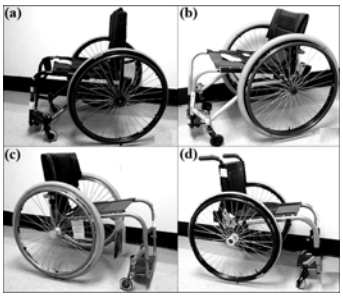
JRRD at a Glance

Evaluation of titanium ultralight manual wheelchairs using ANSI/RESNA standards

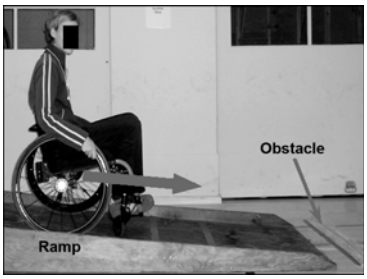
Hsin-yi Liu, BS, et al.



We tested a series of commercially available titanium ultralight wheelchairs using American National Standards Institute (ANSI)/ Rehabilitation Engineering and Assistive Technology Society of North America (RESNA) testing procedures to compare their durability with previously tested aluminum ultralight wheelchairs and lightweight wheelchairs. Three of each of the following titanium wheelchairs were tested: Invacare Top End, Invacare A4, Quickie Ti, and TiLite ZRA. The Quickie Ti wheelchairs had the most forward and rearward center of gravity adjustability. All titanium wheelchairs passed the impact strength tests, but six wheelchairs failed in two of the static strength tests. Two Invacare A4 and one Invacare Top End wheelchairs successfully completed the double-drum and curb-drop tests, but the remaining wheelchairs failed prematurely. No significant difference was found in the number of equivalent cycles or value among the four models. The titanium wheelchairs had less equivalent cycles and value than the previously tested aluminum ultralight wheelchairs. The failure modes in the static strength and fatigue tests were consistent within model and revealed important design issues of each model. Our results suggest that manufacturers need to perform more careful analyses before commercializing new products.

Comparison of wheelchair wheels in terms of vibration and spasticity in people with spinal cord injury

Sigrid N. W. Vorrink, MSc, et al.



Individuals with spinal cord injury often report that vibration from wheeling over obstacles can trigger painful spasms. For users of high-end wheelchairs, Spinergy wheelchair wheels are a popular choice because they are durable, very light, and promoted as being capable of dampening vibration. The results of this study showed no difference in wheelchair vibration when the subjects used Spinergy wheels versus steel-spoked wheels and no difference in subject-reported spasms. Spinergy wheels may be beneficial because they are lighter and easier to transfer, but they may not be useful for reducing spasm-inducing vibrations.

Clinical evaluation of Guido robotic walker

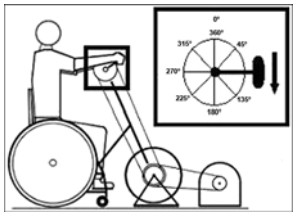
Andrew J. Rentschler, PhD, et al.

The Guido is a robotic walker that provides navigation and obstacle avoidance assistance. Previous testing found that the device met applicable design standards. This study determined whether the Guido met reasonable performance standards. The performance of the Guido was compared with a low-tech mobility aid developed at the Atlanta Department of Veterans Affairs Medical Center, the Assistive Mobility Device (AMD), in trials involving older adults with visual impairments. Subjects traversed an obstacle course with the Guido and the AMD. Completion time, obstacle and wall contacts, and reorientations were compared for both

devices. The Guido did not perform better than the AMD during the trials. Revisions to the device as well as a change in subject requirements and testing protocol may produce different results.

Consistency of within-cycle torque distribution pattern in hand cycling

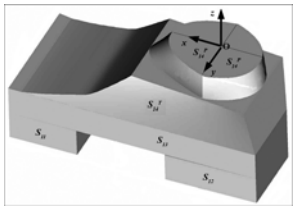
Joeri Verellen, MSc, et al.



Hand cycling has enhanced mobility in activities of daily living and increased training and sports opportunities for wheelchair users. Several determinants that affect performance during hand cycling have not yet been scientifically addressed. Nevertheless, such data can be important to the optimization of performance and the prevention of propulsion-related overuse injuries. Particularly, the force generation, movement, and muscle activation patterns should all be studied. This study provides a first step in understanding these patterns and their consistency in hand cycling and offers a starting point for further research in hand cycling optimization.

Effect of inaccuracies in anthropometric data and linked-segment inverse dynamic modeling on kinetics of gait in persons with partial foot amputation

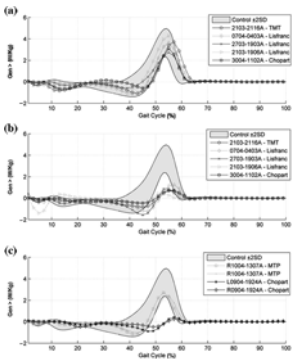
Michael P. Dillon, BPO(Hons), PhD, et al.



