

Reliability of thermal quantitative sensory testing: A systematic review

Niamh A. Moloney, MSc, et al.

Quantitative sensory testing (QST) is a method of assessing the function of nerves. It is used to assess medical conditions such as diabetes (for screening diabetic neuropathy) and spinal cord injuries (for assessing nerve function). Recently, QST has also been used to assess conditions such as referred pain from the spine and whiplash. It is thought that results from QST will lead to more accurate diagnoses and treatments. The reliability of QST is not fully established. This review evaluates the current level of reliability of thermal QST and highlights areas of QST protocols in need of greater attention.

New portable tool to screen vestibular and visual function—National Institutes of Health Toolbox initiative

Rose Marie Rine, PT, PhD, et al.



As part of the National Institutes of Health Toolbox initiative, we developed easy-to-use computerized tests of vision and inner ear (vestibular system) function. Research has shown that the lack of easy-to-use tests prevents those who would benefit from

treatment from being appropriately identified. The tools developed provide reliable testing, are appropriate for use with individuals 3 to 85 years old, and provide testing that correlates with the gold standard measures of vision and vestibular function. These new tools will assist in identifying those who should be referred for specialized testing or treatment for problems with vision, the inner ear, or balance.

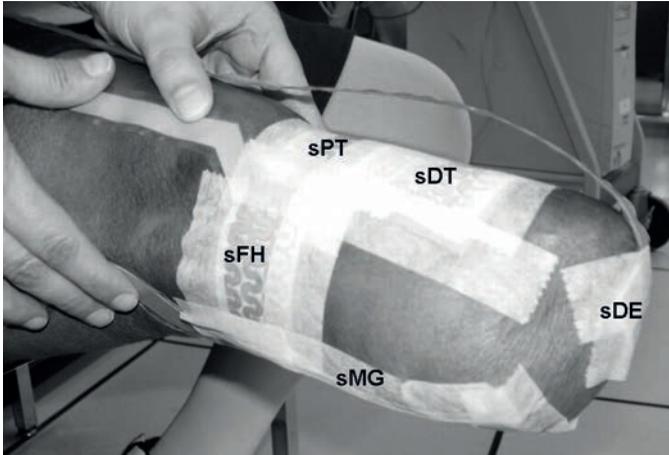
Asymmetric lower-limb bone loss after spinal cord injury: Case report

Alison M. Lichy, PT, DPT, NCS;
Suzanne Groah, MD, MPH

Osteoporosis (bone loss) is a significant secondary condition that occurs rapidly after spinal cord injury (SCI). In this study, we report on a 32-year-old Caucasian male whose 13-foot fall resulted in an SCI. He received inpatient and outpatient rehabilitation, including 3 months of robotic body-weight-supported treadmill training three times a week. The patient regained more strength and function in one leg than the other. At 1.5 years after his injury, the weaker leg showed less weight bearing during walking and was osteoporotic compared with the stronger leg. These results are important for understanding treatment goals and precautions following an SCI.

Effect of prosthetic gel liner thickness on gait biomechanics and pressure distribution within the transtibial socket

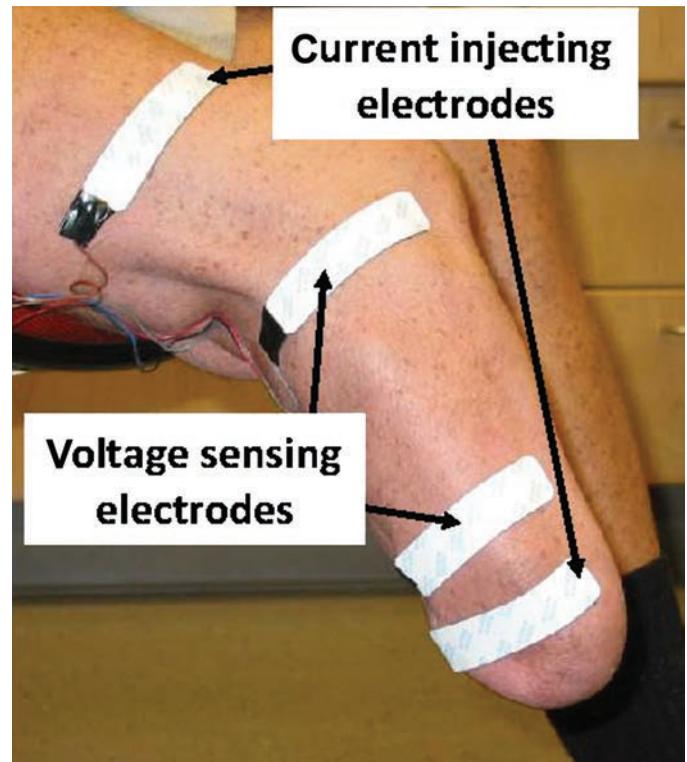
Erin Boutwell, MS, et al.



