Development of a customised protocol for diagnosis and treatment of obesity specific foot biomechanics

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Declaration of Authorship

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Abstract

The foot plays a crucial role in locomotion, impact bearing, and vertical stability and hence disruptions to the foot biomechanics can be detrimental to a person's ability to carry out daily activities. Foot disorders and pathologies can cause alterations in the overall foot and lower limb biomechanics. This thesis develops and applies a methodology using computational and experimental methods to analyse the lower limb biomechanics. The biomechanical analysis allowed foot pressure, stress and other changes that occur during gait due to pathology to be identified. The developed methods were implemented on obese subjects to characterise changes in the lower limb biomechanics caused due to increased loading following which some computational studies were carried out to further characterise the link between obesity and osteoarthritis. Finally, a subject specific modelling method is explored in order to take the initial methodology which is purely a research solution into one that may be used in a clinical setting. The findings of this study highlight the importance of studying the foot biomechanics as a whole whilst undertaking biomechanical studies, as the lower limb is a chain where problems occurring at the foot can be observed higher up in the lower limb and vice versa. The results of this study suggest that alterations in the foot posture are a key indicator of increased internal stress and pressure. The data collected for this thesis was from a South Asian (Sri Lankan) population, and hence a useful data-set for future comparison with the large body of European data currently available has been obtained.

Keywords: Foot Mechanics, Obesity, Finite Element Modelling, Biomechanics, Gait Analysis

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