The state of current knowledge regarding evidence-based conservative management of iliotibial band syndrome: A systematic review

By

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I, Kelly Jayne Harris, do declare that this dissertation is representative of my own work in both conception and execution.

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DEDICATION

I dedicate this dissertation to my father, Nic.

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I would like to thank my father, Nic, for his love and support throughout the duration of my studies, and for never doubting my abilities. I hope you share my pride in my achievements that were not possible without you!

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ABSTRACT

Background:

It has become practically impossible for practitioners to remain current with clinical developments. Additionally the demand from patients and third party payors for quality evidence is increasing. A systematic review is one manner in which information can be graded, summarised and presented in a succinct format for use by practitioners, patients and third party payors.

Objectives:

To identify the current knowledge available on the conservative management of iliotibial band syndrome (ITBS) and to evaluate the scientific and methodological rigor of that knowledge. The systematic review of these studies identified the level and type of evidence that currently exists in the support of conservative management of ITBS and the specific interventions and combinations of interventions currently employed.

Method:

A systematic review of ITBS studies was conducted. ITBS studies were identified using key indexing terms (iliotibial band syndrome, treatment, conservative and intervention) on several databases (EBSCOhost, Google Scholar, Metalib, Pubmed, Science Direct and Springerlink), all studies were included up until the date of ethics approval (21st May 2012) . The gathered studies were screened for compliance with the inclusion criteria, and then reviewed by blinded independent reviewers (reviewer criteria included qualification, clinical experience, academic experience, research experience and discipline).

Data Collection and Analysis:

The reviewers rated the methodological rigour of the ITBS studies utilising an appropriate scale (e.g. PEDro Scale). Feedback was collated and analysed for discordance. Studies were then analysed, ranked and followed by a discussion in the context of their clinical outcomes, thus formulating a structured summary of the known clinical data with regards to the clinical management of ITBS.

Results:

The identified citations (4130) were screened and sorted by study type. This resulted in 167 citations that were reviewed by abstract for compliance with the inclusion criteria. A final total of 23 studies meet eligibility criteria. Eight articles reported on a combination of interventions,

four discussed biomechanical and causative factors, and the remaining eleven articles investigated individual interventions in the treatment of ITBS. After review and analysis, combination interventions were supported by the strongest level of evidence, thus advocating the use of a combination of interventions in the management of ITBS in providing better clinical outcomes. Moderate evidence favoured the use of customised orthoses, injectable corticosteroids, phonophoresis and addressing biomechanical and causative factors. However, there was moderate evidence against the use of deep tissue frictions, as no improvement was found. This outcome suggests a need for further evidence to advocate the appropriateness of these interventions in clinical care of ITBS. Hip abductor strengthening and stretch therapy were found to have limited evidence. However, no evidence was found to support the application of active release technique, corrective neuromuscular approach, custom dry floatation cushions and talar joint manipulation in the management of ITBS. This latter outcome indicated a need for studies to investigate their appropriateness or inappropriateness in clinical care.

Conclusion:

The systematic review of ITBS studies revealed that use of a combination of conservative therapies was found to have the strongest level of evidence, which may indicate its appropriateness in the management of patients suffering from ITBS. Specific combinations of conservative therapies and the use of individual therapies require future research in order to better delineate their contribution to the management of ITBS. Randomised controlled trials are the gold standard for research, as they have the greatest level of methodological quality, and should be used where possible when investigating the efficiency of interventions in the treatment of ITBS. Studies, which were not randomised controlled trials, but adopted the principles of a randomised controlled trial structure, contributed positively towards the methodological rigor of these studies.

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LIST OF ABBREVIATIONS

CS:	Case study / series
CSs:	Case studies
DTF:	Deep transverse frictions
DUT:	Durban University of Technology
ITB:	Iliotibial band
ITBS:	Iliotibial band syndrome
ITT:	Iliotibial tract
LFE:	Lateral femoral condyle
MFTP:	Myofascial trigger point
MFTPs:	Myofascial trigger points
NSAID:	Non-steroidal anti-inflammatory
NSAIDs:	Non-steroidal anti-inflammatories
N-RCT:	Non-randomised controlled trial
N-RCTs:	Non-randomised controlled trials
OBS:	Observational study
OBSs:	Observational studies
OMT:	Osteopathic manipulative treatment
PRS:	Pain rating scale
RCT:	Randomised controlled trial
RCTs:	Randomised controlled trials
TFL:	Tensor fascia latae

GLOSSARY OF TERMS

***A priori* calculation:** An *a priori* analysis or planned analyses is defined by the Cochrane collaboration (Green and Higgins, 1995) as statistical analyses which are specified in the trial protocol, prior to data collection, in contrast to unplanned analyses.

Conservative treatment: Conservative treatment is defined by The Dictionary of Nursing (2008) as "a treatment aimed at preventing a condition from becoming worse, in the expectation that either natural healing will occur or progress of the disease will be so slow that no drastic treatment will be justified".

Cybex test: In an email communication on 22 July 2013 with the director of product management of Cybex International, Mr Steve Suchanek describes the Cybex test as a test utilising an isokinetic dynamometer, which allows a subject to move through a range of motion against a fixed speed. The isokinetic dynamometer measures the torque speed at each point in the range of motion using pre-selected speeds. The side being tested is typically compared to the contralateral side, in order to identify deficits in the range of motion. Additionally, this test is also used to investigate agonist and antagonist ratios as a predictor of muscular strength, imbalances and injury.

Kinematic chain: A kinematic chain is a term that defines two or more links that are connected by a single joint, for example, a human arm is considered to be a kinematic chain, where the forearm and arm are connected by the elbow. The human body consists of multiple body segments connected by joints thus constituting a complex motor unit (Zatsiorsky, 1998).

Liddle scale: For ease of reference, the method for evaluating research and guideline evidence (MERGE) checklist is referred to as the "Liddle scale" throughout the dissertation (Liddle *et al.,* 1996).

Systematic review: A systematic review endeavors to identify, evaluate and synthesize all the empirical evidence that meets pre-specified eligibility criteria to answer a given research question. Researchers conducting systematic reviews use clear methods aimed at minimizing bias, in order to produce more reliable findings that can be used to inform decision making (Cochrane Collaboration, 2011).

CHAPTER ONE
INTRODUCTION

1.1 Introduction to the study

A systematic review of literature is a sequenced and logical method for identifying and evaluating literature, pertaining to a specific research question, with the use of objective reviewers, and scientific review tools (scales). This approach is deemed to be the best method for rating the methodological rigor of a particular study or group of studies. Feedback from each reviewer forms the bulk of data to be analysed and presented in a summated form, providing a summary of methodological rigor and a link between the methodological rating and clinical or pragmatic outcomes of the study (Higgins and Green, 2011, Liberati *et al.,* 2009),

This method of systematic review provides a scientifically sound method to summarise and evaluate studies, and provide a knowledgeable informative document, which is beneficial for clinical practitioners who address the conditions covered within systematic reviews. This method of reviewing literature is also beneficial for third party payors, such as policy makers and consumers, providing understandable and reliable information, which may otherwise be difficult to interpret (Higgins and Green, 2011, Liberati *et al.,* 2009). Thus, the purpose of this study was to examine and review the quantity and quality of the published literature available on the conservative management of ITBS, and to evaluate the strength of evidence to support the current methods of conservative management,

1.2 Aim

This study aimed to determine the state of current knowledge of the conservative management of ITBS and the extent to which there is evidence in the support of this conservative management.

1.3 Objectives

The objectives of the study were:

1. To identify appropriate studies based on the inclusion criteria.

2. To categorise the studies into randomised controlled trials, controlled trials, case reports / series, observational studies, systematic reviews, literature reviews and expert opinion.

3. To identify the level and type of evidence (review) that existed in the support of conservative management of patients with ITBS.

4. To contextualise the published clinical evidence in the context of the methodological rigor of the studies.

1.4 Rationale and benefits for the study

Systematic reviews have been deemed to be important in accurately summarising evidence in terms of the efficacy and safety of healthcare interventions (Liberati *et al.,* 2009). Thus a systematic review of the conservative management of ITBS is beneficial. A systematic review is beneficial in that it provides a summated form of evidence, completed through rigorous compilation of scientific papers (Liberati *et al.,* 2009); which is the objective of this review, therefore advocating or discouraging the application of various forms of conservative management of ITBS, ultimately ensuring that all patients receive quality, evidence-based healthcare. Therefore, clinical practitioners have access to scientific and evidence-based summary, which may be employed to assist with clinical decisions (Moher *et al.,* 2009).

This review seeks to provide scientific evidence in a summated form, to provide ease for clinicians, as well as third party payors. The summary provides clear indications with regard to conservative management of ITBS, as it is composed from evaluation of the best evidence-based published literature available for ITBS, and is aimed at providing clinicians with the best possible evidence, from which they are then able to base clinical decisions regarding the care and management of individual patients. The review takes the difficulty out of searching for valid and reliable literature, individually, and provides an overview of all available interventions used currently in the management of ITBS patients.

The study included all relevant literature, including randomised controlled clinical trials, non-randomised clinical trials, observational studies and case studies, providing a fair and broad consideration of as many interventions available for the conservative management of ITBS.

The rationale for this was some studies, other than randomised controlled clinical trials have supported more recent interventions; even though they have less scientific credibility. This review identifies interventions which may have a potential benefit, and which are therefore recommended for further studies. This review not only focuses on beneficial interventions for the treatment of ITBS, but it also in turn identifies interventions which may be harmful and ineffective for patient management and should not be used in clinical practice. This review also provides guidelines on the best choices for management of patients with ITBS.

Finally, the systematic review may provide a number of medical professional societies with summarised information by which to base their decisions (Tunis *et al.*, 2003; Garber, 2001).

1.5 Limitations

The limitations of the study were that it would only reflect conservative care, and excluded surgical intervention options, as surgery should be seen as the last option when treating a condition.

A further limitation in the methodology was that only English articles or articles translated into English were utilised, therefore a small percentage of articles were not included in the review. This limitation was imposed as there was a limited budget, which did not allow for the translation of non-English studies. To ensure non-bias in future studies, it is suggested that translation has the greatest potential for inclusion of all studies within a particular context and thus into the systematic review.

Although every possible measure was taken to ensure all studies were included – this review only included published papers, therefore there is a potential for publication bias. This limitation was seen rather as a desirable bias, in that only papers which were peer-reviewed were included into the review. This exclusion avoided unnecessary reviewing of studies that were small, with a potentially higher susceptibility to error and bias.

The systematic review assumed that all studies included in the review ensured that the correct diagnosis of participants was made. The review does not take into account the possibility that participants may have been incorrectly diagnosed as suffering from ITBS.

Although reviewers were provided with both the scale and an explanatory guide for the use of the scale, both of these tools were open to personal interpretation of the requirements of each scale. This may have allowed variants between the reviewers not directly attributable to the methodological rigor of the study. However, the converse is also true in that individual interpretation of the manner in which the study was presented would also result in variants in the reporting of the scale. Where interpretation of the scale was needed, the researcher was available for explanation, this assistance, however, did not assist with interpretation of any individual study.

This study was not intended as a meta-analysis (Dagenais and Haldeman, 2012), as this study only addressed methodological rigor of previous studies, as opposed to both statistical rigor and methodological rigor. In this context, the Cochrane Collaboration (Green and Higgins, 2005) describes a systematic review as the entire process of collecting, reviewing and presenting all available evidence. By contrast, the term meta-analysis refers to the statistical technique involved in extracting and combining data to produce a summary. Sackett *et al*., (1996) describes that a meta-analysis is a specific strategy in which the results of several studies are assembled into a single estimate. Clarke (2007) suggests that meta-analyses are beneficial in inclusion into a systematic review, in the event that studies included in the review have similarities that are comparable. As this review considers a broad variety of conservative interventions in the management of ITBS, as well as having included four different article types (randomised controlled trials, non-randomised controlled trials, observational studies and case studies), it was decided that a meta-analyses was inappropriate in reflecting conservative management in entirety.

1.6 Outline of Chapters

Based on the overview presented in this chapter, Chapter Two presents a literature review outlining the condition under review in this study, as well as the mechanisms of review. Chapter Three outlines the material and methods that enabled this study. Chapter Four presents the results, Chapter Five presents the discussion of the findings, and the final chapter - Chapter Six presents the conclusions and recommendations which are pertinent to this study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of the literature on the iliotibial band (ITB): its anatomical and biomechanical importance. Further, the clinical presentation and diagnosis, as well as the current trends in the management of ITBS are discussed. Also discussed are the limitations presented by the literature at present and how these limitations can be overcome through literature review, literature synthesis, systematic reviews and meta-analyses, in order to contextualise the methodology (Chapter Three).

2.2 Introduction to Iliotibial band syndrome

ITBS is the most common cause of lateral knee pain presenting in athletes (Strauss *et al.,* 2011; Ellis *et al.,* 2007; Fredericson and Wolf*,* 2005*;* Khaund and Flynn, 2005; Taunton *et al.,* 2002). It is associated with repetitive motion of the knee joint, and often diagnosed in runners, cyclists and other athletes (Lavine, 2010). In this context ITBS is described as an inflammatory, non-traumatic, overuse injury of the knee, which is primarily seen in runners (Fredericson *et al.*, 2000; Orchard *et al.*, 1996; Barber and Sutker, 1992; Anderson, 1991; Schwellnus *et al.*, 1991). Clinically, ITBS produces pain located in the region of the lateral femoral condyle, or inferiorly to it, frequently with radiation to the outer thigh or upper calf (Kirk *et al.,* 2000; Noble *et al.*, 1982; Orava, 1978).

The occurrence of ITBS in active persons is becoming a frequent complaint (1.6 – 52% of individuals suffering from lateral knee pain), as the popularity of recreational sports is increasing (Kirk *et al.,* 2000). Therefore, as running in particular has become increasingly popular as a form of cardiovascular exercise as well as recreational activity, particularly over the previous decade (Taunton *et al.,* 2002; Wen *et al.,* 1998; Anderson, 1991; Newell and Bramwell*,* 1984) so too the frequency of ITBS has increased as a complaint.

2.3 Anatomy of the Iliotibial band (ITB)

The ITB (see Figure 2.1) is composed of fascia, which is a connective tissue structure investing individual muscles and muscle groups (Moore and Dalley, 1999). The ITB or iliotibial tract (ITT) is a thick fascial band that forms proximally from the iliac crest and is strengthened by the convergence of the aponeurosis of the tensor fascia latae muscle (TFL). Thus, the ITB is principally, the lateral thickening of the tensor fascia latae. The ITB continues down the lateral aspect of the thigh passing over the greater trochanter of the femur, at this level fascia of the gluteus maximus (occurring posterolaterally), fascia of the gluteus medius (medially) and the fascia of the TFL muscles merge with the ITB. The ITB then runs vertically along the lateral aspect of the thigh, attaching superficially to the fascia encasing the vastus lateralis muscle in the distal-lateral aspect of the thigh, by way of the intermuscular septum it also attaches to the linea aspera, a ridge located on the posterolateral femur. As the ITB travels distally, it passes over the lateral femoral epicondyle (LFE) and divides into two main structures, the iliopatella band and the distal extension of the ITB. The distal extension of the ITB attaches to Gerdy's tubercle / lateral condyle of the tibia, blending along with the fascia of the biceps femoris muscle. The iliopatella band attaches to the lateral aspect of the patella (Pribut, 2012; Birnbaum *et al.,* 2004; Moore and Dalley*.,* 1999; Muhle *et al.,* 1999; Simons *et al.,* 1999; Orava, 1978).

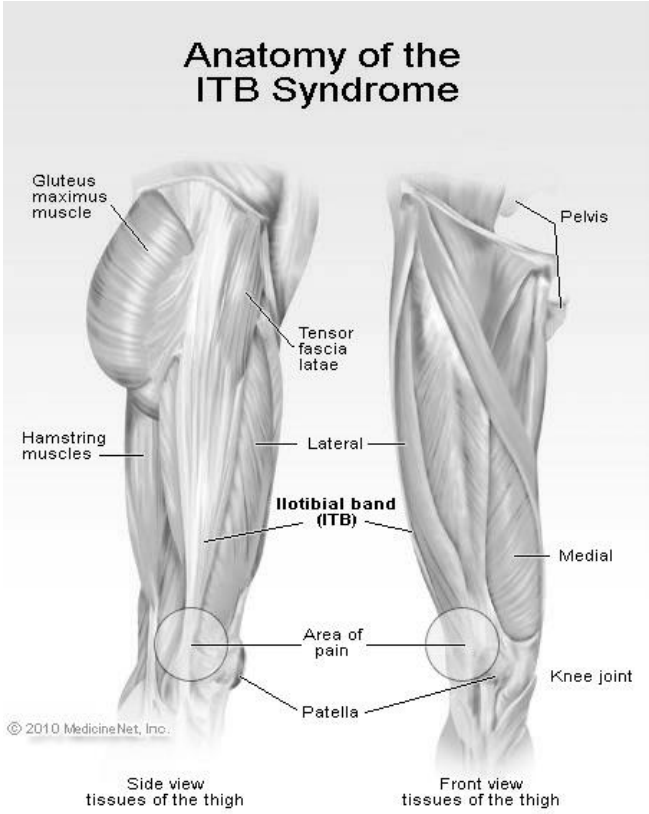

Figure 2.1 Anatomy of the Iliotibial band (obtained from www.medicinenet.com)

These muscles whose fascial sheaths contribute to the ITB and thus have an effect on the ITB are outlined in Table 2.1, where they are described by name, proximal and distal attachments as well as their innervation and action.

Table 2.1 Muscular relations of the iliotibial band

Muscle:	Proximal Attachment	Distal Attachment	Innervation	Action
Gluteus maximus	Ilium posteriorly to posterior gluteal line, dorsal surface of the sacrum and coccyx, and sacrotuberous ligament.	Most fibres end in iliotibial band, inserting into the lateral tibial condyle and gluteal tuberosity of the femur.	Inferior gluteal nerve (L5, S1 and S2).	Thigh extension (from flexed position mainly), assists with lateral rotation, steadies thigh and assists in rising from seated position.
Gluteus medius	External surface of ilium between anterior and posterior gluteal lines.	Lateral surface of greater trochanter of femur.	Superior gluteal nerve (L5 and S1).	Abducts and medially rotates thigh, keeps pelvis level when opposite leg is raised.
Tensor of fascia latae	Anterior superior iliac spine.	Iliotibial band that attaches to lateral condyle of tibia.	Superior gluteal nerve (L4 and L5).	Abducts, medially rotates, and flexes thigh; helps to keep knee extended; steadies trunk on thigh.
Biceps femoris	Long head: ischial tuberosity Short head: linea aspera and lateral supracondylar line of femur.	Lateral side of head of fibula; tendon is split at this side by fibular collateral ligament of the knee.	Long head: tibial division of the sciatic nerve (L5, S1 and S2) Short head: common fibular (peroneal) division of sciatic nerve (L5, S1 and S2).	Both heads flex the leg and rotate it laterally when the knee is flexed; and the long head extends thigh.

Table adapted from Moore and Dalley, 1999.

From the above anatomical outline, it is evident that the ITB has four foci with respect to its biomechanical functions:

- The ITB acts as a connection between the anterior and posterior pelvic structure and the lateral hip and knee (Cael, 2011).
- Superiorly, the ITB acts as a lateral hip stabiliser, resisting hip adduction (Fredericson *et al.,* 2000).
- The distally attaching fibres of the ITB aid the lateral collateral ligament in the knee by, withstanding varus stress placed on the knee, thus preventing excessive separation of the lateral condyles of the femur and tibia of the knee, and providing lateral stabilization of the knee (Cael, 2011).
- Distal fixation of the ITB to LFE through the lateral intermuscular septum and the fascia of the quadriceps muscle limits the amount of antero-posterior motion during flexion and extension movements of the knee (Cael, 2011).

2.3.1 Normal biomechanical functioning of the lower limb

During walking, the feet are in contact with the ground for approximately 60% of the duration of stride known as the stance phase, and approximately 40% of the stride is spent with at least one foot off the ground, known as the swing phase. The stance phase begins with heel strike, continuing to mid-stance, in which the foot is flat on the ground surface and the body is directly above the planted foot. The heel then rises with the contralateral foot contacting the ground, known as the double stance phase. Double stance phase is then followed with the swing phase (Standring, 2009; Subotnick, 1999; Norkin and Levangie, 1992).

During initial contact of the foot in the stance phase, the knee flexes to approximately 21°, and the ITB is located anteriorly to the LFE, as the foot position changes to accommodate for weight loading, the ankle pronates and the tibia internally rotates, knee flexion increases beyond 30° and the ITB translates posteriorly to the LFE (Swanson and Caldwell, 2000; Norkin and Levangie, 1992).

Fairclough *et al.,* (2006) found that compression of the ITB against the femur is present at 30° of knee flexion, during which the ITB draws medially. The moment in which the ITB translates anterior to the LFE during knee flexion, and then translates posteriorly as knee flexion exceeds 30°, is referred to as the impingement zone.

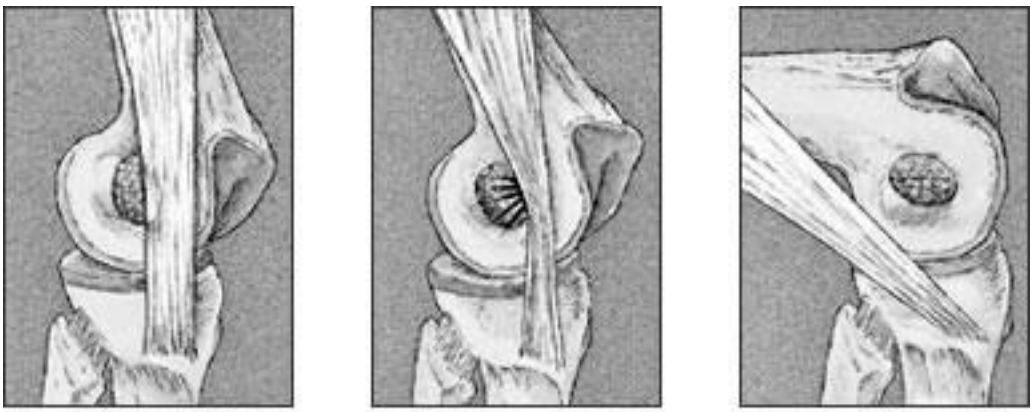

Figure 2.2 Arc of impingement of the iliotibial band (obtained from www.physioroom.com)

It is proposed that repetitive flexion and extension of the knee results in repetitive “snapping” of the ITB over the LFE, producing friction and resultant ITBS (Fredericson *et al.,* 2000; Kirk *et al.,* 2000; Orchard *et al.,* 1996).

However, Fairclough *et al.,* (2006) disagreed with the notion of an anterior-posterior translation of the ITB, and proposed instead, that this was an illusion of anterior-posterior “snapping” of the ITB. Fairclough *et al.,* (2006) instead proposed that ITBS is more likely the result of medial-lateral compression of the ITB against the distal femur. The literature is inconclusive as to the mechanism, however, symptomology in ITBS would suggest that irrespective of mechanism, irritation still occurs at the interface between the distal femur and the ITB (Fredericson and Wolf*,* 2005*;* Khaund and Flynn, 2005).

2.4 Aetiology

A number of biomechanical, training and anatomical factors have been associated with the aetiology of ITBS (Fredericson *et al.*, 2000; Reid, 1992). However, the aetiology remains unclear and is largely debated (Strauss *et al.,* 2011; Beers *et al.,* 2008; Noerhen *et al.,* 2007; Reid, 1992), with motivation that proximal and distal factors seem to be the primary contributors towards the development of ITBS.

2.4.1 Biomechanical factors:

2.4.1.1 Weak hip abductors

Due to the attachments of the ITB, it is likely that adduction of the hip joint / pelvic asymmetry (z axis rotation away from the side with ITBS) results in greater tension imposed on the ITB, resulting in greater vulnerability of the ITB to become impinged at the LFE (Fairclough *et al.,* 2006; Norkin and Levangie, 1992; Reid, 1992). In addition to this, adduction may result in a greater demand imposed on the gluteal musculature with regards to eccentric demand, which results in greater hip abduction movement and consequent increased tension of the ITB (Noerhen *et al.,* 2007; Sahrmann, 2002). Fredericson *et al.,* (2000) found that runners who were identified as suffering from ITBS had concurrent weak hip abductors, resulting in increased thigh adduction, thigh internal rotation and valgus stress imposed on the knee during running. It could, however, not establish whether this was a contributor to the development of ITBS or whether the presence of myofascial trigger points (MFTPs) or pain inhibited normal functioning of an otherwise normal muscle, which then resulted in the aberrant mechanical relationships (Sahrmann, 2002; Chaitow and DeLany, 2000; Simons *et al.*, 1999).

By contrast, Fairclough *et al.,* (2006) and Turnbull (2011) believe that impaired gluteus medius functioning is a predisposing factor for the development of ITBS. To this end, a number of authors support the concept of inhibited abductor functioning, as a result of pain and / or MFTPs (Grau *et al.,* 2011; Dippenaar *et al.,* 2008; Daly, 2005; Weyer-Henderson, 2005; Dippenaar, 2003).

The importance of hip musculature and the role it plays in the management and prevention of ITBS remains controversial, and more studies, as well as larger sample sizes are required to verify or deny this relationship (Schreiber and Louw, 2011).

2.4.1.2 Tight iliotibial band

Hypertonicity in the associated musculature of the ITB, namely the tensor fascia latae, gluteus maximus and gluteus medius, vastus lateralis and biceps femoris muscles are strongly believed to result in tightness of the ITB. Tightness in the ITB results in shortening of the band and contributing to friction within the distal aspect of the ITB (Cael, 2011; Broadhurst, 2004). Anderson (1991) proposed that tightness or inadequate functioning of the TFL, gluteus maximus and medius, results in displacement of the centre of gravity at the level of the pelvis, therefore, increasing the tension within the ITB. Thus, it is possible that a combination of one or both muscle hypertonicity and / or pelvic imbalance are thought to promote the development of ITBS (Tucker, 2007).

2.4.1.3 Muscular imbalances

Muscular imbalances are a typical occurrence in which synergistic groups of muscles function abnormally. Specifically, one or more muscle(s) is / are overactive or shortened, and one or more muscle(s) is / are underactive or lengthened (Chaitow and DeLany, 2000; Sahrmann, 2002; Simons *et al.*, 1999). A study completed by Fredericson *et al*., (2000) discovered a significant presence of ITB tightness in athletes diagnosed with ITBS. Conversely, Noerhen *et al.,* (2007), published a study concluding that runners suffering from ITBS were likely to present with an elongated or "loose" ITB, which underwent greater strain. Noerhen *et al's.,*(2007) contradictory findings question the validity of stretching in the clinical management of ITBS, as it encourages elongation of the band, and continuation of symptoms related to ITBS.

2.4.1.4 Knee Flexion Angle

Friction produced between the ITB and LFE is noted to be greatest between 20° – 30° of knee flexion (Fredericson *et al.,* 2000; Kirk *et al.*, 2000; Orchard *et al.,* 1996; Noble *et al.*, 1980). ITBS typically presents with increased pain on downhill running (Orchard *et al*., 1996; Orava, 1978). This is possibly due to a greater degree of knee flexion during heel strike, thus introducing a greater degree of pressure placed on underlying structures by the ITB (Lavine, 2010; Norkin and Levangie, 1992). Additionally, it has been suggested that biomechanics may be altered during activity, due to muscle fatigue, inducing further strain on the ITB (Miller *et al.,* 2007; Chaitow and DeLany, 2000; Simons *et al.*, 1999).

2.4.1.5 Rearfoot eversion

Two studies, conducted by Noerhen *et al.,* (2007) and Messier *et al.,* (1995) found that runners suffering from ITBS had a decreased rearfoot eversion when compared to controls.

2.4.1.6 Knee internal rotation

Only two studies (Noerhen *et al.,* 2006; Noerhen *et al.,* 2007) have addressed this biomechanical factor, although the attachments of the ITB distally to the LFE and Gerdy's tubercle suggest that the ITB is elongated via the distal attachment during internal ration of the tibia (Norkin and Levangie, 1992; Reid, 1992). It, therefore, seems logical that persons suffering from ITBS would have a greater degree of internal rotation of the knee, placing greater stain on surrounding structures. It remains poorly understood and requires further investigation (Noerhen *et al.,* 2007). Noerhen *et al.,* (2007) found that overall, participants suffering from ITBS showed greater internal rotation of the knee, as well as, increased hip adduction. Patients suffering from ITBS were noted to have a greater degree of tibial internal rotation, and femur external rotation, when compared to the normal subjects (Noerhen *et al.,* 2007). Greater internal rotation of the knee is believed to move the attachment of the ITB at Gerdy's tubercle and thus, increase the amount of compression of the ITB against the LFE (Norkin and Levangie, 1992; Reid, 1992). It is hypothesised that the greater femur external rotation, resulting in knee internal rotation, was the result of muscular imbalances at the level of the hip (Noerhen *et al.,* 2007).

2.4.2 Anatomical factors:

A number of anatomical variants have been associated with the development of ITBS (Taunton *et al.,* 2002; Fredericson *et al.,* 2000; Kirk *et al.*, 2000; Messier *et al.,* 1995; Noble *et al.*, 1980) these include but may not be limited to:

- Abnormal foot biomechanics (Reid, 1992):
    - Subtalar varus
    - Subtalar valgus
    - Forefoot varus
    - Excessive pronation
    - Pes cavus or high foot arches,
- Leg-length discrepancies,
- Genu varum or bowing of the legs,
- Prominent lateral femoral condyle,

- Weakness within the knee extensors/flexors or hip abductors,
- Increased Q-angle of the lower limb and
- Pre-existing tightness of the ITB and/or TFL.

Khaund and Flynn, (2005) propose that a combination of overuse and biomechanical factors are the cause of ITBS. Repetitive flexion and extension of the knee, as occurs in activities such as running and cycling are believed to irritate the band, producing symptomatic and painful inflammation of the ITB (Khuand and Flynn, 2005). Baker *et al.,* (2011) attribute abnormal biomechanical functioning of the hip and knee as primary contributors to the development and perpetuation of ITBS.

2.4.3 Training factors:

A number of training factors have been associated with the development of ITBS, particularly any sudden increases in recreational or sporting activity (Fredericson *et al.,* 2000; Kirk *et al.,* 2000; Messier *et al.,* 1995; Sutker *et al.,* 1985; Noble *et al.*, 1980; Orava, 1978):

- Sudden increase in mileage,
- Track running, particularly in the same direction,
- Road running along a cambered surface,
- Downhill running,
- Running with worn running shoes and / or
- Running on cambered or uneven/slippery surfaces.

Messier *et al.,* (1995) and Clement *et al.,* (1983) suggest that runners wearing worn running shoes are a significant risk to the development of ITBFS, and that running shoes should be replaced after every 300 – 500 miles.

2.5 Pathophysiology

Inflammation has been advocated as the primary cause of ITBS (Reid, 1992). A number of anatomical structures have been identified including the lateral synovial recess (Nemeth and Saunders, 1996; Ekman *et al.,* 1994; McNicol *et al.*, 1981; Orava, 1978), friction of the posterior ITB fibres (Fredericson *et al.,* 2000; Kirk *et al.,* 2000; Ekman *et al.,* 1994) and inflammation of the LFE periosteum (Fredericson *et al.,* 2002; Noble *et al.,* 1982; McNicol *et al.,* 1981) as possible sources of pain.

Literature written when the concept of ITBS was first identified suggests that ITBS was the result of repetitive knee flexion causing the ITB to "snap" in an anterior-posterior motion over the lateral femoral condyle, and that motion was regarded to produce inflammation (Fredericson and Wolf, 2005; Norkin and Levangie, 1992; Reid, 1992). Ekman *et al.,* (2002) conducted a study to examine magnetic resonance imaging of the ITB, in which they found that patients who presented with ITBS had thickened iliotibial bands, resulting in / from inflammation and oedema of the potential space between the fascial band and the femoral epicondyle. Ekman *et al.,* (2002) therefore suggested that a bursa was present between the opposing surfaces of the ITB and lateral femoral condyle.

Renne (1975) proposed a "zone of impingement", which is found at approximately 30° of knee flexion, during which the friction between the ITB and LFE is thought to be greatest.

More recently, a study conducted by Fairclough *et al.,* (2006) found that anatomically, ITBS is more likely the result of compression of a layer of highly innervated "fat pad" occurring between the ITB and the distal femur. In addition to this, Fairclough *et al*., (2006) identified as part of their anatomical study, that ITBS, appeared to not be a true frictional syndrome. Additionally, an illusion of an anterior to posterior movement of the ITB was created, but could not truly occur. Instead, they proposed that a lateral to medial movement provided significantly more compression, contributing to the perceived pain felt in ITBS, which was as a result of compression of the fatty layer or "fat pad".

As a result it is possible that ITBS encompasses inflammation, involving not only the bursa, but also from compression of the fatty tissues occurring beneath the ITB, as well as direct inflammation to the ITB (Lavine, 2010). This suggests that pathogenesis and pathology of ITBS remains somewhat poorly understood.

2.6 Epidemiology

ITBS is prevalent among the active population, particularly in persons running a higher mileage, particularly between 20 to 40 miles or higher per week, for longer than one year, and is very infrequent among non-active individuals (Fields *et al.,* 2010; Barber and Sutker, 1992; Sutker *et al.,* 1985; Orava, 1978). Sutker *et al.,* (1985) found a predominance of ITBS in male runners (75% of ITBS presentations), thought to be due to males running further than women; and, women having an increased prevalence of genu valgum, increased ligament laxity, increased subcutaneous fat and less prominent lateral femoral condyles.

The incidence of ITBS ranges from between 1.6% to 12% of running injuries, however it has been noted to increase to 50%, depending on population demographics (Taunton *et al.,* 2002; Fredericson *et al.,* 2000; Kirk *et al.,* 2000; Messier *et al.,* 1995; McNicol *et al.,* 1981; Orava, 1978). With an incidence of over 50%, which is assumed to increase as running increases in popularity (a recreational activity that is economically affordable); Taunton *et al., (2002)* thus suggested that manual therapists would be treating patients suffering from ITBS in practice more regularly.

ITBS is the most common running injury involving the lateral knee AS reported by Orava (1978). This was supported by Sutker *et al.,* (1985) who found that 35 of 48 participants evaluated in their study presented with unilateral ITBS, they proposed that running on sloped or cambered terrain was likely to result in one knee being predominately affected. By contrast Taunton *et al.,* (2002) conducted a retrospective case-control analysis of 2002 running injuries, which concluded that ITBS was the second most common running-related injury diagnosed, and that the knee presented with 42.1% of total injuries. Taunton *et al.,* (2002) also observed an increase of the incidence of ITBS as compared to identical studies conducted by Taunton *et al.,* in 1981 (4.3%), 1991 (7.5%) and 2000 (8.4%). Most recently Noerhen *et al.,* (2007) conducted a prospective study including 400 female athletes, in which the incidence of ITBS was reported to be 16% of all reported injuries. Therefore, it appears that ITBS is a common condition with its prevalence and incidence being dictated by the inclusion criteria of the studies completed over time (Noerhen *et al.,* 2007; Taunton *et al.,* 2002; Sutker *et al.,* 1985; Orava, 1978)

ITBS has also been reported frequently in cyclists (Noerhen *et al.*, 2007; Farrell *et al.,* 2003). Within cycling, 15 - 24% of overuse injuries are as a result of ITBS (Farrell *et al.*, 2003).

The development of ITBS in athletes is however, not only limited to runners and cyclists, and it has been observed in athletes participating in volleyball, tennis, soccer, skiing, weight lifting and aerobics (Messier *et al.,* 1995).

2.7 Clinical Presentation and diagnosis

2.7.1 Presentation

Typically persons suffering from ITBS will complain of a sharp burning pain occurring on the lateral aspect of the knee. There is usually associated tenderness on palpation of the lateral knee, commonly present two centimetres superior to the lateral knee joint line (Lavine, 2010; Ellenbecker *et al.,* 2009; Ellis *et al.*, 2007; Magee, 2002; Reid, 1992; Noble *et al.,* 1980; Orava, 1978; Renne, 1975). As severity progresses patients complain of pain preventing exercise, as well as radiation of the pain proximally and distally from the original region of onset (Ellenbecker *et al.*, 2009).

The patient may report that the onset of pain occurs during running or at a specific distance (Ellis *et al.,* 2007; Reid, 1992; Anderson, 1991; McNicol *et al.*, 1981), with pain subsiding at rest and, typically returns with the next run. Patients may report that pain occurs primarily with downhill running (Ellis *et al.*, 2007); however as the severity of ITBS progresses pain may be produced on daily activities, such as walking up / down stairs (Ellis *et al.*, 2007; Renne, 1975).

As the syndrome progresses, the pain becomes increasingly sharp and localised over the LFE and / or over the lateral tibial tubercle (Reid, 1992). Inflammation worsens with activity, with pain onset occurring during or on cessation of activity. Pain may be reported at rest, as the ITBS worsens (Khuand and Flynn, 2005).

2.7.2 Physical Examination

A detailed history taking and physical examination should reveal one or more of the above discussed clinical factors (section 2.4.1) (Dubin, 2005).

On physical examination, persons suffering from ITBS presents with tenderness on palpation in the region of approximately two centimetres superior to the lateral knee joint line. Tenderness is exacerbated when the patient is standing with the affected knee flexed to 30° (Ellis *et al., 2007;* Panni *et al.,* 2002; Fredericson *et al.,* 2000; Noble *et al.*, 1980). Ellis *et al.*, (2007) and Noble (1980) report that crepitation, snapping and / or mild pitting oedema may also be located over the affected area. Associated with ITBS (either causative or as a result), myofascial trigger points may present in the vastus lateralis, gluteus medius and biceps femoris musculature, producing referral pain to the lateral aspect of the affected knee on palpation (Fredericson *et al.,* 2000; Messier *et al.,* 1995; Orchard *et al.,* 1996).

Cael (2011) proposes that the structure of the ITB has a prominent connection to the thoracolumbar fascia, creating a stabilizing structure. Thus, adhesions and improper functioning of the ITB are thought to produce excessive tension and pain within the lower back (Reid, 1992). Thus persons suffering from ITBS may report the occurrence of tension or pain within the low back predominantly during walking, running, driving or ascending / descending stairs or when sitting down (Reid, 1992; Magee, 2002).

Additionally, patients may present with hip abductor weakness (Fredericson *et al.,* 2000; Messier *et al.,* 1995).

Finally, on observation of the athlete a number of anatomical variants (Fredericson *et al.,* 2000; Kirk *et al.*, 2000; Messier *et al.,* 1995; Schwellnus, 1991;), identified in the aetiology of ITBS, may be noted, including but not limited to one or more of the following:

- Leg length discrepancy (Clement *et al.,* 1981),
- Forefoot varus (Noble, 1980),
- Increased knee Q angle (Sutker *et al.,*1985; Noble, 1980),
- Prominent lateral femoral condyle (Sutker, 1985; Noble, 1980),
- Pes cavus or high arched feet (Noble, 1980) and
- Varus knee position (Noble, 1980).

