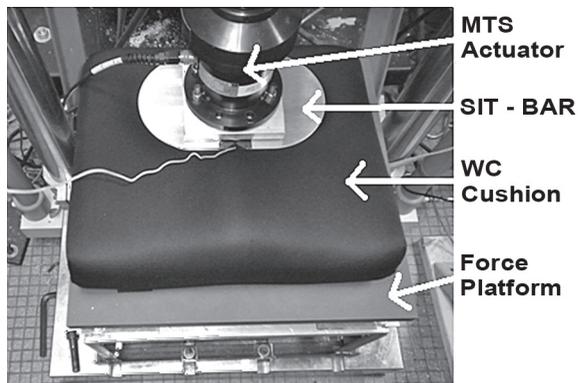


## Dynamic stiffness and transmissibility of commercially available wheelchair cushions using a laboratory test method

Yasmin Garcia-Mendez, BS, et al.



A variety of factors have been associated with back and neck pain, such as inadequate postural support, stress, and vibration exposure. Substantial evidence links vibration exposure with spinal injuries, and driving has been found to be the most common way to transmit vibration to the human body. Because wheelchair users spend long periods of time propelling their wheelchairs, they may be exposed to similar risks. Our study evaluates commercial wheelchair cushions' characteristics for reducing or amplifying vibration exposure to wheelchair users with two laboratory test methods. Among the cushions tested, the air-bladder cushions had lower vibration transmissibility than the foam- or gel-based cushions.

## Changes in surface electromyography signals and kinetics associated with progression of fatigue at two speeds during wheelchair propulsion

Liping Qi, PhD, et al.

Veterans with spinal cord injury, amputation, or who for other reasons use a manual wheelchair are likely to experience chronic shoulder pain and loss of independence. Biomechanical analysis of

wheelchair propulsion can determine the conditions likely to result in upper-limb damage and guide wheelchair design, propulsion technique, and recommendations for exercises to strengthen musculature around the shoulder joint. We have developed a method for identifying the onset of fatigue in shoulder muscles during wheelchair propulsion. This method helps us identify ways to reduce muscle fatigue and overexertion and, therefore, reduce the conditions thought to contribute to degenerative changes in the shoulders of long-term wheelchair users.

## Clinical evaluation of semiautonomous smart wheelchair architecture (Drive-Safe System) with visually impaired individuals

Vinod Sharma, PhD, et al.

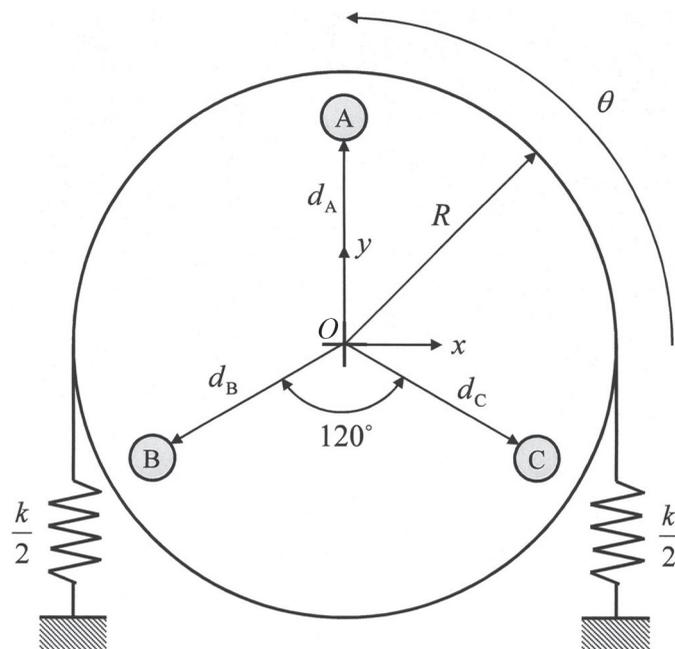


Some veterans with disabilities are denied powered mobility because they lack the visual, motor, and/or cognitive skills required to safely operate a powered wheelchair. The Drive-Safe System (DSS) is designed to help power wheelchair users avoid collisions. Therefore, it could help people with mobility impairments who also have difficulty seeing, using their arms and hands, or learning driving skills,

including veterans with multiple injuries. In this project, we clinically evaluated the DSS in a controlled laboratory with people with visual impairments. When using the DSS navigation assistance, the participants were able to reach the assigned target without hitting obstacles. Participants were also able to easily understand and use the DSS. These findings suggest that the DSS is a practical powered mobility solution for wheelchair users with visual impairments.

### Test method for empirically determining inertial properties of manual wheelchairs

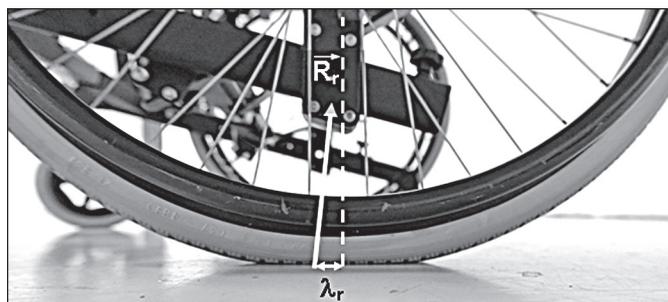
Matthew R. Eicholtz, MS, et al.



