

Evaluation of the Acute Effects of Dynamic and Static Stretching on Pain Tolerance, Muscular Activation, and Isometric Strength

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Abstract: Research conducted since 2014 has explored ergonomic interventions to enhance the efficiency of construction workers. These interventions include stretching, exercising, engineering controls, job training, and education. Preliminary studies indicate that dynamic stretching (DS) increases isometric strength and muscular activation, while static stretching (SS) decreases isometric strength. This suggests that the choice of stretching modality affects the outcomes significantly. SS and DS are common techniques used during exercise, rehabilitation, and musculoskeletal pain management. However, the acute effects of stretching exercises in preventing Work-Related Musculoskeletal Disorders (WMSDs) remain inconclusive due to methodological limitations and conflicting findings. Therefore, further research is necessary to assess the impact of stretching on injury prevention. Our study aims to compare the acute effects of SS and DS on Pain Tolerance (PT), muscular activation, and isometric strength. Using a single-subject random-block design, we will analyze these variables. Participants will undergo baseline assessments of PT using a neurosensory analyzer, muscular activation of the wrist flexor and extensor muscles using surface EMG (sEMG), and muscular strength using a hand dynamometer. Then, the participants will randomly perform SS or DS exercises for two minutes. PT, muscular activation, and strength will be measured after completing the stretching exercises. We anticipate a greater improvement in PT, muscle activity, and hand grip strength with DS stretching exercises than with SS exercises. These findings will provide valuable insights for selecting appropriate upper extremity stretching techniques for construction workers and those involved in repetitive motion activities. Future investigations can explore different biomarkers to understand the underlying physiological mechanisms. In conclusion, our research aims to evaluate the acute effects of warm-up exercises and the influence of SS and DS on PT, muscular activation, and strength. By providing evidence-based support for specific stretching techniques, this study aims to enhance injury prevention strategies for construction workers and individuals engaged in repetitive motion tasks.

Keywords: *Warm-up exercises; Work-Related Musculoskeletal Disorders (WMSDs); Stretching; Hand-grip strength; Construction workers.*