

Coactivation of the Trunk Muscles during Asymmetric Loading of the Torso

STEVEN A. LAVENDER,¹ YANG-HWEI TSUANG,² ALI HAFEZI, and GUNNAR B. J. ANDERSSON, *Rush-Presbyterian-St. Luke's Medical Center*, and DON B. CHAFFIN and RICHARD E. HUGHES, *University of Michigan*

Materials handling tasks in industry are rarely performed in the midsagittal plane. Often these tasks, labeled *nonsagittally symmetric* or *asymmetric lifting tasks*, can be expected to lead to an unequal distribution of forces between the left and right sides of the body. Because of the large number of muscles capable of resisting loads in the torso, researchers are forced to make simplifications when using biomechanical models to estimate mechanical loading of the spine during such tasks. Simplifications and assumptions regarding the coactivation of antagonistic muscles are frequently used because sufficient experimental data do not exist. The present study was designed to quantify coactivation of the trunk musculature in response to applied asymmetric loads. This load was varied in direction from an anterior midsagittal plane orientation to a posterior midsagittal plane orientation in 15-deg increments. The results showed little coactivation when the applied load directions were anterior and within 45 deg of the midsagittal orientation. When load directions were greater than 45 deg, coactivation was quantifiable in ipsilateral and posterior muscle groups.