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Optimizing Musculoskeletal Health and Joint Performance

Osteoarthritis is an end-stage joint debilitating condition and a leading cause for early disability and aging worldwide. This translates into severe pain and inability to maintain health goals, loss of productivity and income, and more money spent on healthcare, medication, and rehabilitation. Musculoskeletal impairment, joint debilitation, and osteoarthritis can be often attributed to: 1) poor recognition; 2) poor characterisation; and 3) poor treatment of the injury or disease process. At the intersection of the body's centre of mass, the hip joint is comprised of several interlinked hard and soft tissue entities (e.g., pelvis, femur, muscles, ligaments) that controls locomotion and maintains postural alignment and core stability. As hip osteoarthritis has been provided with very limited options through artificial joint implants, more feasible and economical solutions need to be available in order to address the most common underlying causes of early degeneration. This multidisciplinary research program in musculoskeletal biomechanics combines novel in vitro robotic testing platforms (physical injury modelling/simulations) with in vivo (imaging, gait, functional metrics) and in silico research methods (predictive modelling/simulations) to optimize diagnosis, treatment, and prevention strategies. The most important findings will advance the multidisciplinary evaluation of musculoskeletal joint injuries and aging with the long-term goals to improve recognition, characterisation, and treatment.

Biography

Geoffrey specialises in musculoskeletal biomechanics, orthopaedics, and joint preservation methods -- aspiring to outline a path for joint restoration, injury prevention, and healthy aging. He implements an interdisciplinary approach to his musculoskeletal research (in vivo, in vitro, in silico) and bridges the basic, clinical, and translational aspects of his work with the MSk Lab and The Biomechanics Group.

Graduating as Valedictorian from the University of Ottawa, Geoffrey received his PhD in Mechanical Engineering specializing in orthopaedic biomechanics. With the aim to examine the effects of cam-type femoroacetabular impingement on hip joint loading, Geoffrey determined which anatomical and functional characteristics were associated with clinical symptoms and simulated patient-specific computational models to assess the risks of early hip osteoarthritis. Currently, Geoffrey continues to examine joint preservation techniques for the young adult hip, to better understand the effects of structural morphology (e.g., hip impingement, dysplasia), capsular ligaments, instability, implant options, novel surgical techniques, and reconstruction parameters on joint function and mechanics.

Geoffrey recently received a Canadian Orthopaedic Research Legacy Award (Canadian Orthopaedic Foundation) for his work in hip joint preservation and surgical strategies for the young adult hip. Geoffrey also received a coveted New Investigator Recognition Award (Orthopaedic Research Society) and was co-awarded the Kappa Delta Elizabeth Winston Lanier Award (American Academy of Orthopaedic Surgeons). He also received honours from the British Hip Society, British Orthopaedic Research Society, Canadian Medical and Biological Engineering Society, International Society of Biomechanics, and Clinical Orthopaedics and Related Research©.