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Journal of Electromyography and Kinesiology 8 (1998) 215–225

JOURNAL OF
ELECTROMYOGRAPHY
AND
KINESIOLOGY

Trunk kinematics and trunk muscle activity during a rapidly applied load

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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. © 1998 Elsevier Science Ltd. All rights reserved.

Keywords: Sudden loading; Gender; Trunk muscle activity; Biomechanics; Spine
