



**UNIVERSITY OF
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MEDIAL TIBIAL STRESS SYNDROME

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ABSTRACT

The aim of the work presented in this thesis was to review the current differential diagnoses that present as chronic exertional leg pain, and to investigate Medial Tibial Stress Syndrome (MTSS) as the most common condition in this group of diagnoses. The thesis explores, in turn; the risk factors associated with development of MTSS, the utility of a screening test for predicting those at risk of developing MTSS, the reliability of a commonly-used method for classifying and evaluating running technique modifications, and the effectiveness of extracorporeal shockwave intervention for MTSS.

A systematic review and meta-analysis of prospective risk factors for MTSS indicated that female gender, a previous history of MTSS, fewer years of running experience, orthotic use, increased Body Mass Index, an increased navicular drop, and increased external rotation hip range of motion in males were all significantly associated with an increased risk of developing MTSS in runners. As a consequence of identifying each of these risk factors, a foundation for better understanding of the causative mechanisms associated with development of MTSS can be developed that will inform future risk factor analysis and preventative screening efforts. A new continuum model for MTSS is presented as a basis for further research efforts.

The prospective study of a cohort of military trainees presented in this thesis identified two clinical tests that in asymptomatic individuals predict those who are more likely to develop MTSS into the future. Together these tests represent an additional tool for preventive countermeasures for a condition that is difficult to treat and commonly recurs.

Running technique “errors” are frequently attributed as being causal factors in the onset of

MTSS, and as a consequence interventions aimed at “correcting” running technique are often employed in clinical practice. There is a paucity of evidence on the reliability of methods for classifying and evaluating outcomes in aspects of running technique, and this is particularly so in relation to clinical settings. A reliability study of visually-based methods for classifying footstrike and knee valgus in two speeds of running gait conducted here highlights the necessity for judgements to be based on laboratory methods rather than solely visual observation when running technique modifications are being implemented and evaluated.

Currently, there is insufficient evidence supporting the efficacy of any specific intervention for MTSS. Previous research has suggested extracorporeal shockwave therapy to be one of the more promising interventions. A pilot randomised double blind sham controlled trial was carried out, and it revealed no difference between sham dose and therapeutic dose for runners experiencing MTSS. An observed reduction in bone pain associated with the sham dose therapy suggests, however, that there may be an effect associated with low dose. Further research is required that includes a no treatment control and higher numbers of participants in order to more fully understand the effectiveness of no treatment, low dose and standard dose shockwave therapy in MTSS.

The findings from this project, in conjunction with work on other bone conditions, indicate the need for future research to consider the complex interactions of bone and muscle in response to mechanosensory inputs. Consistent with this, a theory of network disruption within bone is proposed to explain the recalcitrant nature of MTSS, its unique signs and symptoms, and its potential causes.

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PUBLICATIONS

Parts of the work presented in this thesis have been published and/or presented in the following forums:

PUBLISHED PAPERS

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- Newman, P., R. Adams, and G. Waddington “Real time observation of runners compared with freeze frame video analysis for reliability of classifying footstrike and knee valgus in running gait” *Physical Therapy in Sport* submitted February 2016
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CONFERENCE PRESENTATIONS - ORAL

- Two simple clinical tests for predicting onset of medial tibial stress syndrome: shin palpation test and shin oedema test. *Sports Medicine Australia* Jan 2013
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- Newman, P. (2012). Professor Phillip Newman On Dealing With Shin Pain. *British Journal of Sports Medicine Podcasts*. Interview by K. Khan.