Three orthopaedic tests are most commonly used in order to confirm the diagnosis of ITBS, in addition to, Thomas's Test which is used to identify hip muscular contractures and tightness. These are:

2.7.2.1 Ober's Test:

The purpose of this test is to identify overall tightness within the ITB and TFL. The patient lies on the non-injured side, with the affected limb superior. The doctor raises the affected limb in slight abduction, keeping the limb extended. The limb is placed in slight hip extension and the thigh is then slowly lowered vertically into adduction. During this process the pelvis is stabilized (by placing the doctor's hand on the patient's hip) to prevent any truncal rotation. A positive Ober's test is produced if the patient's thigh does not adduct vertically more than 10° beyond the horizontal plane (Magee, 2002; Reider, 1999; Norkin and Levangie, 1992; Reid, 1992).

2.7.2.2 Noble's Test:

Noble's test is utilized to differentiate between ITBS and other differentials for lateral knee pain (e.g. lateral collateral knee ligament injury). The patient is positioned supine or side lying, with the affected leg hanging off the side of the examination bed. The knee is flexed to 90°. The doctor places a thumb over the LFE. The patient is then asked to extend the leg. The ITB translates under the doctor's thumb at 30°; in a positive Noble's test the patient will report pain at 30° of knee flexion, as translation occurs (Magee, 2002; Reider, 1999; Norkin and Levangie, 1992; Reid, 1992).

2.7.2.3 Renne Creak's Test:

This test is performed with the patient standing erect and instructed to stand on the affected leg. The doctor places a thumb over the LFE, applying light pressure. The patient is then instructed to slowly bend the knee to 30° – 40° of flexion. As the patient bends, the ITB translates over the LFE and reproduction of pain occurs usually at 30° of flexion as the band translates beneath the doctor's thumb (Reider, 1999; Norkin and Levangie, 1992; Reid, 1992; Renne, 1975).

2.7.2.4 Thomas Test:

The patient is positioned supine on an examination table and instructed to flex both knees to the chest. The affected limb is then dropped into extension onto the examination bed, and the knee allowed to flex as the leg relaxes over the end of the bed. In the event that the extended leg flexes at the level of the hip a tight iliopsoas muscle is indicated. If the extended thigh abducts, a tight TFL is present, and in the event that the extended leg is unable to flex at the knee, a tight rectus femoris muscle is present (Magee, 2002; Reider, 1999; Norkin and Levangie, 1992; Reid, 1992).

Distally, contractures of the gastrocnemius and soleus muscle may reduce range of the ipsilateral ankle dorsiflexion, resulting in increased pronation of the subtalar joint as well as increased knee flexion (Vo, 2002; Reider, 1999; Norkin and Levangie, 1992; Reid, 1992).

2.8 Prevention

The best method of prevention for the development of ITBS is to ensure correct training methods. When increasing training distances, it should be done incrementally, and large increases in distance training should be avoided. Additionally, long-distance training should avoid hill-running as well as high speed training (Reid, 1992). It is also suggested that shortening the stride during training may be beneficial, although no published articles have supported this theory (Noble *et al.*, 1980).

2.9 Management and prognosis

Ellis *et al.*, (2007) identified a "baseline" treatment regime when conducting a systematic review of literature. They found that the baseline regime should incorporate (based on the majority of studies reviewed) a combination of ice application (Kitchen and Bazin, 1996), phonophoresis (Kitchen and Bazin, 1996), deep friction massage (Cyriax, 1993) and stretching (Sahrmann, 2002; Simons *et al.,* 1999; Chaitow and DeLany, 2000). However, it was noted that although these interventions were frequently mentioned, and utilised in clinical practice (Reid, 1992), there appeared to be very little evidence-based literature to advocate those interventions (Ellis *et al.* 2007).

Most patients suffering from ITBS respond to a conservative treatment regimens and / or altering patient training regimes (Strauss *et al.,* 2011; Lavine, 2010; Hreljac and Ferber, 2006; Khaund and Flynn, 2005; Dubin, 2005; Kirk *et al.*, 2000; Barber and Sutker, 1992; Reid, 1992; Taunton *et al.,* 1987; Sutker *et al.,* 1985; Orava, 1978). Baker *et al., (*2011) propose that addressing the underlying contributing factors is critical to effectively resolving

ITBS, and although the aetiology of ITBS remains poorly understood, inflammatory control and strengthening of the associated musculature is strongly recommended. In the event of a patient responding poorly to conservative management invasive procedures are typically recommended (Khaund and Flynn, 2005). Most commonly, the posterior 2cm of the ITB is surgically released (Drogset *et al.*, 1999). Symptomatically, ITBS can persist for up to six months (Barber and Sutker, 1992), and development of a chronic problem occurs frequently (Beers *et al.,* 2008).

2.9.1 Rest from activity

In the event that an athlete presents with ITBS it is imperative that rest from activity is encouraged (Noble *et al.,* 1980), as continuation of activity, such as running, and attempts to run through the pain, result in exacerbation of symptoms, and contribute to a more severe injury (Dubin, 2005; Taunton *et al.,* 1987); with symptoms subsiding with immediate cessation of the activity (Noble *et al.,* 1980). Rest is believed to lessen the inflammatory process that is present and to reduce oedema, with resultant desensitization of nerve endings, and therefore decreased symptomatology (Noble *et al.*, 1980).

2.9.2 Cryotherapy

Cryotherapy is frequently recommended in the treatment of ITBS, as it reduces the inflammatory reaction present as well as directly reducing pain (Khaund and Flynn, 2005; Noble *et al.*, 1980; Orava, 1978).

2.9.3 Training modifications

Fredericson *et al.,* (2000) describe the treatment of ITBS to require a number of items, including: modification of physical activity, soft tissue massage, stretching and strengthening of affected muscle groups, anti-inflammatory medication. These are beneficial for patients who have a low mileage activity. In the treatment of athletes with higher mileage, or who are unable to completely cease from activity, a more intense treatment programme is frequently required. This usually includes: icing and anti-inflammatory medications, activity modification with reduced mileage until symptoms have subsided, and replacement of activity with swimming to maintain cardiovascular fitness, following which a rehabilitative protocol should be initiated (Khaund and Flynn, 2005; Grady *et al.,* 1986; McNicol *et al.,* 1981; Noble 1980). Re-introduction of the athlete to activity beginning with shorter lengths of activity (such as running) and at a lower intensity; followed by gradual increase of level of activity (within in asymptomatic range), assists the athlete in returning to the normal level of

activity (Khaund and Flynn, 2005; Fredericson *et al.,* 2000; Taunton *et al.,* 1987; McNicol *et al.*, 1981).

2.9.4 Anti-inflammatory medication and analgesics

The use of oral non-steroidal anti-inflammatory drugs (NSAIDs) and / or the use of corticosteroid injections aid in reducing acute inflammatory processes occurring at the site of pain (Strauss *et al.,* 2011; Noble *et al.*, 1980). Schwellnus *et al.,* (1991) found that early management of ITBS with a combination of anti-inflammatory medication (NSAIDs), analgesic medication, and a physiotherapeutic programme was beneficial. Additionally, they also found that participants receiving a combination of these interventions showed greater improvement, as compared to the participants who received only oral medication or physiotherapy. The use of anti-inflammatory medication (NSAIDs) is shown to be beneficial when used in conjunction with other forms of conservative treatment (Ellis *et al.,* 2007; Schwellnus *et al.,* 1991). Falvey *et al.,* (2010) suggest that reducing an inflammatory response may assist in controlling acute symptoms, however, addressing underlying biomechanical issues allows for long-term benefit (Norkin and Levangie, 1992; Reid, 1992).

2.9.5 Stretching

Incorporating stretching into the treatment protocol in patients suffering from ITBS is proposed to reduce tension within the ITB, as well as restore the functional tissue length (Fredericson *et al.,* 2002).

Stretching of the affected muscles, including gluteus medius, maximus and tensor fascia latae is frequently recommended in the treatment of ITBS (Noerhen *et al.*, 2007). Although Fredericson *et al*., (2002) recommended one particular stretch, which was found to produce the greatest increase in ITB length (which is performed with the patient standing upright with the affected leg extended and adducted across the other leg, hands are clasped above the head and the arm on the affected side is stretched in the same direction, during exhalation the trunk is flexed laterally to the unaffected side), Fredericson *et al.,* (2002) found that stretches were likely to be patient dependent, in that their efficiency varied between participants possibly due to participant expectation.

There is a lack in correlation between stretching of the ITB and the long-term changes involved (Noerhen *et al.,* 2007) this is supported by Fredericson *et al.,* (2002) who emphasised the inclusion of stretching associated musculature in patients with ITBS. Cael (2011) proposed that stretching of these structures reduces tension within the ITB, by increasing flexibility of the lower attachment of the ITB. Cael (2011) proposes that

addressing maintenance of flexibility of the ITB as well as correct alignment within the lower limb assists in reducing the repetitive stress placed on the ITB.

2.9.6 Muscular strengthening

Beers *et al.,* (2008) conducted a prospective study to address the effectiveness of incorporating hip abductor strengthening into a physiotherapeutic programme for participants suffering from ITBS.

Findings indicated that participants presented with abductor muscle weakness affecting the injured limb as compared to the non-injured limb, and that at completion of the study there was resolution of the measured weakness, as well as a significant improvement in participant's symptoms (Beers *et al.,* 2008). They were, however, unable to establish whether the weakness was the result of the ITBS, or a cause thereof (Beers *et al.,* (2008). Fredericson *et al*., (2000) reported that 90% of subjects involved in their study, suffering from ITBS improved following a six week hip abductor strengthening programme, although it is unclear whether muscular weakness occurs prior to or following onset of ITBS. Noerhen *et al.*, (2007) found that participants suffering from ITBS presented with increased hip adduction as well as increased knee internal rotation. These are most likely due to the result of muscular imbalances present at the hip, and suggested that patients would respond well to a management regime aimed towards improvement of strength within the hip musculature (Sahrmann, 2002), as well as neuromuscular control of the hip joint. Pettitt *et al.,* (2000) investigated the effectiveness of a corrective neuromuscular approach to the treatment of ITBS, they propose that the use of exercises based on neuromuscular facilitation, is a viable method for management of ITBS, although further investigation is recommended.

2.9.7 Other interventions

When treating ITBS, if MFTPs are present (either as a causative factor or as a result of existing ITBS), addressing and treating the associated MFTPs within the muscles are recommended (Fredericson and Wolf, 2005). The use of myofascial trigger point therapy, either the form of direct compression (ischaemic compression or deep tissue massage) (Simons *et al.*, 1999; Chaitow and DeLany, 2000) or dry needling (Simons *et al.*, 1999; Chaitow and DeLany, 2000) of the trigger point, aids in reducing pain (Hong *et al.,* 2006) and contracture (Simons *et al.*, 1999; Chaitow and DeLany, 2000) within the associated musculature, as well as reducing the tension present in the ITB (Simons *et al.*, 1999; Chaitow and DeLany, 2000). Myofascial trigger points of the gluteus minimus, vastus

lateralis and distal musculotendinous junction between the vastus lateralis and biceps femoris muscles are most frequently in ITBS (Fredericson *et al.,* 2000; Simons *et al.*, 1999; Chaitow and DeLany, 2000).

Fascial adhesions may also be present in the distal portion of the ITB, and may respond well to various myofascial trigger point therapy (Fredericson *et al.,* 2000; Simons *et al.*, 1999).

Schwellnus *et al.,* (1991) conducted a trial to establish the efficiency of deep tissue friction massage in the management of ITBS; they found that there was no significant improvement between the test subjects and the control group. This implied that the incorporation of deep tissue friction massage into the management of ITBS was not supported.

Other interventions aimed at reducing levels of inflammation include rest, phonophoresis of the affected area, and direct injection of anti-inflammatory into the location (Noerhen *et al.*, 2007; Reid, 1992)

Phonophoresis was found to reduce the amount of days for recovery, and reduced pain levels during treadmill running tests, as compared to the control group, in the study conducted by Bischoff *et al.,* (1995). Although ultrasound has been noted as an effective modality in the management of ITBS (Beers *et al.,* 2008; Bischoff *et al.*, 1995; Schwellnus *et al.,* 1991; McNicol *et al.*, 1981); these assertions are limited by the lack of placebo control studies that isolate ultrasound as a single modality.

Noble (1980) suggests that chronic ITBS can be treated adequately with total rest from activity for four to six weeks, and with use of corticosteroid injections at two week intervals.

The use of orthotics has become prevalent, particularly in the running population. They are believed to be beneficial in the incorporation in a management regime for ITBS and improvement in pain (Hirschmüller *et al.,* 2011; Taunton *et al.,* 1987; McNicol *et al.,* 1981).

A study completed by Hansen *et al.,* (2012) investigating the effects of the Graston Technique in the treatment of ITBS, concluded that the use of the Graston Technique in the treatment of ITBS resulted in measured subjective symptoms and a resultant improvement, and reduction in the tightness of the ITB. The authors suggested that further studies be completed using larger sample groups and over a longer duration of time to fully support this finding.

2.9.8 Invasive methods

In the event of a patient responding poorly to conservative management, or if reoccurrence occurs, invasive procedures are typically recommended (Khuand and Flynn, 2005; Noble *et al.*, 1980). Most commonly, the posterior two centimetres of the ITB is surgically released (Drogset *et al.*, 1999; Reid, 1992; Noble *et al.*, 1980).

Given the above discussion on the numerous interventions for ITBS, it would be more practical for clinicians to have a summary of the evidence available to treat this condition. This summary would allow clinical practitioners to implement the recommendations of the literature for the benefit of the patients and would also provide medical schemes, third party payors and others with a vested interest in patient health outcomes with a readily available resource upon which to base their decisions in relation to ITBS.

To create such a resource, the most common methods utilised are:

Literature Review: Defined as a critical summary and assessment of the current understanding of knowledge of a particular topic (Cano, 2002).

Systematic review: A systematic review, as described by the Cochrane Collaboration and Moher *et al.,* (2009) attempts to identify, appraise and synthesize all the empirical evidence that meets pre-specified eligibility criteria to answer a given research question. Researchers conducting systematic reviews use explicit methods aimed at minimizing bias, in order to produce more reliable findings that can be used to inform decision making (Cochrane Collaboration, 2011).

Meta-Analysis: As defined by the Cochrane Collaboration (2005) is the use of statistical techniques within a systematic review which integrates the results of the included studies. A systematic review may or may not include a meta-analysis.

Conservative Care: Defined by A Dictionary of Nursing (2008) where conservative is defined as treatment aimed at preventing a condition from becoming worse, in the expectation that either natural healing will occur or progress of the disease will be slow that no drastic treatment will be justified.

The next section follows by giving a short description of each of these methods and concludes by focussing specifically on the method utilised in this study.

2.10 Systematic review

The process of reviewing literature plays an integral part of appropriate healthcare provision (Hemingway and Brereton, 2009). There are different types of literature reviews; in general, they are grouped into three separate categories; narrative, systematic and meta-analyses (Rhoades, 2011).

Narrative reviews of literature (also referred to as overviews or standard/traditional reviews of literature) function to critically summarize literature available on a specific topic (Hemingway and Brereton, 2009), although they do not have as broad of a search scope or inclusion as compared to a systematic reviews or meta-analyses (Rhoades, 2011). Narrative reviews provide usefulness in summarising literature, although their pitfall includes that they may not incorporated with a peer-review process, and their findings are frequently irreproducible (Babbie and Mouton, 2001; Brink, 1996; Sackett *et al.,* 1996). Additionally, it has been found that that literature reviews may be biased, in that it is easier for the author to select and cite studies which support their personal opinions and beliefs, and it is infrequent that literature reviews describe the selection, inclusion and assessment of the included literature (Babbie and Mouton, 2001; Brink, 1996; Sackett *et al.,* 1996). Narrative reviews and expert opinion/commentaries are more commonly replaced with systematic reviews, as the demand for review of literature, with the same rigour as primary research increases (Hemingway and Brereton, 2009). In order to ensure that systematic reviews conducted are of the best methodological quality, a formal scientific process has been developed (Hemingway and Brereton, 2009; Liberati *et al.,* 2009).

A systematic review of literature is defined as a review of clearly formulated questions, which utilize a systematic and explicit method to identify, select and critically scrutinize the current existing and relevant research. In addition to this, data are collected and analysed from studies which are included in the review (Moher *et al.,* 2009).

2.10.1 Procedure for a systematic review

In order to begin with a systematic review, the researchers are required to identify an appropriate healthcare question. This question needs to identify the objectives of the review, including, the type of study or evidence that will address this question. The objectives of the systematic review are utilized to develop the criteria of inclusion or exclusion into the study (Hemingway and Brereton, 2009).

Once the objectives of the study have been established, the search of literature is conducted. Published as well as unpublished literature is meticulously searched for studies

which are pertinent to the review, and which fall within the criteria determined by the objectives. In order to reduce bias in the review, as many databases as available must be searched. Hand-searches as well as searches based on reference lists of full-text articles may also be conducted (Hemingway and Brereton, 2009).

Once the search has been conducted, and all possible studies identified, they are then processed for eligibility for inclusion according to criteria developed. Typically, studies which are found to be of poor quality are excluded, and discussed within the study report; this is referred to as a synthesis of the best evidence. Alternatively, a review that includes both poor and good quality studies is typically a comprehensive synthesis of evidence around a particular topic. The data from the studies finally included in the review are extracted into data tables by way of reviewer feedback. Review of the articles included is normally conducted by a minimum of two individual reviewers (Higgins and Green, 2011; Hemingway and Brereton, 2009; Liberati *et al.,* 2009).

The resultant feedback from the minimum of two reviewers is aggregated and forms the summary of evidence, which is discussed with relevance to the clinical effectiveness, feasibility, appropriateness and meaningfulness of the intervention being reviewed. The review ends with a discussion of the findings of the review, putting the data processed from the reviewers into context, and discussing factors such as methodological quality and outcome of the studies (Hemingway and Brereton, 2009).

Systematic reviews are beneficial in that they provide a summation of the evidence available, by identifying the methodological rigour of individual studies which is pertinent in establishing whether scientific findings are consistent and reproducible across various factors (populations, settings, treatment variations) and take into consideration the findings for an individual topic, such as ITBS. Thus allowing for clinical practitioners to keep up to date with current knowledge (Hemingway and Brereton, 2009; Green, 2005; Oxman *et al.,* 1994; Mulrow, 1994). In addition, systematic reviews provide a starting point for the development of standard clinical guidelines for practice (Moher *et al.,* 2009). Employing evidence generated from reliable research, in the form of a review (for ITBS), ensures the best practice and standardisation in health care delivery (Green, 2005). Systematic reviews are believed to be the best form of evidence (Glazious *et al.*, 2004).

Mulrow (1994) describes the primary use of systematic reviews to refine hypotheses via identification and justification, and to identify pitfalls in previous studies, which serve to highlight weaknesses for future studies. This warrants systematic reviews as an important

step in research, in promoting future studies, with strengthened methodological quality and therefore strengthened evidence-based outcomes.

A systematic review of the conservative management of ITBS may act to advocate the use of conservative interventions, by establishing clinical as well as cost-effectiveness, or imply their inappropriateness in clinical care (Hemingway and Brereton, 2009). Particularly as conservative interventions are the primary choice for management of ITBS (Dubin, 2005; Khaund and Flynn, 2005; Kirk *et al.*, 2000; Barber and Sutker, 1992). Thus this study, a through systematic review (Moher *et al.,* 2009), will provide an evidence-based quality assessment of conservative interventions available, thereby helping clinical practitioners with clinical decision making.

In a similar context, Ellis *et al.*, (2007) completed a systematic review concerning the non-surgical, medicinal management of ITBS; however, this review only considered 4 studies (Ellis *et al.*, 2007) [which included only randomised controlled clinical trials], that were evaluated with particular reference to non-surgical, medicinal interventions (viz. search terms included anti-inflammatory agents, non-steroidal / therapeutic use, glucocorticoids / therapeutic use, injections, immobilisation, phonophoresis, and immobilisation). The only non-surgical intervention noted as non-medicinal intervention was deep friction massage, indicating a lack of consideration for studies dealing with non-medicinal interventions.

With increasing pressure for evidence based protocols that are cost effective (Dagenais and Haldeman, 2012), there is an increasing need to move away from high-cost surgical and medicine-based interventions. This is particularly relevant in that more patients are turning to complementary and alternative therapies (National Centre for Complementary and Alternative Medicine, 2004; National Pharmaceutical Association, 2004; The United Kingdom Parliament, 2000; Fisher and Ward, 1994), which are mostly conservative therapies, in the management of conditions such as ITBS. However without clear guidelines practitioners are often forced to deal with addressing ITBS in practice without advocation for conservative management protocols (Dubin, 2005; Kirk *et al.*, 2000; Noble *et al.*, 1980) prior to consideration of surgical intervention where, little literature and clinical trials supports its use (Dubin, 2005). This leads to a clinical quandary, in that the treatment of patients should not occur in isolation of patients' best interests, third party payors and other stakeholders (Dagenais and Haldeman, 2012). Thus, a systematic review of this topic would assist in optimizing patient outcomes for ITBS and providing therapists and other healthcare providers with clear guidelines in the form of easily accessible high-quality information for addressing this complex condition.

2.10.2 Systematic analysis of case studies / case series and observational studies

The Liddle Scale was developed using The Method for Evaluating Research and Guideline Evidence (MERGE) principals (Liddle *et al.,* 1996). MERGE uses a clear and standardised method of approach to developmentally reviewing of scientific evidence and was developed in order to evaluate the quality of evidence of studies, and standardised in order to ensure consistency by users of the scale. MERGE was developed by the New South Wales Health Department with input from the Cochrane Collaboration and numerous epidemiologists and clinicians and has subjected to wide evaluation. Subsequently, the MERGE checklist has been adopted by such agencies as the Scottish Intercollegiate Guidelines Network as the accepted method of evaluation of observational studies. The overall assessment of quality is determined by the separate evaluation criteria and a judgement about the relative importance of each source of bias and the extent to which potential biases may collectively influence results. The summation of the criteria of the scale allows for overall assessment of the publication under review, therefore, the Liddle scale is an explicit approach to evaluating evidence and establishing the quality of a study, based on sound epidemiological principles (Liddle *et al.,* 1996).

For ease of discussion, the analysis of case studies / case series and observational studies are discussed together. The Liddle Scale (Liddle *et al.,* 1996) is used to review both study types, with only one differing criteria which is identified below. The Liddle Scale is composed of twelve and thirteen individual criteria, for case studies / series and observational studies respectively.

The fulfilment of each criterion is done with the use of codes:

Table 2.2 Evaluation Criteria Coding – Liddle Scale

Evaluation criteria are coded according to the extent to which the criteria are fulfilled	**Code**
Criterion entirely fulfilled	A
Criterion mostly fulfilled	B1
Criterion mostly not fulfilled	B2
Criterion not at all fulfilled	C
Criterion not described adequately to classify as a,b1,b2 or c	I
Criterion not applicable	n/a

Adapted from: Liddle *et al.,* 1996.

Table 2.3 Description of Codes A, B1, B2 and C – Liddle Scale

Low risk of bias	A	All or most evaluation criteria from the checklist are fulfilled. Where evaluation criteria are not fulfilled, the conclusions of the study are thought very unlikely to alter.
Low-moderate risk of bias	B1	Some evaluation criteria from the checklist are fulfilled. Where evaluation criteria are not fulfilled or are not adequately described, the conclusions of the study are thought unlikely to alter.
Moderate to high risk of bias	B2	Some evaluation criteria from the checklist are fulfilled. Where evaluation criteria are not fulfilled or are not adequately described, the conclusions of the study are thought likely to alter.
High risk of bias	C	Few or no evaluation criteria fulfilled. Where evaluation criteria are not fulfilled or are not adequately described, the conclusions of the study are thought very likely to alter.

Adapted from: Liddle *et al.,* 1996.

The criteria composing the Liddle Scale are as follows:

- Adequate description of participants, in terms of time, place and person.
- Percentage of individuals that refused to participate.
- Measurement of outcomes in standard, valid and reliable way.
- Measurement of outcomes same for the intervention and control group.
- Factors, excluding the intervention, are comparable between the intervention and control groups. If these factors are not comparable, are they adjusted for in the analysis?
- Percentage of loss to follow-up.
- Analysis is by intention to intervene / treat. This criterion only applies to case studies / series.
- Homogenous results between sites (if study is a multicentre / multisite study).
- Extent that study minimised bias.
- Overall effect of study as the result of the tested intervention.
- Are there any practical or ethical issues that an RCT could not be done.

The awarding of an “A” indicated that the criterion reviewed had the strongest possible methodological rigor, in comparison to an “I”, which indicates the weakest possible methodological rigor. Strength of methodological rigor is ranked in decreasing strength in the following order: A, B1, B2, C and I. An “n/a” was reported in the event that the criterion did not apply to the study being reviewed.

2.10.3 Systematic analysis of non-randomised controlled trials

A commentary by Stang (2010) criticised that the validity of the NOS remains unknown, lacking sufficient support for its use in providing a quality ranking of case and cohort studies. However, the NOS has been endorsed by the Cochrane Collaboration (Higgins and Green, 2011) as well as Deeks *et al.,* (2003) who established that the Newcastle-Ottawa Scale was easy to use and suitable for use in systematic reviews. The validation, as well as the inter-rater reliability of the NOS were rated as being strong, achieving an ICC of 0.94 by Wells *et al.,* (2003). Notwithstanding this, review and refinement of the scale has continued (Hartling *et al.,* 2012; Wells *et al.,* 2003).

Non-randomised controlled trials were reviewed using the Newcastle-Ottawa Scale (Wells *et al.,* 2003). Newcastle-Ottawa Scale is divided into 8 items, that are subdivided into 3 categories; selection, comparability and exposure.

For each of the 8 items, there is a variety of response options; one response (a, b, or c, etc.) is to be chosen, with the exception of the comparability section, where one, two or no response can be chosen.

One point is available to be awarded for each item, excepting comparability, which allows for two points to be awarded. The maximum amount of stars that a study can be awarded is nine points.

The individual criteria for the Newcastle-Ottawa Scale are as follows:

(Wells *et al.,* (2003)

- SELECTION:
  - Is the case definition adequate?
    - Some independent validation is required (e.g. more than one person / record / time / process to extract information / reference to primary record source such as x-rays or medical / hospital records) – One point awarded.
    - Record linkage (e.g. ICD codes) or self-report with no reference to primary record.
    - No description.
  - Representativeness of the cases:
    - All eligible cases with outcome of interest over a defined period of time, all cases in a defined catchment area, all cases in a defined hospital or clinic, group of hospitals, health maintenance organisation, or an appropriate sample of those cases (e.g. random sample) – One point awarded.
    - Not satisfying requirements in part (a) or not stated.
  - Selection of controls - This item assesses whether the control series used in the study is derived from the same population as the cases and essentially would have been cases had the outcome been present:
    - Community controls (i.e. same community as cases and would be cases if had outcome) – One point awarded.
    - Hospital controls, within the same community as cases (i.e. not another city) but derived from a hospitalised population.
    - No description.
  - Definition of controls:
    - If cases are first occurrence of outcome, then it must explicitly state that controls have no history of this outcome. If cases have new occurrence of outcome, then controls with previous occurrences of outcome of interest should not be excluded – One point awarded.
    - No mention of history of outcome.

- COMPARABILITY
  - Comparability of cases and controls on the basis of the design or analysis
    - A maximum of two points can be awarded in this category. Either cases or controls must be matched in the design and / or confounders must be adjusted for in the analysis. Statements of no differences between groups

or that differences were not statistically significant are not sufficient for establishing comparability.

- EXPOSURE
  - Ascertainment of exposure
    - Secure record – One point awarded.
    - Structured interview where blind to case / control status – One point awarded.
    - Interview not blinded to case / control status.
    - Written self-report or medical record only.
    - No description.
  - Same method of ascertainment for cases and controls
    - Yes – One point awarded.
    - No.
  - Non-response rate
    - Same rate for both groups – One point awarded.
    - Non respondents described.
    - Rate different and no designation.

For each criterion that was sufficiently fulfilled, a point is awarded. A mean score was calculated from the end score for each of more than two reviewers. The mean score indicates the methodological rigor of the study. Where a mean score of nine was achieved, the highest possible level of methodological rigor is indicated. In comparison to a mean score of zero which indicates the lowest possible level of methodological rigor.

2.10.4 Systematic analysis of randomised controlled trials

Maher *et al.,* (2011) found that the PEDro Scale achieved a rating for individual scale items of “fair” to substantial”, with the overall PEDro Scale score achieving a reliability rating of “fair” to “good”, with a total ICC score of 0.56 reported. Maher *et al.,* (2011) therefore established that the PEDro Scale is sufficient for use in assessing the quality of RCTs, and for use in systematic reviews.

Randomised controlled trials were reviewed using the PEDro Scale (1999). The PEDro Scale is composed of eleven individual criteria; each criterion is utilized to establish the methodological strength of the study being reviewed. One point is awarded for each criterion fulfilled, therefore, a maximum score of eleven or a minimum score of zero can be achieved.

The criteria composing the PEDro Scale are as follows:

1. Inclusion criteria and selection of participants is described.
2. Random allocation of participants to their study group.
3. Concealment of allocation to groups.
4. Study groups are similar at baseline, specifically, with regards to prognostic indicators.
5. All participants were blinded as to the intervention they received.
6. Therapists administering therapy were blinded.
7. All assessors who measured at least one key outcome were blinded.
8. Measures of at least one key outcome were obtained from 85% or more of the participants allocated to the groups.
9. All participants, from whom, measures were taken, received treatment / were allocated to the control group. In the event that this was not the case, data for at least one outcome was analysed by “intention to treat”.
10. Statistical comparisons (between control and intervention group) for at least one key outcome is reported.
11. The study provided point measures (measure of the size of the treatment effect), as well as measures of variability (standard deviations, standard errors, confidence intervals, interquartile ranges / quantile ranges and ranges) for at least one key outcome.

For each criterion that was sufficiently fulfilled (on a literal reading of the trial report), a point was awarded. A mean score was calculated from the end score for a minimum of two

reviewers. The mean score indicates the methodological rigor of the study. A mean score of eleven, indicating the highest possible level of methodological rigor, whereas, a mean score of zero, indicating the lowest possible level of methodological rigor.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

This chapter provides an explanation of the methodology used for this systematic review, including the search for literature, study selection, criteria for inclusion and exclusion, data collection, data evaluation and synthesis of the results.

3.2 Research design

A systematic review at dissertation level methodically obtains articles, via electronic database searches, as subscribed to by the Durban University of Technology library (EBSCOhost, Metalib, Pubmed, Science Direct and Springerlink), but also included any other database, such as Google Scholar that are available for article searches. The individual database searches were done with the use of specific key search terms, which pertain to the conservative management of iliotibial band syndrome (ITBS) (see Appendix A). Databases accessed included as many as possible (see section 3.4 and Appendix A). Individual articles were rated as per scales determined to provide objective evaluation of the studies. The total number of articles yielded from the search that were found to suit the criteria for this study, were then divided into different study types (see Table 3.3), and allocated to three reviewers for their review of the articles. The feedback from each reviewer was then analysed for similar or dissimilar factors, and statistical analyses provided a basis from which a conclusion was discussed.

The research design, as based on the PRISMA Statement (Liberati *et al.,* 2009) (see the modified PRISMA checklist – Appendix L), was approved by the Institutional Research and Ethics Committee (IREC) of the Durban University of Technology (DUT) (Appendix J), indicating that the proposal and hence the research that was undertaken was compliant with the Declarations of Helsinki, Belmont and Nuremberg of 1975 (Johnson, 2005).

3.3 Procedure

3.3.1 Database search

A search for articles pertaining to the topic of conservative management of ITBS was done via databases (Creswall, 2009) that are subscribed to by DUT; as well as any other available databases. The following databases were searched:

a) EBSCOhost (CINAHL, Health Source, MEDLINE, SPORTDiscus)
b) Google Scholar
c) Metalib
d) Pubmed
e) Science Direct
f) Springerlink

Database searches commenced on 10 January 2012 and completed on 21 May 2012.

3.3.2 Search terms

Each electronic database was systematically searched for articles relevant to this study using key search terms:

a) Iliotibial band syndrome
b) Iliotibial band syndrome, treatment
c) Iliotibial band syndrome, conservative
d) Iliotibial band syndrome, intervention

Figure 3.1 Flow Diagram illustrating search strategy based on the PRISMA statement

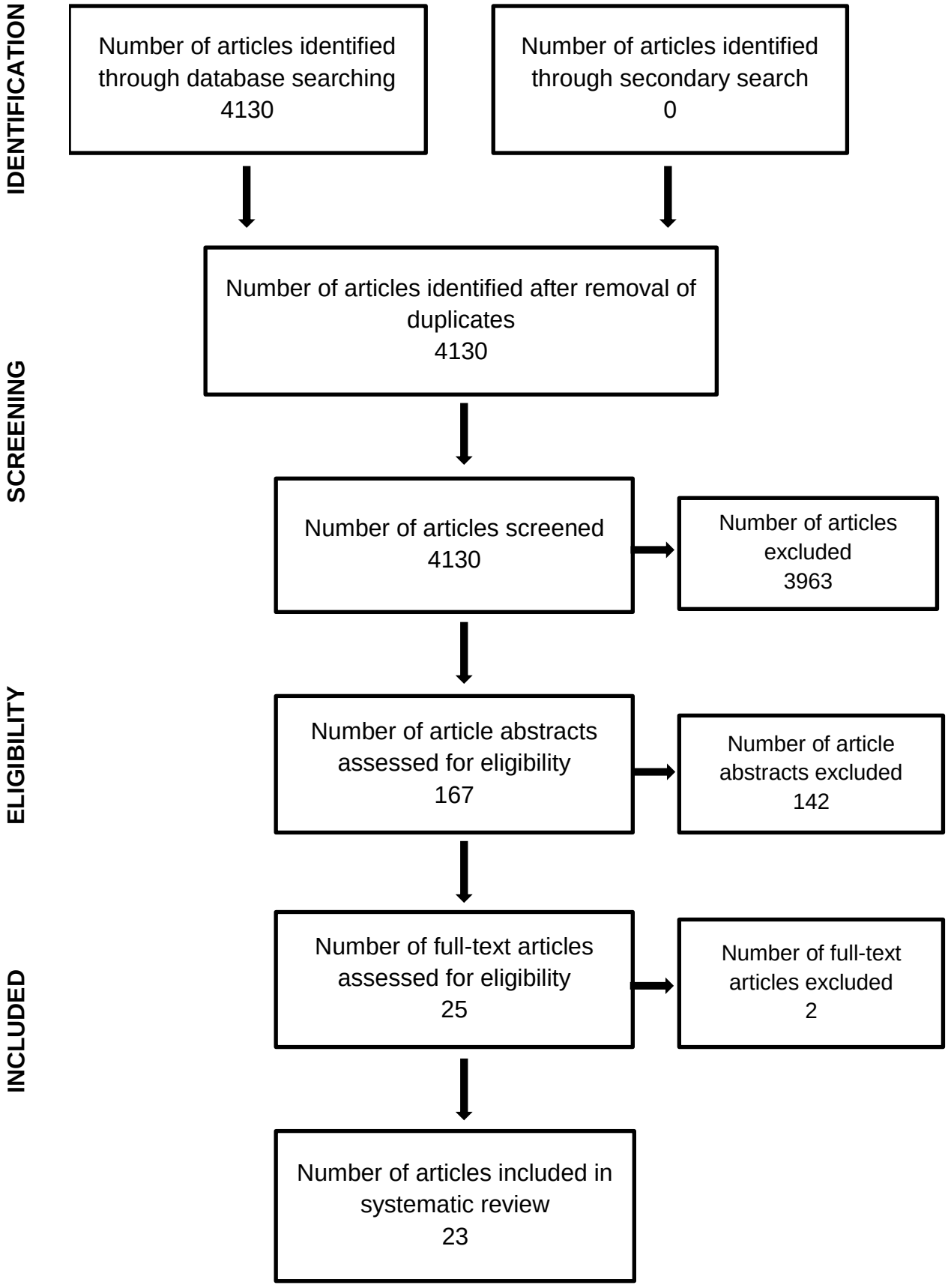

Table 3.1 Number of articles yielded via database searches

	Database:					
Search Term:	EBSCOhost	Google Scholar	Metalib	Pubmed	Science Direct	Springerlink
Iliotibial band syndrome	962	4,130	16	151	768	0
Iliotibial band syndrome, treatment	64	3,550	8	97	656	0
Iliotibial band syndrome, conservative	8	1,150	4	22	303	0
Iliotibial band syndrome, intervention	5	3,660	9	11	357	0

3.3.3 Identification and screening of citations

The citations yielded from database searches (see Table 3.2) were printed into citation lists. Citation lists were then scrutinized by the researcher, with assistance of the primary and secondary research supervisor, with majority consensus used to identify articles which fell within the inclusion criteria (section 3.3.3.1). In instances where there were queries with regards to the suitability of an article, the full abstracts of the studies were read and utilised as a basis for inclusion into this review. Articles which were included could either be in electronic or print form.

Table 3.2 Number of articles for inclusion in individual databases

	Database:					
Search Term:	EBSCOhost	Google Scholar	Metalib	Pubmed	Science Direct	Springerlink
Iliotibial band syndrome	21	12	1	10	3	0
Iliotibial band syndrome, treatment	8	12	1	9	1	0
Iliotibial band syndrome, conservative	0	12	1	2	0	0
Iliotibial band syndrome, intervention	0	12	1	1	1	0

Note: The number reflected includes duplicate articles that were found in each database.

In addition to the primary search, secondary searches were completed based on the sourced full text articles (section 3.4.3.3). No additional articles were identified through the secondary search.

Through this process, the number of articles deemed to fit the criteria for inclusion (see Figure 3.1 above) in the study, including duplicate articles, presented in more than one database were sorted through to produce the master list of articles (Appendix B). The master list included the removal of all duplicate articles present in more than one database search, as well as articles that fell within the inclusion criteria.

The articles within the master list were then subdivided into study types (non-randomised controlled trials, randomised controlled trials, case studies / series and observational studies) so that they could be more easily allocated to individual reviewers.

The articles listed on the master list were then sourced in full text articles.

Table 3.3 Total number of articles – Study type division

Study Types for Inclusion:	**Total Number of Articles:**
Non-randomised Studies	5
Randomised Controlled Trials	6
Case Reports/Case Series	10
Observational Studies	2
Total Number of Articles for Inclusion	23

NOTE: All duplicate studies found within other databases have been excluded from the above representation.

3.4 Research sample

3.4.1 Sample size

Collection of articles commenced in January 2012 and ceased in December 2012, and included all publications prior to December 2012. The final date for inclusion of a study into this research study deemed to be at the date of ethical approval (21st May 2012), so to increase the potential number of articles included in the review. Prior to this systematic review, one other systematic review (Ellis *et al.*, 2007) was completed, in which a total of four randomised controlled trials (RCTs) were reviewed. It was decided that to maximise the number of studies for potential inclusion into the review, other study types, including RCTs, would be included. In addition to RCTs, observational studies, case studies as well as control studies (non-randomised) were included. All studies were accessed via electronic databases. Databases were accessed through the DUT library, however any other studies cited frequently (not accessible through DUT, but through interlibrary loans) were also included into the study. In addition, Google Scholar was utilised as a database to maximise potential studies found. Once database searches were completed, the task of identifying articles which fell within the inclusion and exclusion criteria of the study was completed. A database list was composed (Appendix A), which listed each database and the corresponding articles that were identified by citation and abstract examination, to fit within the criteria for the systematic review. From the database list, a master list (Appendix B) was composed, which removed all duplicate articles (articles found in more than one database), to provide a final and composite list of articles which were included in the systematic review. A total of twenty-five citations were retrieved with twenty-three papers located. Two citations were eliminated because one was a poster presentation and the second could not be obtained.

