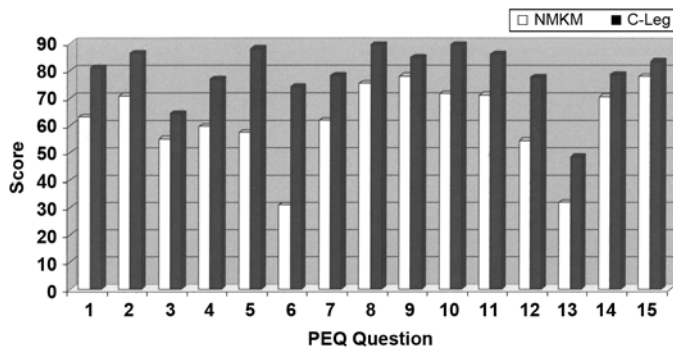


Comparison of nonmicroprocessor knee mechanisms versus C-Leg on Prosthesis Evaluation Questionnaire, stumbles, falls, walking tests, stair descent, and knee preference

Jason T. Kahle, CPO, LPO, et al.



Manufacturers of microprocessor-controlled prosthetic knee mechanisms, specifically the C-Leg® (Otto Bock; Minneapolis, Minnesota), claim the knee allows subjects to seamlessly change speed, descend stairs step-over-step, and recover from stumbles. To test these and other potential functions, we gave 19 transfemoral amputees the opportunity to accommodate to a C-Leg and tested them in a series of nine evaluative measures. First, we tested subjects in their previously accommodated nonmicroprocessor-controlled prosthetic knee mechanism and then, following an accommodation period, tested the subjects again on a C-Leg. Testing included subjective measures of prosthesis function and prosthesis-related quality of life, number of stumbles and falls, walking tests (of various speeds and distances), and a question on preference. The C-Leg yielded improvements in all categories tested and was preferred by most subjects. A secondary analysis revealed that many subjects who were initially considered limited community ambulators were able to increase their status to unlimited community ambulators when they used the C-Leg. We will look more closely at microprocessor candidacy in a more functionally diverse sample of subjects in future studies.

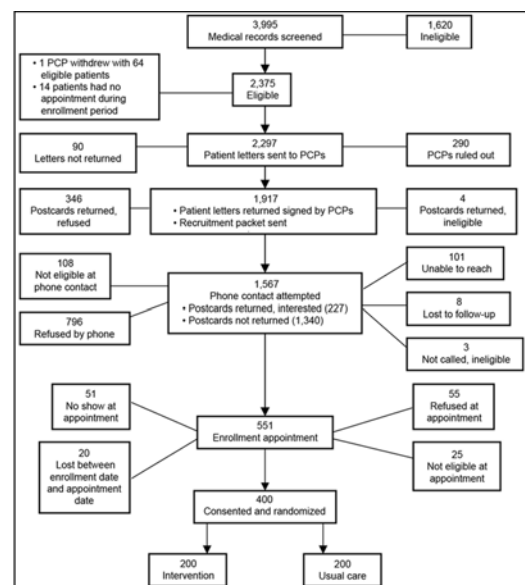
Review of secondary physical conditions associated with lower-limb amputation and long-term prosthesis use

Robert Gailey, PhD, PT, et al.

We reviewed literature on the secondary conditions associated with long-term lower-limb prosthesis use among people with amputation. The most common diagnoses found in this population were osteoarthritis of the intact knee and hip, osteopenia and osteoporosis of the amputated-side hip, and back pain. The main contributors to these diagnoses included dependence and increased stress on the intact limb; prosthetic fit, alignment, and leg length; and posture. Knowing the potential secondary conditions associated with long-term prosthesis use can help clinicians provide high-quality and preventive rehabilitation to their clients with limb loss.

Project LIFE—Learning to Improve Fitness and Function in Elders: Methods, design, and baseline characteristics of randomized trial

Miriam C. Morey, PhD, et al.