The robust estimation of inertial properties is crucial in studies on manual wheelchair efficiency. The mechanical work and forces necessary for a wheelchair to execute a turning maneuver are directly proportional to the moment of inertia of the wheelchair. We have designed a test method to accurately determine wheelchair mass and moment of inertia using a spring-loaded rotating turntable. This research will be most useful to researchers interested in wheelchair inertia experiments. However, all manual wheelchair users may indirectly benefit from this work because it may inform better wheelchair design.

### Assessment of field rolling resistance of manual wheelchairs

Christophe Sauret, PhD, et al.



Pushing a manual wheelchair is strenuous and frequently causes muscle and joint problems. Rolling resistance during manual wheelchair propulsion also causes energy loss that decreases users' ability to get around and increases their risk of musculoskeletal pain and injuries. This article presents a method for evaluating subject-specific rolling resistances with respect to the types and sizes of front and rear wheels and the fore-aft distribution of the total mass. The method is easy to use and could be used clinically to ensure that the most appropriate wheels and wheelchair adjustments are chosen.

### Pilot study for quantifying driving characteristics during power wheelchair soccer

Amit Kumar, MS, PT, et al.



Participation in adapted sports has contributed significantly to the quality of life of veterans with disabilities. This study measured the mobility

patterns of power wheelchair soccer players during the National Veterans Wheelchair Games. A custom-designed data-logging device was used to capture the average distance, speed, and amount of time the power soccer players used their wheelchairs during a game. The information from this descriptive study provides insight for future research in the field of adapted sports for people with high-level impairments using power wheelchairs for their mobility.

**Issues in defining and measuring veteran community reintegration: Proceedings of the Working Group on Community Reintegration, VA Rehabilitation Outcomes Conference, Miami, Florida**

Linda Resnik, PT, PhD, et al.

In January 2010, the Department of Veterans Affairs (VA) Rehabilitation Research and Development Service convened a State of the Art (SOTA) conference to advance the field of outcome measurement for rehabilitation-related studies. This article reports on the proceedings of the SOTA Working Group on Community Reintegration and suggests steps to enhance community reintegration measurement and research. If these recommendations can be successfully addressed, the VA has the potential to foster the development of strategies and tools that will greatly enhance the community reintegration of veterans.

**Vocational services research: Recommendations for next stage of work**

Charles E. Drebing, PhD, et al.

As the field of vocational services research matures, it is necessary to review its progress and identify any important gaps in measurement and methodology that may hamper future efforts. To encourage progress, we have identified ways to increase consistency in measurement of employment outcomes, emerging patterns and lingering gaps in the range of variables and measures commonly used in vocational services research, broader methodological patterns and needs in the area of study design and sampling,

interventions that warrant additional study, and broad strategies to increase the overall amount and quality of research on vocational services. The goal of this article is to assist the field in achieving clearer coherence in shared expectations and standards for research so that the field can consolidate its gains as it assists people to return successfully to rewarding jobs in the community.

**Mental health assessment in rehabilitation research**

John R. McQuaid, PhD, et al.

This article describes how mental health is measured in research and makes recommendations on how to improve this measurement. We suggest that, while symptoms and diagnosis are important, researchers need to pay more attention to how people with mental disorders function in their lives. In addition, we discuss ways to use computers and technology to better measure the important outcomes. These recommendations can help researchers better understand how mental health problems affect patients and which treatments work so that research can lead to mental health patients receiving better care.

**Measurement of social participation outcomes in rehabilitation of veterans with traumatic brain injury**

William Stiers, PhD, et al.

The Department of Veteran Affairs (VA) has devoted substantial resources to the rehabilitation of veterans with traumatic brain injury (TBI). One of the most important rehabilitation outcomes is participation in community and work activities, which is strongly linked to quality of life. This article discusses the concept of participation, existing ways to measure participation, and research issues in measuring participation. Suggestions are made to facilitate the use of participation measurement in TBI clinical practice and rehabilitation research and for future VA research funding for measuring participation in veterans with TBI.

### Activity and participation after spinal cord injury: State-of-the-art report

Philip M. Ullrich, PhD, et al.

This article gives recommendations to researchers about how to measure activity and participation among persons with spinal cord injury. The recommendations were put together as part of a State-of-the-Art (SOTA) Conference on Outcome Measures in Rehabilitation, held in January 2010 and sponsored by the Department of Veterans Affairs. Tools for measuring activity and participation are described and critiqued. Suggestions are made for future research.

### Small $N$ designs for rehabilitation research

Scott D. Barnett, PhD, et al.

Rehabilitation research presents unique and challenging problems to investigators during both the design and analysis periods. Statistical issues regarding

sample size requirements for an adequately powered study may directly conflict with realistic recruitment and subject retention goals. The small  $N$  approach is used widely in clinical and rehabilitation research in which understanding and changing of maladaptive patterns in patient's behavior and functional status are primary goals. Appropriate design and analysis are critical to the success of small studies. Data from small  $N$  studies should be analyzed both visually and statistically. Small  $N$  studies (including pilot studies) should be conducted more often because they are a valuable part of the evidence base.

