Exponent®
Engineering & Scientific Consulting

Jon Mortensen, Ph.D., P.E.

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Professional Profile

Dr. Mortensen's expertise is in analyzing and modeling the biomechanics of human movement as it relates to injury, musculoskeletal disorders, and performance. His work analyzes loading, posture, and muscle forces to determine injury mechanics and injury potential.

Dr. Mortensen's experience has been directly applied to specific projects involving wearable device design, automotive incidents, law enforcement, workplace incidents, and other incidents involving injury.

Dr. Mortensen has investigated the effects of several factors on head injury metrics in various activities involving blunt force trauma (including American football). These factors include active neck muscles, posture prior to impact, and impact magnitude. He has conducted studies on ergonomic risk, sports performance, and muscle control. Dr. Mortensen has developed and maintains an open-source musculoskeletal model of the head and neck, which is freely available through SimTK.org.

Prior to joining Exponent, Dr. Mortensen was a Graduate Assistant in the University of Utah Department of Mechanical Engineering, working in the Ergonomics and Safety Lab. During his time in this lab, Dr. Mortensen was a National Institute of Occupational Safety and Health trainee.

Academic Credentials & Professional Honors

Ph.D., Mechanical Engineering, University of Utah, 2019

M.S., Mechanical Engineering, University of Utah, 2018

B.S., Mechanical Engineering, Brigham Young University, 2016

National Institute of Occupational Safety and Health (NIOSH) Fellowship, 2016-2019

Prior Experience

Graduate Assistant in University of Utah Ergonomics and Safety Lab, 2016 - 2019

- Modeling effect of neck muscle activation during blows to the head or torso
- Extensive OpenSim model development
- Optimization techniques implemented in MATLAB
- Developing adaptive technology assisting spinal cord injury patients to engage in water sports

Publications

Mortensen, J. D., Vasavada, A. N., & Merryweather, A. S. Sensitivity analysis of muscle properties and impact parameters on head injury risk in American football. Journal of Biomechanics. 2020; 109411.

Mortensen JD, Vasavada AN, Merryweather AS. The inclusion of hyoid muscles improve moment generating capacity and dynamic simulations in musculoskeletal models of the head and neck. PLOS ONE. 2018;13(6):e0199912.

Mortensen J, Trkov M, Merryweather A. Exploring novel objective functions for simulating muscle coactivation in the neck. Journal of Biomechanics. 2018;71:127-34.

Presentations

Mortensen, J.D., Homayounpour, M. and Merryweather, A.S. Subject-Specific Models of the Head and Neck for Reproducing Experimentally Obtained Head Impacts in OpenSim. Podium Presentation, ASME International Mechanical Engineering Congress and Exposition, American Society of Mechanical Engineers. November 2019.

Merryweather, A, Mortensen, J, Homoyounpour, M. Altered Head and Torso Position and Active Neck Muscles prior to impact Reduce Brain Injury Metrics. Motor Control & Concussion Research Symposium. Salt Lake City, Utah, October 16, 2019

Merryweather, A, Mortensen, J. NIOSH ERC Ergonomics Webinar: OpenSim as a Platform for Improving Quantitative Ergonomic Assessments, August 2019

Mortensen J, Merryweather A. Does player strategy reduce head injury metrics during impact? A simulation study. Poster Presentation, International/American Society of Biomechanics. August 2019

Mortensen J and Merryweather A. The Effect of Posture and WBV on Neck Muscle Activation Requirements. Podium Presentation, 18th Annual Regional National Occupational Research Agenda (NORA) Young/New Investigators Symposium, Salt Lake City, UT, 2019

Mortensen J and Kuo K. Muscle and Ligament Model of the Head and Neck to Study Physiological Motions and Dynamic Impacts, OpenSim Webinar, 2019

Homayounpour M, Mortensen J, Merryweather M. Directional Auditory Warnings Alter Neck Muscle Activation Patterns. Poster Presentation, Biomedical Engineering Society Annual Meeting, Atlanta, GA, 2018

Mortensen J, Trkov, M, Merryweather A. Improved Ergonomic Risk Factor Assessment Using OpenSim and Inertial Measurement Units. Poster Presentation, Conference on Connected Health: Applications, Systems, and Engineering Technologies, Washington, D.C., 2018

Mortensen J, Merryweather A. Using OpenSim to Investigate the Effect of Active Muscles and Compliant Flooring on Head Injury Risk. Podium Presentation, Congress of the International Ergonomics Association, Florence, Italy, 2018

Mortensen J, Merryweather A. Active Neck Muscles During Impacts in Sports Reduce Traumatic Brain Injury Risk. Poster Presentation, World Congress of Biomechanics, Dublin, Ireland, 2018

Mortensen J, Merryweather A. Exploring Individual Muscle Characteristics on Free Throw Performance. Podium Presentation, Rocky Mountain American Society of Biomechanics, Estes Park, CO 2018

Mortensen J, Merryweather A. Modeling Stiffening in the Neck in Specified Directions Through Muscle Coactivation. Thematic Poster Presentation, American Society of Biomechanics, Boulder, CO, 2017

Mortensen J, Merryweather A. Exploring Novel Objective Functions for Simulating Muscle Coactivation in the Neck. Podium Presentation, Summer Biomechanics, Bioengineering, and Biotransport Conference, Tucson, AZ, 2017

Mortensen J, Fullwood D. Low-Cost Hydrogen Microprint Technique and Identification of Microstructures in Advanced High Strength Steels that are Susceptible to Hydrogen Embrittlement. Poster Presentation, Utah Conference on Undergraduate Research, Salt Lake City, 2016

Peer Reviews

Biomechanics and Modeling in Mechanobiology

Computer Methods in Biomechanics and Biomedical Engineering

PLOS ONE

Clinical Biomechanics