Analysis of dynamic foot biomechanics and ligament characteristics using in vitro experimentation and in vivo 4D CT-scanning.

Promoters: J. Vander Sloten - I. Jonkers

Description: The human foot is a complex structure. Therefore, the analysis of its biomechanical function during walking is challenging. At KU Leuven, a multidisciplinary research group studies foot-ankle biomechanics relying on in vitro experimental measurements of foot bone kinematics and foot pressure. The group gathers biomechanical engineers, specialists in motion analysis and clinicians. A unique gait simulator for cadaveric experimentation was developed for this purpose. Experimental data interpretation has been supplemented with kinematic modeling to understand the development of foot pathology. The role of the ligament constraints in combination with the joint surface geometry in the kinematic guidance of the ankle-foot complex is however less well explored.

It is the scope of the current PhD project

(1) to extend our in vitro experimental protocol with DVRT- measurement of ligament strain at the ankle and subtalar joint

(2) to develop and test a protocol for evaluating the interaction between joint surface characteristics and ligament constraints in vivo using 4D CT-scanning

(3) to integrate the acquired knowledge in a musculoskeletal model capable of representing this interaction.

The ideal candidate is an engineer with a background in biomedical engineering or mechanical engineering. He/she should be highly interested in working in a multi-disciplinary environment consisting of engineers, physical therapists and medical doctors. He/she has an interest and proven skills in developing the required measurement set-up and experimenting during the measurement sessions. Experience with control of mechanical systems is an added value. Furthermore, he/she should present sufficient mathematical background for the kinematic modeling.

Key words: Biomechanics, in vitro experiments, foot, 4D CT

Financing: available

Type of position: scholarship

Duration: The PhD position is open for 4 years, depending however on a positive evaluation after the first year.

If interested, please send a detailed CV plus a motivation letter to Prof. J. Vander Sloten (jos.vandersloten@kuleuven.be) AND to Prof. I. Jonkers (ilse.jonkers@kuleuven.be) before March 15, 2016.