Previous investigations of walking in people with partial foot amputation (PFA) likely underestimated the work required of the hip extensor and knee flexor muscles, particularly during swing phase, by not accurately modeling the residual foot and prosthetic replacement. In this investigation, we sought to understand how much errors in the models influenced our understanding of the walking patterns of people with PFA. To do this, we developed customized models that more accurately represented the residual foot, prosthesis, and footwear. The results indicate that conventional models accurately describe the gait of people with PFA during stance phase but underestimate the work required of the knee flexor and hip extensor muscles during swing phase.

Comparison of gait of persons with partial foot amputation wearing prosthesis to matched control group: Observational study

Michael P. Dillon, BPO(Hons), PhD;
Timothy M. Barker, BE(Hons), PhD



We aimed to describe how people with partial foot amputation walk while wearing their existing prosthesis and footwear. Our results suggest that people with metatarsophalangeal amputation who wear insoles walk in much the same way as people without amputation. People with transmetatarsal and Lisfranc amputations who wear a low-profile prostheses that does not restrict ankle movement have a unique way of walking: they keep pressure under the foot behind the end of the remaining foot for most of the stance phase. Many walking features are normalized in people with Chopart amputation who wear a clamshell prosthesis, even though their ankle is immobilized. Once the ball of the person's foot was amputated, his or her hip joint muscles, not calf muscles, did most of the muscle work required to walk.

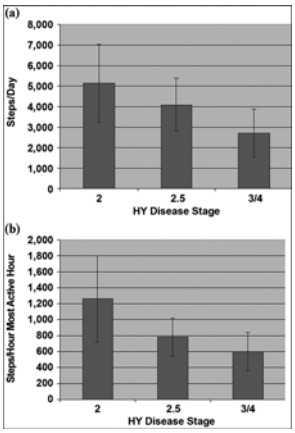
Validity of DynaPort GaitMonitor for assessment of spatiotemporal parameters in amputee gait

Han Houdijk, PhD, et al.

In this study, we tested the suitability of the DynaPort GaitMonitor for evaluating amputee gait. The GaitMonitor uses a small measuring device (accelerometer) placed at the back of the pelvis to measure average step time, step length, and walking speed. We found that the GaitMonitor can measure these gait characteristics during a controlled unidirectional walking task with sufficient accuracy. However, separate step time measurements of the intact and prosthetic leg were systematically over- and underestimated. Therefore, gait symmetry could not be measured adequately. We conclude that the DynaPort GaitMonitor can be used to quantitatively evaluate amputee gait during rehabilitation and prosthetic prescription.

Daily ambulatory activity levels in idiopathic Parkinson disease

Frank M. Skidmore, MD, et al.



Although a number of studies have looked at walking in Parkinson disease in a laboratory environment, little information exists about how individuals with Parkinson disease walk at home. We conducted a study using a computer-linked walking monitor to see how severity of disease affected walking behavior at home in Parkinson disease. We found that individuals with more severe disease walked less, indicating that home walking monitors might be useful to evaluate function and effects of treatments in this disease.

Use of mental health services by veterans disabled by auditory disorders

Caroline J. Kendall, PhD; Robert Rosenheck, MD

This study compared use of Department of Veterans Affairs mental health services by veterans disabled by auditory disorders, including tinnitus and/or hearing loss, with use of such services by veterans disabled by four other chronic illnesses in 2005. We examined group differences from other related characteristics such as age and sex. We found that veterans disabled by auditory disorders were more likely than other disabled veterans to use mental health services at least once. However, veterans with auditory disorders accessed fewer visits than those disabled by other conditions. Veterans with auditory disorders may not be getting all the mental health services they need.

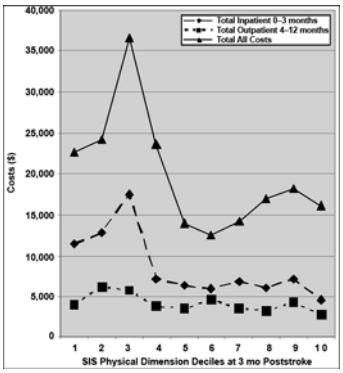
Home-based physical telerehabilitation in patients with multiple sclerosis: A pilot study

Joseph Finkelstein, MD, PhD, et al.

In this study, we examined whether giving multiple sclerosis patients a computer program to help them exercise at home would improve their health status. The computer guided patients in following their exercise plan at home. At the end of the day, an exercise log was automatically sent to the medical center. If patients had difficulties with their exercise, their physical therapist contacted them by telephone. After patients used the computer program for 12 weeks, their health status improved. The patients liked the computer program and expressed interest in using such a program in the future.

Factors associated with VHA costs of care for first 12 months after first stroke

Jeanne Hayes, PhD, et al.



