

**PATHOKINESIOLOGY LABORATORY  
RANCHO LOS AMIGOS NATIONAL REHABILITATION CENTER**

**ABSTRACTS FROM PUBLISHED MANUSCRIPTS (2004 – 2005)**

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**Effect of spinal cord injury level on the activity of shoulder muscles during wheelchair propulsion: An electromyographic study.** Mulroy SJ, Farrokhi S, Newsam CJ, Perry J. *Arch Phys Med Rehabil* 2004;85:925-934.

Objective: To determine the influence of spinal cord injury (SCI) level on shoulder muscle function during wheelchair propulsion.

Design: Fine wire electromyographic activity of 11 muscles was recorded during wheelchair propulsion.

Setting: Biomechanics research laboratory.

Participants: Sixty-nine men with spinal cord injury: low paraplegia (N=17), high paraplegia (N=19), C7/C8 tetraplegia (N=16) and C6 tetraplegia (N=17).

Interventions: Not applicable.

Main Outcome Measures: Timing of muscle onset, cessation, duration of activity and time of peak intensity for each functional group was compared with one-way analysis of variance. Median EMG intensity also was compared.

Results: Two functional synergies were observed: push (anterior deltoid, pectoralis major, supraspinatus, infraspinatus, serratus anterior, biceps) and recovery (middle and posterior deltoid, supraspinatus, subscapularis, middle trapezius, triceps). Push phase activity began in late recovery and ceased in early to late push. Recovery phase muscles functioned from late push to late recovery. Recruitment patterns for the groups with paraplegia were remarkably similar. For subjects with tetraplegia, pectoralis major had significantly prolonged activity compared to subjects with paraplegia ( $p < .05$ ). Subscapularis activity shifted from a recovery pattern in subjects with paraplegia to a push pattern in persons with tetraplegia.

Conclusions: Level of SCI significantly affected the shoulder muscle recruitment patterns during wheelchair propulsion. Differences in rotator cuff and pectoralis major function require specific considerations when designing rehabilitation programs.

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