Category: Biology and physiology of work-related musculoskeletal disorders

[266] Associations of trunk motor variability with fatigue and low-back pain in repetitive lifting

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Introduction: The concept of trunk motor variability (MV) is relevant to understanding the control of spinal movement and stability, since neuromuscular control of the spine relies on the coordinated action of numerous muscles working synergistically. Neuromuscular control is known to be altered during fatigue and in individuals with chronic pain - hence, alterations in spinal motor control, as detected by MV, could be key to understanding the development of fatigue and low-back pain (LBP). The purpose of this review was to summarize the available evidence on whether MV systematically changes when individuals perform repetitive lifting under fatiguing conditions; and whether MV systematically differs between individuals with and without chronic LBP.

Methods: We searched for full-length original articles written in English from MEDLINE, Scopus, and Web of Science. The search terms were structured to capture task (lifting), trunk (body response), MV (response details), fatigue and LBP (outcomes).

Results: A total of 16 studies were identified, with 5 studies exploring the association between MV and fatigue, 10 studies focused on quantifying the association between MV and LBP, and one study of the association between MV and fatigue in control and LBP groups. All MV-fatigue studies showed evidence of increased MV in late- vs. early-fatigue. However, evidence from the MV-LBP studies was more mixed: association between kinematic trunk MV and LBP was inconsistent across the examined studies (higher, lower, and no difference in kinematic MV were reported by different studies). MV-LBP studies that were focused on muscle activity of the erector spinae reported decreased spatial variability in muscle activity in LBP vs. control groups.

Discussion: Interesting associations between trunk MV, fatigue, and LBP emerged, and were in accordance with results from isometric exercise as well as dynamic tasks involving other body regions such as the upper and lower extremities. However, the generalizability of the MV-fatigue and MV-pain associations to occupational settings is unknown since the reviewed studies involved small samples of individuals performing controlled lifting tasks in laboratory environments.

Conclusion: Since the associations between trunk MV, fatigue, and LBP during repetitive lifting were only assessed in cross-sectional studies conducted in controlled laboratory settings, the current literature base does not strongly support for interpreting whether MV changes seen in individuals with LBP are functional or maladaptive.