

The Development of Response Strategies in Preparation for Sudden Loading to the Torso

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Sudden and unexpected loading to the torso has been reported in the literature as a potential cause of low-back disorders. When such loadings occur, it is hypothesized that the body's response is designed to minimize the destabilizing postural disturbance, and to minimize the mechanical loading of the musculoskeletal system. This study tested hypotheses regarding the role of task experience in the development of preparatory strategies that potentially minimize the postural disturbance to the body and minimize the mechanical loading of the spine. These strategies were hypothesized to consist of muscle pretensioning, postural changes, and intra-abdominal pressure (IAP). Four subjects participated in five to six experimental sessions in which a sudden load was applied by dropping a weight once a minute for 30 minutes. Electromyographic (EMG) data from 10 trunk muscles, IAP data, and postural data were collected during the initial session and final sessions for each subject. The results indicate where each subject developed a unique preparatory strategy. The preparation always involved the pretensioning of the erector spinae muscles, although the coactivation of the other trunk muscles was quite variable across subjects. During the sudden loading the overall postural disturbance was not consistently reduced; however, the trunk flexion was significantly reduced in most subjects. Furthermore, the estimated spinal compression due to muscle loading was significantly reduced in all subjects. [Key words: preparation, electromyography, EMG, sudden loading, lumbar spine, low-back injury]