Shoulder Preservation after SCI: Wheelchair Mobility & Reaching Activities

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Fact Sheet

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SPECIAL INTEREST GROUP

a Special Interest Group of

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Wheelchair Mobility

Manual wheelchair (WC) propulsion is highly-repetitive, bilateral weightbearing activity which places high demands on the upper limbs and therefore increases the chances of injury and pain. However, there are many opportunities to mitigate upper limb demand.

Movement Optimization for Wheelchair Propulsion

During WC propulsion, people with spinal cord injury should:

- "Use a long, smooth stroke" in order to reduce upper limb loads1 See Figure 1.
- Avoid high impact during the early portion of the push phase (hand before the top center of the wheel). See Figure 1.
- With pneumatic tires, push directly on the tire to help absorb the shock of high impact forces.
- Avoid shoulder internal rotation with abduction or forward flexion. Maximum shoulder extension combined with internal rotation and abduction should also be avoided, particularly when transferring out of the WC.[3]

Fast WC propulsion and management of inclines increase vertical shoulder joint forces by as much as three-fold three – fold.[2] Consider the following changes:

- Reduce the propulsion speeds, particularly in the presence of shoulder pain. Use long, smooth strokes that limit high impacts on the pushrim.[3]
- On inclines, use a slalom-style/weaving approach

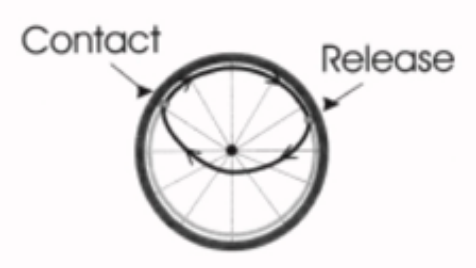

Figure 1: Semicircular pattern for wheelchair propulsion
(figure sourced from www.pva.org)

Adaptive Equipment Modifications

- For manual WC users, a lightweight, adjustable and rigid frame WC keeps propulsion demands as low as possible.
- Forward placement of the rear axle of the wheelchair (as far forward as possible without compromising the person's stability) will decrease rolling resistance and increase propulsion efficiency.
- Forward wheel axle position also helps to avoid extreme shoulder extension and internal rotation in the early push phase which leads to a reduced superior shoulder joint force[3] subsequently decreasing the risk for impingement of subacromial structures.

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Adaptive Equipment Modifications (continued)

- Seat height adjusted for an elbow flexion angle of approximately 60-80° (angle between upper arm and forarm is 100-120°) when the hand is placed at the top center (i.e. 12 o'clock position) of the wheel will allow for optimal alignment.[4] (Figure 2)
- Setting the seat in no more incline than necessary will maximize the patient's safety.
- Consider alternate-style pushrims, such as projection, foam-covered, or ergonomically contoured pushrims, that can increase the surface area for gripping, reduce the loads of propulsion effort and decrease energy spent and fatigue.
- Consider power-assisted or power wheelchair for those with tetraplegia or shoulder pain

Figure 2

Reaching Activities

Similar to the overhead athlete, wheelchair users often experience shoulder pain because of an increased need to perform tasks in an overhead position. In addition, picking objects up from the floor while sitting in a wheelchair creates the same movement patterns and mechanical challenges as an overhead reach. Therefore, similar recommendations apply to wheelchair users for reaching low as to reaching overhead.

Movement Optimization for Reaching

WC users should:

- Lift and hold objects close to the body to decrease the external demand of the tasks.
- Avoid internal rotation of the shoulder during overhead reaching.

Adaptive Equipment/Modifications

- Organizing commonly used items to be placed at shoulder height or below will minimize the need for overhead reaching.
- Using a reacher to obtain items out of reach will allow the WC user to avoid extreme shoulder positions. (Figure 3)

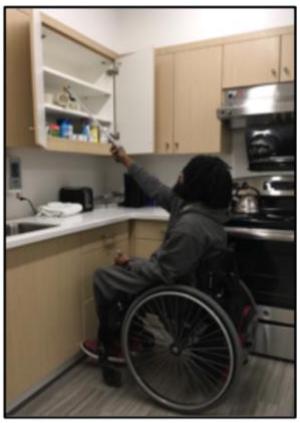

Figure 3

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