HOSSEIN AHMADI

PHD STUDENT | PROGRAM 1
ARC TRAINING CENTRE FOR JOINT BIOMECHANICS

PhD duration: February 2022 - September 2025

My interests: Medical Device Research and Development, Patient Specific Finite Element Modelling, Computer-Aided Design and Drafting, and 3D Printing and Biofabrication. I am eager to apply my skills and expertise to projects related to medical device research and development (R&D) in the orthopaedic industry. I am particularly interested in supporting projects that involve the design of personalized medical devices.

BSc (Shahid Bahonar University)
MSc (University of Tehran)

Supervisors:
Prof. Lynne Bilston & Dr Bart Bolsterlee

PROJECT OVERVIEW

Project Title: Three-dimensional finite element modelling of human shoulder muscles

THE PROBLEM

Understanding the internal biomechanical conditions (e.g. forces, stresses and strains) of shoulder muscles is required to understand healthy shoulder function and to better prevent, diagnose and treat shoulder pathology, dysfunction, and injury.

Why does this need more research?
The details of biomechanical shoulder function are difficult to measure with experimental methods, but computational models could give important insights. Current computational models of shoulder muscles do not include explicitly the effect of muscle composition (e.g. fat infiltration), architecture, and mechanical properties on muscle function, limiting the ability of these models to predict important biomechanical quantities like muscle forces and stress and strain distribution.

How can finite element modelling of shoulder muscles help?
Three-dimensional finite element modelling could pave the way to understanding the function of shoulder muscles by modelling the relationship between shoulder material properties, muscle architecture and neural drive.

HYPOTHESIS

Three-dimensional finite element models that incorporate realistic mechanical properties and fibre orientations of the shoulder muscle can predict movement patterns and stresses and strains experienced by the shoulder joint.

PROJECT AIMS

My PhD project aims to develop and validate a three-dimensional finite element model of human shoulder muscles that ultimately can be used clinically, for example to examine the effects of soft tissue tensioning and muscle activation on the shoulder joint loading and stability.

OUR SOLUTION & EXPECTED OUTCOMES:

A more realistic three-dimensional finite element model of the shoulder muscle that better reflects the shoulder joint biomechanics.

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