This study evaluates how prosthetic gel liners worn between the residual limb and the prosthetic socket can affect persons with below-knee amputations. Each subject wore both a thin and a thick gel liner and walked at a comfortable speed. Forces and pressures were recorded during walking, and the two liners were compared. The force under the foot during loading was slightly increased with the thicker liner, but lower pressure was found at one high-pressure area on the residual limb with the thicker liner. Many subjects found the thicker liner more comfortable to wear, especially people with bony residual limbs.

How do sock ply changes affect residual-limb fluid volume in people with transtibial amputation?

Joan E. Sanders, PhD, et al.



People with transtibial amputation walked for 3-minute periods with different sock ply while their residual-limb fluid volume was measured using bioimpedance analysis. The results showed that approximately half of the people in the study experienced limb volume reduction with a sock added to their usual prosthesis and limb volume increase with the sock removed. Many subjects' residual limbs decreased in volume from the beginning to end of the session, and this decrease was related to the vascular health and presence of diabetes, obesity, and smoking. The results help shed light on factors that influence limb volume change during prosthesis use.

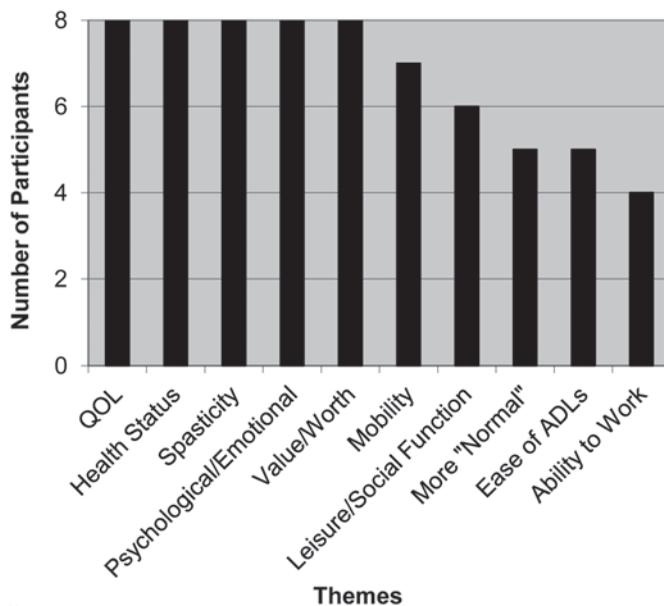
Colonoscopic lesions in veterans with spinal cord injury

Meheroz H. Rabadi, MD, MRCPI, FAAN;
Andrea S. Vincent, PhD

The many veterans with either combat- or non-combat-related traumatic spinal cord injury (SCI) also experience associated complications, of which bowel and bladder problems are the most frequent. We documented commonly encountered colonic (large intestine) lesions in veterans with SCI who had gastrointestinal complaints and highlighted the value of preventive strategies such as a bowel program to help veterans deal with gastrointestinal issues.

Exploratory study of perceived quality of life with implanted standing neuroprostheses

Loretta M. Rohde, PT, DPT, et al.

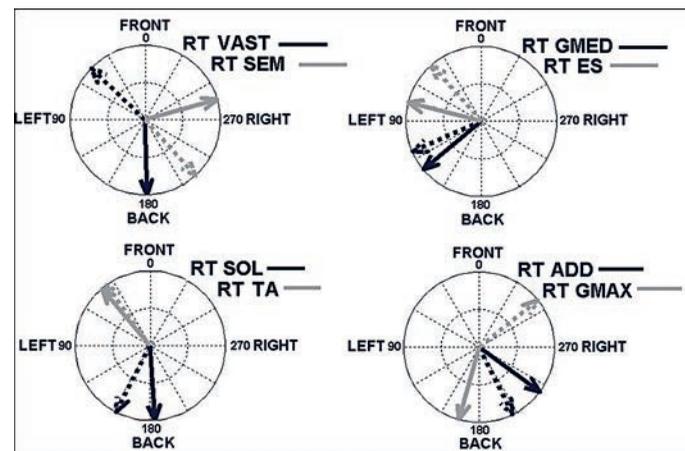


Although barely 11% of Americans are veterans, they represent 25% of all individuals with spinal cord injury (SCI) in the United States. Paralysis resulting from SCI is a debilitating and costly condition that compromises the ability to take part in activities of

daily living associated with an independent and productive lifestyle. Immobility resulting from SCI can cause degenerative changes in almost every major organ system, including the bones, joints, heart, lungs, and skin. Neuroprostheses that allow individuals to stand, exercise, and transfer have the potential to prevent or postpone medical complications and improve the functional independence of veterans.

Center of mass acceleration feedback control for standing by functional neuromuscular stimulation: A simulation study

Raviraj Nataraj, et al.



