Department of
Biomedical Engineering
UNIVERSITY OF WISCONSIN–MADISON

Fall 2017 Seminar Series

Graduate Panel: Neuromuscular Biomechanics

Michael Vignos
Ph.D. Candidate, UW-Madison
Mechanical Engineering

Graft Geometry is Linked with Asymmetric Knee Mechanics Following ACL-Reconstruction

The long-term prognosis of ACL-reconstruction is concerning, given that >50% of patients develop early osteoarthritis at 10-15 years post-surgery. This high incidence rate is believed to be caused, in part, by abnormal cartilage loading that remains following surgery.

In this work, we seek to assist orthopedic surgeons in restoring normal cartilage loading patterns by investigating the relationship between controllable surgical factors, such as ACL-reconstruction graft geometry, and post-operative knee mechanics. A combination of experimental and computational methods are used to determine the effect of variations in ACL-graft placement on knee kinematics and cartilage contact.

Jack Martin
Ph.D. Candidate, UW-Madison
Materials Science & Engineering

Gauging Force by Tapping Tendons

Muscle-tendon force estimates are fundamental to the study and treatment of various musculoskeletal disorders, injuries and diseases.

However, current methods for determining these forces are highly limited. Modeling approaches rely on many assumptions relating to neuromuscular coordination and tissue geometry, while direct measurement approaches are highly invasive.

In this talk, I will discuss the basis for—and early implementation of—a novel technique for non-invasive tendon stress measurement. This technique is based on generating and tracking shear waves in tendon, where shear wave speed is directly related to tendon stress. The ability is gives us to non-invasively measure tendon stresses has a numberof potential applications within clinical and research biomechanics.

Colin Smith
Ph.D. Candidate, UW-Madison
Mechanical Engineering

Can Altered Neuromusclar Coordination Restore Healthy Cartilage Loading Following ACL Injury?

Current ACL injury treatments are largely successful in restoring knee stability and function. However, long-term outcomes are sub-optimal, as ~ 50% of patients develop early onset osteoarthritis (OA). Restoring cartilage loading patterns during functional movements is key to preventing disruption of cartilage tissue homeostais and early onset OA. While surgical techniques are now evaluated on their ability to restore pre-injury knee kinematics and loading, it is unknown whether this goal is achievable throughconservative treatment. In this talk, I will present a musculoskeletal simulation framework to predict cartilage loading during walking and investigate whetherhealthy cartilage loading can be restoredin ACL deficient knees through neuromuscular retraining.

Monday, October 16, 2017
12 - 1 PM in Tong Auditorium (1003 Engineering Centers)