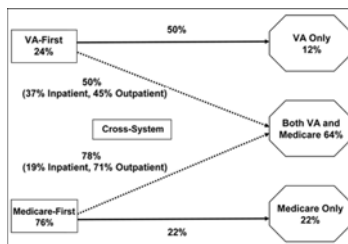


This article describes the design and methods of a research project currently under way at the Department of Veterans Affairs Medical Center in Durham, North Carolina. The research project aims to develop a partnership

between physician, health educator, and patient that will promote physical activity. This partnership is important because sedentary older adults experience significant losses in mobility that can be reversed with an appropriate individually tailored physical activity intervention. Physicians frequently do not have sufficient time to provide in-depth physical activity counseling. By partnering with a health educator, older adults can become more physically active. Our expectation is that, as a result of being more physically active, older adults will experience significant improvements in mobility, walking, and other activities common in daily living.

Department of Veterans Affairs-Medicare dual beneficiaries with stroke: Where do they get care?

Yujing Shen, PhD, et al.



Where do veterans receive care after they have a stroke: a community hospital that is reimbursed by Medicare, a Department of Veterans Affairs (VA) hospital, or some combination of both? We found

that veterans who were white, married, female, or living farther from a VA hospital were more likely to use a community hospital first. These veterans then used both VA and community hospitals for their ongoing care in the year after their stroke. This combined use of care systems means that coordination of care across and between the two systems must be addressed.

How many people would benefit from a smart wheelchair?

Richard C. Simpson, PhD, ATP, et al.

Both children and adults benefit from access to a means of independent mobility, but not everyone who needs a wheelchair, particularly veterans, is able to operate one safely and effectively. For example, a veteran who exhibits upper-limb intention tremor may have trouble with tasks that require fine motor control, a veteran with a high-level spinal cord injury may have trouble seeing and avoiding obstacles behind the wheelchair, and a veteran with multiple sclerosis may have difficulty com-

pleting long navigation tasks because of fatigue. To accommodate users who have trouble operating a wheelchair independently, researchers have used technologies developed for mobile robots to create “smart wheelchairs” that offer a range of functions to meet different needs. This article estimates the number of individuals in the United States who could benefit from a smart wheelchair, based on previously published population estimates.

Curb descent testing of suspension manual wheelchairs

Andrew M. Kwarciak, MS, et al.



Manual wheelchair users are regularly exposed to harmful vibrations from rolling over obstacles and uneven surfaces. One way users may protect themselves is by using a suspension manual wheelchair. We

investigated the ability of suspension manual wheelchairs to reduce seat vibrations during 5, 10, and 15 cm curb descents. Suspension wheelchairs reduced vibrations during the 5 cm descents, but they became less successful as curb height increased. Though curb descents are specific tasks, they demonstrate the benefits and limitations of the wheelchairs. Consumers and clinicians should consider these results when selecting a wheelchair for everyday use.

Investigation of large transit vehicle accidents and establishing appropriate protection for wheelchair riders

Greg Shaw, PhD



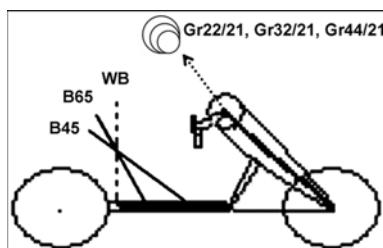
This study examines injury-producing events aboard large city buses so that we may better understand the potential risks and required protection for wheelchair users. The study found that few injuries and fatalities occur onboard large

transit buses. Abrupt braking or turning occurs frequently and is associated with approximately half of onboard passenger injuries. Crash events are much less common. Most of the crashes in which bus passengers were injured

involved frontal impacts with another vehicle or roadside object. This study provides information that will inform the development of safe, easy-to-use wheelchair tiedown systems.

Effects of backrest positioning and gear ratio on nondisabled subjects' handcycling sprinting performance and kinematics

Arnaud Faupin, PhD, et al.



