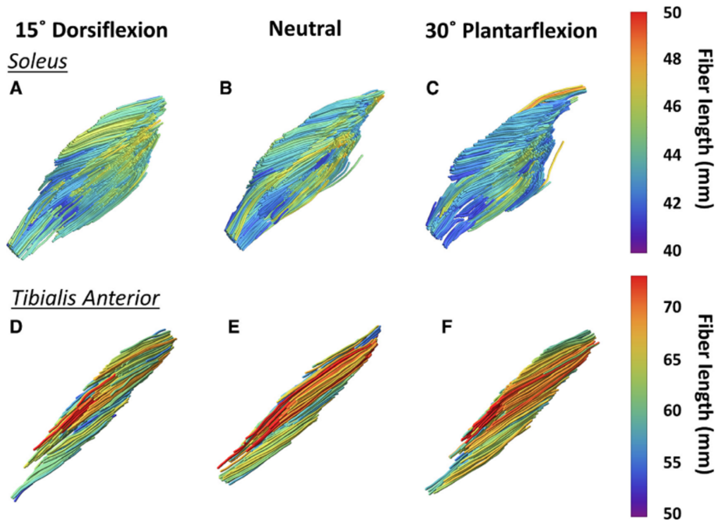
Measuring hamstring muscle architectural parameters in basketball players using diffusion-tensor magnetic resonance imaging (DT-MRI).

Hamstring muscle strains are one of the most frequent injuries among sports that involve high-speed running. The efficacy of preventative exercises can be described for a large part on muscle architecture, and can be obtained by using ***Diffusion Tensor MRI*** (DT-MRI) and ***fiber tractography***. The two most important architectural parameters are: pennation angle (angle of the muscle fiber with respect to the tendon), and fascicle length (the length of multiple sarcomeres, linked in series).



Reconstruction and visualization of muscle fibers using DT-MRI, Oudeman et al. (2016).

The project

In this project, you will develop a protocol and method for estimating ***fascicles lengths*** in the three hamstring muscles (m. biceps femoris, m. semitendinosus, and m. semimembranosus). You will be analyzing data from more than 100 DT-MRI datasets which were acquired in semi-professional ***basketball players*** who underwent an injury-preventive exercise in the context of the Basketball Muscle and Injury (BAMI) study (link). You will be working on the tools to extract muscle fiber lengths (fascicle length) from this data and interpret the results in relation to the exercise.

Requirements

We are looking for Bachelor and Master students with a technical background (e.g. Technical Medicine, Medical sciences, Computational sciences, Physics, Mathematics) with an interest in medical imaging, and the muscular system. Experience with programming (particularly Matlab, but Mathematica experience is also welcome) is strongly desired. Because of the large dataset, working systematically is also strongly desired.

Learning goals

Next to general programming and research skills, the student will gain an in depth understanding of MRI physics, muscle functioning, application of MRI tools to study sport-related injury, and data processing of large sets of data.

Contact

Joep Suskens j.j.suskens@amsterdamumc.nl
Prof. dr. Gustav Strijkers g.j.strijkers@amsterdamumc.nl