

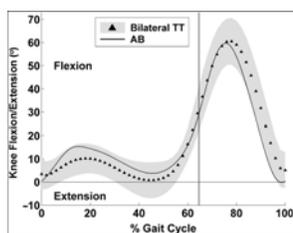
## Expert opinions on success factors for upper-limb prostheses

Aimee E. Schultz, BS, et al.

We provide a summary of professionals' opinions on the most important factors in the successful use of an upper-limb prosthesis. This summary allows designers and researchers to ensure they are pursuing the most needed areas of improvement and allows patients and professionals to compare their opinions. Comfort, specifically socket-interface comfort, was considered most important for a unilateral amputee, whereas function, specifically agility, was considered most important for a bilateral amputee. This survey shows a moderate degree of agreement with a past survey of amputees; however, the lack of agreement between the professionals surveyed here and the prosthesis users surveyed in the past indicates that more work should be done to ascertain the opinions of prosthetics professionals and align their goals with those of the amputee population.

## Gait characteristics of persons with bilateral transtibial amputations

Po-Fu Su, MS, et al.



No published studies have reported the gait characteristics of persons with bilateral transtibial amputations. This study investigated the gait of 19 persons with bilateral transtibial amputations. The results showed

that subjects walked with better symmetry than individuals with unilateral transtibial amputations. Compared with nondisabled persons, the subjects walked at slower speeds and lower cadences, had shorter step lengths and wider step widths, and displayed hip hiking during swing phase. Additionally, the subjects had reduced ankle motion in stance phase compared with nondisabled individuals. These results are important for prosthetists fitting prostheses on persons with bilateral transtibial amputations. Further studies are needed to enhance prosthesis function and improve the gait of persons with amputations.

## Biomechanical and energetic effects of a stance-control orthotic knee joint

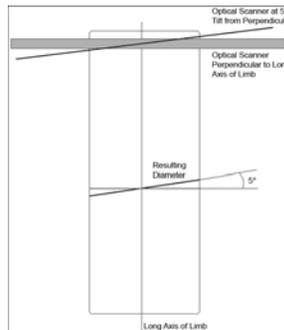
Angelika Zissimopoulos, MS, et al.



Stance-control knee-ankle-foot orthoses (KAFOs), which prevent knee flexion during stance phase but allow knee flexion during swing phase, may improve function for veterans with spinal cord injury, multiple sclerosis, quadriceps weakness, and leg paralysis or paresis, all of which are more prevalent in the aging population. Stance-control KAFOs can improve gait by eliminating the need for compensatory mechanisms such as hip hiking and circumduction and by allowing swing-phase knee flexion. The greater ease of mobility can improve quality of life.

## Consistency, precision, and accuracy of optical and electromagnetic shape-capturing systems for digital measurement of residual-limb anthropometrics of persons with transtibial amputation

Mark D. Geil, PhD

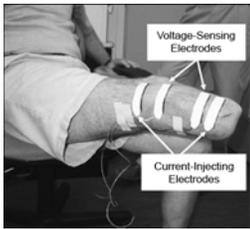


In this study, prosthetists and prosthetics students used two different digital systems to capture the shape of three limb models. Both systems were accurate and consistent, and both participant groups produced similar results. The digital shape-capture results were also similar to the same measurements collected with traditional calipers and tape measures.

Prosthetists may consider digital shape capture for all patients with limb loss, including veterans, even if they do not plan to use it to build the socket.

### Assessment of residual-limb volume change using bioimpedance

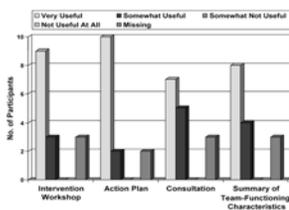
Joan E. Sanders, PhD, et al.