The boom in handcycling means that this activity has spread to a broader population. The position of the handcycle's backrest is a significant factor that one must consider when op-

timizing the user-to-chair interface. We investigated the effects of backrest position and gear ratio on the handcycling sprinting of 10 nondisabled participants. Angle parameters for the arms and trunk were calculated with three-dimensional movement analysis. Our results suggest that handcycle users with good trunk control can improve their performance by removing the backrest altogether. Future studies should look at specific groups of people with spinal cord injuries.

Pilot safety and feasibility study of treadmill aerobic exercise in Parkinson disease with gait impairment

Frank M. Skidmore, MD, et al.

We studied whether aerobic treadmill exercise was possible and safe in individuals who have difficulties with walking and/or balance because of Parkinson disease (PD). We found that support harnesses were necessary to prevent injury from falls. We also found that blood pressure can drop during exercise even when the person exercising does not notice the change. These findings uncovered safety concerns that we will need to study further. All five people who enrolled completed the study and improved function, indicating that we should continue to study treadmill exercise in PD.

Rehabilitation implications of stepper exercise technique on exertion and hip extensor muscle activation—A small exploratory study

COL Raul Marin, MD, et al.

Patients with low back pain have untrained buttocks muscles. Rehabilitation for low back pain focuses on training the back muscles and cardiovascular activity. Stepper exercise combines cardiovascular exercise and, possibly, buttocks training into one modality. We studied two different styles of stepping to determine which one was perceived as the most demanding, whether stepping activates the buttocks and whether one style is better than the other. We found that small steps without support are perceived as more difficult than big steps with support. Although the buttocks muscles were activated, we found no differences between the two styles. Stepper machines can be used during low back rehabilitation because they activate the buttocks. The small-step technique appeared to provide more of a training challenge.

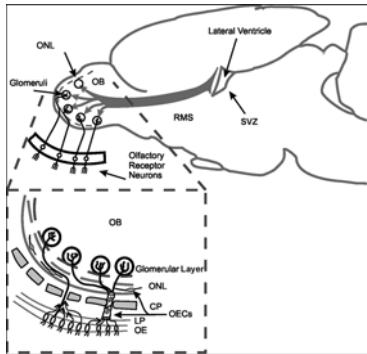
Silver hydrogel urinary catheters: Evaluation of safety and efficacy in single patient with chronic spinal cord injury

Irene M. Estores, MD, et al.

In 2001, urinary tract infection (UTI) was the primary diagnosis for 8.4% of scheduled outpatient visits and 6.1% of unscheduled visits to the Spinal Cord Injury (SCI) Service of the Miami Department of Veterans Affairs Medical Center; it also accounted for 11.2% of diagnoses for patients in the home care program. Preventing UTIs can spare veterans the associated discomfort and decrease the time they spend in hospitals and clinics, thereby allowing them to remain in the community and perform their usual activities. One preventive method that has recently shown promise is use of a silver hydrogel catheter (SHC). This article describes one subject who used an SHC for 6 months. Using the indwelling SHC effectively prevented this subject from developing a symptomatic UTI. He did not display any symptoms of silver toxicity or increased serum levels of silver. This preliminary article can be used to develop further studies on the SHC for bladder management in persons with SCI and neurogenic bladder dysfunction.

Potential of olfactory ensheathing cells for cell-based therapy in spinal cord injury

Christine Radtke, MD, PhD, et al.



The olfactory ensheathing cell (OEC), a specialized glial cell in the olfactory system, remarkably improves functional outcome when transplanted into rodents with spinal cord injury (SCI). Clinical studies transplanting OECs into people with SCI are ongoing.

Yet, controversial issues related to OEC biology and transplantation must be addressed so that we may understand the rationale and expectations for OEC use in SCI therapy. In this review, we provide information on the basic biology of the OEC, its therapeutic effects in animal models, and current clinical studies of OECs in patients with SCI.

