UNC ORTHOPAEDICS

OrthoRaMS SEMINAR SERIES

Orthopaedic Research and Musculoskeletal Science

Thursday, January 15, 2026 12:00-1:00

Location: *Dickson Conference Room, 3200 Thurston Bldg.*
Zoom Meeting ID: *988 6670 4852,* ***PW:*** *114616*

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Damage Response Following High-Rate Axial Loading

High-rate axial loading, such as that experienced during underbody blast (UBB) events in military contexts, poses a significant risk for lower extremity injuries among service members. This study investigates the biomechanical response and injury patterns of the lower extremities, with a focus on sexual dimorphism, anatomical vulnerability, and fracture thresholds. Extremity injuries account for the majority of UBB-related injuries and associated disability costs. Experimental testing using post-mortem human specimens (PMHS) under controlled axial loading conditions demonstrates distinct injury mechanisms in the tibia, talus, pelvis, and calcaneus. Notably, females exhibit a higher susceptibility to ankle injuries, attributed to differences in bone mineral density and structural robustness. Statistical analysis confirms significant differences in fracture tolerance between midsized males and female groups, suggesting that sex-related factors influence injury risk beyond body size alone. The findings contribute to the development of injury risk curves and inform protective strategies for military personnel, emphasizing the need for sex-specific considerations in injury prevention and rehabilitation.

BIO

Kerry Danelson, PhD, MBA, Professor of Orthopaedic Surgery, is leveraging her former military training and service to reduce the risk of injury and improve outcomes for other service members. Danelson now conducts military safety and orthopaedic biomechanical testing to reduce the risk of injury. Dr. Danelson received an undergraduate degree in mechanical engineering from the United States Military Academy at West Point and served in the United States Army, stationed in Fort Hood, Texas for five years, achieving the rank of captain. She then earned her master's degree and doctorate in biomedical engineering from the Virginia Tech-Wake Forest School of Biomedical Engineering and Sciences at Wake Forest School of Medicine, where she focused on finite element modeling and automotive safety. In addition to military biomechanics, Danelson leads orthopaedic testing studies to improve surgical techniques for issues such as rotator cuff tears, brachial plexus injury, fractures and upper limb mobility. Using biomechanical measurement, computational modeling and animal microsurgery, she evaluates and predicts the success of instrumentation and surgical methods.