We investigated whether measuring residual-limb volume changes with bioimpedance measurements in lower-limb amputees was possible. Residual-limb volume changes can cause the socket to become loose, concentrate interface stress in soft tissues, produce excessive pressures, and block blood flow, which can all result in soft tissue injury. Four strip electrodes were positioned across the lower leg or residual limb; the outer pair applied current and the inner pair sensed voltage. We used a commercial bioimpedance analyzer to supply current at different frequencies. We then determined fluid resistance and from that limb fluid volume. Bioimpedance offers a potential advantage over most other volume assessment methods: it can be conducted while the residual limb is within the prosthetic socket, and it could potentially be a useful tool in prosthetics research and clinical practice.

### Utility of Treatment Implementation methods in clinical trial with rehabilitation teams

Alan B. Stevens, PhD, et al.



Rehabilitation medicine uses a team approach to promote the recovery of function in individuals with disabilities. These professionals bring complementary skills to assist in the recovery of, for example, ambulation (physical therapy), self-care (occupational therapy), and language difficulties (speech-language pathology). While some teams are better than others, researchers have limited tools with which to scientifically study teams. This article describes Treatment Implementation (TI), an approach that promotes and tracks a complex team-training intervention. The TI methods were useful in demonstrating that the participants received and enacted the intervention strategies.

### Reproducibility of noninvasive cardiac output during arm exercise in spinal cord injury

Jonathan Myers, PhD, et al.

Cardiac output is an important measurement that provides information on cardiovascular health. It is often used to study the effects of therapies on patients with limited heart function. For example, many individuals with spinal cord injury (SCI) have limited cardiac function. Because cardiac output is difficult to measure directly, various methods have been used to estimate it. However, the usefulness of these methods in SCI is still unclear. In this study, we evaluated the reproducibility of cardiac output using a technique known as “carbon dioxide rebreathing.” We found that cardiac output can be estimated in persons with SCI during exercise with reproducibility that is similar to studies in nondisabled persons.

### Comparison of two exercise testing protocols in patients with chronic fatigue syndrome

Jo Nijs, PhD, PT, et al.

Previous study findings on the ability of individuals with chronic fatigue syndrome (CFS) to perform an exercise test have been contradictory. Some studies revealed a diminished ability to perform exercise, while others found no differences in exercise performance between CFS patients and nondisabled control subjects. The different studies, however, used different protocols to assess exercise performance. Therefore, our study compared the outcome of two different exercise testing protocols in patients with CFS: a bicycle exercise test with a linear increase in workload and a bicycle exercise test with a sudden increase in workload every 3 minutes. We found that both tests generated similar responses at the final stages of the exercise, but the linear increase in workload resulted in a slower increase in oxygen uptake during exercise (a more efficient performance).

### Assessing mobility characteristics and activity levels of manual wheelchair users

Michelle L. Tolerico, MS, et al.



Although research shows that participating in an active lifestyle is beneficial to maintaining quality of life, a majority of wheelchair users are inactive. The goal of this study was to compare the mobility characteristics and activity levels of manual wheelchair users in two real-world settings: the National Veterans Wheelchair Games (NVWG) and the subjects' residential settings. The ability to accurately measure mobility characteristics and activity levels allows us to assess whether manual wheelchair users are attaining recommended activity levels. Attaining the recommended level of physical activity is important for reducing the risk of secondary health problems. This study demonstrates the effectiveness of the NVWG at providing an environment for manual wheelchair users to increase their activity levels.

### Longitudinal assessment of vibrations during manual and power wheelchair driving over select sidewalk surfaces

Erik Wolf, PhD, et al.



Individuals seated for long periods of time when exposed to vibration, such as wheelchair users, are at risk of injury and pain. However, few studies have reported the vibration levels manual wheelchair users experience, and even fewer have reported the levels power wheelchair users experience. Ten nondisabled subjects propelled over nine different sidewalk surfaces in a manual wheelchair and a powered wheelchair in 3 consecutive years. Vibration data were collected at the seat and the footrest. One surface was a standard poured concrete sidewalk, and the others were concrete or brick pavers of varying bevels. We found significant differences between surfaces and years for both the manual and power wheelchairs. The results clearly show that many of the surfaces are just as good if not better than the standard poured concrete surface at reducing the amount of vibration transmitted to wheelchair users.

