Trunk kinematics and trunk muscle activity during a rapidly applied load

James S. Thomas a,*, Steven A. Lavender b, Daniel M. Corcos c,d, Gunar B.J. Andersson b

a Departments of Physical Therapy and Biological Sciences, University of Illinois at Chicago, Chicago, IL 60612, USA
b Department of Orthopedic Surgery, Rush-Presbyterian St. Luke Medical Center, Chicago, IL 60612, USA
c School of Kinesiology and Department of Psychology, University of Illinois at Chicago, Chicago, IL 60608, USA
d Department of Neurological Sciences, Rush Medical College, Chicago, IL 60612, USA

Abstract

This study investigated the trunk kinematics and electromyographic (EMG) activity of eight trunk muscles when “expected” and “unexpected” loads were applied directly to the torso. Twenty individuals (mean age: 25.1 yr; range 20–33 yr) participated in this mixed model study in which gender was the between-subjects factor, and expectancy and symmetry of the applied load were within-subject factors. The sudden load was delivered to the subject via a cable attached to a thoracic harness and motion was restricted to the lumbar spine by strapping the pelvis to a rigid fixation apparatus. Surface EMG was recorded bilaterally from the longissimus thoracis (LGT), erector spinae (ERS), rectus abdominis (RAB) and the external obliques (EXO). Trunk kinematics were measured with a Lumbar Motion Monitor™. During expected loading conditions, the peak muscle activity was reduced for the RAB and EXO bilaterally, and for the ERS(R) (p < 0.01) relative to the unexpected conditions. Conversely, the normalized area of EMG activity prior to the onset of load was increased for the ERS and EXO bilaterally, and for the RAB(R) (p < 0.05) during an expected loading event. Trunk motion in the sagittal and frontal planes was reduced during expected loading. Activation of the trunk muscles just prior to a rapid loading event increases trunk stiffness, decreasing trunk displacement and peak muscle activity.

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