This article explores the use and costs associated with care delivered to veterans who have had a stroke. We examined all hospital and outpatient costs that occurred in the 12 months after each patient's first stroke. As expected, we found that costs varied depending on the patient's stroke severity, health status, discharge location, and number of additional diseases. These results demonstrate that the cost data used by the Department of Veterans Affairs (VA) are fairly accurate. In addition, median patient costs varied by VA hospital, suggesting that further study is needed to determine the factors involved in these different hospital-specific costs.

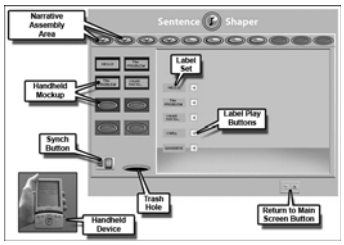
Rasch analysis of Minimum Data Set mandated in skilled nursing facilities

Ying-Chih Wang, PhD, et al.

This study used a statistical method called the Rasch analysis to determine whether the physical and cognition items of the Minimum Data Set (MDS) measure only one attribute, fit the Rasch model, and target the sample. We also inspected whether the rating scales function well or not and determined the item difficulty level in the MDS scale. We hope that this study will benefit the MDS scale development as the Centers for Medicare and Medicaid Services continue to revise the MDS items.

Building on residual speech: A portable processing prosthesis for aphasia

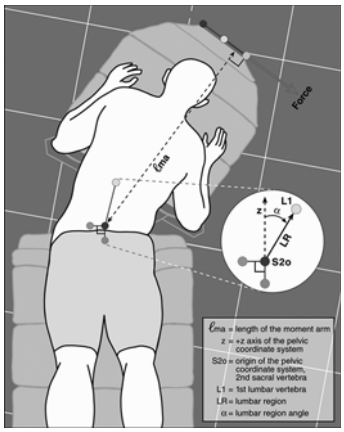
Marcia C. Linebarger, PhD, et al.



Studies have shown that some individuals with mild-to-moderate aphasia can produce more grammatical and informative speech with SentenceShaper®, a computerized language prosthesis, than they can without assistance and that use of the system can lead to treatment effects. Because SentenceShaper differs markedly from other communication aids, it has unique strengths and weaknesses as an assistive aid for community use. We report on the development of a new portable extension of SentenceShaper called SentenceShaper To Go™ and discuss the factors motivating its design. Preliminary data suggest ways to help persons with mild-to-moderate aphasia communicate while maximizing their use of retained linguistic abilities.

Validity and reliability of a system to measure passive tissue characteristics of the lumbar region during trunk lateral bending in people with and without low back pain

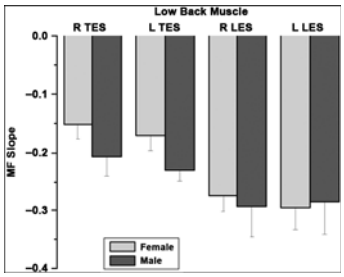
Sara P. Gombatto, PhD, PT, et al.



Low back pain affects a large proportion of people at some point in their lives. Several investigators have reported that a person's dysfunctional movement strategies may contribute to a chronic or recurrent low back pain problem. Understanding how low back stiffness may contribute to these dysfunctional movement strategies will help practitioners select appropriate strategies to treat low back pain. The current article describes the accuracy and repeatability of measurements of low back stiffness in people with and without low back pain.

Gender differences in spectral and entropic measures of erector spinae muscle fatigue

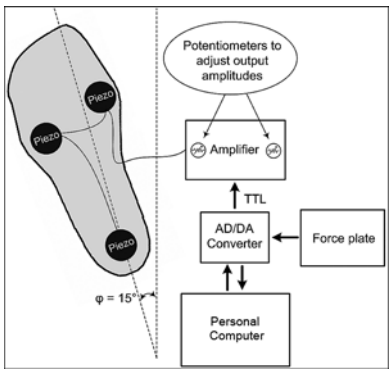
Paul S. Sung, PhD, DHSc, PT, et al.



Numerous studies compare the fatigability of back muscles for men versus women. However, the spectral measures of electromyography (EMG) of back muscle fatigue do not consistently demonstrate endurance levels. In this comparative study, we investigated the gender differences exhibited by entropy and power spectrum measures of EMG time series for subjects with low back pain. The Shannon (information) entropy of the time series quantifies the degree of "noisiness" of the signal. The entropy values for the lumbar part of the erector spinae muscle were higher for males than for females.

Effects of vibrating insoles on standing balance in diabetic neuropathy

Juha M. Hijmans, MSc, et al.



This study investigated the effects of vibrating insoles on balance in nondisabled people and in people with decreased sensation in the feet due to diabetic neuropathy. Only in subjects with neuropathy and only when attention was distracted from standing did balance improve when a substantial vibration was applied to the bottom of the feet. No effects of vibration were found in nondisabled subjects.