Over 25% of individuals with spinal cord injury (SCI) are veterans, and functional neuromuscular stimulation (FNS) has been proven effective in restoring basic mobility following paralysis. This article investigates a novel feedback controller for improving balance function following SCI using an implantable FNS standing system. The controller was developed and tested using a computer model of the human legs and trunk. Inclusion of feedback control improved balance function by 43% in the model. Future work will concentrate on customizing this control system for specific users and testing under live laboratory conditions.

Evaluation of sensation evoked by electrocutaneous stimulation on forearm in nondisabled subjects

Bo Geng, MSc, et al.

Artificial limbs could be controlled more accurately and efficiently if they provided sensory feedback. One way to create sensory feedback is by applying electrical stimulation to the skin. It is still not clear how to electrically stimulate in order to create specific sensations. Therefore, we need to better understand how stimulation parameters affect sensations. We evaluated the effects of four parameters on sensations in nondisabled participants. Our results yield practical recommendations for future use of sensory feedback in prostheses and for the design of sensory feedback schemes to treat phantom pain.

Human distal sciatic nerve fascicular anatomy: Implications for ankle control using nerve-cuff electrodes

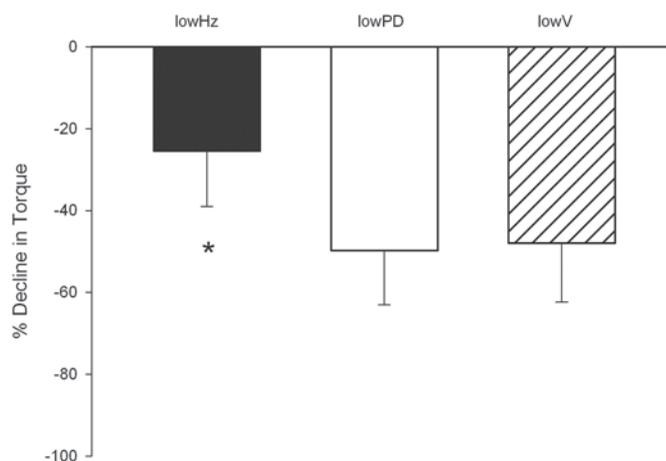
Kenneth J. Gustafson, PhD, et al.

Electrical stimulation of the distal sciatic nerve can help people who have lost control over their legs to stand or walk. We need to better understand the nerve anatomy to design better nerve electrodes. Nerve fascicles from branches of human sciatic nerves were traced to create fascicle maps. Sciatic nerve branches were consistently represented as individual fascicles or distinct groups of fascicles in the sciatic nerve. Sciatic nerves were relatively elliptical. Selective stimulation of functional muscle

groups is therefore possible with a single nerve cuff electrode and may improve ankle control for standing and walking functions.

Matching initial torque with different stimulation parameters influences skeletal muscle fatigue

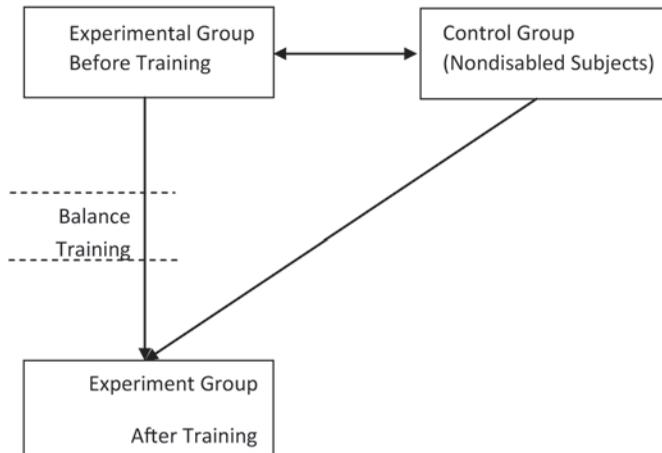
C. Scott Bickel, PhD, et al.



Electrical stimulation is often used to assist in the rehabilitation of muscles after injury. However, because of the high levels of muscle fatigue that occur with this type of treatment, electrical stimulation is not being used effectively. This study looks at how changing different parameters of electrical stimulation can help to reduce the amount of fatigue that occurs. If electrical stimulation can be significantly improved, care for veterans with injuries that warrant the use of this modality will be greatly advanced.

Do diabetic neuropathy patients benefit from balance training?

Mohammad Akbari, PhD, et al.



Peripheral neuropathy is a common complaint of diabetes. Peripheral neural damage in turn will cause balance impairments in diabetic patients. We compared balance abilities of patients with diabetic neuropathy and age-matched normal participants by using the Biodex Balance System. All tests were conducted in eyes-open and closed conditions on bilateral and unilateral standing. After 10 sessions of balance training, patients with diabetic neuropathy were examined exactly like the first time. The results of this study showed that balance training can improve stability indices in diabetic patients with neuropathy.