

## Walking after incomplete spinal cord injury using an implanted FES system: A case report

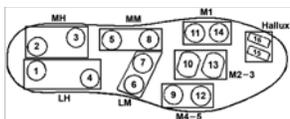
Elizabeth C. Hardin, PhD, et al.



We measured the effects of a functional electric stimulation (FES) system on walking after spinal cord injury (SCI). A receiver stimulator and intramuscular electrodes were surgically inserted in a person with incomplete SCI who could stand but not step. We implanted electrodes bilaterally to recruit relevant muscles, customizing the system to the participant. After 12 weeks of gait training with the system, the participant's walking distance increased substantially, his fastest walking speed was 10 times greater, his physiological cost was 5 times less, and he achieved the status of limited community walking. Paralysis can compromise one's ability to have an independent, productive lifestyle. SCI complications can lead to regular and costly hospitalization, and immobility can damage major organ systems. FES systems may postpone or prevent complications and increase the independence of people with SCI by helping them exercise, stand, and move in various environments. Veterans comprise more than 25 percent of all Americans with SCI. This study should contribute to the distribution of FES technology throughout the Department of Veterans Affairs healthcare system.

## Using effect size to quantify plantar pressure asymmetry of gait of nondisabled adults and patients with hemiparesis

François J. Potdevin, MD, et al.



Asymmetry quantification is necessary for detecting limits between normality and abnormality for diagnosing pathological walking pattern or guiding rehabilitation processes. The present study tested the effect size (ES) method as a mean

of quantifying the asymmetry in disabled and nondisabled populations. The peaks of plantar pressure on eight footprint locations of 27 nondisabled subjects and 18 patients with hemiparesis were bilaterally compared. The results show an advantage in using the ES procedure to quantify asymmetry, when confidence limits are performed in addition. Conversely, traditional asymmetry indexes immediately implied asymmetry without statistical basis. Further studies on asymmetry of gait using ES analysis are needed to shed further light on significant bilateral differences. Our findings should be considered when clinicians attempt to diagnose pathological walking patterns or guide rehabilitation processes.

## Step Activity Monitor: Accuracy and test-retest reliability in persons with incomplete spinal cord injury

Mark G. Bowden, MS, PT; Andrea L. Behrman, PhD, PT



This study determined the accuracy and the test-retest reliability of the Step Activity Monitor for use as an outcome measure in the rehabilitation of walking after incomplete spinal cord injury. Accurate and reliable

tools are important to adequately describe the individual's performance outside the clinical and research environments so clinicians and researchers can examine the effects of interventions on self-selected walking behavior in the home and community.

## Development and validation of Patient Reported Impact of Spasticity Measure (PRISM)

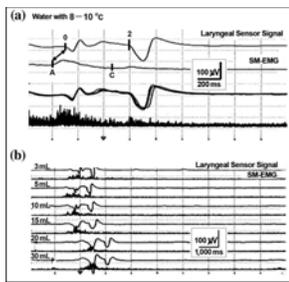
Karon F. Cook, PhD, et al.

Persons with spinal cord injury (SCI) experience a range of symptoms including spasticity. People with SCI and spasticity report that spasticity is among the five factors in their lives that concern them most. In this study, we interviewed people with SCI to find out how spasticity affects their lives. We learned that spasticity has psychological, social, and physical effects. We also learned that

spasticity has both positive and negative effects. We constructed a measure that people can use to report how spasticity affects their lives. This self-report is important because not everyone's experience of spasticity is the same. Knowing how spasticity affects someone's life can help clinicians select appropriate treatment alternatives.

### Effect of temperature on electrophysiological parameters of swallowing

Barin Selçuk, MD, et al.

