

## Mobility research

One of the unintended benefits of over two decades of cost cutting measures in physical medicine and rehabilitation in the United States has been the focus on evidence-based practice. As the funding for rehabilitation is reduced, clinicians are required to defend their choices of treatment modality as well as their use of assistive and orthotic equipment. In the area of mobility research, much research has been conducted to evaluate and compare effectiveness of various treatment protocols.

An exciting development in the field of physical medicine and rehabilitation is a new gait therapy technique with implications for all patients with neurological impairment. This technique is referred to by a multitude of names including partial weight bearing (PWB) and partial body weight (PBW) gait therapy or body weight support (BWS) treadmill training or Laufband training in the literature. It is supported by basic science studies as well as human clinical trials. Three of the articles in this issue of *NeuroRehabilitation* address various aspects of this new field of study.

S. Hesse provides a review of the great body of knowledge amassing in support of partial weight bearing gait therapy, including recent citations of the application to a multitude of impairments. While providing the background and rationale for PWB the paper discusses many studies comparing these techniques to traditional interventions. This paper gives a rare account of the details of the protocol and procedures used by the author. Hesse suggests use of an automated gait training machine capable of producing gait like motions of the limbs and the entire body.

P. Trueblood establishes the prevalence of stroke and the persistent gait deficit in patients with CVA. She points out the shortcomings of the traditional approaches to gait retraining of these patients, and in a frame work of Central Pattern Generators, System Theory, and Forced Use concepts provides a rationale for use of the new techniques. The paper provides support from existing literature and takes the reader through a logical journey of establishing usefulness of the techniques with a series of pilot studies. First, the effect of

the PWB environment on normal subjects and stroke victims, then a study establishing the outcome of repeated PWB treadmill training. The paper also reports balance improvements in patients and relates it to postural support the patient is afforded in the PWB environment used in the study. P. Trueblood also suggests further studies with stroke patients to account for population differences.

E. Miller reports on just that kind of a case study. While providing an in depth literature review she gives the rationale for application of the PWB techniques with a unique addition of over ground training. Most research in this field has been conducted while training over a treadmill. This paper gives results of the influences of over ground PWB training in the transfer of skills learned over treadmill to over ground walking. A series of threshold changes are provided in evaluation of the impact of training on a single subject.

Most, if not all, of the clinical studies in PWB gait therapy are treatments confined to the treadmill. While the measurements of gait performance are those of over ground ambulation, most studies did not have the ability to train patients under partial weight bearing over ground. Ellen Miller, with access to an on and off the treadmill device, incorporates both mediums in a single subject case study.

All the above three authors refer to the need for provision of postural stability during gait retraining using the PWB techniques. The reader is well served to note the differences between the partial weight bearing environment used by these authors.

One of the most universally appealing features of the new gait training techniques is the ease of integration into and/or along with other forms of intervention. One such additional therapy is electrical stimulation (ES). It can be used not only to assist proper muscle contraction but also to enhance the responses of spinal cord during locomotion training. C. Sadowsky provides a survey of some of the uses of ES.

The supported treadmill training provides for many repetitions of corrected goal oriented movements of the lower limbs. This very same concept applied to the up-

per extremity is the subject of the paper by R. Maulucci and R. Eckhouse. This paper discusses the impact of continuous feedback of the error made in a goal directed arm movement on recovery of that same movement, as well as activities of daily living in patients with stroke. A comprehensive survey of existing work supports the implementation of the study. The authors discuss a multitude of objective and subjective measures – compiled and analyzed – to expand on the nature of the changes observed as a result of the proposed therapy.

L. Selby-Silverstein reports on a study to measure the usefulness of foot orthoses in young patients with Down Syndrome (DS) and excessively pronated feet. The gait function in these children is compared with

and without the orthoses and to a group of non-disabled children in a well constructed and thorough study. A complete discussion of the results and the clinical applications of the use of foot orthoses is provided.

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