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Biomarker Responses to Static Axial Trunk Loading and Unloading

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Abstract: Work-related musculoskeletal disorders (WMSDs) continue to be prevalent and costly in a wide variety of industrial settings. Biomarkers related to tissues commonly involved in WMSDs may be useful in assessing physiological damage following exposure to risk factors. Recent studies have demonstrated that exposure to dynamic spinal loading, through lifting tasks or repeated compressive forces, elicits measureable changes in these biomarkers. There is, however, little evidence examining the effect of static loads on these biomarkers, despite clear evidence linking both static and dynamic forces to an increased risk of WMSDs. Here, changes in cartilage oligomeric matrix protein (COMP), interleukin-6 (IL-6), and creatine phosphokinase (CPK) were monitored before and after 1hr of exposure to static axial trunk loading and again after 1hr of prone rest. Low to moderate loads were applied while seated, at 0 (control), 20, and 40% of individual body weight. COMP significantly decreased over time, while CPK was unaffected. Though not significant, IL-6 exhibited a delayed increase (+0.177 ng/L normalized change) in the 40% load condition. All three biomarkers exhibited low sensitivity to the current levels of static axial loading, which contrasted with previous evidence in dynamic spinal loading and a clear dose-response patterns in reported discomfort. COMP, IL-6, and CPK appeared insufficiently sensitive to reflect isolated tissue stress or damage, and suggest longer exposure times or larger sample sizes may be required. Additionally, COMP may require an unloading period to achieve baseline levels. More work is needed to explore the utility of biomarkers in conditions of low to moderate static spinal loading.

Keywords: Biomarker; Interleukin-6, Cartilage Oligomeric Matrix Protein, Creatine Phosphokinase, Static Trunk Loading