3.4.2 Sample allocation and method

A master list of articles was composed (Appendix B), which was based on the findings of the database list (Appendix A). The master list excluded any duplicated articles, and presented the list of final articles to be included into the review. The articles in the master list were then divided into the relevant study types;

Studies were allocated to study type divisions, these were:

a) Case studies / series – defined as the collection and presentation of information which reports on a small group of individuals (case series) or a particular individual (case study). These studies draw conclusions only regarding that

participant or group of participants and with regard to that specific context. The focus of such research is usually a single cause-effect relationship which has limited generalisability (Cassell and Symon, 2005). This study is best evaluated using the Liddle Scale (Liddle *et al.*, 1996) (Appendix F). A total of nine case studies were included in this review.

b) Non-randomised controlled studies – the Cochrane Collaboration defines a non-randomised study as a study evaluating the effectiveness of an intervention (clinical trial – intervention compared against a control) which does not use randomisation when allocating participants to comparison and control groups (Green and Higgins, 2005). This type of study is best evaluated using the Newcastle-Ottawa Scale (Wells *et al.,* 2003) (Append7ix C). A total of five non-randomised controlled trials were included in this study.

c) Randomised controlled trials - The Medicines Act of 1968, Section 31 describes a clinical trial as an investigation / series of investigations consisting of the administration of one or more medicinal products to patient(s) where there is evidence that these medicinal products have effects which may be beneficial to the patient(s) in question and the administration of the product(s) is for the purpose of ascertaining whether, or to what extent, the product(s) has / have effects, which may be beneficial or harmful. This type of study is best evaluated using the PEDro Scale (www.pedro.org.au, 1999) (Appendix D). A total of six RCTs were included in this review.

d) Observational Studies – defined as a study in which the researcher observes behaviour using a systematic method, with an absence of influence or interference of the behaviour (Shaughnessy *et al.*, 2005). This study is best evaluated using the Liddle Scale (Liddle *et al.*, 1996) (Appendix E). A total of three observational studies were included in this review.

Table 3.4 Division of study types and total number of articles for inclusion

Study Types for Inclusion:	Total Number of Articles:
Case studies / series	9
Non-randomised controlled studies	5
Randomised controlled trials	6
Observational studies	3
Total Number of Articles for Inclusion	**23**

3.4.3 Sample inclusion and exclusion criteria

3.4.3.1 Inclusion criteria

a) Articles had to be available in electronic format for purposes of accessing the citation, however the article could be available electronically or in paper form.

b) Title / keywords needed to include one or more of the following term(s):
   i) Iliotibial band syndrome
   ii) Iliotibial band syndrome and treatment
   iii) Iliotibial band syndrome and conservative
   iv) Iliotibial band syndrome and intervention

c) Articles were required to have been written in English or have been translated to English, in order to reduce the costs, time and language limitations related to translation.

d) Randomised controlled trials, non-randomised controlled trials, case reports or series and observational studies were included in the study.

e) Studies pertaining to the conservative management of iliotibial band syndrome.

f) Studies pertaining to medicinal and non-surgical interventions.

3.4.3.2 Exclusion criteria

b) Non-English articles.

c) Articles defined as a systematic review, review of literature or expert opinions (Creswall, 2009).

d) Studies pertaining to surgical procedures and non-conservative interventions.

e) Book chapters were excluded from the review.

3.4.3.3 Secondary search

Any articles which were identified to fall within the inclusion criteria, which were found by a process of reference list screening of articles that were found through the primary search (which is outlined in section 3.2 above) where considered for inclusion into this review. There were no articles identified using the secondary search method (Vernon and Schneider, 2009).

3.5 Reviewers:

Four external independent reviewers were asked to participate in the study, the fifth reviewer being the researcher. The five reviewers were:

1. Professor M. Cameron (BAppSc (Ost), MHSc, PhD)
2. Dr. G. Harpham (M.Tech: Chiropractic, CCFC)
3. Dr. R Naidoo (BSc, HSc, MSc, PhD)
4. Dr. H. White (BSc, MEd, HDE, M.Tech: Chiropractic, CCFC)
5. K.J. Harris (researcher)

Each reviewer was required to sign a memorandum of agreement (Appendix G) detailing all necessary information.

Reviewers were divided into 2 groups, with two reviewers being allocated to either group 1 or group 2, and the fifth reviewer, being the researcher, reviewed both group 1 and group 2 articles, thus ensuring that three reviewers reviewed each study (Ellis *et al.,* 2007).

Table 3. Reviewer Groups

	Group 1:	**Group 2:**
Reviewer 1:	Professor M. Cameron (BAppSc (Ost), MHSc, PhD)	Dr. R. Naidoo (BSc, HSc, MSc, PhD)
Reviewer 2:	Dr. H. White (BSc, MEd, HDE, M.Tech: Chiropractic, CCFC)	Dr. G. Harpham (M.Tech: Chiropractic, CCFC)
Reviewer 3:	K.J. Harris (Researcher)	K.J. Harris (Researcher)

Allocation to a group ensured that each group contained three reviewers, and of the three reviewers, two reviewers possessed a PhD qualification (one in each group), and two

reviewers had a background in education (one in each group). Reviewers were blinded in respect of who the other reviewers were, in order to reduce any bias of feedback results.

Allocation of articles was split amongst Group 1 and Group 2 of the reviewers. Group 1 received only case reports/case series articles that were included in the study (Appendix H), whereas Group 2 received the non-randomised controlled studies, randomised controlled trials as well as the observational studies included in the study (Appendix I).

Table 3.6 Reviewer – Individual aspects

Reviewers:	PhD	Masters	Academic	Clinical	Research Experience	Group Allocation
Prof M. Cameron	X		X			1
Dr. G. Harpham		X	X	X		2
Dr. R. Naidoo	X		X	X	X	2
Dr. H. White		X	X	X	X	1

Note: Allocation of the reviewers to the feedback tables in Chapter 4 does not correlate to the numbering mentioned in the above Table 3.6.

Table 3.7 Allocation of articles to Reviewers

	Group 1:	**Group 2:**
Study Type Allocation:	1) Case studies / series	2) Non-randomised controlled studies 3) Randomised controlled trials 4) Observational studies
Total number of articles allocated:	10	13

Each article was individually reviewed by three of the reviewers. The reviewers were provided with the corresponding scales, and were required to answer the corresponding scale (Table 3.8). Once reviewers rated scales for the corresponding article, the feedback was submitted to the researcher for data analysis.

3.6 Measurement tools and analysis

Each study type was reviewed according to the following rating scales:

Table 3.8 Study Scales

Study Type:	**Scale:**
Non-randomised controlled trials	Newcastle-Ottawa Scale (Wells *et al*., 2003) (Appendix C)
Randomised controlled trials	PEDro Scale (PEDro Scale 1999) (Appendix D)
Observational studies	Liddle Scale (Liddle *et al.*, 1996) (Appendix E)
Case reports / case series	Liddle Scale (Liddle *et al.*, 1996) (Appendix F)

Data tables were constructed with each reviewer's feedback entered therein. Tabulation of this data allowed for comparison of similarities and differences between individual reviewer feedback, additionally, articles were ranked out of a total score, which allowed for three individual scores for each article, from which a majority score was tabulated.

In addition to the review of each article, the following study properties were tabulated:

- Form of measurement,
- Frequency of measurement,
- Duration of study,
- Number of participants,
- Assessors blinded,
- Control used and
- Randomisation of participants.

These properties of the individual studies were then compared to and discussed with the outcomes of the corresponding study. This allowed for contextualisation of the overall achievements of the reviewed studies.

This allows for strengths and weakness in individual sectors of the study to be identified, as well as a total ranking for the specific study. Total ranking of individual studies was discussed with regards to ranking of methodological quality as well as the outcome of the corresponding study.

Statistical analyses were considered for this study, however, based on the recommendations by the Cochrane Collaboration (Higgins and Green, 2011) and in consultation with

statisticians: Mrs Tonya Esterhuizen and Mrs Taryn Young (as per email communication on 20 August 2013), it was deemed unnecessary to complete statistical analyses for this study.

CHAPTER FOUR

RESULTS

4.1 Introduction

This chapter presents the feedback collected from the five reviewers. The feedback from the reviewers has been transcribed into the tables titled “Tabulated Feedback Data”. A Tabulated Feedback Data table is presented for each individual study which was reviewed, and has been collectively displayed along with corresponding study types (CSs, N-RCTs, RCTs and OBs). These tables display the overall ranking that each study achieved, as well as the overall percentage agreement between the reviewers. A second table for each study, which follows the data table, entitled the analysis of article, is then displayed for each individual study. This table indicates the overall percentage agreement and ranking of the study, along with the properties of the study (these included: form of measurement, frequency of measurement, duration of the study, number of participants, blinding of the assessors, the use of a control group and randomisation of participants). The limitations that were identified by the authors of those specific studies, as well as limitations of the study that were identified by the reviewers are discussed. The outcome of the studies are contextualised within the strength of the study and discussed, ending with a conclusion for each study.

4.2. Data

4.2.1 Primary data

After completion of the primary and secondary searches a list of final articles was complied. The final articles for inclusion into the systematic review were reviewed by three individual reviewers, the feedback data from each review is represented in a table titled the Tabulated Feedback Data table. Each table displays the feedback from each individual reviewer, and the majority ranking. Majority ranking is considered to be the response that was reported as the majority from the three reviewers. The total score is established from the total of the scores displayed in the majority column. Percentage agreement is calculated for each criterion for the scale, and represents the percentage of agreement between the reviewers for each specific criterion. In the event of all three reviewers agreeing, a percentage agreement of 100% is given. In the event of the reviewers all selecting a different rating for the criterion, a percentage agreement of 33% is calculated. The overall percentage agreement was calculated for the study, this was calculated from the percentage agreement for each criterion. Overall percentage agreement represents the degree of cohesiveness

between reviewers, therefore a study in which the overall percentage agreement was considered to be a good level (70% and above) (Liberati *et al.,* 2009) of overall agreement, indicates that reviewers had similar understanding and feedback for the criteria of the study. This, therefore, represents an article which had clarity, and in which the criteria were easily understood and identified.

4.2.2 Secondary data

Secondary data were obtained via a number of sources; these data types included books, commentaries, referenced journal articles and systematic reviews. The largest amount of information was obtained from online articles, as well as articles sourced through the Durban University of Technology (DUT) library. Additional information was obtained through books available at the DUT library.

4.3 Abbreviations

CS: Case study / series

CSs: Case studies

DTF: Deep transverse frictions

DUT: Durban University of Technology

ITB: Iliotibial band

ITBS: Iliotibial band syndrome

N-RCT: Non-randomised controlled trial

N-RCTs: Non-randomised controlled trials

OBS: Observational study

OBSs: Observational studies

OMT: Osteopathic manipulative treatment

PRS: Pain rating scale

RCT: Randomised controlled trial

RCTs: Randomised controlled trials

4.4 Results

The results are represented in four different sections. Sections one to four each present an introduction, the examiner agreement and ranking of articles and discussion for CSs, N-RCTs, RCTs and OBSs, respectively.

4.4.1 Case studies introduction

Case studies and case series were ranked using the Liddle Scale (Liddle *et al.,* 1996). For each criterion, of which there were a total of eleven criteria, six different responses or codes could be chosen. These codes indicate the degree to which a criterion has been fulfilled. The codes which could be chosen where: "A", "B1", "B2" and "C", which represent the level of criterion fulfilled and risk of bias. The code "A" representing that the criterion was mostly fulfilled, and presented with low risk of bias, in comparison to "C", which represented that few or no criteria were fulfilled, and that a high risk of bias was present. Additionally, "n/a" could be chosen, in the event that the criterion was not applicable. Or in the event that the criterion was not adequately described to classify as a code "A", "B1", "B2" or "C", then "I" could have been selected. The Liddle scale and its ranking are discussed in greater detail in section 2.10.1.

4.4.1.1 Examiner agreement and ranking of articles: Case studies

Table 4.1 List of table numbers for case study feedback and analysis

Tabulated feedback data table number:	Analysis of article table number:	Author(s):	Year:	Title:
Table 4.2	Table 4.3	Baer	1999	Iliotibial band syndrome in cyclists: evaluation and treatment: a case report
Table 4.4	Table 4.5	Baker	1995	Iliotibial band and tibialis posterior syndromes resulting from a fixed talus: a case report
Table 4.6	Table 4.7	Barber and Sutker	1992	Iliotibial band syndrome
Table 4.8	Table 4.9	Fredericson, Cookingham, Chaudhari, Dowdell, Oestreicher and Sahrmann	2000	Hip abductor weakness in distance runners with iliotibial band syndrome
Table 4.10	Table 4.11	Noble	1979	The treatment of Iliotibial band friction syndrome
Table 4.12	Table 4.13	Noble	1980	Iliotibial band friction syndrome in runners
Table 4.14	Table 4.15	Pedowitz	2005	Use of osteopathic manipulative treatment for iliotibial band friction syndrome
Table 4.16	Table 4.17	Pettitt and Dolski	2000	Corrective neuromuscular approach to the treatment of iliotibial band friction syndrome: a case report
Table 4.18	Table 4.19	Schreiber and Louw	2011	The effect of gluteus medius training on hip kinematics in a runner with iliotibial band syndrome
Table 4.20	-	Simoens, Vanhoenacker, Willemen and De Schepper	2002	Iliotibial band friction syndrome

Table 4.2 Tabulated Feedback Data for CS: Article 1

AUTHOR(S):	Baer					
YEAR:	1999					
TITLE:	Iliotibial band syndrome in cyclists: evaluation and treatment: a case report					
CRITERION:		**Reviewer 1**	**Reviewer 2**	**Reviewer 3**	**Majority**	**Percentage Agreement**
1	Are the study participants well-defined in terms of time, place and person?	I	I	I	I	100%
2	What percentage of individuals refused to participate?	n/a	I	I	I	66%
3	Are outcomes measured in a standard, valid and reliable way?	C	I	C	C	66%
4	Are outcomes measured in the same way for both intervention and control groups?	n/a	I	n/a	n/a	66%
5	Are factors other than intervention comparable between intervention and control groups and if not comparable, are they adjusted for in the analysis?	n/a	I	n/a	n/a	66%
6	What percentage of individuals recruited into the study are not included in the analysis?	I	I	I	I	100%
7	Is the analysis by intention to intervene (treat)?	n/a	I	n/a	n/a	66%
8	Are results homogenous between sites?	n/a	I	n/a	n/a	66%
9	How well was the study done to minimise bias?	C	I	C	C	66%
10	Is the overall effect of the study due to the study intervention?	C	I	C	C	66%
11	Explain if there is any practical/ethical reason why an RCT cannot be done?	n/a	I	n/a	n/a	66%
	TOTAL SCORE	A: 0 B1: 0 B2: 0 C: 3 I: 2 n/a: 6	A: 0 0 B1: 0 B2: 0 C: 0 I: 11 n/a: 0	A: 0 B1: 0 B2: 0 C: 3 I: 3 n/a: 5	**A:** 0 **B1:** 0 **B2:** 0 **C:** 3 **I:** 3 **n/a:** 5	
		OVERALL PERCENTAGE AGREEMENT:				**72%**

Table 4.3 Analysis of Article CS: Article 1

AUTHOR(S):	Baer
YEAR:	1999
TITLE:	Iliotibial band syndrome in cyclists: evaluation and treatment: a case report

STUDY PROPERTIES:

Form of measurement	Frequency of measurement	Duration of study	Number of participants	Assessors blinded	Control used	Randomisation of participants	Ranking	Total Percentage Agreement
No description of measures used.	Five individual treatment sessions were completed over the duration of one month.	One month, followed by follow-up treatments, which were not described.	Case study with n = 1, single male participant.	No blinding, as this was a case study.	No control group used, as this was a case study.	No randomisation, as study is a single case study.	A: 0 B1: 0 B2: 0 C: 3 I: 3 n/a 5	72%

LIMITATIONS:

The author did not discuss any limitations, however a number were found. Firstly, no form of measurement was used to record the participant's level of discomfort prior to commencement of treatment, or to measure the level of improvement over the course of the five reported treatments.

Secondly, no short-term or long-term outcomes of the participant were recorded by the author. It is possible that the duration of one month was insufficient in determining the efficacy of the intervention, as compared to the natural history of ITBS.

Thirdly, this case is not applicable to the generalizable public, in that the single participant was a 29-year-old male, presenting with acute ITBS which was assumed to be the result of recreational cycling.

Lastly, the author incorporated a number of interventions in the treatment regimen, these included: active release technique, manipulation of the ipsilateral sacroiliac joint, manipulation of the ipsilateral fibular head, home ice application, education and addressing biomechanical and training factors. It cannot be assumed that any one particular intervention was beneficial over another, or that the active release technique was of any benefit to the participant.

OUTCOME:	The author noted a complete resolution of the participant's symptoms at the completion of the five treatment sessions, done over the course of one month. Follow-up treatments thereafter were not recorded. However, the author reported that follow-up treatments were only to be instituted if the participant required further treatment. The author suggested that the use of active release technique, when treating ITBS, is an effective and quick method. The author recommended that further research should be focused on the biomechanical factors, as a cause of ITBS, particularly at the level of the knee. Additionally, the author suggested that athletes who cross-train should be evaluated fully, with special attention to the kinetic chain functioning of the body, as multiple factors may contribute to the development of ITBS.
DISCUSSION:	This study lacks the core criteria to validate improvement of the participant condition, such as the lack of use of a pain rating scale (PRS), as well as any other subjective or objective clinical measures. The author did mention that follow-up treatments were recommended to the participant, if they experienced a reoccurrence, although none were reported. Additionally, one cannot assume that the participant's ITBS was fully resolved at the end of five individual treatments, as the author indicated that the participant was still eligible for further care if required. A variety of inventions (active release technique, manipulation of the ipsilateral sacroiliac joint and fibular head, home ice application, education and addressing biomechanical and training faults) were used in managing the participants' symptoms, therefore, it cannot be assumed that one particular intervention was superior or inferior to the other. The study lacked adequate description and discussion of the interventions mentioned (namely the active release technique and manipulation of the sacroiliac joints / fibular head), there was also no explanation as to the roles that these interventions played in the treatment of ITBS. The applicability of previously documented efficiency related to active release technique / sacroiliac manipulation / fibular head manipulation cannot be assumed in this study due to the lack of description and reference to those previously documented therapies.

DISCUSSION CONTINUED:	A RCT evaluating the efficacy of each of these individual interventions would provide greater insight into the individual benefit of incorporating manipulation of the sacroiliac joint, or fibular head, or use of the active release technique, in the treatment of ITBS. Furthermore, it is advised that a large sample group, including males and females would provide a study with a more generalizable feedback.
CONCLUSION:	There is insufficient evidence to support the use of the active release technique / sacroiliac manipulation / fibular head manipulation, alone or in combination for the treatment of ITBS. This is because the case study lacked the essential basics to provide greater methodological strength. Based on the noted limitation, outcomes and discussion of the study, the ranking achieved at a 72% agreement level and a score consisting of “C” – 3, “I” – 3 and “n/a” – 5 (see Table 4.2, Ranking column), indicating that the study is of poor quality, and adds limited information into the current knowledge of ITBS; however, it does provide a requirement for investigation. Further studies evaluating the efficiency of the active release technique / sacroiliac manipulation / fibular head manipulation, alone, or in combination are required. The use of a larger sample group consisting of both male and female participants and the use of a control group is recommended to support the application of these interventions in the management of ITBS.

Table 4.4 Tabulated Feedback Data for CS: Article 2

AUTHOR(S):	Baker					
YEAR:	1995					
TITLE:	Iliotibial band and tibialis posterior syndromes resulting from a fixed talus: a case report					
CRITERION:		**Reviewer 1**	**Reviewer 2**	**Reviewer 3**	**Majority**	**Percentage Agreement**
1	Are the study participants well-defined in terms of time, place and person?	C	I	C	C	66%
2	What percentage of individuals refused to participate?	n/a	I	n/a	n/a	66%
3	Are outcomes measured in a standard, valid and reliable way?	C	I	C	C	66%
4	Are outcomes measured in the same way for both intervention and control groups?	n/a	I	n/a	n/a	66%
5	Are factors other than intervention comparable between intervention and control groups and if not comparable, are they adjusted for in the analysis?	n/a	I	n/a	n/a	66%
6	What percentage of individuals recruited into the study are not included in the analysis?	I	I	I	I	100%
7	Is the analysis by intention to intervene (treat)?	n/a	I	n/a	n/a	66%
8	Are results homogenous between sites?	n/a	I	n/a	n/a	66%
9	How well was the study done to minimise bias?	C	I	C	C	66%
10	Is the overall effect of the study due to the study intervention?	C	I	C	C	66%
11	Explain if there is any practical/ethical reason why an RCT cannot be done?	n/a	I	n/a	n/a	66%
	TOTAL SCORE	A: 0 B1: 0 B2: 0 C: 4 I: 1 n/a: 6	A: 0 B1: 0 B2: 0 C: 0 I: 11 n/a: 0	A: 0 B1: 0 B2: 0 C: 4 I: 1 n/a: 6	**A:** 0 **B1:** 0 **B2:** 0 **C:** 4 **I:** 1 **n/a:** 6	
		OVERALL PERCENTAGE AGREEMENT:				**69%**

Table 4.5 Analysis of Article CS: Article 2

AUTHOR(S):	Baker
YEAR:	1995
TITLE:	Iliotibial band and tibialis posterior syndromes resulting from a fixed talus: a case report

STUDY PROPERTIES:

Form of measurement	Frequency of measurement	Duration of study	Number of participants	Assessors blinded	Control used	Randomisation of participants	Ranking	Total Percentage Agreement
The author identified the presence of fixation of the talus of the affected side, and concludes that treatment resolved the fixation, and therefore ITBS symptoms resolved.	The participant was treated with three manipulations over the course of one week. The participant may have received additional follow-up treatment, which was not documented or discussed in great detail.	Initial treatment was conducted over the course of one week, however follow -up sessions are not discussed.	Case study, n=1, single, female participant.	This study was a case study, n = 1. No blinding.	No control used, as the study was a single case study.	No randomisation, as this study was a single case study.	A: 0 B1: 0 B2: 0 C: 4 I: 1 n/a: 6	69%

LIMITATIONS:	Two individual problems were identified in this participant, ITBS being one of them, with the second being tibialis posterior syndrome. The author claimed that ITBS as well as tibialis posterior syndrome were the result of a prior eversion injury of the ankle, and resultant fixation of the talus of the affected limb. There was no discussion of the relationship between the single injury and the development of the fixation of the talus, nor was there significant literature identified in the publication, to substantiate the relationship between the talar fixation, ITBS and tibialis posterior syndrome. This study focused on one individual participant, a 33-year-old female participant, who suffered with ITBS, and tibialis posterior syndrome, which is not generalizable to the public. The participant sought treatment for these conditions prior to this study, from multiple practitioners (which included, but were not limited to: anti-inflammatory medication, stretching exercises and rest). During that time, multiple treatment interventions were incorporated in the management of these conditions. Therefore, it

LIMITATIONS CONTINUED:	cannot be assumed that the outcome of this study was purely as a result of the author's intervention, as the natural history of the condition may have changed over the course of time, and therefore resulted in clinical improvement that coincided with the author's intervention strategy. Similarly, extraneous variables related to the participant's level of activity, can also not be ruled out as being responsible for the changes in clinical symptomatology that the author attributes to his / her intervention. Additionally, the lack of clarity with regards to frequency, duration and type of interventions, noted prior to the author's reported interventions, do not allow for the reader to contextualise the impact of the participant improvement reported in the study.
OUTCOME:	The author reported that manipulative treatment was sufficient in resolving the symptoms produced by ITBS. The author noted the possibility of reoccurrence, and it is assumed that should future treatment have been required, that manipulation would have been the principal intervention. This is based on the premise that the talar fixation was a primary cause for the onset of ITBS in this participant.
DISCUSSION:	Although clinical success was noted in this report, the study lacked focus particularly to ITBS, as there was more than one injury to the lower limb present in the participant. There was no mention of the frequency or method of measurement, or scale of improvement of the participant between each treatment. Without these measures, it proves difficult for the reader to rate the degree of improvement, or to validate the claim that manipulation of the talus was beneficial in the treatment of ITBS. The lack on contextualising the current treatment in the participant's intervention history does not allow the reader to adequately understand the effect of those interventions, time and / or other extraneous variables that may have affected the participant's condition, and contributed towards the improvement of the ITBS.

CONCLUSION:	Baker (1995) makes three assumptions, one being that there is a relationship between talar fixations and the development of ITBS, secondly, that there is a relationship between tibialis posterior syndrome and ITBS, and thirdly that their, and only their treatment was responsible for the resolution of the symptoms of ITBS. Of those three, there is little support from the literature, as reported in the study, to substantiate those assumptions. Treatment that the participant received prior to this study, were not given consideration for the potential effects they may have had on the tibialis posterior syndrome and ITBS. Therefore as a result of these assumptions it doesn't allow the reader to establish the benefit of manipulation of the talus, particularly in the treatment of ITBS. However, it does raise the question of whether full kinematic chain interventions should be more extensively considered in the treatment and further research in this regard should be done. The study however does address the fact that investigation of participants suffering from ITBS should not focus on the knee specifically, but to take the entire kinematic chain into consideration, as well as addressing proximal and distal joints for contribution to the development and perpetuation of ITBS. Based on the noted limitations, outcomes and discussion of the study, the ranking achieved at a 69% agreement level. A score of "C" – 4, "I" – 1 and "n/a" – 6 (Table 4.4), indicates that the study is of poor quality, and adds limited information into the current knowledge of ITBS; however, it does provide a requirement for investigation. It is noted, that a percentage agreement of less than 70% indicates that there is a lack in clearly defined methodological rigor of the study, which proved difficult for reviewers to draw information from the study.

Table 4.6 Tabulated Feedback Data for CS: Article 3

AUTHOR(S):	Barber and Sutker					
YEAR:	1992					
TITLE:	Iliotibial band syndrome					
CRITERION:		**Reviewer 1**	**Reviewer 2**	**Reviewer 3**	**Majority**	**Percentage Agreement**
1	Are the study participants well-defined in terms of time, place and person?	C	I	C	C	66%
2	What percentage of individuals refused to participate?	I	I	I	I	100%
3	Are outcomes measured in a standard, valid and reliable way?	C	I	C	C	66%
4	Are outcomes measured in the same way for both intervention and control groups?	n/a	I	n/a	n/a	66%
5	Are factors other than intervention comparable between intervention and control groups and if not comparable, are they adjusted for in the analysis?	n/a	I	n/a	n/a	66%
6	What percentage of individuals recruited into the study are not included in the analysis?	I	I	I	I	100%
7	Is the analysis by intention to intervene (treat)?	n/a	I	n/a	n/a	66%
8	Are results homogenous between sites?	n/a	I	n/a	n/a	66%
9	How well was the study done to minimise bias?	C	I	C	C	66%
10	Is the overall effect of the study due to the study intervention?	C	I	C	C	66%
11	Explain if there is any practical/ethical reason why an RCT cannot be done?	n/a	I	n/a	n/a	66%
	TOTAL SCORE	A: 0 B1: 0 B2: 0 C: 4 I: 2 n/a: 5	A: 0 B1: 0 B2: 0 C: 0 I: 11 n/a: 0	A: 0 B1: 0 B2: 0 C: 4 I: 2 n/a: 5	**A: 0** **B1: 0** **B2: 0** **C: 4** **I: 2** **n/a: 5**	
		OVERALL PERCENTAGE AGREEMENT:				**72%**

Table 4.7 Analysis of Article CS: Article 3

AUTHOR(S):	Barber and Sutker							
YEAR:	1992							
TITLE:	Iliotibial band syndrome							
STUDY PROPERTIES:								
Form of measurement	**Frequency of measurement**	**Duration of study**	**Number of participants**	**Assessors blinded**	**Control used**	**Randomisation of participants**	**Ranking**	**Total Percentage Agreement**
No form of measurement was discussed.	No frequency of measurement was discussed.	The study retrospectively reviewed clinical data of the authors' sports medicine centre over the duration of three years.	Nineteen participants in total were included in the study, of those twelve were men and seven were women.	The study was a retrospective case series; there was no blinding of assessors.	The study was a retrospective case series, and therefore, no control group was used.	The study was a retrospective case series, and participants were not randomised.	A: 0 B1: 0 B2: 0 C: 4 I: 2 n/a: 5	72%
LIMITATIONS:	As a result of the study being a retrospective analysis of multiple case studies, the participants received a broad variation of interventions which were used singularly and in combination during the duration of the study. The interventions included combinations of the following: rest from activity, altering biomechanics of athletic training, avoidance of camber surfaces during running, use of correct shoes, stretching, ice and heat application, oral corticosteroid medication and non-steroidal anti-inflammatory injections. Each treatment regimen was tailored for individual participants, based on best clinical practice, at the time of them seeking clinical care. This negates the possibility that rigid structured methodological protocols are comparable between the case studies included in this retrospective study. Notwithstanding this, the authors concluded that all combinations of treatment options contributed positively towards the recovery of the participants; however, no single intervention appeared to be superior to another. Additionally, a second restriction of retrospective studies, are that a number of extraneous factors could not be excluded. For example: variation in ages of participants; differing recreational activities (including running, cycling, soccer and tennis); variations in mileage; acute / chronic cases of ITBS; as well as variations between the treatment regimen that individual							

LIMITATIONS CONTINUED:	participants received. This lack of homogeneity did not allow for the authors to draw definitive conclusions on identification of any intervention as being the primary reason for response to the intervention combinations used.
OUTCOME:	The authors concluded that ITBS has a good prognosis, when causative factors are identified and adequately addressed, with full return to activity being the main goal. High mileage was found to be the principal factor. Addressing this, along with other causative factors which have been identified, are best treated with rest from activity, reduction in mileage, correct selection of shoes for activity, use of anti-inflammatory medication, use of local modalities and stretching. All participants were adequately managed with conservative therapy, and none required surgical intervention. The authors noted that runners who were exposed to road camber tended to develop ITBS on the affected side. When this was the case, addressing this factor, was reported to aid treatment outcomes, and resulted in decreased reoccurrence of ITBS on return to training.
DISCUSSION:	There was a broad variation in the number of factors in this study. Had there been a control, it would have provided greater validation of the response to the treatment combinations. There was also no consistent reporting of measures of clinical improvement of participants (e.g. pain rating scale). Thus, the participants reported improvement could not be compared to themselves over time, or between participants. Without a link between structured outcome measures and period of treatment intervention, it became difficult for the reviewer to contextualise participant responses in terms of natural history, or as a result of the intervention strategies. This lack of clarity is further confounded by the number of interventions that were incorporated into each participant's clinical protocol, which were not congruent with those of other participants, with which they were compared. Thus, it cannot be assumed that the improvement of the participants was the result of any one of the interventions, or combinations of the interventions used in this study (viz. no *p* values could be generated), or that the improvements were solely as the result of the interventions (as a result of the variable extraneous factors present in the study).

CONCLUSION:	This study seems to support the use of combinations of conservative interventions in the management of ITBS. It also acknowledges the effect of extraneous variables that need to be considered in order to achieve optimal clinical outcomes. These conclusions are however, mutually exclusive, as the study cannot determine the efficacy of treatments or combinations of treatments while at the same time consider the impact of various extraneous factors that influence ITBS. These two conclusions are therefore weakened and result in a study that generates poor support for either of the constructs. This poor outcome is reflected in the analysis of this case series by the reviewers in that the study was not only ranked poorly, but achieved the following outcomes: "C" – 4; "I" – 2 and "n/a" – 5 (refer to Table 4.6). The study indicates that a reduction in mileage or complete cessation from activity is a significant method to address ITBS. Additionally, the incorporation of anti-inflammatory medication, local modalities (e.g. ultrasound) and stretching assists with the recovery of participants.

Table 4.8 Tabulated Feedback Data for CS: Article 4

AUTHOR(S):	Fredericson, Cookingham, Chaudhari, Dowdell, Oestreicher and Sahrmann					
YEAR:	2000					
TITLE:	Hip abductor weakness in distance runners with iliotibial band syndrome					
CRITERION:		**Reviewer 1**	**Reviewer 2**	**Reviewer 3**	**Majority**	**Percentage Agreement**
1	Are the study participants well-defined in terms of time, place and person?	B1	A	A	A	66%
2	What percentage of individuals refused to participate?	I	A	I	I	66%
3	Are outcomes measured in a standard, valid and reliable way?	B2	B1	B2	B2	66%
4	Are outcomes measured in the same way for both intervention and control groups?	A	I	A	A	66%
5	Are factors other than intervention comparable between intervention and control groups and if not comparable, are they adjusted for in the analysis?	B1	B1	B1	B1	100%
6	What percentage of individuals recruited into the study are not included in the analysis?	B1	I	B1	B1	66%
7	Is the analysis by intention to intervene (treat)?	n/a	A	n/a	n/a	66%
8	Are results homogenous between sites?	n/a	A	n/a	n/a	66%
9	How well was the study done to minimise bias?	B1	A	B1	B1	66%
10	Is the overall effect of the study due to the study intervention?	B2	A	B2	B2	66%
11	Explain if there is any practical/ethical reason why an RCT cannot be done?	n/a	n/a	n/a	n/a	100%
	TOTAL SCORE	A: 1 B1: 4 B2: 2 C: 0 I: 1 n/a 3	A: 6 B1: 2 B2: 0 C: 0 I: 2 n/a: 1	A: 2 B1: 3 B2: 2 C: 0 I: 1 n/a: 3	**A: 2** **B1: 3** **B2: 2** **C: 0** **I: 1** **n/a: 3**	
		OVERALL PERCENTAGE AGREEMENT:				**72%**

Table 4.9 Analysis of Article CS: Article 4

AUTHOR(S):	Fredericson, Cookingham, Chaudhari, Dowdell, Oestreicher and Sahrmann							
YEAR:	2000							
TITLE:	Hip abductor weakness in distance runners with iliotibial band syndrome							
STUDY PROPERTIES:								
Form of measurement	**Frequency of measurement**	**Duration of study**	**Number of participants**	**Assessors blinded**	**Control used**	**Randomisation of participants**	**Ranking**	**Total Percentage Agreement**
Hip abductor strength was measured using a handheld dynamometer.	Measurements for the test group were taken once per week.	The rehabilitation programme was completed over the duration of six weeks. Once off measurements were taken for the control group, as well as, pre- and post-test readings. Follow-up at six months was done telephonically.	A total of 54 participants were included in this study. 24 were included in the test group and 30 participants in the control group. A total of 28 female participants (14 in the experimental and 14 in the control group) and 26 male participants (10 in the experimental and 16 in the control group).	Not mentioned.	A control group of 30 participants was included in the study.	Participants were randomised.	A: 2 B1: 3 B2: 2 C: 0 I: 1 n/a: 3	72%
LIMITATIONS:	Runners who were performing unsupervised stretching and strengthening exercises were not excluded from the study, additionally; some participants were also using ice application, as well as non-steroidal anti-inflammatory medication over the course of the study. This combination of extraneous variables may have influenced the outcome of the study, but to a far lesser extent than those noted in Baer (1999), Baker (1995) and Barber and Sutker (1992).							

LIMITATIONS CONTINUED:	No mention was made of any participants that were excluded due to injury of their normal limb (within the six week research period). Follow-up of participants was done telephonically, however no comparative clinical measurements were taken. This limits the ability of the study to confirm the effectiveness of the interventions beyond the short-term. The authors considered the control group only in terms of baseline measures, where the control group could be compared to the intervention group. No true control group existed (no placebo treatment was given) for comparison of the intervention, at the final measures. Participants were prescribed anti-inflammatory medication, however, the duration of time that participants took this medication, was not standardised between participants. The application of ultrasound was also used for a variable length, as the authors reported that participants received ultrasound for one to two sessions. These two variations in the treatment protocol may have had an effect on the overall improvement of the participants, as they lacked standardisation between participants.
OUTCOME:	The authors found that runners suffering from ITBS presented with reduced hip abductor strength in comparison to the non-injured control group. The six week rehabilitation programme resulted in good improvement in hip abductor strength, and resultant reduction in the symptoms associated with ITBS, with 92% of participants reporting resolution of ITBS. The authors proposed that improvement of hip abductor strength through a training programme provided significant improvement in ITBS participants (all measures noted improvement where *p* was less than 0.05).
DISCUSSION:	The authors reported that they did not exclude participants who were using other modalities, such as cryotherapy, anti-inflammatory medication, stretching and strengthening exercises. The authors also did not exclude participants who continued with physical activity during the study. In addition, there were a number of interventions within this study, including a six week

DISCUSSION CONTINUED:	rehabilitation programme (included stretching exercises and exercises specific for improving hip abductor strength), non-steroidal anti-inflammatory medication (prescribed to participants, and stopped when the participant reported themselves to be pain-free) and ultrasound for one to two treatment sessions. It cannot be concluded from the results that any one particular intervention was superior over another, in the treatment of ITBS; although the study can make conclusions with regards to the combination of therapies used in the study. Ideally, this study required a true control group, as described by the authors. It is acknowledged that the comparison of baseline values between the control group and the injured group would enable a comparative and accurate description of ITBS as a syndrome, when compared to normal participants. This comparison was, however, not possible post-treatment, as the study did not have a third group, which should have included a group of symptomatic participants that received a sham / sham-combination intervention; as this would have allowed for effective conclusions with regards to the interventions that excluded the possibility of natural history.
CONCLUSION:	In comparison to Baer (1999), Baker (1995) and Barber and Sutker (1992), this particular case series reflected a greater methodological rigor in terms of participant inclusion, participant homogeneity, structured protocols, and identified measurement outcomes. Although the study still has significant limitations when compared to the more rigorous structure of RCTs, it is still able to comment more strongly on the relevance of the interventions used in this study and thus contribute to knowledge in terms of ITBS interventions. This study achieved a ranking of “A” – 2, “B1” – 3, “B2” – 2, “I” – 1 and “n/a” – 3, at an agreement level of 72% (see Table 4.8). Based on this ranking, it suggests that a structured combination of including: stretching and strengthening therapies, non-steroidal anti-inflammatory medication and ultrasound, has an impact on hip abductor strength, and the role that it plays in the clinical presentation of ITBS.

