A KINEMATIC COMPARISON OF THE DIGI-JUMP MACHINE VERSUS ROPE JUMPING.

J.R. McLester[1], FACSM, Thomas S. Lyons[2], Zachary J. Callahan[2], and John C. Faircloth[2]. [1]*Department of Health, Physical Education, and Sport Science, Kennesaw State University, Kennesaw, GA* and [2]*Western Kentucky University, Bowling Green, KY.*.

Pursuant to the recent Surgeon General's report identifying bone health as priority and its recommendation of repetitive jumping as a preferred exercise for ameliorating this growing problem, this study investigated kinematic variables with use of the Digi-Jump (DJ) machine. The DJ machine is designed to regulate jumps per minute as well as height per jump in order to simulate rope jumping. **PURPOSE:** To compare the kinematic parameters of the DJ machine and standard rope jumping. **METHODS:** Twenty-eight subjects (age: 21.1±1.8 yrs; bf: 12.7±6.4%; ht: 170.7 ±22.6 cm; wt: 75.6±12.9 kg) performed in counterbalanced order both a 120 JPM trial on the DJ machine and a concrete floor (FL). Subjects were required to reach a minimum of 1/2" height for each jump. Cadence was monitored through a series of lights and audible "beeps," while height was regulated by infrared beams. Data were recorded with a three camera motion capture system. The kinematics (joint angles, velocities, and accelerations) for both trials were calculated and compared using repeated measures ANOVA. **RESULTS:** Overall, the body and segmental motions were similar in both trials. However, significant differences ($p \leq 0.05$) between trials were found for peak vertical velocity (DJ: 149.1±20.3 mm/sec versus FL: 163.6±23.9 mm/sec), peak angular velocity of the knee (DJ: 296.2±59.5 deg/sec versus FL: 352.5±92.9 deg/sec) and ankle (DJ: 417.6±83.2 deg/sec versus FL: 501.1±106.2 deg/sec), peak angular acceleration of the knee (DJ: -4504.2±1588.4 deg/sec^2 versus FL: -5981.1±2917.8 deg/sec^2) and ankle (DJ: -7160.9±2426.3 deg/sec^2 versus FL: -8141.2±2426.5 deg/sec^2), and mean angular acceleration at the knee (DJ: -974.2±172.0 deg/sec^2 versus FL: -1234.4±323.8 deg/sec^2) and ankle (DJ: -1423.8±353.6 deg/sec^2 versus FL: -1773.9±521.5 deg/sec^2). **CONCLUSIONS:** Parameters measured on the DJ machine are similar to standard rope jumping, but not directly equivalent. Peak velocities are higher on a concrete floor versus the DJ machine. This indicates that the floor of the machine may provide some return of strain energy, allowing the subject to maintain the correct jump height and cadence with less energy expenditure. These findings provide indirect evidence that jumping on the DJ machine may be safer due to lower impulse upon landing.