Effect of anodal and cathodal microamperage direct current electrical stimulation on injury potential and wound size in guinea pigs

Gadamali Talebi, MSc, et al.

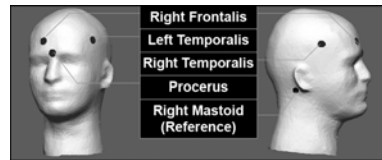


Skin wounds represent major medical, social, and economic concerns for patients. Human or animal skin possesses endogenous electrical potentials such that the external skin surface is

always electronegative with respect to inner skin layers. Following tissue damage, an injury current is generated that is thought to trigger biological repair. Based on these findings, we proposed that external electrical stimulation might help healing through the simulation and enhancement of natural bioelectric currents. A full-thickness skin incision was made on the dorsal region of guinea pigs. We applied microamperage anodal and cathodal direct current (DC) for 1 hour a day, 3 times a week, for 3 weeks. The differential skin surface potential was measured before and immediately after the injury and through the healing process (21 days). Our results suggest that anodal microamperage DC can accelerate the bioelectric properties of skin wounds and cause wound potential to more rapidly return to preinjury levels.

Integrated electromyogram and eye gaze tracking cursor control system for computer users with motor disabilities

Craig A. Chin, PhD, et al.

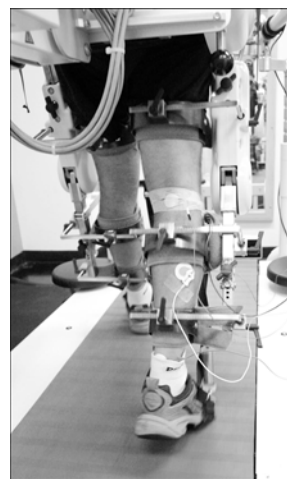


Individuals with disabilities, such as persons with amputations or spinal cord injuries, who cannot use the computer keyboard or mouse face limitations in interacting with computers and accessing the benefits of computers.

Some of these individuals may use eye-gaze tracking (EGT) systems to control the computer cursor. However, these systems may lack stability and accuracy, and users may find performing correct "clicks" on small icons difficult. This article describes a system that uses EGT input for long cursor movements while detecting the contraction of four facial muscles to provide more accurate and reliable small cursor adjustments and reliable clicking.

Synchronous stimulation and monitoring of soleus H reflex during robotic body weight-supported ambulation in subjects with spinal cord injury

Ross G. Querry, PT, PhD, et al.

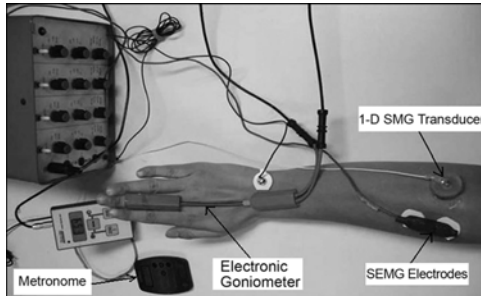


We developed a new method for more accurately measuring the soleus H reflex in patients with spinal cord injury (SCI) during robotic body weight-supported treadmill walking. We used hip joint position from the Lokomat[®] system to acquire the soleus H reflex at specific points in the gait cycle. The method accurately synchronized H reflex stimulation in subjects with SCI during assisted walking at two different speeds. This method will help researchers study how

the H reflex is altered in subjects with SCI and how robotic-assisted ambulation may affect these alterations.

Dynamic monitoring of forearm muscles using one-dimensional sonomyography system

Jing-Yi Guo, BSc, et al.



In this study, we used A-mode ultrasound signals to detect dynamic muscle thickness changes during the contraction of forearm muscles, a method known as sonomyography (SMG). SMG provides an alternative signal source for assessing muscle functions and prosthesis control based on dynamic architectural changes of muscles. We expect that SMG could be used together with electromyography and mechanomyography for a more comprehensive analysis of muscle function.