4.10 Tabulated Feedback Data for CS: Article 5

AUTHOR(S):	Noble					
YEAR:	1979					
TITLE:	The treatment of Iliotibial band friction syndrome					
CRITERION:		**Reviewer 1**	**Reviewer 2**	**Reviewer 3**	**Majority**	**Percentage Agreement**
1	Are the study participants well-defined in terms of time, place and person?	I	B1	I	I	66%
2	What percentage of individuals refused to participate?	n/a	I	n/a	n/a	66%
3	Are outcomes measured in a standard, valid and reliable way?	I	B1	I	I	66%
4	Are outcomes measured in the same way for both intervention and control groups?	n/a	I	n/a	n/a	66%
5	Are factors other than intervention comparable between intervention and control groups and if not comparable, are they adjusted for in the analysis?	n/a	I	n/a	n/a	66%
6	What percentage of individuals recruited into the study are not included in the analysis?	I	I	I	I	100%
7	Is the analysis by intention to intervene (treat)?	n/a	B1	n/a	n/a	66%
8	Are results homogenous between sites?	n/a	B2	n/a	n/a	66%
9	How well was the study done to minimise bias?	C	B1	C	C	66%
10	Is the overall effect of the study due to the study intervention?	C	B1	C	C	66%
11	Explain if there is any practical/ethical reason why an RCT cannot be done?	n/a	n/a	n/a	n/a	100%
	TOTAL SCORE	A: 0 B1: 0 B2: 0 C: 2 I: 3 n/a: 6	A: 0 B1: 5 B2: 1 C: 0 I: 4 n/a: 1	A: 0 B1: 0 B2: 0 C: 2 I: 3 n/a: 6	**A: 0** **B1: 0** **B2: 0** **C: 2** **I: 3** **n/a: 6**	
		OVERALL PERCENTAGE AGREEMENT:				**72%**

Table 4.11 Analysis of Article CS: Article 5

AUTHOR(S):	Noble
YEAR:	1979
TITLE:	The treatment of iliotibial band friction syndrome

STUDY PROPERTIES:

Form of measurement	Frequency of measurement	Duration of study	Number of participants	Assessors blinded	Control used	Randomisation of participants	Ranking	Total Percentage Agreement
Length of time from first consultation to point of participant reporting cessation of pain.	The frequency of measurement was not discussed.	The 221 participants who were included in this case series were seen over a period of two years.	A total of 221 cases of ITBS were diagnosed in long distance runners.	No assessors were blinded.	No control group was utilised in this study.	No randomisation of participants occurred, as all participants received the same treatment regimen.	A: 0 B1: 0 B2: 0 C: 2 I: 3 n/a: 6	72%

LIMITATIONS:

The manner in which this article was written, suggests that it is retrospective in nature, and based in the context of clinical practice. As a result of this, there was a significant loss to follow-up (66%) which implies that the outcomes of the study are only applicable to participants who have a very similar or the same criteria for inclusion. However, this study does not delineate these criteria beyond identifying them as long-distance runners having had ITBS. Thus, the outcomes unfortunately have limited application in the clinical context.

The author chose to use length of time for recovery as a measurement of improvement, as opposed to structured objective / subjective clinical outcomes, which would have enabled the author a more equitable comparison between the participants over the period of study.

As a result of the retrospective method of study, it again becomes apparent that the combinations of interventions were based on best practice principles as applied to each of the individual participants. As a result, there is limited scope to compare the individual participants to each other, thus, there is a limited opportunity to conclusively state the effect of a single intervention

	versus a combination of interventions versus natural history.
OUTCOME:	A total of 221 cases of ITBS were included in the case series, with only nine ultimately requiring surgery. This seems to suggest that conservative care (as outlined by the combination of therapies included in this study) is appropriate for participants with ITBS. This conclusion is however weakened significantly by the 66% loss to follow-up, where it cannot be determined whether their symptoms improved, maintained or regressed. As a result this, the study has a limited scope for future treatment interventions of ITBS. Furthermore, the assumption that particular causative factors could be addressed (e.g. training errors and surface of running) in order to improve the clinical outcome for participants makes the assumption that there were no other extraneous variables that may have differed between the participants (i.e. those that were inadvertently excluded or may yet to be identified in the literature at that time). This limitation, although no fault of the author, would have further weakened any suggestions for any applicability of interventions used in the treatment of ITBS.
DISCUSSION:	Due to the lack of homogeneity of the participant group, lack of a control group, and the use of the measurement of time, the study is unable to comment on the effect of the interventions, as being better than that of the natural history. Additionally, the variability between the participants, both in terms of running ergonomics, as well as their demographic description, do not allow for a cohesive clinical picture that would allow for the results of the clinical study to be generalised to a specific set of participants. In terms of the assumptions that particular training parameters need to be altered to improve participants' clinical outcomes; conclusions concerning any one or a combination of interventions used need to be drawn. Therefore, with a broad participant pool, in additional to, a lack of structured subjective and objective clinical outcomes or measures, (with improvement only noted with time), the strength of the conclusions drawn from this study are further compromised.

CONCLUSION:	In comparison to Baer (1999), Baker (1995) and Barber and Sutker (1992), this study ranked at a similar level (see Table 4.10), and therefore the conclusion made with regards to this study implied that the outcomes are the same (viz. limited applicability to clinical practice, limited evidence for support of the intervention used, and significant amounts of further research is required).

Table 4.12 Tabulated Feedback Data for CS: Article 6

AUTHOR(S):	Noble					
YEAR:	1980					
TITLE:	Iliotibial band friction syndrome in runners					
CRITERION:		**Reviewer 1**	**Reviewer 2**	**Reviewer 3**	**Majority**	**Percentage Agreement**
1	Are the study participants well-defined in terms of time, place and person?	C	B1	C	C	66%
2	What percentage of individuals refused to participate?	C	I	C	C	66%
3	Are outcomes measured in a standard, valid and reliable way?	C	B1	C	C	66%
4	Are outcomes measured in the same way for both intervention and control groups?	n/a	I	n/a	n/a	66%
5	Are factors other than intervention comparable between intervention and control groups and if not comparable, are they adjusted for in the analysis?	n/a	I	n/a	n/a	66%
6	What percentage of individuals recruited into the study are not included in the analysis?	I	I	I	I	100%
7	Is the analysis by intention to intervene (treat)?	n/a	B1	n/a	n/a	66%
8	Are results homogenous between sites?	n/a	B2	n/a	n/a	66%
9	How well was the study done to minimise bias?	C	B1	C	C	66%
10	Is the overall effect of the study due to the study intervention?	C	B1	C	C	66%
11	Explain if there is any practical/ethical reason why an RCT cannot be done?	n/a	n/a	n/a	n/a	100%
	TOTAL SCORE	A: 0 B1: 0 B2: 0 C: 5 I: 1 n/a: 5	A: 0 B1: 5 B2: 1 C: 0 I: 4 n/a: 1	A: 0 B1: 0 B2: 0 C: 5 I: 1 n/a: 5	**A: 0** **B1: 0** **B2: 0** **C: 5** **I: 1** **n/a: 5**	
		OVERALL PERCENTAGE AGREEMENT:				**72%**

Table 4.13 Analysis of Article CS: Article 6

AUTHOR(S):	Noble							
YEAR:	1980							
TITLE:	Iliotibial band friction syndrome in runners							
STUDY PROPERTIES:								
Form of measurement	**Frequency of measurement**	**Duration of study**	**Number of participants**	**Assessors blinded**	**Control used**	**Randomisation of participants**	**Ranking**	**Total Percentage Agreement**
The length of time and requirement of treatment was used to gauge improvement of participants.	No defined measurement was discussed in the study.	No defined duration was discussed in the study.	A total of 94 participants were assessed and treated. 73 participants attended a follow-up evaluation.	No assessors were blinded.	No control group was utilized.	Participants were not randomised.	A: 0 B1: 0 B2: 0 C: 5 I: 1 n/a: 5	72%
LIMITATIONS:	This particular study seemed to be an expansion of Noble's (1979) study and was included in this review as it met the inclusion criteria, and did not appear to have been a follow-on study. This study was a publication in a separate peer-review as peer-review journals usually do not accept reproductions of previously published articles. The limitations of this study are not dissimilar to Noble (1979), however there were suggestions of greater sample homogeneity in Noble (1980) when compared to Noble (1979) (e.g. predominantly males 98%).							
OUTCOME:	No additional information was supplied above and beyond that of the previous study, therefore no additions or modifications to the study were expected by the reviewers.							
DISCUSSION:	The impact of the outcomes of this study were not dissimilar to Noble's previous study (Noble, 1979), except for the fact that the reported outcomes were potentially more applicable to male participants presenting with ITBS.							

CONCLUSION:	This is not dissimilar to the outcomes for the Noble's (1979) case series. However, in term of the ranking of this particular study (although poor) it was slightly stronger, in that it achieved a score of "C" – 4, "I" – 1 and "n/a" – 5 as compared to Noble's previous study which achieved "C" – 2, "I" – 3 and "n/a" - 6 (see Table 4.10 and Table 4.12 for comparison). This may be the result of those criteria relating to homogeneity and participant description would have fared slightly better by comparison.

Table 4.14 Tabulated Feedback Data for CS: Article 7

AUTHOR(S):	Pedowitz					
YEAR:	2005					
TITLE:	Use of osteopathic manipulative treatment for iliotibial band friction syndrome					
CRITERION:		**Reviewer 1**	**Reviewer 2**	**Reviewer 3**	**Majority**	**Percentage Agreement**
1	Are the study participants well-defined in terms of time, place and person?	I	C	I	I	66%
2	What percentage of individuals refused to participate?	n/a	n/a	n/a	n/a	100%
3	Are outcomes measured in a standard, valid and reliable way?	B2	C	B2	B2	66%
4	Are outcomes measured in the same way for both intervention and control groups?	n/a	I	n/a	n/a	66%
5	Are factors other than intervention comparable between intervention and control groups and if not comparable, are they adjusted for in the analysis?	n/a	C	n/a	n/a	66%
6	What percentage of individuals recruited into the study are not included in the analysis?	I	n/a	I	I	66%
7	Is the analysis by intention to intervene (treat)?	n/a	B1	n/a	n/a	66%
8	Are results homogenous between sites?	n/a	I	n/a	n/a	66%
9	How well was the study done to minimise bias?	C	C	C	C	100%
10	Is the overall effect of the study due to the study intervention?	B2	C	B2	B2	66%
11	Explain if there is any practical/ethical reason why an RCT cannot be done?	n/a	n/a	n/a	n/a	100%
	TOTAL SCORE	A: 0 B1: 0 B2: 2 C: 1 I: 2 n/a: 6	A: 0 B1: 1 B2: 0 C: 5 I: 2 n/a: 3	A: 0 B1: 0 B2: 2 C: 1 I: 2 n/a: 6	A: **0** B1: **0** B2: **2** C: **1** I: **2** n/a: **6**	
		OVERALL PERCENTAGE AGREEMENT:				**75%**

Table 4.15 Analysis of Article CS: Article 7

AUTHOR(S):	Pedowitz
YEAR:	2005
TITLE:	Use of osteopathic manipulative treatment for iliotibial band friction syndrome

STUDY PROPERTIES:

Form of measurement	Frequency of measurement	Duration of study	Number of participants	Assessors blinded	Control used	Randomisation of participants	Ranking	Total Percentage Agreement
Daily questionnaire with pain rating scale.	A pain rating scale (PRS) was completed daily by the participant.	Case study was conducted over a period of three weeks.	Case study n=1, single male participant.	No, as this study is a case study.	Case study n=1, therefore no control group was used.	Case study n=1, therefore no randomisation of participants was used.	A: 0 B1: 0 B2: 2 C: 1 I: 2 n/a: 6	75%

LIMITATIONS:	The case study used a single 30-year-old single male participant, suffering from reoccurring ITBS, who had previously had surgery for ITBS. The results of this study are therefore applicable only to participants who fall into the same category used for this study. A number of interventions were used; the primary intervention was osteopathic manipulative treatment (OMT), specifically, the counter-strain technique, as well as stretching, ice and heat application, use of non-steroidal anti-inflammatory medication and addressing biomechanical issues. One cannot assume that improvement was the result of the OMT alone. The participant was non-compliant with the standard treatment regimen, including home stretching, anti-inflammatory medication and ice application; which would have affected the rate of improvement of the ITBS as a clinical syndrome, and not necessarily reflected the true outcomes that the author had intended.
OUTCOME:	The author reported that the participant had experienced a significant improvement (no *p* values stated) in symptoms related to ITBS. Although the author required the participant to fill out a daily questionnaire where their pain level, as well as stretching, ice / heat application, use of non-steroidal anti-inflammatory medication and level of activity were recorded; the author did not

OUTCOME CONTINUED:	provide for an independent, objective measure to confirm the participant's clinical improvement over time. This is of crucial significance in this study, as it was noted and reported by the participant that they did not maintain compliance with additional interventions. It is also noted that the participant suggested that the improvement recorded was primarily as a result of the OMT. The only report by the author in this regard was a comment that the athlete was able to return to full activity within three weeks. Based on the outcomes of this study, the author therefore suggested that OMT is beneficial in the treatment of ITBS and suggest further that the incorporation of OMT into the treatment regimen of ITBS may result in a reduced requirement for medication, as well as an improvement of the participant's mood, sleep and overall quality of life.
DISCUSSION:	The author reported that this was the first study exploring strain-counterstrain OMT as an intervention strategy. From the title of the report it would suggest that this case study was only evaluating strain-counterstrain OMT, however, on reviewing the full publication, it becomes apparent that it is part of a combination of therapies used for ITBS. As a natural consequence, therefore, it is not possible for the author to comment on strain-counterstrain OMT as an individual modality. Pedowitz (2005) ensured that they recorded at periodic intervals a variety of data, however, this data was only subjective (received i.e. from the participant) and thus limited conclusions can be drawn with regards to the combination therapy; as the participant may have been influenced by one or more of the placebo / Hawthorn effects (Babbie and Mouton, 2001). Additionally, the participants maximum recorded pain severity never exceeded more than a rating of two. Therefore, the severity of this particular participant's case may not have been sufficient to identify a great improvement, particularly as a response to the main intervention. The participant may have shown symptomatic improvement purely as a result of altered activity level.

CONCLUSION:	In many respects, Pedowitz's (2005) study is very similar to Baer (1999), Baker (1995), Barber and Sutker (1992), Noble (1979) and Noble's (1980) studies, with the exception that the reviewers rated criterion three and criterion ten more strongly in this study. This decision by the reviewers is based on the use of a standard, valid and reliable outcome measure and the likelihood that the intervention effect was less obstructed by extraneous variables, as compared to the previous studies. Therefore the results of the study, although more limited than Fredericson *et al.,* (2000), suggests that a combination of the following therapies: strain-counterstrain OMT; stretching; ice and heat application; use of non-steroidal anti-inflammatory medication and addressing biomechanical issues, should be considered in participants similar to the case study in this article; however, further research in this regard is recommended, both by the author of the study and the reviewers.

Table 4.16 Tabulated Feedback Data for CS: Article 8

AUTHOR(S):	Pettitt and Dolski					
YEAR:	2000					
TITLE:	Corrective neuromuscular approach to the treatment of iliotibial band friction syndrome: a case report					
CRITERION:		**Reviewer 1**	**Reviewer 2**	**Reviewer 3**	**Majority**	**Percentage Agreement**
1	Are the study participants well-defined in terms of time, place and person?	C	I	C	C	66%
2	What percentage of individuals refused to participate?	n/a	I	n/a	n/a	66%
3	Are outcomes measured in a standard, valid and reliable way?	C	I	C	C	66%
4	Are outcomes measured in the same way for both intervention and control groups?	n/a	I	n/a	n/a	66%
5	Are factors other than intervention comparable between intervention and control groups and if not comparable, are they adjusted for in the analysis?	n/a	I	n/a	n/a	66%
6	What percentage of individuals recruited into the study are not included in the analysis?	I	I	I	I	100%
7	Is the analysis by intention to intervene (treat)?	n/a	I	n/a	n/a	66%
8	Are results homogenous between sites?	n/a	I	n/a	n/a	66%
9	How well was the study done to minimise bias?	C	I	C	C	66%
10	Is the overall effect of the study due to the study intervention?	C	I	C	C	66%
11	Explain if there is any practical/ethical reason why an RCT cannot be done?	n/a	I	n/a	n/a	66%
	TOTAL SCORE	A: 0 B1: 0 B2: 0 C: 4 I: 1 n/a: 6	A: 0 B1: 0 B2: 0 C: 0 I: 11 n/a: 0	A: 0 B1: 0 B2: 0 C: 4 I: 1 n/a: 6	A: **0** B1: **0** B2: **0** C: **4** I: **1** n/a: **6**	
		OVERALL PERCENTAGE AGREEMENT:				**69%**

Table 4.17 Analysis of Article CS: Article 8

AUTHOR(S):	Pettitt and Dolski
YEAR:	2000
TITLE:	Corrective neuromuscular approach to the treatment of iliotibial band friction syndrome: a case report

STUDY PROPERTIES:

Form of measurement	Frequency of measurement	Duration of study	Number of participants	Assessors blinded	Control used	Randomisation of participants	Ranking	Total Percentage Agreement
Performance on step-up and lunge tests, as well as daily reporting of training mileage.	The participant was required to report on their progression and improvement.	Duration of the case study was not discussed.	Case study n=1, single female participant.	No assessors were blinded, as this was a case study.	Case study, n=1, no control group was used.	Case study, n=1, therefore, no randomisation was used.	A: 0 B1: 0 B2: 0 C: 4 I: 1 n/a: 6	69%

LIMITATIONS:

Firstly, this case study used one, 19-year-old female participant, suffering from chronic, reoccurring and recalcitrant ITBS, who had previously had surgical treatment for ITBS. The results can therefore, only be limited to participants with a particular or similar profile to this teenage female participant.

A second significant limitation is that the performance measures are the step-up and lunge test, which were not adequately defined or referenced to appropriate sources for clarity. Additionally, the reporting of mileage as an outcome measure is subject to extraneous variables including weather, surface type, camber, and or terrain type; making it impossible to determine whether the reported mileage actually reflects clinical improvement of ITBS.

Thirdly, the interventions included in the treatment regimen were: modified rest (particularly reduced mileage, avoidance of hill running and running with a shorter stride length), soft tissue treatment (including stretching and effleurage massage, mobilization of the patella and theraband exercises), cryotherapy and rehabilitation sessions (consisting of non-weight bearing exercises and neuromuscular electric stimulation).

As a result of the above three points, the authors could not conclude that any one particular intervention had greater contribution

LIMITATIONS CONTINUED:	to improvement of ITBS, particularly as the effect of previous interventions were not outlined in this study, and their effects were not excluded.
OUTCOME:	Notwithstanding the above limitations, the authors concluded that use of a corrective neuromuscular approach was beneficial in the management of ITBS, and it was found to be a viable alternative to orthoses (even though this was not tested in this case series). Additionally, they suggested that the frequent use of unsupportive footwear, such as sandals perpetuated the ITBS in this particular participant.
DISCUSSION:	The participant discussed in the case report, had previously had surgical treatment for ITBS, and although this is a participant receiving conservative care for ITBS, it is specific in that it applies to participants in a similar context. Therefore, any results obtained from this study would be limited to such participants only. To complicate the limitation of the above outcomes, the authors omitted a discussion regarding the reported results of the participant, and did not display any measurements to validate their claims of improvement. These unsubstantiated claims for improvement therefore, negate the use of corrective neuromuscular approach in the management of ITBS. The variation of treatments that were incorporated in the management of this participant, included adjustment of training errors, soft tissue treatment (included stretching, effleurage massage, electrotherapy and theraband exercises), cryotherapy, and rehabilitation sessions (included non-weight bearing exercises and neuromuscular electric stimulation). These various treatment options further obscure the authors' ability to make specific recommendations about the corrective neuromuscular approach to the treatment of ITBS in the context of this particular case study.

CONCLUSION:	As a result of the above limitations, outcomes and discussion, it can be seen that this study compares to Baer (1999), Baker (1995), Barber and Sutker (1992), Noble (1979), Noble (1980) and Pedowitz (2005) in achieving "C" – 4, "I" – 1 and "n/a" – 6 (see Table 4.16). As a result of the ranking achieved by this study, it can be seen that there is limited methodological rigor with regards to the recording, analysis, and reporting of participant data in a systematic manner, that would enable the study to reach the outcomes it suggested by its title: "Corrective neuromuscular approach to the treatment of iliotibial band friction syndrome: a case report". A corrective neuromuscular approach has limited evidence based on this case study for use in clinical practice. However, these findings suggest that the positive results reported should be followed with a structured RCT, examining the efficiency of corrective neuromuscular approach in the management of ITBS.

Table 4.18 Tabulated Feedback Data for CS: Article 9

AUTHOR(S):	Schreiber and Louw					
YEAR:	2011					
TITLE:	The effect of gluteus medius training on hip kinematics in a runner with iliotibial band syndrome					
CRITERION:		**Reviewer 1**	**Reviewer 2**	**Reviewer 3**	**Majority**	**Percentage Agreement**
1	Are the study participants well-defined in terms of time, place and person?	B1	B1	B1	B1	100%
2	What percentage of individuals refused to participate?	n/a	I	n/a	n/a	66%
3	Are outcomes measured in a standard, valid and reliable way?	B1	B2	B1	B1	66%
4	Are outcomes measured in the same way for both intervention and control groups?	n/a	I	n/a	n/a	66%
5	Are factors other than intervention comparable between intervention and control groups and if not comparable, are they adjusted for in the analysis?	n/a	I	n/a	n/a	66%
6	What percentage of individuals recruited into the study are not included in the analysis?	I	I	I	I	100%
7	Is the analysis by intention to intervene (treat)?	n/a	I	n/a	n/a	66%
8	Are results homogenous between sites?	n/a	I	n/a	n/a	66%
9	How well was the study done to minimise bias?	B2	B1	B2	B2	66%
10	Is the overall effect of the study due to the study intervention?	B2	B1	B2	B2	66%
11	Explain if there is any practical/ethical reason why an RCT cannot be done?	n/a	n/a	n/a	n/a	100%
	TOTAL SCORE	A: 0 B1: 2 B2: 2 C: 0 I: 1 n/a: 6	A: 0 B1: 3 B2: 1 C: 0 I: 6 n/a: 1	A: 0 B1: 2 B2: 2 C: 0 I: 1 n/a: 6	A: **0** B1: **2** B2: **2** C: **0** I: **1** n/a: **6**	
		OVERALL PERCENTAGE AGREEMENT:				**75%**

Table 4.19 Analysis of Article CS: Article 9

AUTHOR(S):	Schreiber and Louw
YEAR:	2011
TITLE:	The effect of gluteus medius training on hip kinematics in a runner with iliotibial band syndrome

STUDY PROPERTIES:

Form of measurement	Frequency of measurement	Duration of study	Number of participants	Assessors blinded	Control used	Randomisation of participants	Ranking	Total Percentage Agreement
Gluteus medius strength, using a hand held dynamometer. Visual analogue scale for pain during rest and activity.	Pre-test and post-test measurements were taken.	The study was conducted over an eight week period. A rehabilitation period of six weeks occurred within the total of eight weeks.	Single participant.	No assessors were blinded.	No control group was used.	No randomisation was done.	A: 0 B1: 2 B2: 2 C: 0 I: 1 n/a: 6	75%

LIMITATIONS:

In a critique of their publication, Schreiber and Louw (2011) suggested that a larger sample size is required. Although this is a limitation, in terms of interpretation of their data, it is seen as a positive outcome with regards, to the methodological rigor of their study.

It was noted that the rehabilitation programme was six weeks in duration. In line with current literature, the authors suggested that a longer duration of six weeks may be required to adequately support the degree of improvement of the gluteus medius strength.

The authors had one participant who was an athletically fit, male 21-years-old, who did not generally represent participants suffering from ITBS.

OUTCOME:	It was found that the participant had a significantly increased adduction of the affected leg, and significantly reduced gluteus medius strength, when compared to the unaffected leg at baseline. Based on the outcome of the study, the authors suggest that improved gluteus medius strength increases the participant's ability to abduct, limits the ability adduct and therefore, improves control of hip function. However, the outcome achieved by this study may only apply to younger, athletically fit, male individuals.
DISCUSSION:	The study was found to have been conducted very thoroughly. It however lacked a large sample group, which would have created more potential for bias. Nevertheless, the structured measurement intervals and clear reporting allowed for the authors to indicate that their findings may be of benefit to a larger, clinical population of ITBS participants. To this end, the authors found that the gluteus medius of the affected leg differed in strength by 37.5%, as compared to unaffected leg, suggesting that the gluteus medius muscle is significantly weaker as compared to the unaffected leg. The participant had been cycling prior to the study, but also continued cycling throughout the study. This exercise was not controlled.
CONCLUSION:	In comparison to Fredericson *et al*., (2000), Schreiber and Louw's (2011) study shows a significant effort by the authors to apply methodologically rigorous structures within the case study, however, unlike Fredericson *et al.,* (2000), they do not have a control, they do not have randomisation of participants, and they only had one participant, as compared to 54 participants in Fredericson *et al.,* (2000). By contrast, this study, when compared to Baer (1999), Baker (1995), Barber and Sutker (1992), Noble (1979), Noble (1980), Pedowitz (2005) and Pettitt and Dolski (2000) (see Table 4.18), has both objective and subjective outcome measures, a pre-test – post-test, A-B-A design and is conducted on a test principal (the interventions were not specifically decided on in terms of their clinical necessity); therefore the level of evidence supporting the use of gluteus medius strengthening in the treatment of ITBS is moderate. Thus, studies establishing the effectiveness of hip strengthening programmes should be conducted on a larger sample group. Additionally, the role of core strengthening with hip abductor strengthening should be explored.

Table 4.20 Tabulated Feedback Data for CS: Article 10

AUTHOR(S):	Simoens, Vanhoenacker, Willemen and De Schepper
YEAR:	2002
TITLE:	Iliotibial band friction syndrome
CRITERION:	Although this study was identified and met the inclusion criteria as outlined in Chapter Three, point 3.3.3.2, an email communication on 22 February 2013, with Mrs Avenal Finlayson confirmed that this article could not be located, and was therefore subsequently excluded from the systematic review.

4.4.1.2 Discussion

Table 4.21 Outcome and Methodological Ranking of Case Studies / Series

Study Type:	**Case Studies / Case Series**			
Author(s)	**Year:**	**Reported Outcome:**	**Methodological Ranking:**	**Outcome as determined by reviewers:**
Fredericson *et al.*	2000	A six week rehabilitation programme focused on **improving hip abductor strength** was efficient in reducing symptoms related to ITBS.	A: 2 B1: 3 B2: 2 C: 0 I: 1 n/a: 3	Good
Pedowitz	2005	The strain-counterstrain method of osteopathic manipulative treatment, when used in conjunction with stretching exercises, ice / heat application and non-steroidal anti-inflammatories (**combination therapy**) is effective in reducing the symptoms related to ITBS.	A: 0 B1: 0 B2: 2 C: 1 I: 2 n/a: 6	Moderate
Schreiber and Louw	2011	Increasing **gluteus medius strength**, results in increased control of the hip, and therefore an improvement in the symptoms related to ITBS.	A: 0 B1: 2 B2: 2 C: 0 I: 1 n/a: 6	Moderate
Baer	1999	**Active release technique** is a quick and effective method to treat ITBS.	A: 0 B1: 0 B2: 0 C: 3 I: 3 n/a: 5	Poor

Author(s)	Year:	Reported Outcome:	Methodological Ranking:	Outcome as determined by reviewers:
Baker	1995	**Manipulation of the talar joint** was sufficient in resolving the symptoms of ITBS, where talar fixation was the cause of ITBS.	A: 0 B1: 0 B2: 0 C: 4 I: 1 n/a: 6	Poor
Barber and Sutker	1992	**A combination of conservative interventions** including: rest from activity, reduction in mileage, correct shoe selection for activity, anti-inflammatory medication, use of local modalities and addressing causative factors are effective in reducing symptoms related to ITBS. Therefore, the prognosis for improvement of ITBS was good.	A: 0 B1: 0 B2: 0 C: 4 I: 2 n/a: 5	Poor
Noble	1979	Addressing causative factors of ITBS, particularly **training errors and the surface on which the athlete trains,** are appropriate in the conservative care of ITBS.	A: 0 B1: 0 B2: 0 C: 2 I: 3 n/a: 6	Poor
Noble	1980	Addressing causative factors of ITBS, particularly **training errors and the surface on which the athlete trains**, are appropriate in the conservative care of ITBS.	A: 0 B1: 0 B2: 0 C: 5 I: 1 n/a: 5	Poor
Pettitt and Dolski	2000	**Corrective neuromuscular approach** is beneficial in the treatment of ITBS, in comparison to prescription of orthoses.	A: 0 B1: 0 B2: 0 C: 4 I: 1 n/a: 6	Poor
Simoens *et al.*	2002	Unavailable	-	-

4.4.2 Non-randomised controlled trials introduction

The Newcastle-Ottawa Scale (Wells *et al.,* 2003) was selected as the scale of choice for the review and rating of all non-randomised controlled trials. The scale is divided into three individual sections; selection, comparability and exposure. Each section has a specific number of criteria, for which a single star can be awarded, with the exception of the comparability section, for which a maximum of two stars can be awarded. The maximum number of stars that can be awarded are four stars for selection, two for comparability and three for exposure. A total of nine stars can, therefore, be achieved for each study. For ease of data capturing, when a star was awarded, it was recorded with a "1", whereas, if no star was awarded, a "0" was recorded. The total of each reviewer is listed within the total score row, with a mean total score calculated from the total score of each reviewer. The percentage agreement was calculated for each individual criterion, to establish the degree of agreement between reviewers. A percentage agreement of 100% indicates that the reviewers were all in total agreement regarding that individual criterion, whereas, a percentage agreement of 66% indicates that one of the three reviewers was not in agreement, and a percentage agreement of 33% indicated that neither of the three reviewers were in agreement.

The total percentage agreement indicates the overall level of agreement between reviewers throughout review of an individual study.

4.4.2.1 Examiner agreement and ranking of articles: Non-randomised controlled trials

Table 4.22 List of table numbers for non-randomised controlled trial feedback and analysis

Tabulated feedback data:	Analysis of article:	Author(s):	Year:	Title:
Table 4.23	Table 4.24	Beers, Ryan, Kasubuchi, Fraser and Taunton	2008	Effects of multi-modal physiotherapy including hip abductor strengthening, in participants with iliotibial band friction syndrome
Table 4.25	Table 4.26	Fredericson, White, MacMahon and Andriacchi	2002	Quantitative analysis of the relative effectiveness of 3 iliotibial band stretches
Table 4.27	Table 4.28	Sutker, Barber, Jackson and Pagliano	1985	Iliotibial band syndrome in distance runners
Table 4.29	Table 4.30	Taunton, Clement, Smart and McNicol	1987	Non-surgical management of overuse knee injuries in runners
Table 4.31	Table 4.32	Wong and Wade	1995	Reducing iliotibial band contractures in participants with muscular dystrophy using custom dry floatation cushions

Table 4.23 Tabulated Feedback Data for N-RCT: Article 1

AUTHOR(S):	Beers, Ryan, Kasubuchi, Fraser and Taunton					
YEAR:	2008					
TITLE:	Effects of multi-modal physiotherapy including hip abductor strengthening, in participants with iliotibial band friction syndrome					
CRITERIA:[1]		**Reviewer 1**	**Reviewer 2**	**Reviewer 3**	**Majority**	**Percentage Agreement**
Selection:	1. Is the case definition adequate?	1	0	1	1	66%
	2. Representativeness of the cases	1	0	1	1	66%
	3. Selection of controls	0	1	1	1	66%
	4. Definition of controls	1	1	1	1	100%
Comparability:[2]	5. Comparability of cohorts on the basis of design or analysis	1	2	1	1	66%
Exposure:	6. Ascertainment of exposure	0	0	0	0	100%
	7. Same method of ascertainment for cases and controls	0	1	0	0	66%
	8. Non-response rate	0	1	0	0	66%
	TOTAL SCORE	**4**	**6**	**5**	**5**[3]	
		OVERALL PERCENTAGE AGREEMENT:				**75%**

[1] For ease of reference, the eight criteria have been labelled one to eight in section 4.2.2. This is in contrast to the Newcastle-Ottawa Scale (Wells *et al.,* 2003) which delineates the questions per criterion (viz. selection, comparability and exposure).
[2] This is the only criterion which has a two point allocation.
[3] The score calculated for the study, is derived from the majority score of the three reviewers, and not a mean calculation of the three individual reviewer total scores.

Table 4.24 Analysis of Article N-RCT: Article 1

AUTHOR(S):	Beers, Ryan, Kasubuchi, Fraser and Taunton
YEAR:	2008
TITLE:	Effects of multi-modal physiotherapy including hip abductor strengthening, in participants with iliotibial band friction syndrome

STUDY PROPERTIES:

Form of measurement	Frequency of measurement	Duration of study	Number of participants	Assessors blinded	Control used	Randomisation of participants	Ranking out of 9	Total Percentage Agreement
Hip strength was measured using a dynamometer, additionally the Allan McGavin Health Status Index and a five-point numeric rating scale was used to rate improvement of participants' symptoms.	Measurements for hip abductor strength were taken at week 0 and 6. The Allan McGavin Health Status Index and the numeric rating scale were measured at weeks 2, 4 and 6.	The study was completed over a six week duration.	Sixteen participants were included in the study.	Not mentioned.	No control group was included.	Participants were not randomised.	5	75%

LIMITATIONS:	A small sample size of sixteen participants was used, which implies that there was no *a priori* analysis that was completed (as noted by the authors). There is inconsistent reporting of the participant number, including a variation between thirteen to sixteen participants (number diagnosed, sporting activities per participant). Although the consort description of participant recruitment and dropout is consistent with the abstract. Not all participants participated in similar sporting activities, which implies that within the sixteen participants there were subsets of different sporting activity.

LIMITATIONS CONTINUED:	Three different exercises were included in the rehabilitation programme, all of these were focused on improving hip abductor strength. In addition to this, two ITB stretches, ultrasound, muscle energy technique and self-correction exercise to improve any pelvic malalignment present, were also utilised. This limits the ability of the study to conclude improvement on any one exercise, and only allows for comment on the programme as a whole. The lack of a control group negates the ability of the authors in suggesting that rehabilitation programme was solely responsible for the resolution of the ITBS, as no comparison to the natural history of ITBS, either via the use of a control treatment (receiving a sham treatment, or a non-intervention group was possible. It should be noted that the authors do report this as a major criticism of their study. It is not clearly defined which of the authors were responsible for participant assessment (i.e. participant diagnosis), and who were responsible for administering the various outcome measures, and whether they were the same or different individuals. The lack of clarity in this regard, limits the reviewer's ability to determine the possible presence of bias, and therefore provides difficulty when contextualising the clinical improvement of participants.
OUTCOME:	The structured rehabilitation programme was sufficient in improving hip abductor strength. The authors suggested, based on trends of improvement, that the use of a rehabilitation programme was able to affect clinical change in the treatment of ITBS. Further to the above, the authors could not establish whether muscular weakness preceded the development of pain, or whether pain resulted from the development in muscular weakness. They did, however, suggest that increasing the strength of the hip abductors improved the overall outcome of ITBS. Nevertheless, the authors of the study concluded that inclusion of a hip abductor strengthening exercises into a rehabilitation programme for ITBS, contributed positively towards the overall improvement of the participants' symptoms.

DISCUSSION:	Due to the number of other interventions which were incorporated in the rehabilitation programme, the limited sample size, and the lack of significance achieved over the six week intervention programme, the findings do not fully support the authors' statement that strengthening of the hip abductor musculature alone contributed to the imbalances reported at the hip. The authors could not conclude that strengthening the hip abductor musculature alone contributed to the improvement of imbalances reported at the hip. In addition, the lack of a control group in the design of the study, further limits the conclusions that were drawn by the authors. As a result the authors are only able to comment on a comprehensive rehabilitation programme as a unit, and based on non-significant trends that were established during the course of the study.
CONCLUSION:	Although the study highlights the possibility that weak hip abductor musculature may play a role in the initiation and / or perpetuation of ITBS, and that its treatment may allow for expedient recovery of participants suffering from ITBS, these significant limitations as noted in Table 4.23, limit the authors' ability to firmly conclude these outcomes. This analysis of their publication concurs with that of the reviewers, in which the overall review ranking attained an average score of five out of nine, indicating the reviewers' reservations around those particular criteria that are linked to the flaws of this study.

Table 4.25 Tabulated Feedback Data for N-RCT: Article 2

AUTHOR(S):	Fredericson, White, MacMahon and Andriacchi					
YEAR:	2002					
TITLE:	Quantitative analysis of the relative effectiveness of 3 iliotibial band stretches					
CRITERIA:		**Reviewer 1**	**Reviewer 2**	**Reviewer 3**	**Majority**	**Percentage Agreement**
Selection:	1. Is the case definition adequate?	0	0	0	0	100%
	2. Representativeness of the cases	0	0	0	0	100%
	3. Selection of controls	1	1	1	1	100%
	4. Definition of controls	0	1	1	1	66%
Comparability:	5. Comparability of cohorts on the basis of design or analysis	2	2	2	2	100%
Exposure:	6. Ascertainment of exposure	0	0	0	0	100%
	7. Same method of ascertainment for cases and controls	0	1	1	1	66%
	8. Non-response rate	0	1	1	1	66%
	TOTAL SCORE	**3**	**6**	**6**	**6**	
		OVERALL PERCENTAGE AGREEMENT:				**87%**

Table 4.26 Analysis of Article N-RCT: Article 2

AUTHOR(S):	Fredericson, White, MacMahon and Andriacchi							
YEAR:	2002							
TITLE:	Quantitative analysis of the relative effectiveness of three iliotibial band stretches							
STUDY PROPERTIES:								
Form of measurement	**Frequency of measurement**	**Duration of study**	**Number of participants**	**Assessors blinded**	**Control used**	**Randomisation of participants**	**Ranking out of 9**	**Total Percentage Agreement**
Change in tissue length of the ITB. Verbal confirmation from participants as to the sensation of the "best" degree of stretch of the ITB.	A once off measurement was taken.	The duration of the study was not reported.	Five participants were included in this study.	Assessors were not blinded.	No control group was used.	Participants were not randomised.	6	87%
LIMITATIONS:	The limitations of the study include; a small sample size, the lack of *a priori* analysis and a lack of appropriate confidence interval adjustment, as well as the study was focused to a group of elite male athletes. A control group was also not used, and there was no indication at baseline that the five participants had similar inability to perform the stretch. Additionally, no discussion was made as to whether the participants competed in any other sporting activities, or had at that point had a stretching regimen, prior to starting the study. Although the use of randomised sequences for the sequence in which the stretches were performed, it does not allow for consistency in comparing inter-stretch effects of the different stretches between participants. The authors collected data, according to what participants reported as a "good stretch"; which is a very subjective method of measurement and the perception of a "good stretch" may have differed between participants.							

OUTCOME:	The study reported that one particular stretch was seen as being the best, as well as statistically more efficient in increasing the functional tissue length of the ITB. The stretch requires the participant to stand upright, with the affected leg extended and adducted across the unaffected leg. The participant is asked to exhale and slowly flex the trunk over to the unaffected side, and to clasp hands overhead and to extend the arms over to the side in which the trunk is flexing. This stretch was found to achieve the greatest change in length of the ITB. Thus the authors suggest that this stretch should be considered when teaching athletes how to stretch.
DISCUSSION:	Notwithstanding the limitations, the authors went to great lengths to control as many factors as possible (these included; taking the measurements at the same time of day, taking the average of five measurements, allowing for a warm-up stretch, comparing what the participants reported, to what was physically measured, randomisation of the stretches performed and no history of previous injury or surgery to the lower extremity). In the context of limitations, however, it is suggested that the use of these stretches are further tested clinically and in laboratory settings to ensure that the outcomes of this study indeed hold true.
CONCLUSION:	In view of the limitations of this study, the reviewers at best ranked this study as having attained an average outcome (see Table 4.25), indicating that although several parameters were adequately controlled for in the study design, there were still numerous flaws, of which the outcomes of this study need to be contextualised. This ranking further implies that the outcomes of this particular study will need to be validated through more rigorous and controlled studies with larger sample sizes, in order to confirm the use of the indicated stretch in clinical practice.

