

THE EFFECTS OF LIFTING SPEED AND LOAD MAGNITUDE ON THE TORSIONAL AND LATERAL BENDING MOMENTS DURING TWISTING

Steven A. Lavender, Ph.D., Yichun Li, M.S.* , R.N. Raghu Natarajan, Ph.D.,
Gunnar B.J. Andersson, M.D., Ph.D., and Maury Nussbaum, Ph.D.^
Rush-Presbyterian-St. Luke's Medical Center, Chicago, Illinois

*University of Illinois at Chicago

^University of Michigan, Ann Arbor, Michigan

Epidemiological studies have associated occupations that require twisting of the torso with increased low-back disorders. The objective of this study was to quantify the torsional and lateral bending moments acting on the spine in three lifting modes that varied in the amount of twisting required. Fifteen subjects lifted boxes, weighing 10 and 20 percent of their body weight, at two speeds. Kinetic and kinematic data were obtained with a two force-platform, four camera, opto-electronic motion detection system. These data were run through an inverse dynamic model to quantify the net torsional and lateral bending moments at L5/S1. Results indicated that the asymmetric lifting activities tested created significantly greater lateral bending and torsional moments on the spine than the sagittally symmetric task. The greatest lateral bending and torsional moments were observed as subjects lifted the 20 percent body weight load from a 90 degree asymmetric position positioned 88 cm from the floor. The faster lifting speed significantly reduced the torsional and lateral bending moments during particular phases of the lifts tested. This suggest that during rapid twisting motions the path taken by the box was closer to the body, thereby, minimizing the box's external moment.