MD Adams Powers Musculoskeletal Studies to Keep Astronauts Stronger during Long-Duration Missions

SANTA ANA, CA--(Marketwire – June 7th, 2011) – MSC Software Corporation, the leader in multidiscipline simulation solutions that accelerate product innovation, today announced that researchers in the Computational, Robotics, and Experimental biomechanics (CoRE) Lab within the Department of Orthopaedics and Sports Medicine at the University of Washington are performing musculoskeletal modeling and simulations powered by MD Adams to identify exercises that will help astronauts keep their bones and muscles stronger during long-duration space missions.

Loss of bone mineral density (BMD) is a major risk factor that NASA scientists and crew surgeons are trying to mitigate before assigning crewmembers to long-duration missions to remote planetary surfaces. As a person’s percentage of BMD decreases, his/her chance of bone fracture increases. Performing exercises that target anatomical areas prone to higher levels of BMD loss can help reduce the possibility of fracture due to a fall or traumatic impact. The hip is one such region that is particularly vulnerable to disuse induced bone atrophy.

Because direct measurements of hip joint contact forces are not feasible except in unusual circumstances, biomechanical simulation is an important tool to perform this research. The Combined Countermeasure Device (CCD), a low-power, small footprint integrated musculoskeletal exercise countermeasure device, was modeled in MSC Software’s MD Adams, and the LifeMOD™ plug-in was used for biomechanics simulation. These two software packages provide a powerful simulation and analysis tool for modeling complex human and machine motion in reduced gravity environments.

One of the primary advantages of using LifeMOD™, as opposed to other biomechanics simulation software, is the ability to import MD Adams components for the human interface that allows analysis of a complete system. LifeMOD™ is used to estimate the hip joint contact forces during exercise at 1g and 1/6g on the Combined Countermeasure Device (CCD), with and without gravity replacement using a subject load device (SLD) during squats and hip ab/adduction exercises. Hip ab/adduction exercises result in higher hip joint forces than squat exercise and would therefore have the potential of being more osteoprotective.

“The MD Adams platform is a very powerful tool that supports our goals of modeling the interface between humans and exercise equipment to examine the biomechanical impact. Exercising in a microgravity environment presents many new challenges to equipment design and human performance,” said Andrea Hanson, PhD, Postdoctoral Fellow at the University of Washington. “The use of
biomechanical simulation allows us to estimate how the microgravity environment will impact forces at the hip during specialized exercise programs. It is our goal to use data from these studies to help design a more effective exercise program for astronauts that will help them maintain stronger bones during future missions to the moon and Mars. MD Adams is helping us to advance the capabilities of human space travel."

“Even outside traditional medical fields, biomechanics simulations provide extensive insight into how movement and loading conditions impact human joints and muscles,” said David Yuen, Sr. Vice President Americas at MSC Software. “The applications for applying the technology are boundless, and we are proud to provide the University of Washington with the tools and support to continue exploring new possibilities.”

About the Computational, Robotics, and Experimental biomechanics (CoRE) Lab
The Computational, Robotics, and Experimental biomechanics (CoRE) Lab in the Department of Orthopaedics and Sports Medicine at the University of Washington is a function biomechanics research facility with interests in computational, robotic, and experimental biomechanics. Currently headed by Professor Peter Cavanagh, DSc, PhD, it is currently working on several projects in the field of biomedical engineering including finite element models of the foot, simulations of musculoskeletal disorders using MD Adams and LifeMOD, a robotic system to study injuries and surgical treatments of musculoskeletal systems, and a harness for treadmill exercise in outer space. For more information, visit http://www.orthop.washington.edu/Research/OurLabs/CoREBiomechanicsLab.aspx.

About MSC Software
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