PATHOKINESIOLOGY LABORATORY
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ABSTRACTS FROM CONFERENCE PRESENTATIONS (2003 – 2005)

SPINAL CORD INJURY

Effect of seat position on shoulder joint demand during manual wheelchair propulsion: A preliminary report. Newsam CJ, Gutierrez DD, Gronley JK, Mulroy SJ, Perry J. *J Spinal Cord Med* 2003;26(1):S13.

Objective: To determine the effect of moving the wheelchair seat posteriorly on shoulder joint forces and moments.

Design: Repeated measures.

Participants: Six men with complete paraplegia and 2 men with complete C7 tetraplegia participated. Subjects were asymptomatic for upper extremity pain.

Methods: Subjects propelled an instrumented wheelchair positioned on a stationary ergometer at their pre-determined, self-selected velocity in 2 seat positions: (1) wheel axle aligned with the shoulder joint center and (2) with the seat moved 8cm posterior to the initial position. The right pushrim of the test wheelchair was instrumented with force transducers that recorded pushrim forces. Three dimensional motion of the right arm was recorded with a Vicon motion analysis system. An inverse dynamics approach calculated three dimensional shoulder joint reaction forces and moments.

Results: Mean propulsion velocity for seat forward and back positions was similar (72.7 +/- 15.1 m/min; 71.8 +/- 15.0 m/min, respectively). The vertical shoulder joint reaction force (Fz) was significantly reduced with the posterior seat position (mean superior force = 7.6N vs. 0.0N, $p<.01$). Horizontal and medial forces were similar between conditions. Shoulder joint moments also were similar between conditions, however, there was a trend toward reduced abduction moment in the posterior seat position (1.4 Nm vs. 0.4Nm, $p=.16$).

Conclusion: Adjusting the wheelchair seat posteriorly reduced shoulder joint demand without compromising propulsion velocity. Reduction of the superior joint reaction force and abduction moment decreases the risk for subacromial impingement and may increase propulsion endurance by decreasing muscular demand.

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