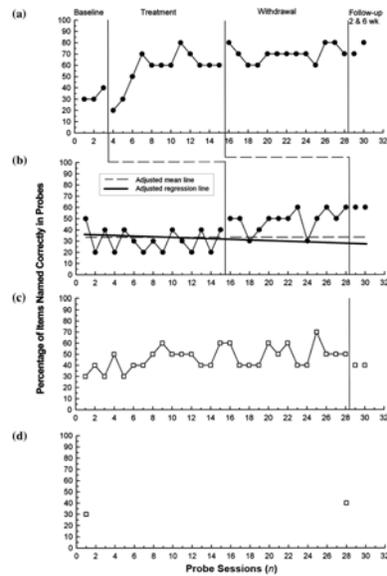


We studied the effect of three different temperature ranges on the triggering of voluntary-induced swallowing and on the duration of the pharyngeal phase of swallowing electrophysiologically. We found the time for triggering of swallowing to be shorter for cold and

hot water than for normal temperature water. The duration of swallowing was also shorter for cold and hot water than for normal temperature water. The maximum capacity of a single bolus (dysphagia limit) was >20 mL of water in all nondisabled subjects for different temperatures. In conclusion, we found the three temperature ranges effective in triggering voluntary-induced swallowing. Further studies of swallowing patterns in nondisabled patients should ideally be developed in terms of thermal tactile stimulation in different sizes and viscosity to determine the optimal intervention and treatment strategies.

### Application of semantic feature analysis to retrieval of action names in aphasia

Julie L. Wambaugh, PhD; Morelia Ferguson, MS

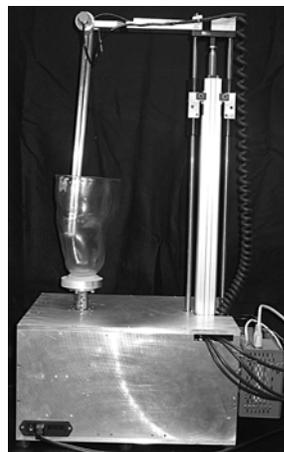


Aphasia is a condition that results from damage to regions of the brain that control language. Word-finding problems are common to all persons with aphasia. Most treatments for word-finding in aphasia have focused on improving object-naming. However, action names (verbs) are also important in producing language. Little is known about treatments for improving action-naming.

Consequently, this study was designed to examine the effects of a treatment for action-naming. We applied therapy with an individual with long-standing aphasia and resulted in improved naming of trained items and increases in the amount of information produced in connected speech.

### CAD/CAM transtibial prosthetic sockets from central fabrication facilities: How accurate are they?

Joan E. Sanders, PhD, et al.



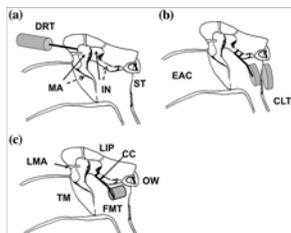
Sockets made by central fabrication facilities with computer-aided fabrication equipment were tested. We carefully measured the shapes of the sockets using a custom instrument and then compared them with the computer file shapes. Results showed that some central fabrication facilities consistently made sockets that matched the computer files shapes quite well, some consistently made sockets that did not, and some made

sockets that matched quite well some of the time. This study is relevant to the prosthetics industry because the results

help provide insight into limitations in central fabrication and thus identify areas of needed improvement.

### Human temporal bones versus mechanical model to evaluate three middle ear transducers

Christof Stieger, MSc, et al.

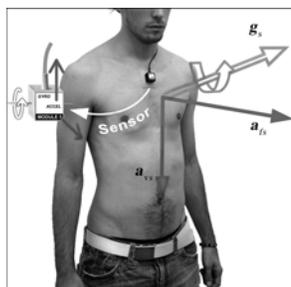


Approximately one out of seven persons in the United States and an even larger portion of veterans experience hearing loss. Conventional hearing aids have a number of drawbacks, such as feedback and limited speech understanding, which might be

reduced with new implantable hearing aids. Testing and improving implantable hearing aids is a complex task. In this article, a life-size mechanical middle ear was evaluated and used for the first time to test three different implantable hearing aid designs. Compared with tests that use human temporal bones, handling of the mechanical model was simpler and less time-consuming.

### Quantification of everyday motor function in a geriatric population

Eling D. de Bruin, PhD, et al.