Table 4.27 Tabulated Feedback Data for N-RCT: Article 3

AUTHOR(S):	Sutker, Barber, Jackson and Pagliano					
YEAR:	1985					
TITLE:	Iliotibial band syndrome in distance runners					
CRITERIA:		**Reviewer 1**	**Reviewer 2**	**Reviewer 3**	**Majority**	**Percentage Agreement**
Selection:	1. Is the case definition adequate?	0	0	0	0	100%
	2. Representativeness of the cases	0	1	0	0	66%
	3. Selection of controls	0	1	1	1	66%
	4. Definition of controls	0	0	0	0	100%
Comparability:	5. Comparability of cohorts on the basis of design or analysis	1	2	2	2	66%
Exposure:	6. Ascertainment of exposure	0	0	0	0	66%
	7. Same method of ascertainment for cases and controls	0	1	1	1	66%
	8. Non-response rate	0	1	1	1	66%
	TOTAL SCORE	**1**	**6**	**5**	**5**	
			OVERALL PERCENTAGE AGREEMENT:			**75%**

Table 4.28 Analysis of Article N-RCT: Article 3

AUTHOR(S):	Sutker, Barber, Jackson and Pagliano
YEAR:	1985
TITLE:	Iliotibial band syndrome in distance runners

STUDY PROPERTIES:

Form of measurement	Frequency of measurement	Duration of study	Number of participants	Assessors blinded	Control used	Randomisation of participants	Ranking out of 9	Total Percentage Agreement
No form of measurement was discussed.	Frequency of measurement was not discussed	The study was for the duration of one year.	A total of 48 participants were included in the study.	No, as this was a retrospective study.	No control group used, as this was a retrospective study.	No randomisation of participants as this was a retrospective study.	5	75%

LIMITATIONS:	The limitations in this study are presented as this was a retrospective study; therefore the study relies on accurate record keeping by the physician (physicians) who observed the participants over a particular year. In addition, there would also have been variants in the treatment combinations between participants diagnosed with ITBS, as the interventions would have been based on best clinical practice, according to individual participant requirements, as compared to a more rigid and structured delineated research protocol. The authors could not exclude prior interventions, prior to inclusion into the study.
OUTCOME:	The outcome of the study was to describe various parameters / characteristics of participants suffering from ITBS and to comment on the most commonly employed treatment interventions, with limited ability to discuss the effectiveness of these interventions. The limitation around treatment effectiveness is present as a result of the fact that descriptive data only measures the frequency with which treatment interventions are used, and not whether they achieve a clinically significant outcome for the participant. Additionally, the combination of treatments utilised limited the authors, minimises the ability to suggest the use of any one or more modalities as being effective in isolation or combination in the treatment of ITBS.

DISCUSSION:	Based on the significant limitations of retrospective studies, this particular study is unable to draw firm conclusions with regards to effective strategies for the management of ITBS. This inability is further compounded by the focus on descriptive statistics which utilized frequency of interventions, which have in some instances been utilized to infer their clinical effectiveness. As a result, this study has significantly limited ability to suggest any form of intervention as being the most suited for the expedient clinical treatment of ITBS.
CONCLUSION:	Based on the limitations, outcomes and discussion of this study, it is therefore not surprising that the reviewers individually and collectively rated this study from average to very poor, in terms of the criteria outlined in the Newcastle-Ottawa Scale (Wells *et al.,* 2003). This agreement between the reviewers again suggested that the outcomes of this study have limited methodological rigor underpinning them. Therefore, the results need to be contextualised and read with caution limiting their use in clinical practice. It is, therefore, recommended that future studies investigate the assertions made by the authors.

Table 4.29 Tabulated Feedback Data for N-RCT: Article 4

AUTHOR(S):	Taunton, Clement, Smart and McNicol					
YEAR:	1987					
TITLE:	Non-surgical management of overuse knee injuries in runners					
CRITERIA:		**Reviewer 1**	**Reviewer 2**	**Reviewer 3**	**Majority**	**Percentage Agreement**
Selection:	1. Is the case definition adequate?	1	0	0	0	66%
	2. Representativeness of the cases	1	1	1	1	100%
	3. Selection of controls	0	1	0	0	66%
	4. Definition of controls	1	0	0	0	66%
Comparability:	5. Comparability of cohorts on the basis of design or analysis	2	2	2	2	100%
Exposure:	6. Ascertainment of exposure	0	0	0	0	100%
	7. Same method of ascertainment for cases and controls	0	1	0	0	66%
	8. Non-response rate	0	1	1	1	66%
	TOTAL SCORE	**5**	**6**	**4**	**4**	
		OVERALL PERCENTAGE AGREEMENT:				**79%**

Table 4.30 Analysis of Article N-RCT: Article 4

AUTHOR(S):	Taunton, Clement, Smart and McNicol
YEAR:	1987
TITLE:	Non-surgical management of overuse knee injuries in runners

STUDY PROPERTIES:

Form of measurement	Frequency of measurement	Duration of study	Number of participants	Assessors blinded	Control used	Randomisation of participants	Ranking out of 9	Total Percentage Agreement
Improvement in ability to train pain-free.	Not discussed.	Not discussed.	A total of 73 participants were included in the study, of those 73, ten were suffering from ITBS.	No blinding of assessors.	No control group used.	Participants were not randomised.	4	79%

LIMITATIONS:

The study is not limited to only ITBS participants and included a wide variety of clinical conditions and aetiologies.

Study was completed with regards to management of overuse knee injuries, ten of which were ITBS participants.

Treatment included a number of interventions: modified rest, reduction in training volume and intensity, flexibility exercises, local physiotherapy, anti-inflammatory medication, ice massage, muscular strengthening of the quadriceps and hamstrings and orthoses as required. The interventions were not standardised by condition or research protocol. For the most part, the research participants were used as their own control, as the study was set up as a pre- and post-evaluation study. Therefore, there is limited capability to exclude the effects of the natural history of ITBS, without the use of a placebo or natural history group, with which comparisons can be made.

The use of the combination of therapies, also does not allow for the identification of particular or individual modalities that are effective in the treatment of ITBS.

The assumption that relief of pain over time (when natural history is excluded) as an isolated measure of clinical improvement, limits the ability to determine the clinical effectiveness of the interventions. Another limitation in terms of the cybex is the

LIMITATIONS CONTINUED:	assumption that muscle inhibition is only related to the presence of pain, within the hip or knee joint. Therefore, the assumption is made that improved cybex readings infer an absence / decrease of pain and therefore infer clinical resolution. The authors do not state whether a familiarisation protocol was followed in order to ensure that participants were familiar with the use of a cybex machine. The lack of this description suggests that the readings taken at point one may more accurately reflect the participants inability to understand the use of a cybex, as compared to their second set of readings, at which they may have become familiar with the use of the machine.
OUTCOME:	The outcomes seem to be based on a number of different criteria which includes the reduction of symptoms, including the reduction of activity, control of pain and swelling, institution of specific strength and flexibility training programme, changes to biomechanical function, orthotics, and the controlled return to activity. Combinations of these various criteria suggest that a comprehensive plan that is structured and goal directed would attain the best outcomes for participants with knee injuries from running. But, the findings have limited capability to support any one form of intervention over another.
DISCUSSION:	This particular study presented with a variety of variables through the inclusion of all knee injuries related to running, within the context of an active sports medicine clinic; as a result the study has significant limitations in so far as identifying improvement for individual overuse conditions of the knee. The study had a sample size of ten participants who were suffering from ITBS. This sample size limits the reliability of conclusions drawn from the study with regards to the management of ITBS. To further confound the above, the application of multimodal therapy programmes obscures the authors' ability to make comment on the effectiveness of any one treatment, of any of the conditions (e.g. ITBS).

CONCLUSION:	As a result of the significant limitations discussed in Table 4.28, and as noted by the authors, it becomes apparent that the capability of the study to suggest particular interventions for the treatment of ITBS becomes impaired. This outcomes is consistent with the rating of the reviewers where the majority ranking indicates an average to below average outcome, reinforcing the limitations outlined in Table 4.30 and as a result this analysis by the three reviewers concurs with the authors, suggesting that future studies should attempt to isolate the variable in the treatment protocols that allow for effective clinical resolution of the various conditions reported.

Table 4.31 Tabulated Feedback Data for N-RCT: Article 5

AUTHOR(S):	Wong and Wade					
YEAR:	1995					
TITLE:	Reducing iliotibial band contractures in participants with muscular dystrophy using custom dry floatation cushions					
CRITERIA:		**Reviewer 1**	**Reviewer 2**	**Reviewer 3**	**Majority**	**Percentage Agreement**
Selection:	1. Is the case definition adequate?	1	0	0	0	66%
	2. Representativeness of the cases	0	0	0	0	100%
	3. Selection of controls	0	0	0	0	100%
	4. Definition of controls	0	0	0	0	100%
Comparability:	5. Comparability of cohorts on the basis of design or analysis	0	1	1	1	66%
Exposure:	6. Ascertainment of exposure	0	0	0	0	100%
	7. Same method of ascertainment for cases and controls	0	1	1	1	66%
	8. Non-response rate	0	1	0	0	66%
	TOTAL SCORE	**1**	**3**	**2**	**2**	
		OVERALL PERCENTAGE AGREEMENT:				**83%**

Table 4.32 Analysis of Article N-RCT: Article 5

AUTHOR(S):	Wong and Wade
YEAR:	1995
TITLE:	Reducing iliotibial band contractures in participants with muscular dystrophy using custom dry floatation cushions

STUDY PROPERTIES:

Form of measurement	Frequency of measurement	Duration of study	Number of participants	Assessors blinded	Control used	Randomisation of participants	Ranking out of 9	Total Percentage Agreement
Degree of ITB contracture was measured using goniometry. The participants' reported levels of comfort were also recorded.	Measurement of contracture was taken every three weeks. Two measurements were taken prior to intervention use, and three times following intervention use.	The measurements of the study were taken within twelve weeks. Follow-up was done telephonically at six months and twelve months.	Nine participants were initially included in the study, although two dropped out of the study, and a final total of seven participants completed the study.	No assessors were blinded.	No control group was used.	Participants were not randomised.	2	83%

LIMITATIONS:

This study was applied to a very selective group of participants, in that they were nine male subjects suffering from varied stages of Duchenne's or limb-girdle muscular dystrophy, who were non-ambulatory and who suffered from ITB contractures. Therefore, the results of this study can only be applied to populations, falling within this participant specification.

There was inconsistency with the prior treatment regimen that participants had been receiving: three participants had used a gel cushion, three participants had used foam cushions, and one participant had used no cushion. Credit is due to the authors, that although this was a factor that they were unable to control, they did ensure that no changes in medication / physical therapy occurred during the study for the individual participants (this does not indicate that physical therapy was comparable between the individual participants).

The cushions were inflated according to individual participants' requirements. In one particular participant, the cushion had to be divided into two halves which were inflated separately, so as to accommodate for the participant's spinal scoliosis and pelvic

LIMITATIONS CONTINUED:	obliquity. Over the duration of the treatment period, the custom cushions were inflated so as to increase adduction of the participant's limbs. Therefore, this incremental increase in the stretch of the ITB was very specific between the individual participants, and therefore not standardised. This limited comparability between participants at measurement time points. When reviewing the previous three paragraphs, it becomes apparent that each participant may have been receiving various combinations of physical therapy and incremental increases in ITB stretching; this resulted in the interventions each participant received incomparable to each other. A small sample group of seven participants were used in the study, of which five were followed-up telephonically at six months and one year; of these five only two were physically re-evaluated at six months and one year. Conclusions on the effectiveness of the intervention in the short-term (twelve weeks) were drawn on all participants, whereas conclusions of the long-term effectiveness of the intervention was drawn on only two participants. As a result the conclusions reached i.e. the level of effectiveness has erroneously been shown to increase between 4% – 31% without due regard for the possibility that those participants who were not re-evaluated, have regressed or maintained (degree of ITB contracture) at the 34% at the end of the twelve weeks.
OUTCOME:	According to the authors, custom dry floatation cushions were effective in reducing ITB contractures in non-ambulatory muscular dystrophy participants; this conclusion was drawn from the statistical significant reduction in ITB contracture over the first nine weeks of the study. At the one year re-evaluation, the authors suggested that the participant who had had the greatest degree of contracture, (at outset) had shown the greatest degree of improvement. In addition, the study found that custom dry floatation cushions were found to be of average comfort when compared to previous seating systems, and were found to be appropriate for all-day use; the change in the reported level of comfort, however, was not statistically significant.
DISCUSSION:	Although the research protocol was appropriately structured in terms of the data collection processes, the lack of homogeneity within the sample (condition staging and type, age of participants, variations in physical therapy, variation in custom dry

DISCUSSION CONTINUED:	floatation cushion inflation and prior seating system) significantly limited the authors from drawing any firm conclusions, beyond the nine week intervention period. Had there been greater clarity on the type of physical therapy being given, as well as, greater detail into manner in which the custom dry cushion was used to address the ITB contracture (e.g. frequency of inflation and pressure of air), it would allow the reader to more appropriately contextualise the results that the authors suggested. Wong and Wade (1995) suggested that the individual responsible for taking goniometric measures was blinded to a limited extent; it is however evident that he / she had full access to the participants, knew about the interventions, and would have been the therapist to perform the measurements previously. Thus, it is possible that although this therapist may have had limited access to previously recorded data, the extent to which bias toward improvement or lack thereof was not made clear. Credit should be given to the authors for appropriately reporting of methods used for measurement, and consistence, in that one particular therapist was responsible for taking readings. Although the authors declare no conflict of interest and that no parties were to benefit from the results of the study, it becomes apparent on reading the acknowledgements that persons intimately associated with the study did in fact supply the custom dry floatation cushion and accessories. Therefore, it is unclear to what extent an influence if any was exerted on the reported outcomes of the study.
CONCLUSION:	Although the reviewers observed that this study was a valiant attempt at achieving improved clinical outcomes for a particular subset of participants, the inherent flaws related to participant homogeneity did not clearly define the intervention strategies and the significant drop out at the various measurement time points significantly limits the studies capability to draw any firm conclusions with regards to the effectiveness of custom dry floatation cushions. When comparing this outcome and analysis of the study, to the ranking attributed to this article by the reviewers, it becomes evident that the reviewers agree that there are significant flaws within the structure of the study. Therefore, at best it can be concluded that custom dry floatation cushions

	has less than poor evidence for its effectiveness in clinical practice.

4.4.2.2 Discussion

Table 4.33 Outcome and Methodological Ranking of Non-randomised Controlled Trials

Study Type:	**Non-randomised Controlled Trials**			
Author(s)	**Year:**	**Reported Outcome:**	**Methodological Ranking:**	**Outcome as determined by reviewers:**
Beers *et al.*	2008	The inclusion of **hip abductor strengthening** exercises into a rehabilitation programme for the treatment of ITBS, contributed positively towards the overall improvement of the participant.	5	Moderate
Fredericson *et al.*	2002	The study reported that **one particular ITB stretch** was seen as being the best, as well as statistically more efficient in increasing the functional tissue length of the ITB (see Table 4.25 Analysis of Article – N-RCT – Article 2, for description of stretch).	6	Moderate
Sutker *et al.*	1985	The study described various aetiological characteristics of participants suffering from ITBS, and commented on the most commonly employed treatment interventions and their outcome. The study concluded by discussing the effect of various **combinations of treatments** in ITBS.	5	Moderate

Author(s)	Year:	Reported Outcome:	Methodological Ranking:	Outcome as determined by reviewers:
Taunton *et al.*	1987	**A combination treatment** (including: reduction of activity, control of pain and swelling, institution of specific strength and flexibility training programme, changes to biomechanical function, orthotics, and the controlled return to activity) was found to be effective in attaining the best outcomes for persons suffering from knee injuries as a result of running.	4	Poor
Wong and Wade	1995	**Custom dry floatation cushions** were effective in reducing ITB contractures in study participants with non-ambulatory muscular dystrophy participants. Participants who initially presented with the greatest degree of contracture showed greater improvement. In addition, the study found that custom dry floatation cushions were found to be of average comfort when compared to previous seating systems, and were found to be appropriate for all-day use.	2	Very Poor

4.4.3 Randomised controlled trials introduction

The PEDro Scale (www.pedro.org.au, 1999) was utilized for reviewing of all RCTs. The scale consists of eleven criteria to rate, of which a total of one score can be allotted to each criteria, therefore, the maximum ranking a RCT can be rated is eleven. One point was allocated to the study being reviewed for each "Y" awarded. When an "N" was awarded for a criterion, no point was awarded.

4.4.3.1 Examiner agreement and ranking of articles: Randomised controlled trials

Table 4.34 List of table numbers for randomised controlled trial feedback and analysis

Tabulated feedback data:	Analysis of article:	Author(s):	Year:	Title:
Table 4.35	Table 4.36	Bischoff, Prusaczyk, Sopchick, Pratt and Goforth	1995	Comparison of phonophoresis and knee immobilization in treating iliotibial band syndrome
Table 4.37	Table 4.38	Grau, Krauss, Maiwald, Axmann, Horstmann and Best	2011	Kinematic classification of iliotibial band syndrome in runners
Table 4.39	Table 4.40	Gunter and Schwellnus	2004	Local corticosteroid injection in iliotibial band friction syndrome in runners: a randomised controlled trial
Table 4.41	Table 4.42	Hirschmüller, Baur, Muller, Helwig, Dickhuth and Mayer	2011	Clinical effectiveness of customised sport shoe orthoses for overuse injuries in runners: a randomised controlled study
Table 4.43	Table 4.44	Schwellnus, Mackintosh and Mee	1992	Deep transverse frictions in the treatment of iliotibial band friction syndrome in athletes: a clinical trial
Table 4.45	Table 4.46	Schwellnus, Theunissen, Noakes and Reinach	1991	Anti-inflammatory and combined anti-inflammatory/analgesic medication in the early management of iliotibial band friction syndrome. A clinical trial

Table 4.35 Tabulated Feedback Data for RCT: Article 1

AUTHOR(S):	Bischoff, Prusaczyk, Sopchick, Pratt and Goforth					
YEAR:	1995					
TITLE:	Comparison of phonophoresis and knee immobilization in treating iliotibial band syndrome					
CRITERION:		**Reviewer 1**	**Reviewer 2**	**Reviewer 3**	**Majority**	**Percentage Agreement**
1	Eligibility criteria were specified	Y	Y	Y	Y	100%
2	Subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received)	Y	Y	Y	Y	100%
3	Allocation was concealed	N	N	N	N	100%
4	The groups were similar at baseline regarding the most important prognostic indicators	Y	Y	Y	Y	100%
5	There was blinding of all subjects	N	N	N	N	100%
6	There was blinding of all therapists who administered the therapy	N	N	N	N	100%
7	There was blinding of all assessors who measured at least one key outcome	N	N	N	N	100%
8	Measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups	Y	N	Y	Y	66%
9	All subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analysed by “intention to treat”	Y	Y	Y	Y	100%
10	The results of between-group statistical comparisons are reported for at least one key outcome	Y	Y	Y	Y	100%
11	The study provides both point measures and measures of variability for at least one key outcome	Y	N	Y	Y	66%
	TOTAL SCORE	**7**	**5**	**7**	**7**	
		OVERALL PERCENTAGE AGREEMENT:				**94%**

Table 4.36 Analysis of Article RCT: Article 1

AUTHOR(S):	Bischof, Prusaczyk, Sopchick, Pratt and Goforth
YEAR:	1995
TITLE:	Comparison of phonophoresis and knee immobilization in treating iliotibial band syndrome

STUDY PROPERTIES:

Form of measurement	Frequency of measurement	Duration of study	Number of participants	Assessors blinded	Control used	Randomisation of participants	Ranking out of 11	Total Percentage Agreement
Number of days from initial diagnosis to pain-free examination and completion of a pain-free one mile run were used to establish degree of improvement.	Daily measurements were taken from the twenty-five participants.	Each participant was treated with a ten session treatment regimen, over the course of two weeks.	Twenty-five participants were included, one of the participants suffered from ITBS bilaterally; therefore thirteen knees were each allocated to Group I and P.	Assessor blinding was not mentioned in the study.	A control Group and Group P consisted of thirteen knees each.	Knees were randomised to either Group I or Group P.	7	94%

LIMITATIONS:	It is not clear as to the rationale for the comparison of the two therapies, particularly when the therapies achieve clinical outcomes by opposing means. The findings were made artificial through comparison of the clinical differences between the groups at their final readings. In addition to the differing physiological effects of the interventions (phonophoresis versus immobilisation), the use of hydrocortisone, coupled with the ultrasound (phonophoresis) serves to further widen the comparison between the groups, by adding a second mechanism of action for Group P. With the inherent bias toward the group achieving greatest clinical outcome, it would have perhaps been a significant consideration to include a blinded assessor to conduct all measurements to internally validate the results more strongly.

LIMITATIONS CONTINUED:	No *a priori* analysis was completed to determine whether an appropriate sample size was utilised in order to achieve a power of greater than 80%.
OUTCOME:	The study found that treatment of participants suffering from ITBS with phonophoresis was statistically significant when compared to a control group receiving a management programme consisting of rest and immobilization of the affected knee. The study concluded that inclusion of phonophoresis with 10% hydrocortisone into a treatment regime was more beneficial in the treatment of ITBS as compared to knee immobilization.
DISCUSSION:	The study identified that there were a lack of studies supporting the use of phonophoresis alone in treatment of ITBS. As a result of this lack of evidence, the authors structured a RCT in order to determine the relative clinical effectiveness of phonophoresis with 10% hydrocortisone in comparison to an immobilization strategy. In the literature review there was no mention of prior studies evaluating the efficacy of phonophoresis in the treatment of ITBS. Therefore, it is not clear from the publication why the authors chose immobilization as the control group, when the first step in determining the effectiveness of an intervention should perhaps have been to compare it to a placebo (detuned ultrasound) or a similar standard of care (ultrasound without hydrocortisone); which would have allowed the authors to determine the efficacy / effectiveness of the modality versus no treatment or a treatment with a similar mechanism of action. According to the reviewers, it was not unexpected that the results achieved were not statistically significant between the two groups over time, based purely on the lack of an *a priori* analysis. Further aspects of this study that require attention to detail and bare a significant effect on the outcomes of the study (should it be repeated) include: (1) the lack of a consort diagram to represent the drop outs that are mentioned in the methodology but not reported, (2) a significant potential for bias in the exclusion of participants when they were unable to complete a the pain-free one mile treadmill run (it is stated that these participants were allocated to another group should this have happened) (3)

DISCUSSION CONTINUED:	the lack of contextualisation of the results with regards to only those participants that were able to complete the pain-free one mile run, and whether this was applicable to both groups, (4) the lack of representative outcomes that reflect both successful and unsuccessful participants (with regards to the successful resolution of the ITBS) and (5) the use of a median representative participant as a comparison between the two groups was necessitated in the study, due to the presence of significant outliers. This comparison however, does have limitations as the typical participant in each group is not necessarily representative of all ITBS participants, and therefore the context of the outcomes of the study become limited to the typical ITBS participant in this study.
CONCLUSION:	In terms of the review of this study, it is noted that the reviewers agreed to a 94% level and that this study had significant methodological rigor in terms of the criteria outlined in the PEDro scale (www.pedro.org.au, 1999) (reviewers ranked the article with a total score of seven, indicating a good level of methodological rigor, as outlined in Table 4.35). It is, however, apparent that with a lack of a consort diagram and participant tracking that the reader is left with a limited picture of the clinical progression of the participants through the study. As a result of this, the context for the conclusions of the study becomes obscured and the possibility for bias increases; which weakens an otherwise strong study.

Table 4.37 Tabulated Feedback Data for RCT: Article 2

AUTHOR(S):	Grau, Krauss, Maiwald, Axmann, Horstmann and Best					
YEAR:	2011					
TITLE:	Kinematic classification of iliotibial band syndrome in runners					
CRITERION:		**Reviewer 1**	**Reviewer 2**	**Reviewer 3**	**Majority**	**Percentage Agreement**
1	Eligibility criteria were specified	Y	Y	Y	Y	100%
2	Subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received)	Y	N	N	N	66%
3	Allocation was concealed	N	N	N	N	100%
4	The groups were similar at baseline regarding the most important prognostic indicators	Y	Y	Y	Y	100%
5	There was blinding of all subjects	N	N	N	N	100%
6	There was blinding of all therapists who administered the therapy	N	N	N	N	100%
7	There was blinding of all assessors who measured at least one key outcome	N	N	N	N	100%
8	Measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups	Y	Y	Y	Y	100%
9	All subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analysed by “intention to treat”	Y	N	Y	Y	66%
10	The results of between-group statistical comparisons are reported for at least one key outcome	Y	Y	Y	Y	100%
11	The study provides both point measures and measures of variability for at least one key outcome	Y	N	Y	Y	66%
	TOTAL SCORE	**7**	**4**	**6**	**6**	
		OVERALL PERCENTAGE AGREEMENT:				**91%**

Table 4.38 Analysis of Article RCT: Article 2

AUTHOR(S):	Grau, Krauss, Maiwald, Axmann, Horstmann and Best
YEAR:	2011
TITLE:	Kinematic classification of iliotibial band syndrome in runners

STUDY PROPERTIES:

Form of measurement	Frequency of measurement	Duration of study	Number of participants	Assessors blinded	Control used	Randomisation of participants	Ranking out of 11	Total Percentage Agreement
Range of motion of the hip, knee, ankle and rearfoot, as well as velocity of the hip, knee, ankle and rearfoot were measured.	Once off measurement – minimum of seven trials per participant, with average taken.	Duration of the study was not specified.	A total of thirty-six participants were included, eighteen participants were allocated to the two individual groups.	No assessors were blinded.	Eighteen participants were allocated to the control group.	Participants were matched according to gender, height and weight (to exclude differences in biomechanical variables associated with gender-related biomechanical factors as well as anthropometric variables.	6	91%

LIMITATIONS:	In agreement with the authors' suggestion, future studies should incorporate significantly larger samples of participants. Additionally, the authors recommend that a study focusing on gender-specific aetiological factors that contribute to the development of ITBS should be done.
OUTCOME:	This study found that participants suffering from ITBS presented with decreased hip adduction, as compared to the controls. Hip flexion velocity, maximum knee flexion, range of motion of hip frontage as well as hip abduction velocity were found to be significantly reduced. Evaluation of the co-ordination patterns of the lower limb displayed a tendency for ITBS participants to show a significantly earlier hip flexion. The reduced hip adduction in the ITBS participants was thought to be the result of increased knee abduction (although it was not measured in the study). Clinically, the study supports the application of

OUTCOME CONTINUED:	increasing ITB and associated muscle flexibility via stretching and / or massage of the ITB and hip musculature, as well as addressing myofascial trigger points of the associated musculature.
DISCUSSION:	Based on the aetiological findings of this study, it was recommended that the hip abduction range of motion be improved in participants suffering from ITBS. It was suggested that could be done by stretching of the hip musculature, as well as the hamstrings, calf muscles and hip flexors, massage (of the ITB itself, or of the involved musculature). Additionally, the application of myofascial trigger point therapy may be beneficial as an adjunctive therapy. This study identified that future studies should employ a greater number of participants. Furthermore, the authors recommended that a study focusing on the aetiological factors contributing to the development of ITBS (e.g. aetiological factors that are gender-specific in the onset and perpetuation of ITBS). Although this study had the format of a RCT in terms of two groups, comparison between the two groups and the structure of randomisation, it is not classically a clinical trial, because it does not compare two forms of interventions, which leaves the study unable to constructively contribute to literature with regards to particular treatment options as the recommendations for treatments are linked to specific aetiological findings and to treatments whose efficacy / effectiveness or both, may or may not be evident in the literature. In order to better understand the cause-effect relationship between the noted measures of ITBS, a prospective study design may be of benefit.
CONCLUSION:	A factor that contributes to the reviewers' low ranking of the article, is that although it mimics a RCT, it does not fulfil all of the criteria (see section 2.10.3) and therefore, will achieve only a good rating in that context (reviewers ranked this study a seven – Table 4.37). Therefore, the outcomes of the study add limited value in a clinical context (in terms of intervention, efficacy and effectiveness) however; it does provide a valuable resource in providing fertile ground for future research studies.

Table 4.39 Tabulated Feedback Data for RCT: Article 3

AUTHOR(S):	Gunter and Schwellnus					
YEAR:	2004					
TITLE:	Local corticosteroid injection in iliotibial band friction syndrome in runners: a randomised controlled trial					
CRITERION:		**Reviewer 1**	**Reviewer 2**	**Reviewer 3**	**Majority**	**Percentage Agreement**
1	Eligibility criteria were specified	Y	Y	Y	Y	100%
2	Subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received)	Y	Y	Y	Y	100%
3	Allocation was concealed	Y	N	N	N	66%
4	The groups were similar at baseline regarding the most important prognostic indicators	Y	Y	Y	Y	100%
5	There was blinding of all subjects	Y	Y	Y	Y	100%
6	There was blinding of all therapists who administered the therapy	N	N	N	N	66%
7	There was blinding of all assessors who measured at least one key outcome	N	N	N	N	66%
8	Measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups	Y	Y	Y	Y	100%
9	All subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analysed by “intention to treat”	Y	Y	Y	Y	100%
10	The results of between-group statistical comparisons are reported for at least one key outcome	Y	Y	Y	Y	100%
11	The study provides both point measures and measures of variability for at least one key outcome	Y	Y	Y	Y	100%
	TOTAL SCORE	**9**	**8**	**8**	**8**	
		OVERALL PERCENTAGE AGREEMENT:				**91%**

Table 4.40 Analysis of Article RCT: Article 3

AUTHOR(S):	Gunter and Schwellnus							
YEAR:	2004							
TITLE:	Local corticosteroid injection in iliotibial band friction syndrome in runners: a randomised controlled trial							
STUDY PROPERTIES:								
Form of measurement	**Frequency of measurement**	**Duration of study**	**Number of participants**	**Assessors blinded**	**Control used**	**Randomisation of participants**	**Ranking out of 11**	**Total Percentage Agreement**
Running tests were used to analyse participant improvement, using a visual analogue scale to measure pain level during activity.	Measurements were taken on day seven and fourteen.	All measurements were taken within a two week period.	Eighteen participants were included in the study, who were randomly assigned to either the experimental group (n=9) or the placebo control group (n=9).	Assessors were not blinded.	A control group of nine participants was used.	Participants were randomly allocated to the experimental or control group.	8	91%
LIMITATIONS:	The lack of an *a priori* analysis and a small sample size would suggest that type two errors are more likely to occur, and that results of the study are more likely to be related to population groups that have very similar characteristics (willingness to participate, reduction of activity during the duration of the study and recent onset of ITBS) to those of the study, and are not generalizable to the greater running populous. This is reinforced by the fact that the authors report a significant number of potential participants not agreeing to participate in this study. In terms of intervention effects, the limitation of participant activity (outside of the measurement tools) and the inclusion of ice application as intervention modalities, although consistent between the groups, may have resulted in participant improvement irrespective of the intervention being tested. Additionally, these therapies may either enhance or negate the								

LIMITATIONS CONTINUED:	intervention being tested. Although the application of ice and rest was standardised between the intervention and control group, the standardisation of the injectable medications could be misconstrued as being dissimilar. In this study, the experimental group received a total injectable volume of 2ml (consisting of 1ml methylprednisolone acetate and 1ml of 10mg 1% lignocaine hydrochloride) as compared to the control group which also received a total injectable volume of 2ml (but which consisted of 20mg, 2ml, and 1% lignocaine hydrochloride). In comparison, 1ml of 10mg 1% lignocaine hydrochloride could have been consistent between the experimental and control groups, and in place of methylprednisolone acetate in the control group, saline could have been used. The outcomes of the study are limited to the short-term effects of the tested interventions based on the measurement interval not exceeding fourteen days. The authors identified the total daily pain (visual analogue scale) as an insensitive tool for the measurement of change in pain over the duration of the study. This may have been as a result of a two-fold process; (1) ITBS usually presents with clinical discomfort and / or pain as a result of (2) increased / maintained levels of activity. Both of these points would have been negated by limiting the participants running to only those time points associated with measurements. Secondly, the sensitivity of total daily pain is affected by the perception of the participants. Therefore, a decrease in perceived pain as perceived by the participant could be as a result of a number of different factors, which in this study may have been attributed to the participant's perception of the tested interventions and / or the Hawthorne effect. As a result of the above two points, the reviewers agree with the authors that the visual analogue scale may not have been the most appropriate measurement tool to clinically measure the participants' improvement in this particular research context.

OUTCOME:	The study concluded that the use of injectable corticosteroids significantly reduced pain during activity, during the eighth to the fourteenth day in the trial, in comparison to the control group, and this improvement was beyond that which could be attributed to the improvement related to the rest and ice that were applied in both groups.
DISCUSSION:	Credit is due to the authors for controlling as many factors as possible (inclusion criteria, diagnostic criteria, familiarisation of participants with treadmill tests, use of a visual analogue scale to rate severity of pain every minute, and adequate description of the injective procedure) as is required in the structure of a RCT. The outcomes of the study based on a rigorous RCT design support the use of corticosteroids in the short-term for aiding in the resolution of ITBS (for particular participants, that met the same inclusion criteria as were relevant for the study, and who also would consider a period of rest during the administration of the corticosteroid). Therefore, the outcomes of study cannot be related to the long-term, and it is also not possible to extrapolate these results to participants with chronic or long-term ITBS, and to the greater population (as a result of the small sample size of this study).
CONCLUSION:	As can be seen from the ranking given to the study by the reviewers (a total score of eight – see Table 4.39), it can be stated that the authors achieved a significant rigor in the methodology and execution of this study. However, within this stringent context, limitations for the generalizability of the data exist and it can therefore only be stated that corticosteroid use may assist certain participants over the short-term for the symptoms of acute ITBS.

Table 4.41 Tabulated Feedback Data for RCT: Article 4

AUTHOR(S):	Hirschmüller, Baur, Muller, Helwig, Dickhuth and Mayer					
YEAR:	2011					
TITLE:	Clinical effectiveness of customised sport shoe orthoses for overuse injuries in runners: a randomised controlled study					
CRITERION:		**Reviewer 1**	**Reviewer 2**	**Reviewer 3**	**Majority**	**Percentage Agreement**
1	Eligibility criteria were specified	Y	Y	Y	Y	100%
2	Subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received)	Y	Y	Y	Y	100%
3	Allocation was concealed	Y	Y	Y	Y	100%
4	The groups were similar at baseline regarding the most important prognostic indicators	Y	N	Y	Y	66%
5	There was blinding of all subjects	Y	Y	Y	Y	100%
6	There was blinding of all therapists who administered the therapy	N	N	N	N	100%
7	There was blinding of all assessors who measured at least one key outcome	N	Y	N	N	66%
8	Measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups	Y	N	N	N	66%
9	All subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analysed by “intention to treat”	Y	N	Y	Y	66%
10	The results of between-group statistical comparisons are reported for at least one key outcome	Y	Y	Y	Y	100%
11	The study provides both point measures and measures of variability for at least one key outcome	Y	Y	Y	Y	100%
	TOTAL SCORE	**9**	**7**	**8**	**8**	
		OVERALL PERCENTAGE AGREEMENT:				**88%**

Table 4.42 Analysis of Article RCT: Article 4

AUTHOR(S):	Hirschmüller, Baur, Muller, Helwig, Dickhuth and Mayer
YEAR:	2011
TITLE:	Clinical effectiveness of customised sport shoe orthoses for overuse injuries in runners: a randomised controlled study

STUDY PROPERTIES:

Form of measurement	Frequency of measurement	Duration of study	Number of participants	Assessors blinded	Control used	Randomisation of participants	Ranking out of 11	Total Percentage Agreement
A subjective pain experience scale, the pain disability index and a comfort index was used to establish improvement in the orthoses group	Outcome measurements were assessed at the end of every week, however, participants also kept a training diary to record their distance, duration and intensity of training sessions. Additionally, a pain questionnaire and comfort questionnaire was filled out weekly.	The intervention period was for the duration of eight weeks.	A total of 99 participants were included in the study. 51 participants were allocated to the orthoses group, whereas 48 participants were allocated to a control group. A total of thirteen participants were suffering from ITBS.	Not mentioned in this study.	48 participants were allocated to the control group, who continued to regularly train, without the use of customised orthoses.	Participants were randomised.	8	88%

LIMITATIONS:	Although the study seems to have a large population from which the data was drawn and therefore implies that either an *a priori* analysis was done (power was calculated), or a significant number of participants were available to be included, this is in fact, not the case, as only thirteen (six in the orthoses group and seven in the control group) of the total of 99 participants were suffering from ITBS. Therefore, as noted by the authors, findings of this particular study are not necessarily applicable to the general populace, to the same degree, unless they are similar to the participants in the study, with regards, to the clinical syndrome and participant demographics (mild ITBS and participants were able to continue regular training).

LIMITATIONS CONTINUED:	The control group was a non-intervention, natural history group, to which the orthotic intervention was compared; therefore the study is limited in its capability to comment on the orthotic intervention only in the context of it being able to improve clinical symptomology at a rate faster than the natural resolution of the condition. The third limitation is noted by the authors is the lack of a blinded assessor and the lack of blinding of participants, as both the assessors and participants were aware of the group to which they were allocated. The use of orthoses in the context of the stringent inclusion criteria of the study, would imply that the outcomes of the study are only applicable to participants falling within a similar populous as compared to the participants in the study (clinically and participant demographic characteristics).
OUTCOME:	Within the context of the study limitations, the use of customised polyurethane running shoe orthoses are noted as an effective conservative form of treatment of chronic running injuries (including ITBS). There is, however, no evidence provided for the individual conditions (achilles tendinopathy, patellar tendinopathy, patellofemoral pain syndrome, ITBS, plantar fasciitis and periostitis tibiae), as it is possible that these conditions may have responded variably to the intervention, with some participants having significant, and other participants having negligent outcomes. Thus, it is not possible to infer that any one or all of the conditions would necessarily benefit significantly from this form of intervention.
DISCUSSION:	Again, based on the significant methodological rigor, it is suggested that the outcomes of this study are significant, however the above discussed limitations must be considered. The varied conditions within the group does not enable the benefit of orthotics to be discussed for any one particularly subgroup. Secondly, even if data was supplied for each individual condition, the sample sizes would be limiting in being able to interpret the findings. Thirdly, the lack of a blinded assessor introduces an element of bias, therefore weakening the outcomes

	of the study.
CONCLUSION:	Although the study was highly ranked by the reviewers (see Table 4.41) in terms of the methodological rigor, it is apparent that the inclusion criteria were significantly wide enough to include a variety of conditions and participant presentations under the umbrella of “chronic” running injuries. This resulted in the authors only being able to state that the use of orthoses may be indicated in the chronic mechanical conditions (without the ability to define which of these conditions would benefit most or least from this intervention). As a result, this study provides evidence that orthoses may be of use in ITBS, but that future condition-specific research would be required to validate the assumption drawn from the results of this particular research.

