

# **Understanding propulsive shoulder forces and scapular kinematics during manual wheelchair use**

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## **Overview**

Currently little is known about how the interaction between different wheelchair configurations and the user effects forces acting on shoulder girdle structures. This is problematic as associated shoulder pain and inefficient propulsion is common and disabling for wheelchair users, who usually rely heavily on upper limb function for activities of daily living and recreation. Participation in wheelchair-based sport may further predispose individuals to shoulder and upper extremity pain, with a likely higher frequency of rotator cuff disorders than the already high number in the general population. Wheelchair users may spend years refining wheelchair configuration for optimal performance in a sports chair, however, much less time is afforded to the configuration of the more frequently used everyday wheelchair. We have successfully assembled an inter-disciplinary team of experts, with complimentary expertise and technology that have enabled us to accurately measure the forces (kinetics) and movements (kinematics) at the shoulder during manual propulsion of everyday wheelchairs. This work will help establish methods, and generate initial data, that can be employed to better understand how wheelchair configurations can be manipulated to prevent shoulder girdle pain and pathology in later work.

## **Aims & Objectives**

1. Establish methods for the multi-system measurement of shoulder motion during three submaximal speeds of wheelchair propulsion.
2. Measure forces acting on the shoulder girdle, movement patterns of the scapula and technique-related parameters during submaximal manual propulsion in a daily use wheelchair.
3. Assess the intra-observer reliability of the technique for performing kinematic analysis of the shoulder and how this may influence the quantification of forces acting on the shoulder.
4. Examine asymmetries in scapula movement patterns within individuals and between groups defined by the presence of pain during tasks of daily living.