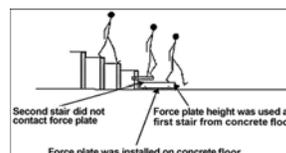


Can the quantity and the quality of physical activity of older adults in residential care facilities be reliably measured with fixed body sensors? To answer this question, we fitted 11 veterans with an ambulatory activity monitor that they wore on their torsos on 2 consecutive

days. Our results show that physical activities and “standing up from a chair” can be measured with the device. This means that mobility disability in older adults, which predicts the onset of disability in tasks essential to living independently and caring for oneself, can be estimated in an early phase of development. This would enable health-care providers to design countermeasures that could postpone mobility disability.

### Leg stiffness and electromyography of knee extensors/flexors: Comparison between older and younger adults during stair descent

Miao-Ju Hsu, PhD, et al.



Falls are the leading cause of injury-related hospitalization and death in persons older than 65. The largest proportion of falls in older adults was reported to occur on stairs. Diminished functioning in many physiological systems is believed to contribute to falls. A smooth stair descent requires good coordination of the agonist and antagonist muscles surrounding the joint during the descent. Since both muscle strength and kinesthetic feedback diminish with age, older individuals may use a different control strategy to descend stairs than younger individuals do. We investigated the biomechanical differences between older and younger men during stair descent. The results showed that the older adults developed compensatory strategies for stair descent.

### Virtual cues and functional mobility of people with Parkinson's disease: A single-subject pilot study

Tatiana A. Kaminsky, MS, OTR, et al.



We studied six adults with Parkinson's disease (PD) and freezing or shuffling walking patterns using Virtual Cueing Spectacles (VCS). Outcomes included losses of balance, freezes, walking patterns, the PD Questionnaire-39, and an exit interview. Data were tracked before, during, and after use of VCS. All participants used the VCS in their homes and communities. We found that some people with PD who used VCS had shorter and/or fewer freezes. All participants were satisfied with VCS. Use of VCS has promise for helping some adults with PD walk better.

## Multisite comparison of wheelchair propulsion kinetics in persons with paraplegia

Alicia M. Koontz, PhD, RET, et al.



We are conducting research at three different institutions to study manual wheelchair propulsion techniques and the relationship between technique and wrist and shoulder injuries in wheelchair users with paraplegia. Before further investigating these topics, we performed a substudy to check that the data were consistent across

study sites so that we could combine each site's data into one large data set. Participants at one site were found to push with less force and torque compared with participants at the other two sites. Further analysis revealed that the wheelchair roller system at this differing site had lower rolling resistance. We developed a method to correct the difference so that the data could be combined and used in future analyses.

## Effects of camber on wheeling efficiency in the experienced and inexperienced wheelchair user

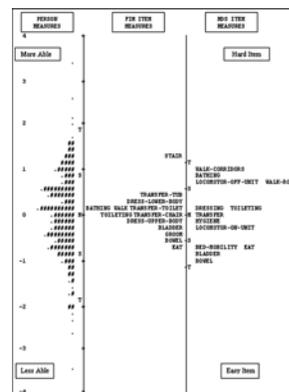
Angeliki Perdios, MSc, et al.

We studied the effect of rear-wheel camber on the wheelchair user. Camber is the angle of the rear wheels and can improve the user's ability to move around obstacles. We compared three different camber angles ( $0^\circ$ ,  $3^\circ$ , and  $6^\circ$ ) to determine which helped the subjects wheel

with the least strain. We also studied which camber angle was most comfortable for the subjects when they wheeled up a ramp or around obstacles. Although we found that camber angle did not affect the subjects' energy effort, the subjects preferred  $6^\circ$  for stability on a side slope, hand comfort on the pushrims, maneuverability, and overall preference. The individual wheelchair user's level of comfort should determine which rear-wheel camber to use.

## Translating measures across the continuum of care: Using Rasch analysis to create a crosswalk between the Functional Independence Measure and the Minimum Data Set

Craig A. Velozo, PhD, OTR/L, et al.



A challenge in following patients in our healthcare system is that different assessments are used in different settings. The Functional Independence Measure (FIM) is used in rehabilitation settings, while the Minimum Data Set (MDS) is used in skilled nursing facilities. This study developed a crosswalk so that a score on the FIM could be translated

to a score on the MDS and vice versa. With the improvement of our ability to follow patients across healthcare settings and compare scores across settings, crosswalks will increase the quality of care for veterans.