

Making Assistive Technology and Rehabilitation Engineering a Sure Bet

Quantifying the Demand on the Shoulder during Lateral Wheelchair Transfers

Megan Naber, BME student^{1,3}, Padmaja Kankipati, MS^{1,2}, Yen Sheng Lin, MS^{1,2}, Alicia M. Koontz, PhD, RET^{1,2},

¹Human Engineering Research Laboratories, Department of Veterans Affairs, Pittsburgh, PA

²Department of Rehabilitation Science and Technology, University of Pittsburgh, Pittsburgh, PA 15261

³Department of Biomedical Engineering, Marquette University, Milwaukee, WI, 53233

ABSTRACT

This study aims at analyzing biomechanical data of wheelchair transfers in terms of strength capability. Peak torques from isokinetic strength data and peak shoulder moments during transfer were identified in five manual wheelchair users with paraplegia. A transfer strength rating (TSR) was calculated to determine a percentage of capability demanded during transfers. Strength data revealed flexion and external rotation as strongest and weakest joint movements, respectively, as in prior studies. The TSR values indicated that demands on several joint movements exceed the measured strength capability, such as external rotation and extension. This analysis technique could potentially be used to identify which muscle groups to strengthen thereby increasing shoulder joint capacity to meet the demands of transfers.

KEYWORDS

Biomechanics; isokinetic strength; spinal cord injury; transfer; upper limb pain

ACKNOWLEDGEMENTS:

Funding for this study was provided by the VA Rehabilitation Research R&D Services and the National Institute on Disability and Rehabilitation Research and the National Institute of Health, Center for Injury Research Control (VA-RR&D E3589V and B3079R NIDRR H133A011107, NIH R49/CCR310285-06).

Author Contact Information:

Megan Naber, BS, Marquette University, 1317 W. Kilbourn Ave., Apt. Y, Milwaukee, WI 53233, cell phone: (517) 290-5987

E-mail: megan.naber@marquette.edu