

Nathan Hogaboom – Abstract

“Biomarkers of Soft-Tissue Pathology in Wheelchair Users with Spinal Cord Injury”

Wheelchair users with spinal cord injury (SCI) rely upon their upper-extremities to perform most activities of daily living. As a result, they are at risk for developing upper-extremity pain that stems from overuse. Wheelchair transfers and propulsion expose shoulder and wrist soft tissues to highly repetitive and forceful loads that can contribute to pathology. The proceeding investigations aim to further understand how wheelchair activities contribute to the development of upper-extremity soft tissue pathology using ultrasound and biochemical markers. The first three studies describe how wheelchair transfers effect quantitative and clinical ultrasound markers for rotator cuff and median nerve pathology. A sample of wheelchair users with SCI was recruited and performed eighteen transfers within 10 minutes. Quantitative ultrasound (QUS) images of the biceps and supraspinatus tendons were collected before and after transfers. Clinical ultrasound markers were collected at the start of the protocol. Better transfer technique (measured using the Transfer Assessment Instrument) was found to correlate with less global shoulder pathology and supraspinatus tendinopathy. Repeated transfers caused acute increases in biceps tendon width and median nerve cross-sectional area; changes were influenced by greater bodyweight and specific transfer skills. The final study involved the development of a novel method of measuring glenohumeral joint inflammatory cytokines in vivo using microdialysis. Six able-bodied veterans and one individual with a SCI were recruited. A microdialysis catheter was inserted into the posterior glenohumeral joint space under ultrasound guidance. Participants then performed an intense wheelchair propulsion and repeated transfer protocol. Microdialysis samples and quantitative ultrasound images of the biceps and supraspinatus tendons were collected before and immediately after the activity, 30 minutes post-activity, and 60 minutes post-activity. Interleukin-8 (IL-8), IL-1RA, and RANTES increased after the activity. Greater cytokine increases were associated with greater propulsive forces, and with ultrasound markers for pathology. Results from these studies indicate that wheelchair activities may cause an acute inflammatory response that affects tendon health, and that using better technique may help prevent the development of pathology.