

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

**ABSTRACTS FROM CONFERENCE PRESENTATIONS (2003 – 2005)**

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**The influence of gender and shoulder torque on wheelchair propulsion characteristics.** Gutierrez DD, Mulroy SJ, Newsam CJ, Gronley JK, Perry J. Combined Section Meeting of the American Physical Therapy Association: February 2005, New Orleans, LA

Purpose/Hypothesis

To determine if gender influences wheelchair propulsion characteristics in persons with spinal cord injury.

Number of subjects

Five men and 5 women, matched by age (mean: 37 years), lesion level (range: T1-T11) and duration of injury (mean: 11 years), with spinal cord injury volunteered for this study.

Materials/Methods

Propulsion characteristics were collected while subjects pushed at a self-selected, free velocity on an instrumented test wheelchair. Velocity, cadence, cycle time, cycle length, duration of push phase and duration of recovery phase were compared between men and women. Maximal isometric shoulder torques (flexion, scaption, adduction, depression, external and internal rotation) were recorded using a Lido Isokinetic Dynamometer. Independent t-test were used to compare propulsion characteristics between men and women. A stepwise regression was conducted to determine if the torque measurements were predictors of propulsion characteristics.

Results

Of the propulsion characteristics studied, velocity was significantly different between women and men (44m/min vs. 69m/min, respectively). This was mostly due to a shorter cycle length in women (.78m vs. 1.3m;  $p=.06$ ). Cadence was not significantly different between women and men (56 cycles/min vs. 57 cycles/min, respectively). All shoulder isometric torques studied were had high to moderate correlations with cycle length (flexion,  $r = .80$ ; scaption,  $r = .75$ ; adduction,  $r = .61$ ; depression,  $r = .65$ ; external rotation,  $r = .86$ ; internal rotation,  $r = .89$ ). The best predictor of cycle length was internal rotation torque, accounting for 80% of the variability ( $r = .89$ ). Once internal rotation torque was entered into the equation, none of the other torques added any significant predictability. Shoulder torques were negatively correlated to cadence with moderate relationships for flexion,  $r = -.48$ ; scaption,  $r = -.60$ ; internal rotation,  $r = -.56$ ; and external rotation  $r = -.51$ ). The best predictor of cadence was scaption, explaining 35% of the variability ( $r = .59$ ). Shoulder torque was moderately correlated to velocity with external rotation as the strongest predictor, explaining 36% of the variance ( $r = .60$ ).

### Conclusions

Women's propulsion velocity is slower than that of men, as their cycle length tends to be shorter. Cycle length is strongly related to the strength of all shoulder muscle groups tested.

### Clinical Relevance

A high cadence has been associated with increased risk of overuse in wheelchair propulsion. Our results suggest that strengthening the shoulder muscles, particularly for women, would be beneficial to decrease the need to use a strategy of high cadence during wheelchair propulsion.

### Acknowledgments

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