### Distribution and cost of wheelchairs and scooters provided by Veterans Health Administration

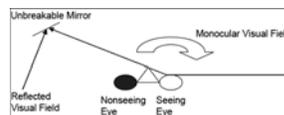
Sandra L. Hubbard, PhD, OTR/L, ATP, et al.



During fiscal years 2000 to 2001, the Veterans Health Administration provided more than 131,000 wheelchairs and scooters to veterans at a cost of \$109 million. This study investigated the types of wheelchairs and scooters that each Veterans Integrated Service Network (VISN) provided. For example, some VISNs provided more ultralightweight manual wheelchairs, while some provided more scooters. We determined whether veterans across the United States have equal access to wheelchairs and scooters and, if not, suggested what could be done to increase equity in wheelchair and scooter provision to veterans.

### Acquired Monocular Vision Rehabilitation program

Carolyn Ihrig, OD; Daniel P. Schaefer, MD, FASC



Existing low vision programs do not readily meet the needs of patients with monocular vision. This article illustrates the development, need, and benefits of an Acquired Monocular Vision Rehabilitation evaluation and training program. This proposed program will facilitate the organization of vision rehabilitation with eye care professionals and social caseworkers to help patients cope with, accept, and recognize obstacles they will face in transitioning suddenly to monocular vision.

### Comparison of spectral and entropic measures for surface electromyography time series: A pilot study

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

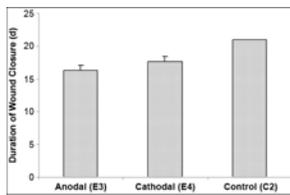


The electromyographic (EMG) spectral measures of back muscle fatigue do not consistently demonstrate endurance levels for patients with or without low back pain (LBP). This study compared the differences between nonlinear analysis of surface EMG time series and the power spectrum analysis in subjects with and without LBP. The variance of the

EMG signal was calculated during a 1-second interval, and the Shannon (information) entropy of the time series was used to quantify the degree of “noisiness” of the signal. The spectral quantities poorly correlated with a clinical diagnosis of LBP; however, surface EMG time series from subjects without LBP demonstrated larger values of entropy than those from subjects with LBP.

### **Anodal and cathodal pulsed electrical stimulation on skin wound healing in guinea pigs**

Fereshte Ghayebi Mehmandoust, MSc, et al.



The polarity effect of electrical stimulation on wound healing is a continuing challenge in rehabilitation. Despite some recent advances in our understanding of wound healing and its basic

principles, many problems in treatment exist, especially for chronic wounds. We studied how daily 1-hour anodal versus cathodal pulsed electrical stimulation for 14 or 21 days affected wound healing in guinea pigs. Our results suggest that electrical stimulation, regardless of

polarity regimen, benefits wound healing, but anodal stimulation the first 3 days and cathodal stimulation the remaining days can strengthen repaired tissue.

### **Reliability of RT3 accelerometer for measuring mobility in people with multiple sclerosis: Pilot study**

Leigh Hale, PhD, et al.

The RT3 is a new small device that can potentially measure the amount of physical activity a person does. However, we do not know how accurate or reliable the measurements are. This article describes a pilot study in which the reliability of the RT3 was investigated. Ten people with multiple sclerosis and ten people without disability were asked to perform the same three mobility tasks: walking for 5 minutes, climbing stairs, and the timed get up and go test, on two different occasions. The RT3 movement measurements were more or less the same on both tests days, indicating that the RT3 can provide the same measure of motion for the same movement task. The study also showed that people move slightly differently each time they repeat a set motor task.