Table 4.43 Tabulated Feedback Data for RCT: Article 5

AUTHOR(S):	Schwellnus, Mackintosh and Mee					
YEAR:	1992					
TITLE:	Deep transverse frictions in the treatment of iliotibial band friction syndrome in athletes: a clinical trial					
CRITERION:		**Reviewer 1**	**Reviewer 2**	**Reviewer 3**	**Majority**	**Percentage Agreement**
1	Eligibility criteria were specified	Y	Y	Y	Y	100%
2	Subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received)	Y	Y	Y	Y	100%
3	Allocation was concealed	N	N	N	N	100%
4	The groups were similar at baseline regarding the most important prognostic indicators	Y	Y	Y	Y	100%
5	There was blinding of all subjects	Y	N	N	N	66%
6	There was blinding of all therapists who administered the therapy	N	N	N	N	100%
7	There was blinding of all assessors who measured at least one key outcome	Y	N	Y	Y	66%
8	Measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups	Y	Y	Y	Y	100%
9	All subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analysed by “intention to treat”	Y	Y	Y	Y	100%
10	The results of between-group statistical comparisons are reported for at least one key outcome	Y	Y	Y	Y	100%
11	The study provides both point measures and measures of variability for at least one key outcome	Y	Y	Y	Y	100%
	TOTAL SCORE	**9**	**7**	**8**	**8**	
		OVERALL PERCENTAGE AGREEMENT:				**94%**

Table 4.44 Analysis of Article RCT: Article 5

AUTHOR(S):	Schwellnus, Mackintosh and Mee
YEAR:	1992
TITLE:	Deep transverse frictions in the treatment of iliotibial band friction syndrome in athletes: a clinical trial

STUDY PROPERTIES:

Form of measurement	Frequency of measurement	Duration of study	Number of participants	Assessors blinded	Control used	Randomisation of participants	Ranking	Total Percentage Agreement
Improvement of participants was measured using a visual analogue scale (which was completed daily by the participants) and a functional treadmill rest.	Pain was recorded daily by each participant, whereas functional treadmill running tests were done on four separate occasions during the study.	The study was completed over the duration of fourteen days.	Twenty participants were initially included, with three excluded from the final results. The final number of participants was seventeen.	The efficacy of treatment was assessed by a separate therapist, who was blinded as to which treatment group the participant was allocated.	A control group was used in this study. The number participants in the control group is not mentioned in the article.	Participants were randomly allocated to Group A or B.	8	94%

LIMITATIONS:	A small sample size of seventeen participants was included in the study, possibly as a result of a lack of a power analysis. The lack of a power analysis would have more accurately determined appropriate sample size to strengthen the outcomes of the study. The variety of interventions included in the study (rest, ice application, baseline physiotherapy with stretch exercises and ultrasound) limited the authors' ability to establish whether one particular intervention was superior over another.

LIMITATIONS CONTINUED:	The therapies within the standard physiotherapy programme were therapies that had the potential to counteract the potential effects of deep transverse frictions (DTF). Therefore, the authors can only compare a specific combination of interventions versus a specific combination of therapies, and they cannot comment exclusively on the effectiveness of DTF in this context. Additionally, there was a lack of direct measure of the impact of DTF. The study duration was only seven days, and may not have been long enough to establish the long-term benefits of deep tissue frictions in the treatment of ITBS. Thus, the outcomes of this study may only apply in the short-term. Additionally, participants were required to abstain from all athletic activity during the course of the study. Therefore, the outcomes of this study are limited to persons who restrict their activity during recovery and treatment. With a lack of activity, there was an associated decrease in the daily pain recall readings (a decrease in the clinical severity of the syndrome), which makes it difficult to determine the effect of natural history and also makes it more difficult for the authors to detect significant changes between the groups, had the syndromes been more severe.
OUTCOME:	The study did not support the theory that the addition of DTF to a standard physiotherapy programme alters the therapeutic outcome of athletes presenting with ITBS. Participants however did improve significantly (reduction in overall daily pain as well as pain reported during running) over the treatment period; this was thought to be as a result of the standard physiotherapy regimen included in both Groups A and B. The authors concluded that a physiotherapy treatment programme, consisting of rest, ice, stretches, ultrasound and improved the participants overall symptoms of ITBS.
DISCUSSION:	Based on the limited literature that is available with regards to DTF, the authors planned a rigorous RCT in order to test the effects of DTF. Within their RCT they compared Group A against Group B, and based on this comparison they concluded that the addition of DTF to the standard physiotherapeutic regimen did not yield improved clinical outcomes. When combining two or more therapies, it becomes increasingly unpredictable, as to how to the therapies interact with each

DISCUSSION CONTINUED:	other and thus impact positively / negatively on the clinical outcome of the condition. For example, amongst other goals, DTF aims to increase blood flow, whereas the abdication of ice aims to decrease blood flow. It, therefore, stands to reason that when comparing two protocols, it is difficult to make a judgement on the effect of that one therapy that is different between the protocols. This is based on the reasoning that this one therapy may be antagonistic to or synergist with another therapy in that group, thus limiting the authors' ability to determine which sequence of events impacts on the clinical outcome of the participants. The lack of significant differences between the groups over time, may have been the result of a small sample size and natural history due to lack of activity. This difference may also have been as a result of the lack of sensitivity of the measurement tools.
CONCLUSION:	Although this study met all the requirements for a strong RCT, which was indicated by the reviewers (see Table 4.43), the issues, such as in the discussion above, detract from the authors' ability to specifically comment on the effectiveness of DTF. The authors were unable to fully address their hypothesis, based on the limitations which prevented the study from ranking any higher on the PEDro scale (www.pedro.org.au, 1999).

Table 4.45 Tabulated Feedback Data for RCT: Article 6

AUTHOR(S):	Schwellnus, Theunissen, Noakes and Reinach					
YEAR:	1991					
TITLE:	Anti-inflammatory and combined anti-inflammatory/analgesic medication in the early management of iliotibial band friction syndrome. A clinical trial					
CRITERION:		**Reviewer 1**	**Reviewer 2**	**Reviewer 3**	**Majority**	**Percentage Agreement**
1	Eligibility criteria were specified	Y	Y	Y	Y	100%
2	Subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received)	Y	Y	Y	Y	100%
3	Allocation was concealed	N	Y	N	N	66%
4	The groups were similar at baseline regarding the most important prognostic indicators	Y	Y	Y	Y	100%
5	There was blinding of all subjects	Y	Y	N	Y	66%
6	There was blinding of all therapists who administered the therapy	Y	Y	N	Y	66%
7	There was blinding of all assessors who measured at least one key outcome	N	Y	Y	Y	66%
8	Measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups	Y	Y	Y	Y	100%
9	All subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analysed by “intention to treat”	N	Y	Y	Y	66%
10	The results of between-group statistical comparisons are reported for at least one key outcome	Y	Y	Y	Y	100%
11	The study provides both point measures and measures of variability for at least one key outcome	Y	Y	Y	Y	100%
	TOTAL SCORE	**8**	**11**	**8**	**10**	
		OVERALL PERCENTAGE AGREEMENT:				**85%**

Table 4.46 Analysis of Article RCT: Article 6

AUTHOR(S):	Schwellnus, Theunissen, Noakes and Reinach							
YEAR:	1991							
TITLE:	Anti-inflammatory and combined anti-inflammatory/analgesic medication in the early management of iliotibial band friction syndrome. A clinical trial							
STUDY PROPERTIES:								
Form of measurement	**Frequency of measurement**	**Duration of study**	**Number of participants**	**Assessors blinded**	**Control used**	**Randomisation of participants**	**Ranking**	**Total Percentage Agreement**
A functional treadmill running test was used. Additionally, a pain rating scale was completed. Participants were also required to record a daily 24-hour recall pain score.	Functional treadmill running tests were completed on days 1, 4 and 8.	The study was completed over the duration of seven days.	A total of 43 participants were included into the study. Placebo control group n = 13. Anti-inflammatory group n = 14. Anti-inflammatory and analgesic group n = 16.	The study was a double-blind, placebo-controlled study.	A placebo control group of thirteen participants was included in the study.	Participants were randomly allocated to the (1) placebo control group, (2) anti-inflammatory medication group or the (3) analgesic / anti-inflammatory group.	10	85%
LIMITATIONS:	A number of interventions were included (rest, ice, ultrasound, stretching, transverse frictions, analgesics and anti-inflammatory medication) in the study. These interventions limit the authors' ability to establish whether any one or a combination of interventions as being superior over another. The study involved a small number of participants and lacked an *a priori* calculation. Thus, the study sample size may have been inappropriate, thereby reducing the potential strength of the outcome of the study. The study was completed over the duration of one week, which limits the ability of the authors to apply the outcomes of the							

LIMITATIONS CONTINUED:	study, to anything longer than the short-term. Additionally, it would have been appropriate to consider measurements beyond the effect of the analgesic medication, in order to determine the actual, as opposed to the perceived effects of the interventions on ITBS. Rest was included as an intervention, and could therefore not be excluded as a contributing factor to the overall improvement of the participants. Group three's interventions, included the prescription of analgesics, which the authors noted as being responsible for eliminating the perception of pain experienced by the participants in this group. As a result, the subjective measures used in this study, may have been more a measure of perceived pain (drug threshold) as compared to the actual clinical syndrome. Therefore, it would be unfair to state that group three had improved clinical outcomes, beyond groups one and two, based on changes of symptomatology, as the participants in group three would not have been able to report on that symptomatology.
OUTCOME:	This study concluded that acute treatment of ITBS showed the best improvement when a combination of a physiotherapeutic regimen, anti-inflammatory and analgesic medication, was used in the management of ITBS. All groups had a reduction in pain levels. Group three which received the physiotherapeutic programme as well as the combined analgesic / anti-inflammatory returned to their activities more quickly as compared to Group one (control) and Group two (anti-inflammatory medication).
DISCUSSION:	The results of the study, as linked to the outcome of the study, recommended that analgesic and anti-inflammatory combination medication administered with the use of a physiotherapeutic programme, is efficient in treating participants suffering from ITBS, particularly within the first week of injury. It is suggested that the application of deep transverse frictions and ultrasound are incorporated into the management of ITBS in future studies. In conclusion, it can be said that combining analgesic / anti-inflammatory medication with a physiotherapeutic programme (including cross frictions and ultrasound) is beneficial in the treatment of ITBS.

CONCLUSION:	Based on the aim of the study, the methodological structure, and its clear, directed and rigorous processes, the results allowed for the reviewers to rank the study very highly. Notwithstanding this, several factors affecting the external validity of the study (sample size, medication affect and lack of follow-up measures) significantly limited the authors' perception of making definitive conclusions about individual interventions utilised in this study. This context is also apparent when comparing the three groups and attempting to determine which protocol delivered the best outcomes in the short-term.

4.4.3.2 Discussion

Table 4.47 Outcome and Methodological Ranking of Randomised Controlled Trials				
Study Type:	**Randomised Clinical Trials**			
Author(s)	**Year:**	**Reported Outcome:**	**Methodological Ranking:**	**Outcome as determined by reviewers:**
Bischoff *et al.*	1995	**Phonophoresis** is an effective treatment for ITBS, as compared to a combination of rest and immobilisation.	7	Good
Grau *et al.*	2011	**Increasing hip range of motion** via stretching and / or massage of the ITB and the associated musculature should be considered in the management of ITBS.	6	Good
Gunter and Schwellnus	2004	**Injectable corticosteroids** are sufficient in reducing ITBS related pain that occurs during activity, additionally, rest and ice contributed to the overall improvement of ITBS.	8	Good
Hirschmüller *et al.*	2011	**Customised polyurethane running shoe orthoses** were effective in the management of ITBS in participants suffering from mild to moderate ITBS.	8	Good

Author(s)	Year:	Reported Outcome:	Methodological Ranking:	Outcome as determined by reviewers:
Schwellnus *et al.*	1992	The authors found that **deep transverse frictions** were not effective in the treatment of ITBS. However, a combination of rest, ice, stretch therapy and ultrasound were effective in reducing symptoms of ITBS.	8	Good
Schwellnus *et al.*	1991	**Anti-inflammatory medication, in combination with analgesics and a physiotherapeutic regimen** were beneficial in the treatment of acute ITBS.	10	Excellent

4.4.4 Observational studies introduction

Observational studies were reviewed using the Liddle Scale (Liddle *et al.,* 1996). The Liddle Scale ranking is discussed in **Appendix F**. For each criterion, of which there were a total of eleven criteria, five different responses could be chose: “A”, “B1”, “B2” and “C”. See the description of codes below:

Table 4.48 Description of Codes A, B1, B2 and C – Liddle Scale

Low risk of bias	A	All or most evaluation criteria from the checklist are fulfilled. Where evaluation criteria are not fulfilled, the conclusions of the study are thought very unlikely to alter.
Low-moderate risk of bias	B1	Some evaluation criteria from the checklist are fulfilled. Where evaluation criteria are not fulfilled or are not adequately described, the conclusions of the study are thought unlikely to alter.
Moderate to high risk of bias	B2	Some evaluation criteria from the checklist are fulfilled. Where evaluation criteria are not fulfilled or are not adequately described, the conclusions of the study are thought likely to alter.
High risk of bias	C	Few or no evaluation criteria fulfilled. Where evaluation criteria are not fulfilled or are not adequately described, the conclusions of the study are thought very likely to alter.

Additionally, “n/a” could be chosen, or in the event that the criterion was not applicable, or the criterion was not adequately described to classify as “A”, “B1”, “B2” or “C”, in which “I” was selected.

4.4.4.1 Examiner agreement and ranking of articles: Observational studies

Table 4.49 List of table numbers for observational study feedback and analysis

Tabulated feedback data:	Analysis of article:	Author(s):	Year:	Title:
Table 4.50	Table 4.51	Clement, Taunton and McKenzie	1983	Iliotibial band friction syndrome
Table 4.52	Table 4.53	McNicol, Taunton and Clement	1981	Iliotibial tract friction syndrome in athletes
Table 4.54	Table 4.55	Noerhen, Davis and Hamill	2007	Prospective study of the biomechanical factors associated with iliotibial band syndrome

Table 4.50 Tabulated Feedback Data for OBS: Article 1

AUTHOR(S):	Clement, Taunton and McKenzie					
YEAR:	1983					
TITLE:	Iliotibial band friction syndrome					
CRITERION:		**Reviewer 1**	**Reviewer 2**	**Reviewer 3**	**Majority**	**Percentage Agreement**
1	Are the study participants well-defined in terms of time, place and person?	B2	B2	B2	B2	100%
2	What percentage of individuals refused to participate?	I	I	I	I	100%
3	Are outcomes measured in a standard, valid and reliable way?	B1	C	C	C	66%
4	Are outcomes measured in the same way for both intervention and control groups?	I	n/a	I	I	66%
5	Are factors other than intervention comparable between intervention and control groups and if not comparable, are they adjusted for in the analysis?	I	n/a	I	I	66%
6	What percentage of individuals recruited into the study are not included in the analysis?	I	I	I	I	100%
7	Are results homogenous between sites?	I	n/a	I	I	66%
8	How well was the study done to minimise bias?	B2	B2	B2	B2	100%
9	Is the overall effect of the study due to the study intervention?	I	n/a	I	I	66%
10	Explain if there is any practical/ethical reason why an RCT cannot be done?	I	n/a	I	I	66%
	TOTAL SCORE	A: 0 B1: 1 B2: 2 C: 0 I: 7 n/a: 0	A: 0 B1: 0 B2: 2 C: 1 I: 2 n/a: 5	A: 0 B1: 0 B2: 2 C: 1 I: 7 n/a: 0	A: **0** B1: **0** B2: **2** C: **1** I: **7** n/a: **0**	
		OVERALL PERCENTAGE AGREEMENT:				**80%**

Table 4.51 Analysis of Article OBS: Article 1

AUTHOR(S):	Clement, Taunton and McKenzie
YEAR:	1983
TITLE:	Iliotibial band friction syndrome

STUDY PROPERTIES:

Form of measurement	Frequency of measurement	Duration of study	Number of participants	Assessors blinded	Control used	Randomisation of participants	Ranking	Total Percentage Agreement
No forms of measurement were discussed.	No frequency of measurement was discussed.	The duration of the study was not mentioned.	A total of 52 runners suffering from ITBS were included in the study.	No blinding of assessors was done.	No control group was used.	Participants were not randomised.	A: 0 B1: 0 B2: 2 C: 1 I: 7 n/a: 0	80%

LIMITATIONS:	The article focused particularly on identifying the aetiological factors of ITBS, and although a management regimen is discussed, there was no in depth discussion into the participants' outcomes. The interventions are discussed in detail (including: cryotherapy, non-weight bearing exercises, ultrasound, anti-inflammatory medication and local corticosteroid injection). However, as there were various and numerous interventions used in the participants' treatment and a lack of structured measures between participants; does not allow for comparable measures or conclusions to be drawn from the interventions, or combination of interventions used in the study. The study did not specify inclusion criteria, as it was a retrospective study of 52 cases of ITBS that had been seen in clinical practice, although credit must be given to the authors for describing the populace well.
OUTCOME:	All participants were reported to have responded well to conservative management, as none of the participants required the use of surgical intervention or local corticosteroid injection (no data was presented in support of these conclusions).

DISCUSSION:	As the study focused on and discussed the aetiological factors of ITBS in great detail, the recording and reporting of intervention protocols became secondary and were not fully discussed. As a result, there was no reporting of any form of measurement to gauge the degree of improvement in the participants. Additionally, a number of different interventions were included (pain and inflammatory control, strengthening exercises, adapting biomechanical contributing factors and re-introduction to training, anti-inflammatory, analgesic treatment, non-weight bearing exercises, ultrasound, muscular strengthening stretching, use of orthoses and gradual introduction of weight training). The number of different treatment interventions used did not allow for standardisation between participants, as the authors stated that treatment was varied according to the severity of the symptoms with which the participant presented. The authors did not document any reasoning for recommending the above discussed interventions, nor did they discuss the participants' outcome, with regards to reoccurrence and time required for resolution of symptoms. They do, however, discuss management of ITBS in great detail, although there is very little evidence to support their recommendations. The study appeared to focus on providing an expert and clinical opinion of aetiological factors associated with ITBS, rather than a scientific methodological study assessing the treatment and effectiveness of interventions.
CONCLUSION:	The study was a retrospective study, focusing predominantly on aetiological factors that had been documented clinically, and therefore has poor capability to comment on clinical treatment outcomes. The limited capability to comment on interventions, or combination thereof was as a result of limited comparability between treatment regimens between participants. Therefore, although the study provided a good descriptive narrative of aetiological factors, which provided for a moderate ranking by reviewers, the study's ability to comment on effectiveness of interventions for the treatment of ITBS is poor.

Table 4.52 Tabulated Feedback Data for OBS: Article 2

AUTHOR(S):	McNicol, Taunton and Clement					
YEAR:	1981					
TITLE:	Iliotibial tract friction syndrome in athletes					
CRITERION:		**Reviewer 1**	**Reviewer 2**	**Reviewer 3**	**Majority**	**Percentage Agreement**
1	Are the study participants well-defined in terms of time, place and person?	B1	B1	B1	B1	100%
2	What percentage of individuals refused to participate?	I	I	I	I	100%
3	Are outcomes measured in a standard, valid and reliable way?	B1	I	B1	B1	66%
4	Are outcomes measured in the same way for both intervention and control groups?	I	n/a	I	I	66%
5	Are factors other than intervention comparable between intervention and control groups and if not comparable, are they adjusted for in the analysis?	I	n/a	I	I	66%
6	What percentage of individuals recruited into the study are not included in the analysis?	I	I	I	I	100%
7	Are results homogenous between sites?	I	n/a	I	I	66%
8	How well was the study done to minimise bias?	B2	B2	B2	B2	100%
9	Is the overall effect of the study due to the study intervention?	I	I	I	I	100%
10	Explain if there is any practical/ethical reason why an RCT cannot be done?	I	n/a	I	I	66%
	TOTAL SCORE	A: 0 B1: 2 B2: 1 C: 0 I: 7 n/a: 0	A: 0 B1: 1 B2: 1 C: 0 I: 4 n/a: 4	A: 0 B1: 2 B2: 1 C: 0 I: 7 n/a: 0	A: 0 B1: 2 B2: 1 C: 0 I: 7 n/a: 0	
		OVERALL PERCENTAGE AGREEMENT:				**83%**

Table 4.53 Analysis of Article OBS: Article 2

AUTHOR(S):	McNicol, Taunton and Clement
YEAR:	1981
TITLE:	Iliotibial tract friction syndrome in athletes

STUDY PROPERTIES:

Form of measurement	Frequency of measurement	Duration of study	Number of participants	Assessors blinded	Control used	Randomisation of participants	Ranking	Total Percentage Agreement
No form of measurement is discussed.	Frequency is not discussed.	The study was completed over the duration of two years.	A total of 52 participants were included in the study.	No blinding of assessors.	No control group.	No randomisation of participants.	A: 0 B1: 2 B2: 1 C: 0 I: 7 n/a: 0	83%

LIMITATIONS:	This study is not dissimilar to the 1983 study by Clement *et al.,* (1983). It is unclear whether the participants reported in the 1983 study are the same sample group utilized in this study, as the number of participants is the same. This particular study was included in this review as it met the inclusion criteria, and did not appear to have been a follow-on study. Additionally, this study was a publication in a separate peer-review journal (peer-review journals usually do not accept reproductions of previously published articles). In terms of a limitation, this study is not dissimilar to Clement *et al.,* (1983) (see Table 4.50), with the exception of improved participant description and additional tables and data to support conclusions.
OUTCOME:	Due to the increased clarity of assessment methods and interventions, as compared to the 1983 study, the authors are able to conclude more effectively that the conservative treatment protocols, with particular attention to addressing training errors/ functional overpronation, is believed to improve clinical improvement of participants' symptoms who suffer from ITBS. Furthermore, the authors suggested that future studies be done with regards to the relation between female runners and the

OUTCOME CONTINUED:	presence of genu valgum, as genu varum is thought to increase tension within the ITB and therefore predispose the ITB to greater frictional forces against the LFE.
DISCUSSION:	Although the authors have contextualised training errors and functional overpronation, and the possible presence of genu varum as factors that influence the presence of ITBS, it is possible that a type two error may have been made in this study. This would principally be attributed to the lack of a control group, and therefore the presence of these aetiological factors cannot be conclusively linked to the development of ITBS. This may be countered by the 94% clinical success rate that was achieved; however, with the multitude of combination interventions employed, it is not possible to determine whether these specific aetiological factors have a role in treating ITBS if they were individually addressed. They do however discuss the management of ITBS in great detail, although there is very little evidence to support their recommendations. The study appears to be focused on providing an expert opinion in comparison, to providing a scientific methodological study.
CONCLUSION:	The authors must be given credit for the improved clarity for describing the interventions, which was noted by reviewers under criterion number three (see Table 4.52). However, the study was a retrospective study, focussing predominantly on aetiological factors that had been documented clinically, and therefore has poor ability to comment on clinical treatment outcomes, the limited ability to comment on interventions, or combination thereof. This was a result of limited comparability between treatment regimens between participants. Therefore, although the study provided a good descriptive narrative of aetiological factors, which provided for a moderate ranking by the reviewers, its ability to comment on the effectiveness of interventions for the treatment of ITBS is poor.

Table 4.54 Tabulated Feedback Data for OBS: Article 3

AUTHOR(S):	Noerhen, Davis and Hamill					
YEAR:	2007					
TITLE:	Prospective study of the biomechanical factors associated with iliotibial band syndrome					
CRITERION:		**Reviewer 1**	**Reviewer 2**	**Reviewer 3**	**Majority**	**Percentage Agreement**
1	Are the study participants well-defined in terms of time, place and person?	B1	A	A	A	66%
2	What percentage of individuals refused to participate?	I	I	I	I	100%
3	Are outcomes measured in a standard, valid and reliable way?	A	A	A	A	100%
4	Are outcomes measured in the same way for both intervention and control groups?	I	A	I	I	66%
5	Are factors other than intervention comparable between intervention and control groups and if not comparable, are they adjusted for in the analysis?	I	A	A	A	66%
6	What percentage of individuals recruited into the study are not included in the analysis?	I	I	I	I	100%
7	Are results homogenous between sites?	I	n/a	I	I	66%
8	How well was the study done to minimise bias?	B1	A	B1	B1	66%
9	Is the overall effect of the study due to the study intervention?	I	n/a	I	I	66%
10	Explain if there is any practical/ethical reason why an RCT cannot be done?	n/a	n/a	I	n/a	66%
	TOTAL SCORE	A: 1 B1: 2 B2: 0 C: 0 I: 6 n/a: 1	A: 5 B1: 0 B2: 0 C: 0 I: 2 n/a: 3	A: 3 B1: 1 B2: 0 C: 0 I: 6 n/a: 0	**A: 3** **B1: 1** **B2: 0** **C: 0** **I: 5** **n/a: 1**	
		OVERALL PERCENTAGE AGREEMENT:				**76%**

Table 4.55 Analysis of Article OBS: Article 3

AUTHOR(S):	Noerhen, Davis and Hamill
YEAR:	2007
TITLE:	Prospective study of the biomechanical factors associated with iliotibial band syndrome

STUDY PROPERTIES:

Form of measurement	Frequency of measurement	Duration of study	Number of participants	Assessors blinded	Control used	Randomisation of participants	Ranking	Total Percentage Agreement
Measurement of peak hip, knee and rearfoot angles, and moments were compared between the ITBS and control group.	Once off measurements were taken of the ITBS and control groups.	Participants were part of an on-going study.	A total of 36 participants were included in the study. Eighteen were included in the ITBS group, and eighteen were in included in the control group.	No assessors were blinded.	Eighteen participants who matched the age and mileage of the intervention group were included into the control group.	The ITBS group were defined by a group of diagnostic criteria, and the control group was matched specifically to the intervention group, according to mileage and age.	A: 3 B1: 1 B2: 0 C: 0 I: 5 n/a: 1	76%

LIMITATIONS:

This study focused primarily on biomechanical factors that were related to the aetiology of ITBS.

This study applied specifically to female, recreational runners, who were required to be between the ages of 18 – 45 and were required to run a minimum of twenty miles per week, which implied they were very fit. Therefore, results could only apply to a population falling within these demographics.

A total of 400 participants were screened prior to the development of ITBS. The study was therefore able to identify the incidence of the condition, but there was limited control of extraneous variables (e.g. participants were not diagnosed by the same clinician and participants communication was done via email).

According to the study structure, participants were required to report on the development of ITBS during the two year study

LIMITATIONS CONTINUED:	period. This reporting had several limitations: (1) there were several different medical / paramedical therapists that could be responsible for diagnosing the participant, (2) there were no overt criteria of diagnosis for ITBS and (3) there was no structure or mechanism to exclude self-diagnosis by the participant.
OUTCOME:	According the outcomes of their hypotheses, the authors found that participants who were in the ITBS group presented with significantly greater hip adduction and knee internal rotation, of the limb that developed ITBS. It is therefore suggested that addressing these biomechanical factors in the treatment of ITBS would assist participants in their recovery.
DISCUSSION:	The authors set out utilizing a rigorous methodology to determine the incidence of ITBS, as well as its association with specified biomechanical measures. This structure allowed the authors, within the constraints of the limitations, to arrive at a specific outcome as delineated in the outcomes. However, having established that specific biomechanical factors are associated with ITBS, the assumption is made that by correcting these factors, in a clinical setting allows for expedited resolution of a participant's clinical symptoms (viz. treatment including strengthening exercises, improved neuromuscular control of the hip, and stretching of the ITB) and a decreased rate of occurrence. This hypothesis however, has not been tested in this study.
CONCLUSION CONTINUED: **CONCLUSION:**	The study suggested that treatment of ITBS should focus on improving neuromuscular control of the hip musculature, particular the gluteus medius. Additionally, the inclusion of stretching exercises which focused on increasing the flexibility of the ITB is beneficial in the management of ITBS. Future studies should investigate this intervention, with the use of a control group of participants who suffer from ITBS, but who do not receive hip abduction exercises / ITB stretches. Future studies should include male participants to make the results more generalizable. Improved methodological rigor of this prospective study is reflected by the improved ranking attributed to the study by the reviewers. Thus by comparison to Clement *et al.,* (1983) and McNicol's *et al.,* (1981) studies, this particular study is ranked highly with regards to methodological rigor; however, based on its focal area being related directly to biomechanical influences in ITBS, the findings have limited ability to suggest treatment

	effectiveness, with regards, to any one or more interventions. As a result, the authors suggested that further studies are required to test the clinical effectiveness of the aetiological factors that they have identified, within a RCT format (e.g. presence of genu varum in females, and the onset of ITBS).

4.4.4.2 Discussion

Table 4.56 Outcome and Methodological Ranking of Observational Studies				
Study Type:	**Observation Studies**			
Author(s)	**Year:**	**Reported Outcome:**	**Methodological Ranking:**	**Outcome as determined by reviewers:**
Noerhen *et al.*	2007	According the outcomes of their hypotheses, the authors found that **addressing biomechanical factors** in the treatment of ITBS would assist in recovery of the participants.	A: 3 B1: 1 B2: 0 C: 0 I: 5 n/a: 1	Good
Clement *et al.*	1983	All participants were reported to have responded well to **conservative management**, as none required the use of surgical intervention or local corticosteroid injection.	A: 0 B1: 0 B2: 2 C: 1 I: 7 n/a: 0	Moderate to Poor
McNicol *et al.*	1981	Due to the increased clarity of assessment methods and interventions, the authors are able to conclude more effectively which **conservative treatment protocols**, with particular attention to addressing **training errors/ functional overpronation**, are believed to improve clinical outcome of participants suffering from ITBS.	A: 0 B1: 2 B2: 1 C: 0 I: 7 n/a: 0	Moderate to Poor

4.5 Conclusions

This chapter presented the findings of the reviewer rating of each of the articles within this review, in addition it has also provided an overview of each article, discussing its methodological rigour in terms of its properties, structure, limitations and outcomes, in order to allow the reader to contextualise the possible reasons for a particular reviewer ranking of the articles. However, to meet the outcomes of this study, the next chapter (Chapter Five) presents a discussion around each of the interventions that the articles reported on in order to be able to determine the level of evidence that is available for each of the particular interventions that have been reported for use in ITBS.

CHAPTER FIVE
DISCUSSION OF RESULTS

5.1 Introduction

From the review of the various study types as presented in Chapter Four, Chapter Five contextualises the level of evidence for each particular intervention for the treatment of ITBS using the results obtained in the review of studies.

The different interventions that were identified within the articles reviewed are represented below in section 5.2. These interventions are presented in tables in section 5.4, with individual interventions tabulated in a separate table, and combinations of interventions represented together in one table. The purpose of these tables is to summate the level of evidence, as determined by the criteria specified by the United States Agency for Healthcare Research and Quality (AHCPR) and by Dagenais and Haldeman (2012) for each intervention, or combination of interventions. From these tables we are able to determine the level of evidence, whether it is sufficient to support the use of the interventions / combinations of interventions in the management of ITBS, or whether there is a lack of evidence, and a requirement for further investigation.

5.2 Review of interventions for ITBS

After reviewing the twenty-three articles that met the inclusion criteria, the following interventions were identified as being employed in the treatment of ITBS:

Individual Therapies:

- Active release technique,
- Corrective neuromuscular approach,
- Custom dry floatation cushions,
- Customised polyurethane running shoe orthoses,
- Deep transverse frictioning,
- Hip abductor strengthening,
- Injectable corticosteroids,
- Phonophoresis,
- Stretch therapy and
- Talar joint manipulation.

Combination of Therapies:

- Addressing biomechanical and causative factors, particularly training errors and training surface.
- Anti-inflammatory medication, analgesics and a physiotherapeutic regimen.
- Increasing hip range of motion, with stretch therapy and massage of the ITB and associated musculature.
- Rest, control of pain and swelling with ice application, NSAIDs and analgesics, stretching and strengthening exercises, changes to biomechanical function, orthoses and controlled return to activity.
- Rest, mileage reduction, correct shoe selection, anti-inflammatory medication, local modalities and addressing causative factors.
- Stretch therapy, particularly stretches of the ITB as well as the associated musculature.
- Strain-counterstrain osteopathic manipulative therapy, stretch therapy, ice and heat application and non-steroidal anti-inflammatory medication.
- Ultrasound, anti-inflammatory medication and hip abductor strengthening.

5.3 Discussion of the criteria for ranking evidence

Each of the above individual interventions or combinations of interventions were ranked according to their level of evidence, as per the criteria specified by the AHCPR and described by Dagenais and Haldeman (2012). Dagenais and Haldeman (2012) state that six levels of evidence are identified, which are: strong, moderate, limited, consensus, conflicting and no evidence.

The levels of evidence are described as follows:

Strong: The findings were supported by the results of two or more RCTs of at least "fair" quality.

Moderate: The findings were supported by a single RCT of at least "fair" quality.

Limited: The findings were supported by at least one non-experimental study (CS, N-RCT and cohort studies).

Consensus: In the absence of evidence, agreement was reached by a group of experts on an appropriate treatment regimen. Consensus opinion is regarded as the lowest form of evidence. As such, it is arguably not considered to be evidence.

Conflicting: There was disagreement between the findings of at least two RCTs. Where there were more than four RCTs and the results of only one was conflicting, the conclusion was based on the results of the majority of the studies, unless the study with the conflicting results was of higher quality.

No evidence: The study / studies available were of poor quality and provided no evidence in the support of the intervention(s) being tested.

5.4 Ranking of evidence for each of the interventions:

The interventions below are discussed in alphabetical order, as listed in Table 5.1.

Table 5.1 List of interventions / intervention combinations and corresponding table number

Table Number:	Intervention / Intervention Combinations:
Table 5.2	Active release technique
Table 5.3	Corrective neuromuscular approach
Table 5.4	Custom dry floatation cushions
Table 5.5	Customised polyurethane running shoe orthoses
Table 5.6	Deep transverse frictions (DTF)
Table 5.7	Hip abductor strengthening
Table 5.8	Injectable corticosteroids
Table 5.9	Phonophoresis
Table 5.10	Stretch therapy
Table 5.11	Talar manipulation
Table 5.12	Addressing biomechanical / causative factors
Table 5.13	Intervention combinations

5.4.1 Active release technique

Table 5.2 Intervention: Active release technique

Author(s) / Year:	Study Type:	Ranking of Individual Study:	Level of Evidence of Intervention					
			Strong	Moderate	Limited	Consensus	Conflicting	No Evidence
Baer (1999)	Case study	Poor						X

There is insufficient evidence to support the use of the active release technique / sacroiliac manipulation / fibular head manipulation, alone or in combination for the treatment of ITBS. This is because the case study lacked the essential basics to provide greater methodological strength.

Based on the noted limitation, outcomes and discussion of the study, the ranking achieved at a 72% agreement level and a score consisting of “C” – 3, “I” – 3 and “n/a” – 5 (Table 4.2), this indicates that the study is of poor quality, and adds limited information into the current knowledge of ITBS; however, it does provide a requirement for investigation.

Conclusions:

According to the criteria specified by Foley *et al.,* (2003), this study was ranked as providing no evidence to support the use of active release technique in the management of ITBS.

Further studies evaluating the efficacy of the active release technique / sacroiliac manipulation / fibular head manipulation, alone, or in combination are required. The use of a larger sample group consisting of both male and female participants and the use of a control group (viz. employ all the criteria of an RCT) is recommended to support the application of these interventions in the management of ITBS.

The addition of stringent exclusion criteria, standardisation of interventions between individual participants and a follow-up strategy would aim to strengthening the outcomes of the study.

5.4.2 Corrective neuromuscular approach

Table 5.3 Intervention: Corrective neuromuscular approach

Author(s) / Year:	Study Type:	Ranking of Individual Study:	Level of Evidence of Intervention					
			Strong	Moderate	Limited	Consensus	Conflicting	No Evidence
Pettitt and Dolski (2000)	Case study	Poor						X

As a result of the limitations of their study, Pettitt and Dolski (2000) achieved limited methodological rigor with regards to the recording, analysis, and reporting of participant data in a systematic manner, which prevented the study from reaching the outcomes suggested by its title: "Corrective neuromuscular approach to the treatment of iliotibial band friction syndrome: a case report". Therefore, the use of a corrective neuromuscular approach in clinical practice has limited evidence based on the evidence or lack thereof presented in this case study.

Conclusions:

As per the criteria specified by Foley *et al.,* (2003), this study provided no evidence in the support of corrective neuromuscular approach in the treatment of ITBS.

Future structured RCTs (e.g. appropriate sample size) should be done to investigate the potential benefits of corrective neuromuscular approach in the management of ITBS. Additionally, limiting the number of interventions included in the study would further assist in supporting the effects of corrective neuromuscular approach in the treatment of ITBS.

5.4.3 Custom dry floatation cushions

Table 5.4 Intervention: Custom dry floatation cushions

Author(s) / Year:	Study Type:	Ranking of Individual Study:	Level of Evidence of Intervention					
			Strong	Moderate	Limited	Consensus	Conflicting	No Evidence
Wong and Wade (1995)	Non-randomised controlled trial	Very poor						X

Although the study was a valiant attempt at achieving improved clinical outcomes for a particular subset of participants, the inherent flaws e.g. related to participant homogeneity, ill-defined intervention strategies and significant drop out at the various measurement time points, significantly limits Wong and Wade's study from drawing any firm conclusions with regards to the effectiveness of custom dry floatation cushions. When comparing this outcome and analysis of the study, to the ranking attributed to this article by the reviewers (Table 4.31), it became evident that the reviewers agreed that there are significant flaws within the structure of the study. Therefore, at best it can be concluded that custom dry floatation cushions has less than poor evidence for its effectiveness in clinical practice.

Conclusions:

According to the criteria specified by Foley *et al.,* (2003), this study provided no evidence in the support of custom dry floatation cushions for the treatment of ITB contractures in non-ambulatory, muscular dystrophy patients.

Future studies, based on structured RCT format (use of a large sample size and control group) should be done to further investigate the role of custom dry floatation cushions in the treatment of ITB contractures. Future studies should aim to adequately record measurements, with particular attention to air pressure, degree of inflation and frequency of inflation. Additionally, factors such as frequency of physiotherapy should be standardised between participants. Long-term outcomes should be investigated with a larger participant sample size.

5.4.4 Customised polyurethane running shoe orthoses

Table 5.5 Intervention: Customised polyurethane running shoe orthoses

Author(s) / Year:	Study Type:	Ranking of Individual Study:	Level of Evidence of Intervention					
			Strong	Moderate	Limited	Consensus	Conflicting	No Evidence
Hirschmüller *et al.,* (2011)	Randomised controlled trial	Good		X				

Although the study was highly ranked by the reviewers, in terms of the methodological rigor it is apparent that the inclusion criteria, were significantly wide enough to include a variety of conditions and participant presentations under the umbrella of "chronic" running injuries, which resulted in the authors only being able to state that the use of orthoses may be indicated in the chronic mechanical conditions (without the ability to define which of these conditions would benefit most or least from this intervention). As a result, this study provides evidence that orthoses may be of use in ITBS but that future condition-specific research would be required to validate the assumption drawn from the results of this particular research.

Conclusions:

As per the criteria specified by Foley *et al.,* (2003), this study achieved a moderate level of evidence in the support of customised polyurethane shoe orthoses in the management of overuse injuries in runners.

