IOWA STATE UNIVERSITY

Department of Industrial and Manufacturing Systems Engineering

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Fall 2018 Graduate Seminar Series

Trunk Kinematics Variability in Repetitive Lifting Tasks

Physical Ergonomics and Biomechanics Lab
Department of Industrial and Manufacturing Systems Engineering, Iowa State University

Wednesday, September 19, 2017, 4:10 pm
1140 Howe Hall

Hamid Norasi, M.S.

Abstract

Trunk kinematics variables have been used to understand risk of low back injuries in the workplace. A repetitive lifting task affords the opportunity for lift-to-lift variability in the lifting strategy and kinematics, which can result in changes in the stresses on the tissues of the low back. Variability can also change as a function of workplace parameters and fatigue development. In these current studies, trunk kinematic variability was studied as a function of time and workplace parameters. Forty participants were recruited to perform a repetitive lifting task in two different studies involving a 90-degree trunk twisting with fixed foot positions. In the first study, participants repetitively lifted a load corresponding to 10% of body weight from knee to elbow height. In the second study, participants performed a repetitive lifting task under four different conditions representing two levels of load weight and starting height. The Lumbar Motion Monitor was used to capture key trunk kinematic variables from the concentric range of lifting motion. Trunk kinematic variables (range of motion, mean angular velocity and peak angular acceleration) were measured as a function of time and workplace parameters, respectively.
The second part of this talk will focus on a RULA-based (Rapid Upper Limb Assessment) approach to using Inertial Measurement Units (IMUs) to quantify musculoskeletal workload on vascular surgeons that Emmanuel and Hamid employed during their summer internship at the Mayo Clinic. Risk factors such as joint angles, static postures and repetitions were calculated through an automated algorithm to generate a risk assessment report for ergonomic intervention.

About the Speakers

Emmanuel Tetteh is a Ph.D. Student in the department of Industrial and Manufacturing Systems Engineering at Iowa State University. He obtained his M.S. and B.S in Biomedical Engineering from the North Carolina A&T State University and University of Ghana respectively where he worked on orthopedic screw performance using Finite Element Analysis. His research interest lies in musculoskeletal injury risk assessment using kinematics and kinetics with the intention of developing long-term interventions.

Hamid Norasi received his Bachelor of Science in Mechanical Engineering from K.N.Toosi University of Technolog in Iran. He then continued his academic journey as a master's student in the Biomedical Engineering (BME) Department of Amirkabir University of Technology. During his master's thesis, he worked on different propulsion mechanisms for manual wheelchairs, which developed his interest in the interaction of machines with humans, a field, known as human factors engineering. Currently, Hamid is a Ph.D. student in the Industrial and Manufacturing Systems Engineering Department of Iowa State University under the supervision of Dr. Gary A. Mirka in the field of physical ergonomics and biomechanics.

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