American Journal of Physical Rehabilitation*. **79** (11): 48-52
10. Simons, D.G. 1996: Clinical and etiological update of myofascial pain from trigger points. *Journal of Musculoskeletal Pain* **4**(1/2):93-121
11. Friction, J.R. 1993: Myofascial pain. *Journal of Musculoskeletal Pain*, **1** (3-4): 37-47