Future studies should be done to investigate the role of orthoses specifically in the management of ITBS. Additionally, the use of a larger sample size, would allow for a greater methodological support for the use of this intervention. Additionally, the use of a true control group and the use of a blinded assessor (viz. employ all the criteria of an RCT) would provide a sound methodological study.

5.4.5 Deep transverse frictions

Table 5.6 Intervention: Deep transverse frictions (DTF)

Author(s) / Year:	Study Type:	Ranking of Individual Study:	Level of Evidence of Intervention					
			Strong	Moderate	Limited	Consensus	Conflicting	No Evidence
Schwellnus *et al.,* (1992)	Randomised controlled trial	Good		X				

Although this study met all the requirements for a strong RCT, which was indicated by the reviewers (see Table 4.43), the limitations highlighted in Table 4.44, detract from the authors' ability to specifically comment on the effectiveness of DTF. The authors were unable to fully address their hypothesis, based on the limitations which prevented the study from ranking any higher on the PEDro scale.

Conclusions:

Only one published and peer-reviewed study is available regarding the effectiveness of DTF in the management of ITBS, which indicates a vital gap in the knowledge of its application. As per the criteria specified by Foley *et al.,* (2003), this study provided a moderate level of evidence that DTF **was not effective** in the management of ITBS.

Future studies investigating the role of DTF in the treatment of ITBS, should be done, which should be based on a structured RCT design and incorporating a larger sample size and limitation of the interventions used. Additionally, increasing the length of the study period, would have allowed for the long-term benefits of DTF to be investigated, or to be identified its inappropriateness in the management of ITBS.

5.4.6 Hip abductor strengthening

Table 5.7 Intervention: Hip abductor strengthening

Author(s) / Year:	Study Type:	Ranking of Individual Study:	Level of Evidence of Intervention					
			Strong	Moderate	Limited	Consensus	Conflicting	No Evidence
Beers *et al.,* (2008)	Non-randomised controlled trial	Moderate			X	X		
Schreiber and Louw (2011)	Case study	Moderate						

Although Beers *et al.,* (2008) highlights the possibility that weak hip abductor musculature may play a role in the initiation and / or perpetuation of ITBS, and that its treatment may allow for expedient recovery of participants suffering from ITBS, the significant limitations noted (Table 4.24); limit the authors' ability to firmly conclude these outcomes. This analysis revealed an overall review ranking attained an average score of five out of nine, indicating the reviewers' reservations around those particular criteria that are linked to the flaws of this study.

Schreiber and Louw's (2011) study show a significant effort by the authors to apply methodologically rigorous structures within the case study. This study has both objective and subjective outcome measures, a pre-test – post-test, A-B-A design and is conducted on a test principle (the interventions were not specifically decided on in terms of their clinical necessity); therefore, the level of evidence supporting the use of gluteus medius strengthening in the treatment of ITBS is moderate. Thus, studies establishing the effectiveness of hip strengthening programmes should be conducted on a larger sample group. Additionally, the role of core strengthening with hip abductor strengthening should be further explored.

Conclusions:

Based on the reviewers' analysis of the study outcomes and limitations, it becomes evident that there is limited evidence (Foley *et al.,* 2003) supporting the use of hip abductor strengthening in the treatment of ITBS.

There is a suggestion, however, that the results from both articles indicate that hip abductor strength has a particular role to play in ITBS. This suggests that future structured RCTs should be done to investigate hip abductor strength as an intervention strategy, and to further support or negate the development of evidence supporting this intervention. To this end, no RCTs have investigated the role of abductor strengthening in the treatment of ITBS.

Additionally: the use of a larger sample size; increasing the duration of the study (to longer than that of six weeks), limiting participants to a particular recreational activity (i.e. runners only included in the sample group); use of one particular exercise to investigate strengthening and use of a control group (as are required in a structured RCT) would further improve methodological quality of future studies investigating the role of this intervention in the management of ITBS.

5.4.7 Injectable corticosteroids

Table 5.8 Intervention: Injectable corticosteroids

Author(s) / Year:	Study Type:	Ranking of Individual Study:	Level of Evidence of Intervention					
			Strong	Moderate	Limited	Consensus	Conflicting	No Evidence
Gunter and Schwellnus (2004)	Randomised controlled trial	Good		X				

As can be seen from the reviewers' ranking given to this study, it can be stated that the authors achieved a significant rigor in the methodology and execution of this study. However, within this stringent context, limitations for the generalizability of the data exist and it can therefore only be stated that corticosteroid use may assist certain participants over the short-term for the symptoms of acute ITBS.

Conclusions:

As per the criteria proposed by Foley *et al.,* (2003), this intervention received a moderate level of evidence, for the support of injectable corticosteroids in the treatment of ITBS.

Future studies investigating the role of injectable corticosteroids in the management of ITBS should employ the structured design of an RCT (appropriate sample size). Additionally, the exclusion of other interventions (ice application, stretching, and rest from activity) will allow for a true reflection of the appropriateness or inappropriateness of injectable corticosteroids in the management of ITBS.

Future RCTs that are based on this study should ensure that the volumes of injectable solutions (intervention and placebo) are similar.

An appropriate combination of measurement tools (objective and subjective) should be considered in future studies.

5.4.8 Phonophoresis

Table 5.9 Intervention: Phonophoresis

Author(s) / Year:	Study Type:	Ranking of Individual Study:	Level of Evidence of Intervention					
			Strong	Moderate	Limited	Consensus	Conflicting	No Evidence
Bischoff *et al.,* (1995)	Randomised controlled trial	Good		X				

In terms of the review of this study, it is noted that the reviewers agreed to a 94% level, because this study had significant methodological rigor in terms of the criteria outlined in the PEDro Scale. It is, however, apparent that with a lack of a consort diagram and participant tracking ability that the reader is left with a limited picture of the clinical progression of the participants through the study. As a result of this, the context for the conclusions of the study become obscured and the possibility for bias increases; which weakens an otherwise strong study.

Conclusions:

As per the criteria discussed by Foley *et al.,* (2003), there is a moderate level of evidence in the support of the application of phonophoresis in the management of ITBS.

Future structured RCTs investigating the effects of phonophoresis versus ultrasound in the treatment of ITBS should be done. The use of a blinded assessor to conduct all measurements and an appropriate sample size would further support the clinical findings of future studies.

5.4.9 Stretch therapy

Table 5.10 Intervention: Stretch therapy

Author(s) / Year:	Study Type:	Ranking of Individual Study:	Level of Evidence of Intervention					
			Strong	Moderate	Limited	Consensus	Conflicting	No Evidence
Fredericson *et al.,* (2002)	Non-randomised controlled trial	Moderate			X			

In view of the limitations of this study, the reviewers at best ranked this study as having attained a limited outcome (Table 4.25), indicating that although several parameters were adequately controlled for (taking measurements at the same time of day, taking the average of five measurements, allowing for a warm-up stretch, comparing what the participants reported, to what was physically measured, randomisation of the stretches performed and no history of previous injury or surgery to the involved lower limb) in the study design, there are still numerous flaws, in which the outcomes of this study need to be contextualised.

Conclusions:

Based on the criteria specified by Foley *et al.,* (2003), this study was found to have a limited level of evidence in the support for stretch therapy, in the management of ITBS.

This ranking further implies that the outcomes of this particular study will need to be validated through more rigorous and controlled studies (RCTs) with larger sample sizes, in order to confirm the use of the stretch that the study identified as the best, in clinical practice. Additionally, future studies based on the above study should describe “good stretch” criteria more specifically.

5.4.10 Talar manipulation

Table 5.11 Intervention: Talar manipulation

Author(s) / Year:	Study Type:	Ranking of Individual Study:	Level of Evidence of Intervention					
			Strong	Moderate	Limited	Consensus	Conflicting	No Evidence
Baker (1995)	Case study	Poor						X

Baker (1995) makes three assumptions, one being that there is a relationship between talar fixations and the development of ITBS, secondly, that there is a relationship between tibialis posterior syndrome and ITBS, and thirdly that this treatment was responsible for the resolution of the symptoms of ITBS. Of these three assumptions, there is a paucity of literature substantiating these assumptions.

Additionally, previous treatments were not given due recognition for their impact on the conditions. Therefore, as a result of these assumptions it does not allow the reader to establish the benefit of manipulation of the talus, particularly in the treatment of ITBS. However, it does raise the question of whether full kinematic chain interventions should be more extensively considered in the treatment and further research in this regard should be done.

Based on the above noted limitations, outcomes and discussion of the study, the study achieved a 69% agreement level between the reviewers and a score of “C” – 4, “I” – 1 and “n/a” – 6 (Table 4.4). This ranking indicates that the study is of poor methodological quality, and adds limited information to the current knowledge of ITBS. However, it does provide an indication that further investigation into the benefits of talar manipulation in the management of ITBS. It is noted, that a percentage agreement between the reviewers of less than 70% indicates that there is a lack in clearly defined methodological rigor of the study. Therefore, it proved difficult for the reviewers to draw from the outcomes from this study.

Conclusions:

According to the criteria specified by Foley *et al.,* (2003), this study provided no evidence for the use of talar manipulation in the management of ITBS.

A study addressing the kinematic effects of ITBS should be done in a structured manner of an RCT (e.g. larger sample size). Future studies based on this study should exclude participants with additional injuries to the lower limb and should ensure adequate reporting of the intervention procedure(s) and treatment sessions, which would act to improve methodological strength of the studies.

5.4.11 Addressing biomechanical / causative factors

Table 5.12 Intervention: Addressing biomechanical / causative factors

Author(s) / Year:	Study Type:	Ranking of Individual Study:	Level of Evidence of Intervention					
			Strong	Moderate	Limited	Consensus	Conflicting	No Evidence
Noerhen *et al.,* (2007)	Observational study	Good			X			
McNicol *et al.,* (1981)	Observational study	Moderate to Poor						
Noble (1979)	Case study	Poor						
Noble (1980)	Case study	Poor						

Noerhen *et al.,* (2007) suggested that treatment of ITBS should focus on improving neuromuscular control of the hip musculature, particular the gluteus medius muscle. Additionally, Noerhen *et al.,* (2007) suggested that the inclusion of stretching exercises that focused on increasing the flexibility of the ITB was stated as beneficial in the management of ITBS. Improved methodological rigor of this prospective study is reflected by the improved ranking attributed to the study by the reviewers. Thus, by comparison to McNicol's *et al.,* (1981) study also ranked in Table 5.12, this particular study is ranked highly with regards to methodological rigor; however, based on its focal area being related directly to biomechanical influences in ITBS, it has limited ability to discuss the effect of the treatment with regards to any one or more interventions. As a result, the authors suggest that further studies are required to test the clinical effectiveness of the aetiological factors that they have identified, within a RCT format.

McNicol *et al.,* (1981) must be given credit for the improved clarity for the descriptions of interventions, which were noted by reviewers under Criterion Three (see Table 4.52). However, the study was a retrospective study, focussing predominantly on aetiological factors that had been documented clinically, and therefore had poor ability to comment on clinical treatment outcomes. The limited ability to comment on interventions, or combination thereof was as a result of limited standardisation and therefore comparability between treatment regimens between participants. Therefore, although the study provided a good descriptive narrative of aetiological factors, which provided for a moderate ranking by reviewers, its ability to comment on effectiveness of interventions for the treatment of ITBS is poor.

Noble's (1979) study ranked poorly according to Table 4.10, therefore the conclusion made with regards to this study implied that the outcomes are the same (viz. limited applicability to clinical practice, limited evidence for support of the intervention used, and significant more research required).

This is not dissimilar to the outcomes for the Noble's (1980) case series, however, in terms of the ranking of this particular study, although poor, it was slightly stronger (see Table 4.10 and Table 4.12 for comparison) than that of its 1979 counterpart, in that those criteria relating to homogeneity and participant description would have fared slightly better by comparison.

Conclusions:

From the above Table 5.12 it can be see that a total of four studies investigated the role of addressing biomechanical / causative factors in the management of ITBS. As per the criteria specified by Foley *et al.,* (2003), there is limited support for addressing biomechanical / causative factors in the management of ITBS. Three of the above studies were ranked poorly, and therefore contribute minimally to the body of knowledge with regards to combinations of interventions in the management of ITBS. This would be better substantiated in future studies investigating individual therapies or fewer therapies. It is however, considered that these studies were not necessarily meant to investigate interventions completely (with particular reference to Noble (1979) and Noble (1980), and were rather intended for expert opinion and introduction to ITBS, in a period in which ITBS was poorly understood, and there was minimal evidence exploring the aetiological factors and management of ITBS.

As a result the authors (Noble (1979) and Noble (1980)) suggested that further studies are needed to test the clinical effectiveness of the aetiological factors that they have identified, within a RCT format.

5.4.12 Combination interventions

Table 5.13 Intervention: Combination interventions

Author(s) / Year:	Study Type:	Ranking of Individual Study:	Level of Evidence of Intervention					
			Strong	Moderate	Limited	Consensus	Conflicting	No Evidence
Schwellnus *et al.,* (1991)	Randomised controlled trial	Excellent	X	X				
Fredericson *et al.,* (2000)	Case study	Good						
Grau *et al.,* (2011)	Randomised controlled trial	Good						
Pedowitz (2005)	Case study	Moderate						
Sutker *et al.,* (1985)	Non-randomised controlled trial	Moderate						
Clement *et al.,* (1983)	Observational study	Moderate to Poor						
Barber and Sutker (1992)	Case study	Poor						
Taunton *et al.,* (1987)	Non-randomised controlled trial	Poor						

Based on the aims of Schwellnus' *et al.,* (1991) RCT study, the methodological structure, and its clear, directed and rigorous processes, allowed for the reviewers to rank the study very highly (Table 4.45). Notwithstanding this, several factors affecting the external validity of the study (sample size, medication affect and lack of follow-up measures) significantly limit the ability of the authors to make definitive conclusions about individual interventions utilised in this study, this context is also apparent when comparing the three groups and attempting to determine which protocol delivered the best outcomes in the short-term.

Fredericson's *et al.,* (2000) case series reflected good methodological rigor in terms of participant inclusion, participant homogeneity, structured protocols and identified measurement outcomes. Although the study still has significant limitations (see Table 4.9) when compared to the more rigorous structure of RCTs, it is still able to comment more strongly on the relevance of the interventions used in this study and thus contribute to knowledge in terms of ITBS interventions. This study achieved a ranking of "A" – 2, "B1" – 3, "B2" – 2, "I" – 1 and "n/a" – 3, at an agreement level of 72% (Table 4.8). Based on this

ranking, it is suggested that a structured combination to include: stretching and strengthening therapies, non-steroidal anti-inflammatory medication and ultrasound, has an impact on hip abductor strength, and the role that it plays in the clinical presentation of ITBS.

Grau's *et al.,* (2011) study mimics a RCT, and achieved a good rating (Table 4.37). Therefore, the outcomes of the study add value in a clinical context (in terms of intervention, efficacy and effectiveness) and it provides a valuable resource in providing fertile ground for future research studies.

In many respects, Pedowitz's (2005) case study is very similar to Barber and Sutker's (1992) non-randomised controlled study, with the exception that the reviewers rated Criterion Three and Criterion Ten more strongly in this study (Table 4.14). This decision by the reviewers is based on the use of a standard, valid and reliable outcome measure and the likelihood that the intervention effect was less obstructed by extraneous variables, as compared to Barber and Sutker's (1992) study.

Therefore, the results of the study, although more limited than Fredericson *et al.,* (2000), suggested that a combination of the following therapies: strain-counterstrain osteopathic manipulative treatment; stretching; ice and heat application; use of non-steroidal anti-inflammatory medication and addressing biomechanical issues, should be considered for inclusion into management regimes for the treatment of ITBS; however, further research in this regard is recommended, both by the authors of the study and the reviewers.

Based on the limitations, outcomes and discussion of Sutker's *et al.,* (1985) study, it is therefore not surprising that the reviewers individually and collectively rated this study from moderate to very poor (Table 4.28), in terms of the criteria outlined in the Newcastle-Ottawa Scale (Appendix C). Therefore, the results need to be contextualised and read with caution limiting their use in clinical practice. It is, therefore, recommended that future studies investigate the assertions made by the authors.

Clement's *et al.,* (1983) study was a retrospective study, focusing predominantly on aetiological factors that had been documented clinically, and therefore had poor ability to comment on clinical treatment outcomes, the limited ability to comment on interventions, or combination thereof were as a result of a limited comparability between treatment regimens between participants. Therefore, although the study provided a good descriptive narrative of aetiological factors, which provided for a moderate ranking by reviewers (Table 4.50), its ability to comment on effectiveness of interventions for the treatment of ITBS is poor.

Barber and Sutker's (1992) case study seemed to support the use of combinations of conservative interventions in the management of ITBS. They also acknowledged the effect of extraneous variables that need to be considered to achieve optimal clinical outcomes. These conclusions are however, mutually exclusive, as the study cannot determine the efficacy of treatments or combinations of treatments while at the same time considering the impact of various extraneous factors that influence ITBS. These two conclusions are therefore weakened and result in a study that generates poor support for either of the constructs. This poor outcome is reflected in the analysis of this case series by the reviewers, in that the study was not only ranked poorly, but achieved the following outcomes: "C" – 4; "I" – 2 and "n/a" – 5 (Table 4.6). The study indicates that a reduction in mileage or complete cessation from activity is a significant method to address ITBS. Additionally, the incorporation of anti-inflammatory medication, local modalities (e.g. ultrasound) and stretching assisted with the recovery of participants.

As a result of the significant limitations discussed in Table 4.29, and as noted by Taunton *et al.,* (1987), it becomes apparent that the ability of their study to suggest particular interventions for the treatment of ITBS becomes impaired. These outcomes are consistent with the reviewers' rating where the majority ranking notes an average to below average outcome, reinforcing the limitations outlined in Table 4.30 and as a result this analysis concurs with the authors, suggesting that future studies should attempt to isolate the variable in the treatment protocols that allow for effective clinical resolution of the various conditions reported.

Conclusions:

Approximately a third of the articles reflected good to excellent outcomes in favour of combination therapies (incorporates two RCTs and one CS). Approximately, a third of the articles showed a poor to moderate ranking in favour of combination therapies (one RCT, one CS and one OBS), and another third showed moderate results in the favour of combination therapies (one CS and one N-RCT).

Given this combination of study types and rankings, as per the criteria specified by Foley *et al.,* (2003), the results would suggest that the overall evidence level for the support of combination therapies is moderate to strong. The evidence does not suggest the type of interventions or the degree to which they should be combined. As a result, specific combination therapies should be further investigated to determine which combinations result in the most effective clinical outcomes in the treatment of ITBS.

5.5 Conclusion of Chapter Five

Table 5.14 Level of evidence for interventions / intervention combinations

Interventions:	Level of Evidence for Interventions					
	Strong	Moderate	Limited	Consensus	Conflicting	No Evidence
Active release technique						X
Corrective neuromuscular approach						X
Custom dry floatation cushions						X
Customised polyurethane running shoe orthoses		X				
Deep transverse frictions		X				
Hip abductor strengthening			X	X		
Injectable corticosteroids		X				
Phonophoresis		X				
Stretch therapy			X			
Talar joint manipulation						X
Addressing biomechanical / causative factors		X		X		
Combination therapies	X	X		X		

In terms of Table 5.14, the most evidence was in favour of combination therapies in the treatment of ITBS.

The following were ranked as providing a moderate level of evidence for use in the treatment of ITBS: customised polyurethane running shoe orthoses, injectable corticosteroids, addressing biomechanical / causative factors and combination therapies. Collectively this group of interventions require further study through the use of RCTs to further support or negate their appropriateness in the treatment of ITBS.

By contrast, deep transverse frictions was noted as having moderate evidence in its use in the treatment of ITBS.

Those interventions with a limited level of evidence, included the following: active release technique, corrective neuromuscular approach, custom dry floatation cushions, hip abductor strengthening, stretch therapy and talar joint manipulation. This indicates the requirement for further studies (of any type) to address their appropriateness or inappropriateness in the treatment of ITBS.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This chapter concludes this dissertation and presents recommendations for future studies.

6.2 Conclusions

The aim of this study was to state the current knowledge of the conservative management of ITBS. To achieve this a systematic search for studies was completed. These were then screened through inclusion criteria, which resulted in a total of twenty-three studies included. Three different, but appropriate measurement tools were used by appointed reviewers to review these studies. Subsequently these studies were ranked according to the level of evidence. Therefore, this chapter summarises the current strengths and weaknesses in conservative interventions, as well as where further research is required.

The majority of studies ranked in a moderate to poor level of methodological strength (according to Tables 4.2 – 4.56), with very few of these studies providing solid conclusions, or having rigorous methodological support. These limitations suggest a gap for future research. A review of twenty-three articles was completed, followed by a discussion of these articles. This ranking was discussed in terms of the outcomes identified by the authors of each respective study. A conclusive paragraph for each study further identified its strengths and weaknesses in each individual study. Lastly, studies were ranked according to study type (CS, N-RCT, RCT and OBS).

Chapter Five grouped studies into their respective intervention type (see Table 5.1). Each intervention was discussed in terms of the level of evidence available, and recommendations for future studies. The majority of interventions were ranked to have a moderate to limited level of evidence, with very few interventions having a strong level of evidence; therefore, it could be assumed that there is a large gap for potential future studies investigating the appropriateness or inappropriateness of interventions in the treatment of ITBS.

In terms of Table 5.13, the most evidence was in favour of combination therapies in the treatment of ITBS.

This was followed by customised polyurethane running shoe orthoses, injectable corticosteroids, addressing biomechanical / causative factors, and combination therapies which showed a moderate level of evidence supporting their use in the treatment of ITBFS. By contrast, deep transverse frictions studies provided moderate evidence negating its use in practice. This group of interventions require further study through the use of RCTs to support or negate their appropriateness in the treatment of ITBS.

Lastly, active release technique, corrective neuromuscular approach, custom dry floatation cushions, hip abductor strengthening, stretch therapy and talar joint manipulation showed limited evidence which indicated the requirement for further studies (of any type) addressing their appropriateness or inappropriateness in the treatment of ITBS.

Therefore in terms of the study meeting its intended objectives, it was found that the majority of interventions in the treatment of ITBFS were rated as having a moderate level of evidence.

6.3 Recommendations

6.3.1 Recommendations to improve this study

Future reviews should consider familiarising reviewers with the measurement tools (i.e. scales) prior to the onset of the article review process. Enabling the reviewers to familiarise themselves with the different scales utilized to review the articles will increase the potential for higher agreement levels to be achieved. This would promote a higher level of understanding by the reviewers of the measurement tools, and therefore potentially increase the level of agreement between reviewers, and reduce the potential for interpretation bias in the results of the systematic review of literature.

Additionally, some reviewers reported difficulty with understanding and interpreting the individual scales, particularly the Newcastle-Ottawa Scale (Wells *et al.,* 2003) and the Liddle Scale (Liddle *et al.,* 1996). Although every effort was taken to provide reviewers with information and explanations of the scales (see Appendix C, D and E), the reviewers still reported some difficulty interpreting, especially in the scales which had more than two potential answers for selection for each criteria, for example, the PEDro Scale (www.pedro.org.au, 1999) had only two options, whereas, the Liddle Scale had six options, and the Newcastle-Ottawa Scale had various options for individual criteria). The betterment of these scales to improve the evaluation process of ranking of the structure of case studies / series, observational and non-randomised clinical trials is required. The reviewers found that the PEDro Scale (www.pedro.org.au, 1999) could have potentially been used to review

all study types (CS, N-RCT and OBS) as these could be compared to the methodological rigor of an RCT.

To ensure that the risk of bias in future systematic reviews is limited to a minimum, it is suggested that non-English articles be included. This would increase the number of articles for potential inclusion into the systematic review. However, the pitfalls of translation, should these articles be included, may serve to increase bias as opposed to detract from the bias. In that, the process of translation has its own pitfalls which need to be considered (Baynham, 1995; Scollen and Scollen, 1995).

By contrast, the inclusion of non-conservative e.g. surgical interventions in a future systematic review may allow for a more balanced view of all therapies for this condition. Studies investigating conservative interventions tended to be less rigorous, in comparison to studies which investigate surgical interventions, which would be more likely to have stronger methodological rigour. Therefore, the potential exists that an inherit skew in the support of the use of non-conservative interventions may be found. A review, therefore, considering both conservative and surgical interventions may advocate the use of surgical interventions, although conservative may fair better for patient care.

6.3.2 Recommendations for future studies

- Ideally randomised controlled trials should be done, when investigating the effectiveness / efficacy of an intervention in the treatment of ITBS. The use of the CONSORT guidelines by authors of these studies should be encouraged in order to facilitate more effective review of RCT studies.
- In studies which are not randomised controlled trials, the incorporation of the factors which make up the rigorous structure of an RCT can assist in improving the methodological rigor of such studies. These include: using a large sample size, determining a sample size with an *a priori* calculation, including both male and female participants, use of inclusion and exclusion criteria, thoroughly documenting all diagnostic / intervention / follow-up procedures, use of a control group, and standardising interventions between participant groups. The use of the KOOS guidelines by authors of these studies should be encouraged in order to facilitate more effective review of N-RCT studies.
- Studies, particularly RCTs, are required to further investigate the benefits of: customised polyurethane running shoe orthoses, injectable corticosteroids, addressing biomechanical / causative factors, combination therapies and deep tissue frictions in the management of ITBS.

- Studies, of any study type (CS, N-RCT, RCT and OBS), are required to investigate the appropriateness / inappropriateness of: active release technique, corrective neuromuscular approach, custom dry floatation cushions, hip abductor strengthening, stretch therapy and talar joint manipulation in the management of ITBS.
- In addition to using the appropriate reporting guidelines, practitioners and researchers should be encouraged to use the most appropriate and validated tool to consistently measure patient progression through the course of their trial, study or case report.
- On review of the studies included a number of different outcome measures were utilized, of all of these, those which were used in the studies with a good to excellent methodological rigor are recommended to be used in future studies. These appropriate outcome measures include;
- Future studies should go into greater depth regarding the specificity of treatments. For example, length of time for rest from activity, types of activities that should be avoided (those causing pain versus those that do not), re-introduction to training.
- There is a need for a systematic review identifying the diagnostic methods employed in the diagnosis of ITBS as well as their reliability.
- The review identified a number of outcome measures which are deemed appropriate, these are; the subjective pain experience scale, pain disability index, comfort index of orthoses, visual analogue scale, functional treadmill running test, 24-hour recall pain score, number of days for participant reporting no pain, pain-free one mile run, six camera 3D infrared motion capture system, handheld dynamometer and the six camera Vicon 512 motion analysis system (Grau *et al.,* 2011; Hirschmüller *et al.,* 2011; Noerhen *et al.,* 2007; Gunter and Schwellnus, 2004; Fredericson *et al.,* 2000; Bischoff *et al.,* 1995; Schwellnus *et al.,* 1992; Schwellnus *et al.,* 1991). It is recommended that these outcome measures be used in combination, where a combination of subjective and objective or primary and / or secondary outcome measures are incorporated in the methodology of future studies.

6.3.3 Recommendations for practitioners

In conclusion, from this chapter, treatment of patients suffering from ITBS is best achieved when a combination regimen is used (see tables 5.13 and 5.14), although specific combinations of interventions require further research. Thus, a regimen could include one or more of the following;

- Stretching of the ITB and associated musculature.
- Strengthening weakened musculature, particularly the gluteus medius muscle.

- Modified rest, including, avoidance of perpetuating activity until pain reduction is achieved, and use of alternative activities to maintain cardiovascular fitness.
- Addressing biomechanical and aetiological factors when present.
- Local modalities, including: ice application and ultrasound.
- Gradual re-introduction to activity that is pain-free.

Additionally, the use of anti-inflammatory medication and analgesics should be incorporated in treatment, when required.

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Communications via email:

Mrs Avenal Finlayson - 22 February 2013.
Mr Steve Suchanek - 22 July 2013.
Mrs Tonya Esterhuizen and Mrs Taryn Young - 20 August 2013.

APPENDICES

APPENDIX A

DATABASE SEARCH LIST:

Database:	EBSCOhost (Medline, SPORTDiscus, MEDLINE, Health Source, CINAHL Plus)				
Search Term:	Article Number:	Articles Included:	Author(s):	Year:	Title:
Iliotibial band syndrome	962	21	Baer	1999	Iliotibial band syndrome in cyclists: evaluation and treatment: a case report
			Baker	1995	Iliotibial band and tibialis posterior syndromes resulting from a fixed talus: a case report
			Bischoff, Prusaczyk, Sopchick, Pratt, Goforth	1995	Comparison of phonophoresis and knee immobilization in treating iliotibial band syndrome
			Clement, Taunton, McKenzie	1983	Iliotibial band friction syndrome
			Federici	1997	Treating itb friction syndrome using iontophoresis
			Fredericson, Cookingham, Chaudhari, Dowdell, Oestreicher, Sahrmann	2000	Hip abductor weakness in distance runners with iliotibial band syndrome
			Fredericson, White, MacMahon, Andriacchi	2002	Quantitative analysis of the relative effectiveness of 3 iliotibial band stretches
			Grau, Krauss, Maiwald, Axmann, Horstmann, Best	2011	Kinematic classification of iliotibial band syndrome in runners
			Gunter, Schwellnus	2004	Local corticosteroid injection in iliotibial band friction syndrome in runners: a randomised controlled trial
			Hirschmüller, Baur, Müller, Helwig, Dickhuth, Mayer	2011	Clinical effectiveness of customised sport shoe orthoses for overuse injuries in runners: a randomised controlled study
			McNicol, Taunton, Clement	1983	Iliotibial tract friction syndrome in athletes
			Nobel	1979	The treatment of iliotibial band friction syndrome
			Noehren, Davis, Hamill	2007	Prospective study of the biomechanical factors associated with iliotibial band syndrome
			O'Hearn	2006	The use of incline running and heel raises in the treatment of iliotibial band friction syndrome in runners: a case series
			Pedowitz	2005	Use of osteopathic manipulative treatment for iliotibial band

					friction syndrome
			Pettitt, Dolski	2000	Corrective neuromuscular approach to the treatment of iliotibial band friction syndrome: a case report
			Schreiber, Louw	2011	The effect of gluteus medius training on hip kinematics in a runner with iliotibial band syndrome
			Schwellnus, Theunissen, Noakes, Reinach	1991	Anti-inflammatory and combined anti-inflammatory/analgesic medication in the early management of iliotibial band friction syndrome. A clinical trial
			Simoens, Vanhoenacker, Willemen, de Schepper	2002	Iliotibial band friction syndrome
			Sutker, Jackson, Pagliano	1981	Iliotibial band syndrome in distance runners
			Taunton, Clement, Smart, McNicol	1987	Non-surgical management of overuse knee injuries in runners
Iliotibial band syndrome, treatment	64	8	Baer	1999	Iliotibial band syndrome in cyclists: evaluation and treatment: a case report
			Grau, Krauss, Maiwald, Axmann, Horstmann, Best	2011	Kinematic classification of iliotibial band syndrome in runners
			Gunter, Schwellnus	2004	Local corticosteroid injection in iliotibial band friction syndrome in runners: a randomised controlled trial
			Nobel	1979	The treatment of iliotibial band friction syndrome
			O'Hearn	2006	The use of incline running and heel raises in the treatment of iliotibial band friction syndrome in runners: a case series
			Pedowitz	2005	Use of osteopathic manipulative treatment for iliotibial band friction syndrome
			Pettitt, Dolski	2000	Corrective neuromuscular approach to the treatment of iliotibial band friction syndrome: a case report
			Schwellnus, Mackintosh, Mee	1992	Deep transverse frictions in the treatment of iliotibial band friction syndrome in athletes: a clinical trial
Iliotibial band syndrome, conservative	8	0			
Iliotibial band syndrome, intervention	5	0			

Database:	Google Scholar				
Search Term:	Article Number:	Articles Included:	Author(s):	Year:	Title:
Iliotibial band syndrome	4,130	12	Beers, Ryan, Kasubauchi, Frazser, Taunton	2008	Effects of multi-modal physiotherapy including hip abductor strengthening, in patients with iliotibial band friction syndrome
			Bischoff, Prusaczyk, Sopchick, Pratt, Goforth	2009	Comparison of phonophoresis and knee immobilization in treating iliotibial band syndrome
			Fredericson, Cookingham, Chaudhari, Dowdell, Oestreicher, Sahrmann	2000	Hip abductor weakness in distance runners with iliotibial band syndrome
			Fredericson, White, MacMahon, Andriacchi	2002	Quantitative analysis of the relative effectiveness of 3 iliotibial band stretches
			Gunter, Schwellnus	2004	Local corticosteroid injection in iliotibial band friction syndrome in runners: a randomised controlled trial
			Noble	1979	The treatment of iliotibial band friction syndrome
			Noble	1980	Iliotibial band friction syndrome in runners
			Pedowitz	2005	Use of osteopathic manipulative treatment for iliotibial band friction syndrome
			Pettitt, Dolski	2000	Corrective neuromuscular approach to the treatment of iliotibial band friction syndrome: a case report
			Schwellnus, Mackintosh, Mee	1992	Deep transverse frictions in the treatment of iliotibial band friction syndrome in athletes: a clinical trial
			Schwellnus, Theunissen, Noakes, Reinach	1991	Anti-inflammatory and combined anti-inflammatory/analgesic medication in the early management of iliotibial band friction syndrome. A clinical trial
			Sutker, Jackson, Pagliano	1981	Iliotibial band syndrome in distance runners
Iliotibial band syndrome, treatment	3,550	12	Beers, Ryan, Kasubauchi, Frazser, Taunton	2008	Effects of multi-modal physiotherapy including hip abductor strengthening, in patients with iliotibial band friction syndrome
			Bischoff, Prusaczyk, Sopchick, Pratt, Goforth	2009	Comparison of phonophoresis and knee immobilization in treating iliotibial band syndrome
			Fredericson, Cookingham,	2000	Hip abductor weakness in distance runners with iliotibial band

			Chaudhari, Dowdell, Oestreicher, Sahrmann		syndrome
			Fredericson, White, MacMahon, Andriacchi	2002	Quantitative analysis of the relative effectiveness of 3 iliotibial band stretches
			Gunter, Schwellnus	2004	Local corticosteroid injection in iliotibial band friction syndrome in runners: a randomised controlled trial
			Noble	1979	The treatment of iliotibial band friction syndrome
			Noble	1980	Iliotibial band friction syndrome in runners
			Pedowitz	2005	Use of osteopathic manipulative treatment for iliotibial band friction syndrome
			Pettitt, Dolski	2000	Corrective neuromuscular approach to the treatment of iliotibial band friction syndrome: a case report
			Schwellnus, Mackintosh, Mee	1992	Deep transverse frictions in the treatment of iliotibial band friction syndrome in athletes: a clinical trial
			Schwellnus, Theunissen, Noakes, Reinach	1991	Anti-inflammatory and combined anti-inflammatory/analgesic medication in the early management of iliotibial band friction syndrome. A clinical trial
			Sutker, Jackson, Pagliano	1981	Iliotibial band syndrome in distance runners
Iliotibial band syndrome, conservative	1,150	12	Beers, Ryan, Kasubauchi, Frazser, Taunton	2008	Effects of multi-modal physiotherapy including hip abductor strengthening, in patients with iliotibial band friction syndrome
			Bischoff, Prusaczyk, Sopchick, Pratt, Goforth	2009	Comparison of phonophoresis and knee immobilization in treating iliotibial band syndrome
			Fredericson, Cookingham, Chaudhari, Dowdell, Oestreicher, Sahrmann	2000	Hip abductor weakness in distance runners with iliotibial band syndrome
			Fredericson, White, MacMahon, Andriacchi	2002	Quantitative analysis of the relative effectiveness of 3 iliotibial band stretches
			Gunter, Schwellnus	2004	Local corticosteroid injection in iliotibial band friction syndrome in runners: a randomised controlled trial
			Noble	1979	The treatment of iliotibial band friction syndrome
			Noble	1980	Iliotibial band friction syndrome in runners
			Pedowitz	2005	Use of osteopathic manipulative treatment for iliotibial band friction syndrome
			Pettitt, Dolski	2000	Corrective neuromuscular approach to the treatment of

					iliotibial band friction syndrome: a case report
			Schwellnus, Mackintosh, Mee	1992	Deep transverse frictions in the treatment of iliotibial band friction syndrome in athletes: a clinical trial
			Schwellnus, Theunissen, Noakes, Reinach	1991	Anti-inflammatory and combined anti-inflammatory/analgesic medication in the early management of iliotibial band friction syndrome. A clinical trial
			Sutker, Jackson, Pagliano	1981	Iliotibial band syndrome in distance runners
Iliotibial band syndrome	3,660	12	Beers, Ryan, Kasubauchi, Frazser, Taunton	2008	Effects of multi-modal physiotherapy including hip abductor strengthening, in patients with iliotibial band friction syndrome
			Bischoff, Prusaczyk, Sopchick, Pratt, Goforth	2009	Comparison of phonophoresis and knee immobilization in treating iliotibial band syndrome
			Fredericson, Cookingham, Chaudhari, Dowdell, Oestreicher, Sahrmann	2000	Hip abductor weakness in distance runners with iliotibial band syndrome
			Fredericson, White, MacMahon, Andriacchi	2002	Quantitative analysis of the relative effectiveness of 3 iliotibial band stretches
			Gunter, Schwellnus	2004	Local corticosteroid injection in iliotibial band friction syndrome in runners: a randomised controlled trial
			Noble	1979	The treatment of iliotibial band friction syndrome
			Noble	1980	Iliotibial band friction syndrome in runners
			Pedowitz	2005	Use of osteopathic manipulative treatment for iliotibial band friction syndrome
			Pettitt, Dolski	2000	Corrective neuromuscular approach to the treatment of iliotibial band friction syndrome: a case report
			Schwellnus, Mackintosh, Mee	1992	Deep transverse frictions in the treatment of iliotibial band friction syndrome in athletes: a clinical trial
			Schwellnus, Theunissen, Noakes, Reinach	1991	Anti-inflammatory and combined anti-inflammatory/analgesic medication in the early management of iliotibial band friction syndrome. A clinical trial
			Sutker, Jackson, Pagliano	1981	Iliotibial band syndrome in distance runners

Database:	MetaLib				
Search Term:	Article Number:	Articles Included:	Author(s):	Year:	Title:
Iliotibial band syndrome	16	1	Bischoff, Prusaczyk, Sopchick, Pratt, Goforth	2009	Comparison of phonophoresis and knee immobilization in treating iliotibial band syndrome
Iliotibial band syndrome, treatment	8	1	Bischoff, Prusaczyk, Sopchick, Pratt, Goforth	2009	Comparison of phonophoresis and knee immobilization in treating iliotibial band syndrome
Iliotibial band syndrome, conservative	4	1	Bischoff, Prusaczyk, Sopchick, Pratt, Goforth	2009	Comparison of phonophoresis and knee immobilization in treating iliotibial band syndrome
Iliotibial band syndrome, intervention	9	1	Bischoff, Prusaczyk, Sopchick, Pratt, Goforth	2009	Comparison of phonophoresis and knee immobilization in treating iliotibial band syndrome

