

PGTA Project Proposal

Discipline:	Sport Biomechanics and Motor Control
Project Title:	Energy dissipation in human soft tissue during impacts
Supervisory Team:	Dr Matthew Pain Dr Dimitrios Voukelatos Dr Glen Blenkinsop
Summary of proposed project:	<p>During high impact activities such as striking, being hit by objects or during locomotion, the transient forces involved are often high and produce significantly higher mechanical shocks compared to active, muscularly directed motion. Those shocks, in turn, cause changes in surface shape and inertial properties of the limbs and lead to the passive dissipation of energy in the soft tissues. These soft tissue deformations are not well documented but have applications in areas such as computer graphics, biomechanical and physiological performance, and the fundamental responses of biological tissue to impact. Energy loss may act to help damp the whole locomotor system but for constant velocity locomotion, the energy lost passively would have to be made up from muscular work and thus increased metabolic energy consumption. This energy loss may have an effect on things such as running economy or in accurately relating mechanical work to metabolic work in computer models of locomotion.</p> <p>This project aims to characterise the tissue motion of the lower limb using lumped mass-spring-damper systems and wave mechanics during impacts with the floor to determine soft tissue energy dissipation. Soft tissue motion will be measured using arrays of reflective markers and a Vicon motion analysis system under various locomotion conditions with techniques and software developed over the last decade within the biomechanics group at Loughborough University. Alongside this, other measurements such as anthropometrics and tissue distributions, medical imaging, gas exchange for metabolic energy and ground reaction forces will be collected. Analysis of data will be carried out in Matlab and some computer simulation modelling could be involved.</p>
Required skills, experience, and/or education:	Good inter-personal skills, experience in teaching, sport biomechanics and motor control or a related field. First Class Degree or Master's degree in a related field
Link to School research themes:	Sport Performance Lifestyle for Health and Wellbeing