

Wrist Immobilization: Does Elbow and Shoulder Overcompensation Occur When Performing Drinking and Hammering Tasks?

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ABSTRACT

Wrist orthoses, which immobilize or reduce motion at the wrist, may cause difficulties in performing daily tasks as they may affect other nearby joints and muscles of the upper extremity. Previous studies have generally focused on compensatory shoulder movements, not elbow movements, when wearing wrist orthoses. The purpose this study was to determine whether wrist immobilization results in compensatory movements of both the elbow and shoulder. Specifically, this study examined joint movement of the elbow and shoulder joints when performing a drinking and hammering task while wearing a wrist orthosis. Informed consent was received from all participants prior to participation in this study. This study was approved by the Southwestern University Institutional Review Board for Human Research. A convenience sample of twenty healthy adults (21.1 ± 1.0 yrs, 1.72 ± 0.08 m, 68.5 ± 10.6 kg) was recruited to participate in this study. Each participant performed both a drinking and hammering task with and without a wrist orthosis three times. Thus, each participant performed six drinking motions and six hammering motions. A Liberty D-ring static wrist splint and two twin-axis electro-goniometers were used. Compensatory movement was defined in terms of joint excursion, or the change in joint motion throughout the performance of the task. Two 2×2 (condition \times joint) repeated measures analyses of variance were used to analyze differences in joint excursion of the elbow and shoulder joints during the two tasks for the orthosis condition (orthosis, no orthosis). There was not a significant interaction between joint movement and orthosis on joint excursion ($F(1,19) = 2.13$, $p = 0.16$, $\eta^2 = 0.10$) for the drinking task. There was also not a significant interaction between joint movement and orthosis on joint excursion for the hammering task ($F(1,19) = 2.35$, $p = 0.14$, $\eta^2 = 0.11$). These results indicate that movement of one joint together with the wearing of the orthosis did not have an effect on joint excursion of the other joint. The results of the study support the use of wrist orthosis as it found that wrist orthosis usage does not cause compensatory movements of the elbow and shoulder. The proper choice of an immobilization or supportive device must be determined by the therapist to better improve functionality.