Database:	Pubmed				
Search Term:	Article Number:	Articles Included:	Author(s):	Year:	Title:
Iliotibial band syndrome	151	10	Beers, Ryan, Kasubauchi, Frazser, Taunton	2008	Effects of multi-modal physiotherapy including hip abductor strengthening, in patients with iliotibial band friction syndrome
			Fredericson, Cookingham, Chaudhari, Dowdell, Oestreicher, Sahrmann	2000	Hip abductor weakness in distance runners with iliotibial band syndrome
			Fredericson, White, MacMahon, Andriacchi	2002	Quantitative analysis of the relative effectiveness of 3 iliotibial band stretches
			Grau, Krauss, Maiwald, Axmann, Horstmann, Best	2011	Kinematic classification of iliotibial band syndrome in runners
			Gunter, Schwellnus	2004	Local corticosteroid injection in iliotibial band friction syndrome in runners: a randomised controlled trial
			Noble	1979	The treatment of iliotibial band friction syndrome
			Noehren, Davis, Hamill	2007	Prospective study of the biomechanical factors associated with iliotibial band syndrome
			Pedowitz	2005	Use of osteopathic manipulative treatment for iliotibial band friction syndrome
			Pettitt, Dolski	2000	Corrective neuromuscular approach to the treatment of iliotibial band friction syndrome: a case report
			Schwellnus, Theunissen, Noakes, Reinach	1991	Anti-inflammatory and combined anti-inflammatory/analgesic medication in the early management of iliotibial band friction syndrome. A clinical trial
Iliotibial band syndrome, treatment	97	9	Barber, Sutker	1992	Iliotibial band syndrome
			Beers, Ryan, Kasubauchi, Frazser, Taunton	2008	Effects of multi-modal physiotherapy including hip abductor strengthening, in patients with iliotibial band friction syndrome
			Fredericson, White, MacMahon, Andriacchi	2002	Quantitative analysis of the relative effectiveness of 3 iliotibial band stretches
			Gunter, Schwellnus	2004	Local corticosteroid injection in iliotibial band friction syndrome in runners: a randomised controlled trial
			Noble	1979	The treatment of iliotibial band friction syndrome

			Noehren, Davis, Hamill	2007	Prospective study of the biomechanical factors associated with iliotibial band syndrome
			Pedowitz	2005	Use of osteopathic manipulative treatment for iliotibial band friction syndrome
			Pettitt, Dolski	2000	Corrective neuromuscular approach to the treatment of iliotibial band friction syndrome: a case report
			Schwellnus, Theunissen, Noakes, Reinach	1991	Anti-inflammatory and combined anti-inflammatory/analgesic medication in the early management of iliotibial band friction syndrome. A clinical trial
Iliotibial band syndrome, conservative	22	2	Noble	1979	The treatment of iliotibial band friction syndrome
			Pedowitz	2005	Use of osteopathic manipulative treatment for iliotibial band friction syndrome
Iliotibial band syndrome, intervention	11	1	Pettitt, Dolski	2000	Corrective neuromuscular approach to the treatment of iliotibial band friction syndrome: a case report

Database:	Science Direct				
Search Term:	Article Number:	Articles Included:	Author(s):	Year:	Title:
Iliotibial band syndrome	768	3	Noehren, Davis, Hamill	2007	Prospective study of the biomechanical factors associated with iliotibial band syndrome
			Schwellnus, Mackintosh	1992	Deep transverse frictions in the treatment of iliotibial band friction syndrome in athletes: a clinical trial
			Wong, Wade	1995	Reducing iliotibial band contractures in patients with muscular dystrophy using custom dry floatation cushions
Iliotibial band syndrome, treatment	656	1	Noehren, Davis, Hamill	2007	Prospective study of the biomechanical factors associated with iliotibial band syndrome
Iliotibial band syndrome, conservative	303	0			
Iliotibial band syndrome, intervention	357	1	Noehren, Davis, Hamill	2007	Prospective study of the biomechanical factors associated with iliotibial band syndrome

Database:	SpringerLink				
Search Term:	Article Number:	Articles Included:	Author(s):	Year:	Title:
Iliotibial band syndrome	159	0			
Iliotibial band syndrome, treatment	305	0			
Iliotibial band syndrome, conservative	186	0			
Iliotibial band syndrome, intervention	64	0			

APPENDIX B

MASTER LIST:

	AUTHOR(S)	YEAR	TITLE	REFERENCE	STUDY TYPE	INCLUDED
1	Baer JM	1999	Iliotibial band syndrome in cyclists: evaluation and treatment: a case report	Baer JM, 1999. Iliotibial band syndrome in cyclists: evaluation and treatment: a case report. *Journal of Sports Chiropractic and Rehabilitation,* 13(2): 66-68, 90-91.	CS	YES
2	Baker GJ	1995	Iliotibial band and tibialis posterior syndromes resulting from a fixed talus: a case report	Baker GJ, 1995. Iliotibial band and tibialis posterior syndromes resulting from a fixed talus: a case report. *Chiropractic Sports Medicine,* 9(4): 119-121.	CS	YES
3	Barber FA and Sutker AN	1992	Iliotibial band syndrome	Barber FA and Sutker AN, 1992. Iliotibial band syndrome. *Sports Medicine,* 14(2): 144-148.	CS	YES
4	Beers A *et al.*	2008	Effects of multi-modal physiotherapy including hip abductor strengthening, in patients with iliotibial band friction syndrome	Beers A, Ryan M, Kasubuchi Z, Fraser S and Taunton JE, 2008. Effects of multi-modal physiotherapy including hip abductor strengthening in patients with iliotibial band friction syndrome. *Physiotherapy Canada,* 60(2): 180-188.	N-RCT	YES
5	Bischoff C *et al.*	1995	Comparison of phonophoresis and knee immobilization in treating iliotibial band syndrome	Bischoff C, Prusaczyk K, Sopchick TL, Pratt NC and Goforth HW, 1995. Comparison of phonophoresis and knee immobilization in treating iliotibial band syndrome. *Sports Medicine, Training and Rehabilitation,* 6(1): 1-6.	RCT	YES
6	Clement DB *et al.*	1983	Iliotibial band friction syndrome	Clement DB, Taunton JE and McKenzie DC, 1983. Iliotibial tract friction syndrome. *Journal of the Canadian Athletic Therapists' Association,* 10(2): 15-16.	OBS	YES
7	Fredericson M *et al.*	2000	Hip abductor weakness in distance runners with iliotibial band syndrome	Fredericson M, Cookingham CL, Chaudhari AM, Dowdell BC, Oestreicher N and Sahrmann SA, 2000. Hip abductor weakness in distance runners with iliotibial band syndrome. *Clinical Journal of Sport Medicine,* 10(3): 169-175.	CS	YES
8	Fredericson M *et al.*	2002	Quantitative analysis of the relative effectiveness of 3 iliotibial band stretches	Fredericson M, White JJ, MacMahon JM and Andriacchi TP, 2002. Quantitative analysis of the relative effectiveness of 3 iliotibial band stretches. *Archives of Physical Medicine and Rehabilitation,* 83: 589-592.	N-RCT	YES
9	Grau S *et al.*	2011	Kinematic classification of	Grau S, Krauss I, Maiwald C, Axmann D, Horstmann T and	RCT	YES

			iliotibial band syndrome in runners	Best R, 2011. Kinematic classification of iliotibial band syndrome in runners. *Scandinavian Journal of Medicine & Science in Sports,* 21(2): 184-189.		
10	Gunter P *et al.*	2004	Local corticosteroid injection in iliotibial band friction syndrome in runners: a randomised controlled trial	Gunter P and Schwellnus MP, 2004. Local corticosteroid injection in iliotibial band friction syndrome in runners: a randomised controlled trial. *British Journal of Sports Medicine,* 38: 269-272.	RCT	YES
11	Hirschmüller A *et al.*	2011	Clinical effectiveness of customised sport shoe orthoses for overuse injuries in runners: a randomised controlled study	Hirschmüller A, Baur H, Müller S, Helwig P, Dickhuth HH and Mayer F, 2011. Clinical effectiveness of customised sport shoe orthoses for overuse injuries in runners: a randomised controlled study. *British Journal of Sports Medicine,* 45: 959-965.	RCT	YES
12	McNicol K *et al.*	1983	Iliotibial tract friction syndrome in athletes	McNicol K, Taunton JE and Clement DB, 1981. Iliotibial tract friction syndrome in athletes. *Canadian Journal of Applied Sports Science,* 6(2): 76-80.	OBS	YES
13	Noble CA	1979	The treatment of iliotibial band friction syndrome	Noble CA, 1979. The treatment of iliotibial band friction syndrome. *British Journal of Sports Medicine,* 13: 51-54.	CS	YES
14	Noble CA	1980	Iliotibial band friction syndrome in runners	Noble CA, Hajek MR and Porter M, 1980. Iliotibial band friction syndrome in runners. *American Journal of Sports Medicine,* 8(4): 232-234.	CS	YES
15	Noehren B *et al.*	2007	Prospective study of the biomechanical factors associated with iliotibial band syndrome	Noerhen B, Davis I and Hamill J, 2007. Prospective study of the biomechanical factors associated with iliotibial band syndrome. *Clinical Biomechanics,* 22(9): 951-956.	OBS	YES
16	**O'Hearn**	**2006**	**The use of incline running and heel raises in the treatment of iliotibial band friction syndrome in runners: a case series**	**Journal of Orthopaedic & Sports Physical Therapy Jan 2006: Vol. 36 Issue 1. p. A52 1p. 01906011 sport**	**CS**	**OMMITED FROM STUDY**
17	Pedowitz RN	2005	Use of osteopathic manipulative treatment for iliotibial band friction syndrome	Pedowitz RN, 2005. Use of osteopathic manipulative treatment for iliotibial band syndrome. *Journal of the American Osteopathic Association,* 105(12): 563-567.	CS	YES
18	Pettitt R and	2000	Corrective neuromuscular	Pettitt R and Dolski A, 2000. Corrective neuromuscular	CS	YES

	Dolski A		approach to the treatment of iliotibial band friction syndrome: a case report	approach to the treatment of iliotibial band friction syndrome: a case report. *Journal of Athletic Training,* 35(1): 96-99.		
19	Schwellnus MP *et al.*	1992	Deep transverse frictions in the treatment of iliotibial band friction syndrome in athletes: a clinical trial	Schwellnus MP, Mackintosh L and Mee J, 1992. Deep transverse frictions in the treatment of iliotibial band friction syndrome in athletes: a clinical trial. *Physiotherapy,* 78(8): 564-568.	RCT	YES
20	Schwellnus MP *et al.*	1991	Anti-inflammatory and combined anti-inflammatory/analgesic medication in the early management of iliotibial band friction syndrome. A clinical trial	Schwellnus MP, Theunissen L, Noakes TD and Reinach SG, 1991. Anti-inflammatory and combined anti-inflammatory/analgesic medication in the early management of iliotibial band friction syndrome. *South African Medical Journal,* 79: 602-606.	RCT	YES
21	Schreiber R and Louw Q	2011	The effect of gluteus medius training on hip kinematics in a runner with iliotibial band syndrome	Schreiber R and Louw Q, 2011. The effect of gluteus medius training on hip kinematics in a runner with iliotibial band syndrome. *South African Journal of Physiotherapy,* 67(2): 23-28.	CS	YES
22	**Simoens WA *et al.***	**2002**	**Iliotibial band friction syndrome**	**Simoens WA, Vanhoenacker FM, Willemen D and De Schepper AM, 2002. Iliotibial band friction syndrome. *Belgian Journal of Radiology,* 85(3): 152-153.**	**CS**	**COULD NOT BE OBTAINED**
23	Sutker AN *et al.*	1981	Iliotibial band syndrome in distance runners	Sutker AN, Barber FA, Jackson DW and Pagliano JW, 1985. Iliotibial band syndrome in distance runners. *Sports Medicine,* 2(6): 447-451.	N-RCT	YES
24	Taunton JE *et al.*	1987	Non-surgical management of overuse knee injuries in runners	Taunton JE, Clement DB, Smart GW and McNicol KL, 1987. Non-surgical management of overuse knee injuries in runners. *Canadian Journal of Sports Sciences,* 12(1): 11-18.	N-RCT	YES
25	Wong CK *et al.*	1995	Reducing iliotibial band contractures in patients with muscular dystrophy using custom dry floatation cushions	Wong CK and Wade CK, 1995. Reducing iliotibial band contractures in patients with muscular dystrophy using custom dry floatation cushions. *Archives of Physical Medicine and Rehabilitation,* 76(7): 695-700.	N-RCT	YES

STUDY TYPE:	**CS**	**N-RCT**	**RCT**	**OBS**	**TOTAL**
NUMBER OF ARTICLES:	9	5	6	3	23

APPENDIX C

Newcastle-Ottawa Scale:

Non-Randomised studies

The Newcastle-Ottawa scale is divided into 8 items, that are subdivided into 3 categories; selection, comparability and exposure.

For each of the 8 items, there is a variety of response options; one response (a, b, or c, etc.) is to be chosen, with the exception of the comparability section, where one, two or no response can be chosen.

One star is available to be awarded for each item, excepting comparability, which allows for two stars to be awarded. The maximum amount of stars that a study can be awarded is nine stars.

In the event that a study only contains one group of subjects, comparability cannot be completed, and should be omitted from the scale.

Definition: Ascertainment: To discover with certainty, as through examination or experimentation. (The free dictionary (online))

Reference:

Stang, A. 2010. Critical evaluation of the Newcastle-Ottawa scale for the assessment of the quality of nonrandomized studies in meta-analyses. *European Journal of Epidemiology.* 25(9): 603-605.

Newcastle-Ottawa Quality Assessment Scale:
Non-Randomised Studies

Reviewer:	
Article Title:	

A study can be awarded a maximum of one star for each numbered item within the **selection** and **exposure** categories. A maximum of 2 stars can be awarded for **comparability**.

Please circle the letter you award for each point:

SELECTION:

1. Is the case definition adequate?
    a. Yes, with independent validation *
    b. Yes, e.g. record linkage or based on self-reports
    c. No description
2. Representativeness of the cases
    a. Consecutive or obviously representative series of cases *
    b. Potential for selection biases or not stated
3. Selection of controls
    a. Community controls *
    b. Hospital controls
    c. No description
4. Definition of controls
    a. No history of disease (endpoint) *
    b. No description of source

COMPARABILITY:

1. Comparability of cohorts on the basis of design or analysis
    a. Study controls for _____(Select most important factor) *
    b. Study controls for **any** additional factor *

EXPOSURE:

1. Ascertainment of exposure
    a. Secure record (e.g. surgical records) *
    b. Structured interview where blind to case/control status *
    c. Interview not blinded to case/control status
    d. Written self-report or medical record only
    e. No description
2. Same method of ascertainment for cases and controls
    a. Yes *
    b. No
3. Non-response rate
    a. Same rate for both groups *
    b. Non respondents described
    c. Rate different and no designation

Adapted from: Wells *et al.*, 2003. *The Newcastle-Ottawa Scale (NOS) for assessing the quality if nonrandomized studies in meta-analyses*.

APPENDIX D

PEDro Scale:

Randomised Controlled Clinical Trial Rating

The PEDro scale is based upon the Delphi list (Delphi list: a criteria list for quality assessment of RCTs for conducting systematic reviews developed by the Delphi consensus. Journal of Clinical Epidemiology, 51(12): 1235-1241). The purpose of the PEDro scale is to determine "internal validity" of a RCT, reflected by criteria 2 – 9. Criterion 1 reflects external validity of the RCT, or simple the applicability of the trial. Criteria 10 – 11 represents whether the RCT statistical information is interpretable.

An additional area in the rating sheet is provided labelled as "where" in order for the page number to be referenced, in the event that there is a disagreement between reviewers this will be used in order to reference where your information was taken from.

The following is an explanation for each individual criterion:

When completing the scale a total of 11 criteria are available. 1 point is awarded for each criterion if the respective criterion is clearly satisfied. When answering yes to a criterion, 1 point is awarded.

Criterion 1	This criterion is satisfied if the report describes the source of subjects and a list of criteria used to determine who was eligible to participate in the study.
Criterion 2	A study is considered to have used random allocation if the report states that allocation was random. The precise method of randomisation need not be specified. Procedures such as coin-tossing and dice-rolling should be considered random. Quasi-randomisation allocation procedures such as allocation by hospital record number or birth date, or alternation, do not satisfy this criterion.
Criterion 3	*Concealed allocation* means that the person who determined if a subject was eligible for inclusion in the trial was unaware, when this decision was made, of which group the subject would be allocated to. A point is awarded for this criteria, even if it is not stated that allocation was concealed, when the report states that allocation was by sealed opaque envelopes or that allocation involved contacting the holder of the allocation schedule who was "off-site".
Criterion 4	At a minimum, in studies of therapeutic interventions, the report must describe at least one measure of the severity of the condition being treated and at least one (different) key outcome measure at baseline. The rater must be satisfied that the groups' outcomes would not be expected to differ, on the basis of baseline differences in prognostic variables alone, by a clinically significant amount. This criterion is satisfied even if only baseline data of study completers are presented. 7-11 *Key outcomes* are those outcomes which provide the primary measure of the effectiveness (or lack of effectiveness) of the therapy. In most studies, more than one variable is used as an outcome measure.
Criterion 5	*Blinding* means the person in question (subject, therapist or assessor) did not know which group the subject had been allocated to. In addition, subjects and therapists are only considered to be "blind" if it could be expected that they would have been unable to distinguish between the treatments applied to different groups. In trials in which key outcomes are self-reported (e.g., visual analogue scale, pain diary), the assessor is considered to be blind if the subject was blind.
Criterion 4, 7-11	*Key outcomes* are those outcomes which provide the primary measure of the effectiveness (or lack of effectiveness) of the therapy. In most studies, more than one variable is used as an outcome measure.
Criterion 8	This criterion is only satisfied if the report explicitly states *both* the number of subjects initially allocated to groups *and* the number of subjects from whom key outcome measures were obtained. In trials in which outcomes are measured at several points in time, a key outcome must have been measured in more than 85% of subjects at one of those points in time.
Criterion 9	An *intention to treat* analysis means that, where subjects did not receive treatment (or the control condition) as allocated, and where measures of outcomes were available, the analysis was performed as if subjects received the treatment (or control condition) they were allocated to. This criterion is satisfied, even if there is no mention of analysis by intention to treat, if the report explicitly states that all subjects received treatment or control conditions as allocated.
Criterion 10	A *between-group* statistical comparison involves statistical comparison of one group with another. Depending on the design of the study, this may involve comparison of two or more treatments, or comparison of treatment with a control condition. The analysis may be a

	simple comparison of outcomes measured after the treatment was administered, or a comparison of the change in one group with the change in another (when a factorial analysis of variance has been used to analyse the data, the latter is often reported as a group × time interaction). The comparison may be in the form hypothesis testing (which provides a "p" value, describing the probability that the groups differed only by chance) or in the form of an estimate (for example, the mean or median difference, or a difference in proportions, or number needed to treat, or a relative risk or hazard ratio) and its confidence interval.
Criterion 11	A *point measure* is a measure of the size of the treatment effect. The treatment effect may be described as a difference in group outcomes, or as the outcome in (each of) all groups. *Measures of variability* include standard deviations, standard errors, confidence intervals, interquartile ranges (or other quantile ranges), and ranges. Point measures and/or measures of variability may be provided graphically (for example, SDs may be given as error bars in a Figure) as long as it is clear what is being graphed (for example, as long as it is clear whether error bars represent SDs or SEs). Where outcomes are categorical, this criterion is considered to have been met if the number of subjects in each category is given for each group.

Adapted from: *PEDro scale* (online). 1999.

Definition of Intention to treat: Fisher et al., (1990) describes intention to treat as an approach for the analysis of RCTs. This strategy associates patients in the groups they were originally randomly assigned to. Generally, this is interpreted as including all patients, regardless of whether;

- They fulfilled the inclusion criteria
- Treatment was actually received
- Withdrawal from the trial
- Derivation from the protocol

Clinical effectiveness of an RCT can be overestimated if the intention to treat analysis is not done.

References:

Fisher, L.D., Dixon, D.O., Herson, J., Frankowski, R.K., Hearon, M.S. and Pearce, K.E. 1990. Intention to treat in clinical trials. In: Pearce, K.E., ed. *Statistical issues in drug research and development. Marcel Decker Inc – New York. 331-350.*

PEDro scale (online). 1999. Available at: www.pedro.org.au (Accessed 06 June 2011).

PEDro Scale:

Reviewer:	
Article Title:	

Please cross out YES or NO for each criterion:

CRITERION:				REFERENCE PAGE:
1	Eligibility criteria were specified	YES	NO	
2	Subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received)	YES	NO	
3	Allocation was concealed	YES	NO	
4	The groups were similar at baseline regarding the most important prognostic indicators	YES	NO	
5	There was blinding of all subjects	YES	NO	
6	There was blinding of all therapists who administered the therapy	YES	NO	
7	There was blinding of all assessors who measured at least one key outcome	YES	NO	
8	Measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups	YES	NO	
9	All subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analysed by “intention to treat”	YES	NO	
10	The results of between-group statistical comparisons are reported for at least one key outcome	YES	NO	
11	The study provides both point measures and measures of variability for at least one key outcome	YES	NO	

Adapted from: *PEDro scale* (online). 1999.

APPENDIX E

Liddle Scale:

Case Studies / Series and Observational Studies

Codes for **evaluation criteria:**

Evaluation criteria are coded according to the extent to which the criteria are fulfilled	**Code**
Criterion entirely fulfilled	A
Criterion mostly fulfilled	B1
Criterion mostly not fulfilled	B2
Criterion not at all fulfilled	C
Criterion not described adequately to classify as a,b1,b2 or c	I
Criterion not applicable	n/a

Codes for overall assessment of **quality** of study checklists:

Low risk of bias	A	All or most evaluation criteria from the checklist are fulfilled. Where evaluation criteria are not fulfilled, the conclusions of the study are thought very unlikely to alter.
Low-moderate risk of bias	B1	Some evaluation criteria from the checklist are fulfilled. Where evaluation criteria are not fulfilled or are not adequately described, the conclusions of the study are thought unlikely to alter.
Moderate to high risk of bias	B2	Some evaluation criteria from the checklist are fulfilled. Where evaluation criteria are not fulfilled or are not adequately described, the conclusions of the study are thought likely to alter.
High risk of bias	C	Few or no evaluation criteria fulfilled. Where evaluation criteria are not fulfilled or are not adequately described, the conclusions of the study are thought very likely to alter.

Adapted from: Liddle, J., Williamson, M. and Irwig, I. 1996. *Method for evaluating research and guideline evidence.* New South Wales Department of Health, Sydney.

Liddle Scale: Observational Studies

APPENDIX E

Reviewer:	
Article Title:	

EVALUATION CRITERIA FOR THE STUDY:	Comments:	Code Option: A, B1, B2, C, or I
1. Are the study participants well-defined in terms of time, place and person?		
2. What percentage of individuals refused to participate?		
3. Are outcomes measured in a standard, valid and reliable way?		
4. Are outcomes measured in the same way for both intervention and control groups? (NB: Blinding/objective measures would meet this criteria).		
5. Are factors other than the intervention e.g. confounding factors, comparable between intervention and control groups and if not comparable, are they adjusted for in the analysis?		
6. What percentage of individuals recruited in to the study are not included in the analysis? (loss to follow-up).		
7. Are results homogeneous between sites? (multicentre/multisite studies only).		
OVERALL ASSESSMENT OF THE STUDY:		
1. How well was the study done to minimise bias? IF coded as B1, B2 or C, what is the likely direction in which bias might affect the study results?		
2. Is the overall effect of the study due to the study intervention?		
3. Explain if there is any practical/ethical reason why an RCT cannot be done.		
4. Include any other comments		

Adapted from: Liddle, J.,Williamson, M., and Irwig, I. 1996. *Method for evaluating research and guideline evidence*. New south Wales Department of Health, Sydney.

APPENDIX F

Liddle Scale:

Case Studies / Series and Observational Studies

Codes for **evaluation criteria:**

Evaluation criteria are coded according to the extent to which the criteria are fulfilled	**Code**
Criterion entirely fulfilled	A
Criterion mostly fulfilled	B1
Criterion mostly not fulfilled	B2
Criterion not at all fulfilled	C
Criterion not described adequately to classify as a,b1,b2 or c	I
Criterion not applicable	n/a

Codes for overall assessment of **quality** of study checklists:

Low risk of bias	A	All or most evaluation criteria from the checklist are fulfilled. Where evaluation criteria are not fulfilled, the conclusions of the study are thought very unlikely to alter.
Low-moderate risk of bias	B1	Some evaluation criteria from the checklist are fulfilled. Where evaluation criteria are not fulfilled or are not adequately described, the conclusions of the study are thought unlikely to alter.
Moderate to high risk of bias	B2	Some evaluation criteria from the checklist are fulfilled. Where evaluation criteria are not fulfilled or are not adequately described, the conclusions of the study are thought likely to alter.
High risk of bias	C	Few or no evaluation criteria fulfilled. Where evaluation criteria are not fulfilled or are not adequately described, the conclusions of the study are thought very likely to alter.

Adapted from: Liddle, J., Williamson, M. and Irwig, I. 1996. *Method for evaluating research and guideline evidence.* New South Wales Department of Health, Sydney.

Liddle Scale: Case Report/Series

APPENDIX F

Reviewer:	
Article Title:	

EVALUATION CRITERIA FOR THE STUDY:	Comments:	Code Option: A, B1, B2, C, or I
8. Are the study participants well-defined in terms of time, place and person?		
9. What percentage of individuals refused to participate?		
10. Are outcomes measured in a standard, valid and reliable way?		
11. Are outcomes measured in the same way for both intervention and control groups?		
12. Are factors other than the intervention e.g. confounding factors, comparable between intervention and control groups and if not comparable, are they adjusted for in the analysis?		
13. What percentage of individuals recruited in to the study are not included in the analysis? (loss to follow-up).		
14. Is the analysis by intention to intervene (treat)?		
15. Are results homogeneous between sites? (multicentre/multisite studies only).		
OVERALL ASSESSMENT OF THE STUDY:		
5. How well was the study done to minimise bias? IF coded as B1, B2 or C, what is the likely direction in which bias might affect the study results?		
6. Is the overall effect of the study due to the study intervention?		
7. Explain if there is any practical/ethical reason why an RCT cannot be done.		
8. Include any other comments		

Adapted from: Liddle, J.,Williamson, M., and Irwig, I. 1996. *Method for evaluating research and guideline evidence*. New south Wales Department of Health, Sydney.

APPENDIX G

Memorandum of Agreement

Title of Research Study: The definition of the current knowledge around evidence based conservative management of iliotibial band friction syndrome (Systematic review of literature).

Principle investigators: Ms Kelly Harris (Researcher)
Co-investigators: Dr. C. Korporaal (Supervisor); Dr. R. Phillips (Co-supervisor)

Brief Introduction and Purpose of the Study:
This study is a systematic review of literature pertaining to the conservative management of ITBS, and includes all forms of intervention, with the exception of surgical procedures. Articles are collected electronically via databases by the researcher, the articles included into the study are divided into different study types of those only randomised controlled clinical trials/clinical trials, case reports/series and observational studies are included in this study. Articles are reviewed by a panel of 5 reviewers using rating scales (specific to the study types listed above) and feedback from reviewers is collated and presented in a statistical presentation.

Outline of Procedures:
Reviewers will receive articles which have been grouped according to study type (RCCT's, case report/series and observational studies) as well as the corresponding scale rating sheet (RCCT's – PEDro scale, Case report/series & observational studies - Newcastle-Ottawa scale, Non-randomised clinical trials – Liddle scale) as well as an explanation sheet for each scale. The reviewer will then individually rate the articles according to its corresponding scale. Rating sheets are collected and collated for statistical analysis. A determined time period will be recommended for each article/group of articles review for feedback.

Benefits: Publication of the study: Should this study be published, all persons participating in the study will be included in the publication as an author. Should the reviewer wish to be exempt from this, please strike through the paragraph and initial alongside.

Remuneration: An honorarium of R1, 000.00 is awarded to each reviewer in appreciation of their time and dedication to this project.

Contact persons: Please do not hesitate to contact either the supervisor and/or researcher regarding any questions or queries via the following methods:

Dr. Charmaine Korporaal (Supervisor):
Telephone: 031 373 2611
Cell no.: 083 463 3562
E-mail: Charmak@dut.ac.za

Ms Kelly Harris (Researcher)
Cell No.: 072 429 6735
E-mail: Kellyj.harris86@gmail.com

Dr. Reed Phillips (Supervisor):
E-mail: Reedp@dut.ac.za

Statement of Agreement to Participate in the Research Study:
I …… (Subject's full name), ……(Identity number), have read this document in its entirety and understand its contents. Where I have had any questions or queries, these have been explained to me by …… to my satisfaction. Furthermore, I voluntarily agree to participate in this study as a reviewer.

Reviewer's name:……Reviewer's

signature:……...Date:……

Supervisor name:……Supervisor

signature:……...Date:……

Researcher name:…….....Researcher

signature:…….....Date:…….……..

APPENDIX H

GROUP 1 ARTICLE ALLOCATION:

CASE REPORTS/CASE SERIES

ARTICLE NUMBER:	ARTICLE AUTHOR(S):	YEAR:	ARTICLE TITLE:
1	Baer JM	1999	Iliotibial band syndrome in cyclists: evaluation and treatment: a case report
2	Baker GJ	1995	Iliotibial band and tibialis posterior syndromes resulting from a fixed talus: a case report
3	Barber FA and Sutker AN	1992	Iliotibial band syndrome (1992)
4	Fredericson M *et al.*	2000	Hip abductor weakness in distance runners with iliotibial band syndrome
5	Noble CA	1979	The treatment of iliotibial band friction syndrome
6	Noble CA	1980	Iliotibial band friction syndrome in runners
7	Pedowitz RN	2005	Use of osteopathic manipulative treatment for iliotibial band friction syndrome
8	Pettitt R and Dolski A	2000	Corrective neuromuscular approach to the treatment of iliotibial band friction syndrome: a case report
9	Schreiber R and Louw Q	2011	The effect of gluteus medius training on hip kinematics in a runner with iliotibial band syndrome
10	Simoens WA *et al.*	2002	Iliotibial band friction syndrome

APPENDIX I

GROUP 2 ARTICLE ALLOCATION:

NON-RANDOMISED CONTROLLED STUDIES

ARTICLE NUMBER:	ARTICLE AUTHOR(S):	YEAR:	ARTICLE TITLE:
1	Beers A *et al.*	2008	Effects of multi-modal physiotherapy including hip abductor strengthening, in patients with iliotibial band friction syndrome
2	Fredericson M *et al.*	2002	Quantitative analysis of the relative effectiveness of 3 iliotibial band stretches
3	Sutker AN *et al.*	1985	Iliotibial band syndrome in distance runners
4	Taunton JE *et al.*	1987	Non-surgical management of overuse knee injuries in runners
5	Wong CK and Wade CK	1995	Reducing iliotibial band contractures in patients with muscular dystrophy using custom dry floatation cushions

RANDOMISED CONTROLLED CLINICAL TRIALS

ARTICLE NUMBER:	ARTICLE AUTHOR(S):	YEAR:	ARTICLE TITLE:
1	Bischoff C *et al.*	1995	Comparison of phonophoresis and knee immobilization in treating iliotibial band syndrome
2	Grau S *et al.*	2011	Kinematic classification of iliotibial band syndrome in runners
3	Gunter P and Schwellnus MP	2004	Local corticosteroid injection in iliotibial band friction syndrome in runners: a randomised controlled trial
4	Hirschmüller A *et al.*	2011	Clinical effectiveness of customised sport shoe orthoses for overuse injuries in runners: a randomised controlled study
5	Schwellnus MP *et al.*	1992	Deep transverse frictions in the treatment of iliotibial band friction syndrome in athletes: a clinical trial
6	Schwellnus MP *et al.*	1991	Anti-inflammatory and combined anti-inflammatory/analgesic medication in the early management of iliotibial band friction syndrome. A clinical trial

OBSERVATIONAL STUDIES

ARTICLE NUMBER:	ARTICLE AUTHOR(S):	YEAR:	ARTICLE TITLE:
1	Clement DB *et al.*	1983	Iliotibial band friction syndrome
2	McNicol K *et al.*	1981	Iliotibial tract friction syndrome in athletes
3	Noehren B *et al.*	2007	Prospective study of the biomechanical factors associated with iliotibial band syndrome

APPENDIX J

DURBAN UNIVERSITY of TECHNOLOGY

21 May 2012

Student No: 20501877

Miss K Harris
10 Thomas Bower Avenue
Bluff
Durban
4052

Dear Ms Harris

MASTER'S DEGREE IN TECHNOLOGY: CHIROPRACTIC

I am pleased to advise that:

1. The Research and Higher Degrees Committee approved the following:

(i) Your research proposal and dissertation title, being:

The definition of the current knowledge around evidence based conservative management of ITBFS: a systematic review.

Please note: ANY PROPOSED CHANGES in the DISSERTATION TITLE require the approval of your supervisor and the Research and Higher Degrees Committee.

(ii) Supervisor – **Dr C. Korporaal**

2. Your request for funding totalling **R 5000.00** subject to any literature referred to in Section A of the PG 4a form being accessioned by this University, and any equipment purchased shall become the property of the department.

NOTE: - This funding is not paid directly to you but is controlled by your Head of Department. Any proposed changes to this funding allocation needs the approval of your supervisor, and Research and Higher Degrees Committee

The University Research Committee has stipulated that:

(a) Ownership of any patent registered in respect of the results of your Master's Degree in Technology studies is retained by you as the initiator of the project;

(b) Should you make any Drift from the results of your Master's Degree in Technology studies, you will be required to repay pro rata, the **R 5000.00** investment which the University Research Committee has made in approving your request for funding;

(c) If the Durban University of Technology provided the equipment/materials for the creation of artefacts, this cost would be refunded to the University if such artefacts were sold and

(d) Durban University of Technology is given first refusal in respect of any possible future sale by you of any patent that may be registered in respect of your said project.

(e) All journal articles, referenced in your dissertation, are to accompany your ring-bound copies when submitting for examination purposes.

May I remind you that notwithstanding Rule LX.CM2, if a student fails to obtain the Masters Degree within two years of first registering for the fifth year, re-registration may be denied. The Academic Board may refuse to renew such registration or may impose any conditions it deems fit.

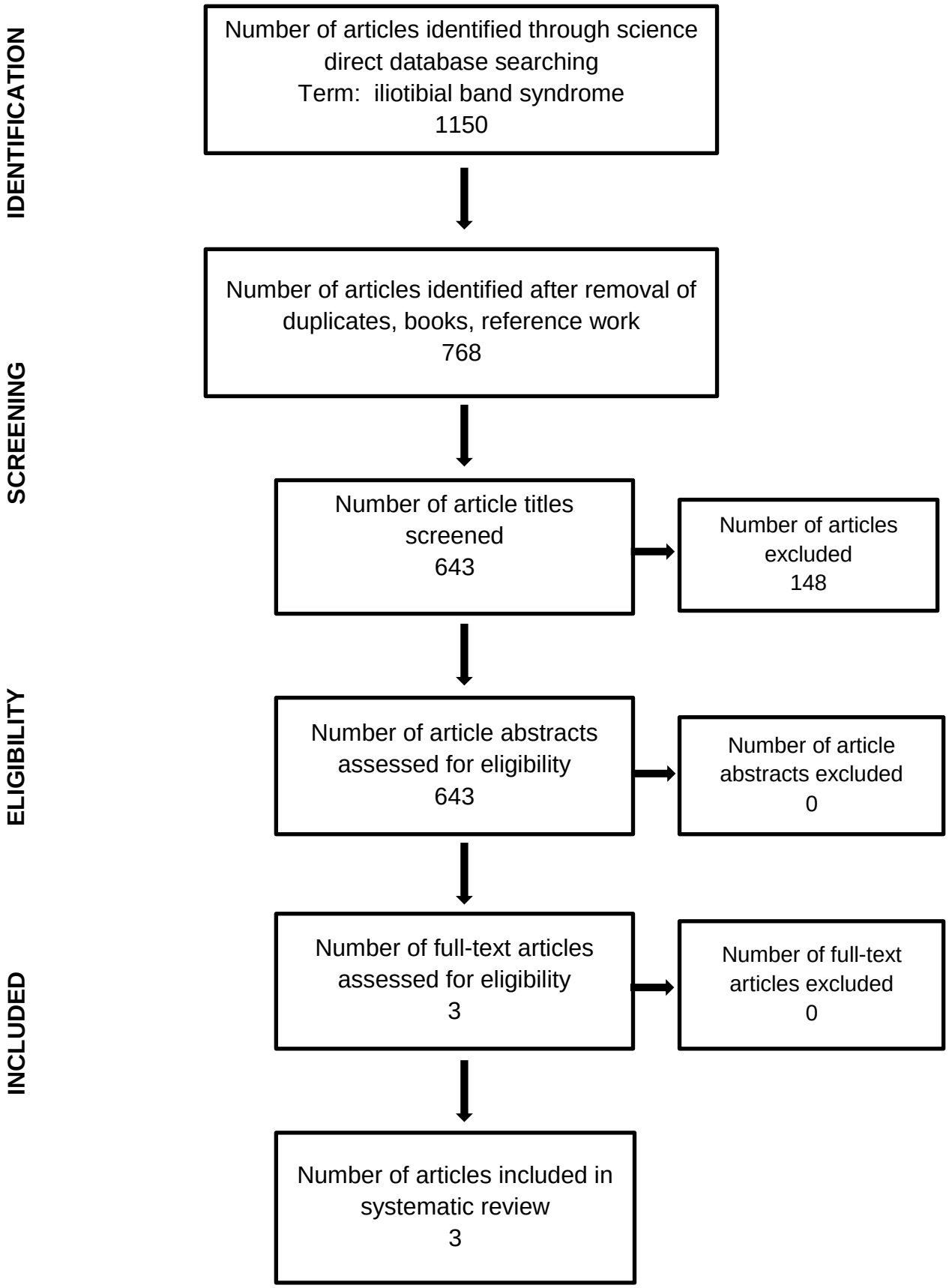
Should you experience any problems relating to your research studies, your supervisor must be informed as soon as possible. If the difficulty persists, you must then approach your Head of Department and thereafter the Dean of the Faculty.

Please do not hesitate to contact me if I can be of any assistance.

Yours sincerely

Mrs S Perumal
Faculty Research Officer

APPENDIX K: Flow chart depicting search strategy example for Science Direct



APPENDIX L: Modified PRISMA Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	i
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	iv and v No systematic review registration number
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	2, 3
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	2
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	No review protocol
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	37, 38
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	35
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	39
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	37, 38
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	43
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	34 – 44
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	44 - 146
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	44
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	44
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	Multiple independent reviewers
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	44
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	35, 36, 37

Section/topic	#	Checklist item	Reported on page #
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	Chapter 4
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome-level assessment (see Item 12).	Chapter 4
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group and (b) effect estimates and confidence intervals, ideally with a forest plot.	Chapter 4
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	44, Chapter 5
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	Multiple independent reviewers
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	44
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., health care providers, users, and policy makers).	168 - 171,
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review level (e.g., incomplete retrieval of identified research, reporting bias).	3, 4
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	iv, v
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	Funding was provided by the Durban University of Technology for completion of M.Tech: Chiropractic