MSC Software’s Adams is Key in Low Back Pain Research Study at The Ohio State University

Research facility at top engineering school uses simulation to assess lumbar spine forces

SANTA ANA, CA--MSC Software Corporation, the leader in multidiscipline simulation solutions that accelerate product innovation, today announced that The Ohio State University Biodynamics Laboratory has conducted a research study on low back pain amongst health care workers. MSC Software’s Adams multibody dynamics simulation software was used to assess lumbar spine forces exerted on the body during the lifting of patient handling devices.

An increased risk of low back pain (LBP) among health care workers has been recognized for quite some time. Specifically, patient handling has been recognized as a high risk activity. Patient lift devices are considered a potential intervention. However, few biomechanical analyses have investigated the spine loads associated with these devices. The objective of the study was to assess the spine loads occurring when operating ceiling-based and floor-based patient handling devices under typical patient handling conditions.

The independent variables consisted of the patient handling system, patient weight, and control required to maneuver the course path. The two patient handling systems consisted of a ceiling-based and a floor-based patient transfer system. The lumbar motion monitor (LMM), a tri-axial electrogoniometer, was used to measure spine motion and has been previously validated. An electromyography (EMG) system was used to measure muscle activity.

The raw EMG signals were processed and then imported, along with the kinematic data, into a subject specific, biologically-assisted (EMG-assisted) model created in the MSC’s Adams software environment with the LifeMOD (LifeModeler, Inc.) biomechanical plug-in. The model is unique to the individual subject and is calibrated to their specific anthropometry, muscle origins and insertions, as well as their specific EMG activities. While there is no practical way to directly measure spinal forces in vivo, using the Adams software to simulate dynamic loads on the body allows our EMG-assisted biomechanical model to estimate the spine forces resulting during the patient handling tasks.

The results of the experiment showed that ceiling-based patient lift systems provide marked benefits compared to manual patient handling techniques. Floor-based patient handling systems also provide a
benefit over manual lifting of patients. In general, they are associated with low levels of spine compression. However, ceiling-based lifts are preferable to floor-based patient lift systems. If floor-based systems must be used, the floor surface and device wheel conditions must be considered in order to reduce LBP risk exposure.

"The Ohio State University Biodynamics Laboratory has been using MSC Software products for more than 10 years to explore dynamic loading in the human body during occupational tasks," said Gregory Knapik, Senior Researcher at The Ohio State University Biomechanics Laboratory. "Adams is an essential component of our biologically-driven lumbar spine model. It allows us to develop subject-specific models that we then drive with motion and force inputs recorded directly off of the subject while performing various work-related tasks. We then use the spinal force measures output from Adams to optimize the work and to make it safer for the subjects. The power and efficiency of Adams has allowed to test and then model hundreds of different subjects and thousands of separate tasks,"

About Ohio State University
The Ohio State University's College of Engineering was established in 1870 and has been recognized by U.S. News and World Report as one of the top engineering schools in the nation. It offers 13 undergraduate and 17 graduate engineering programs through 11 engineering departments and currently has over 6,000 enrolled students. It is known for its Fundamentals of Engineering course sequence taught by distinguished faculty and provides hands on laboratory experience, which includes a Biodynamics Laboratory that is directly involved with The Center for Occupational Health in Automotive Manufacturing (COHAM). The Ohio State University also ranks 10th amongst public research universities and 15th amongst both public and private and has been the beneficiary of several research funds totally to an increase of $124.7 million over the past year. To learn more, visit http://engineering.osu.edu/index.php

About MSC Software
MSC Software is one of the ten original software companies and the worldwide leader in multidiscipline simulation. As a trusted partner, MSC Software helps companies improve quality, save time, and reduce costs associated with design and test of manufactured products. Academic institutions, researchers, and students employ MSC’s technology to expand individual knowledge as well as expand the horizon of simulation. MSC Software employs 1,100 professionals in 20 countries. For additional information about MSC Software’s products and services, please visit: www.mscsoftware.com

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Press Contact:
Leslie Bodnar
leslie.bodnar@mcsoftware.com