

Pre-Conference Workshop 1

## ***FESAiR -FES: Applications in Rehabilitation***

**Organizer:** **Maura Whittaker**  
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**Presenters:** (See below each session.)

### **Session 1: The Neurophysiological Basis for Therapeutic FES**

Evidence-based rehabilitation is widely recognized as the hallmark for good therapeutic practice. Our knowledge of neuroplasticity has advanced tremendously over the last 25 years and it is now understood that rehabilitation is closely associated with plasticity in the brain and spinal cord. The purpose of this session is to provide a physiological framework for the clinical sessions that follow. We will first introduce the basic principles of electrical stimulation and then discuss the physiology of neuroplasticity with special emphasis on the cortical and spinal changes that are associated with FES.

**Michael J Grey** Ph.D is an Associate Professor at the University of Copenhagen, Faculty of Health Sciences, Department of Neuroscience and Pharmacology. Dr Grey is a neurophysiologist whose research interests include spinal and cortical neuroplasticity associated with motor rehabilitation.

### **Session 2: FESAiR: Towards Best Practices in Clinical Use of FES**

Functional electrical stimulation (FES) is a valuable treatment modality that physiotherapists can employ to treat a variety of neuromuscular, musculoskeletal and functional impairments. FES, as a rehabilitation technology, is generally classified as therapeutic when applied to halt or reverse the progress of a disabling condition, or as functional when applied to restore movement, such as walking. Evidence in the scientific literature supports the use of FES to facilitate motor recovery, improve motor function, increase muscle strength, endurance and joint range of motion, promote exercise capacity, re-educate gait and modulate spasticity. This pre-conference course will provide an overview of these fundamentals of FES use including application techniques, innovative approaches to increase efficacy of treatments, strategies to decide when FES should be employed, patient selection, adjunctive treatment approaches, FES goals and clinical outcome measures. *FESAiR - Functional Electrical Stimulation: Applications in Rehabilitation* is an affiliation of physiotherapists, founded at IFESS in 2005, to provide evidence based FES education and promote effective use of this valuable treatment in clinical practice.

**Maura Whittaker** B ScPT, MBA, a physiotherapist on the spinal cord program at GF Strong Rehabilitation Centre, Vancouver has 30 years of clinical experience in the field of stroke and spinal cord rehabilitation. She is a founding member of FESAiR, a member of IFESS and the American Spinal injuries Association (ASIA). She has been involved in FES research since 1994 and has presented on FES at international and local conferences.

### **Session 3: Functional Electrical Stimulation (FES) in the Management of Upper Limb and Locomotor Deficits of Adult Stroke survivors**

This presentation will provide the latest evidence-based derived clinical utilization of functional electrical stimulation (FES) in combination with task-specific training of the sensory-motor systems to manage selected physical impairments and functional deficits following damage to the CNS. Another objective is to present selected clinical cases for a “Grand Round” discussion how to maximize recovery of upper limb function and recovery of locomotion ability of patients that survived CVA. The latest clinical research findings that support the use of FES in stroke rehabilitation will be presented.

Participants of this workshop will learn to identify, differentiate, and select the appropriate training paradigms presented and be able to state the major clinical advantages and limitation of using FES in stroke rehabilitation. Participants should become proficient in stating why, how, and when a stroke survivor is a candidate for FES training.

**Gad Alon** PhD, PT is an Associate Professor at the University of Maryland, School of Medicine, Department of Physical Therapy & Rehabilitation Sciences. His major teaching includes Electrotherapy, Management of limb amputation, and Pathological movements. Dr. Alon’s research and teaching has earned him world recognition in the field of clinical electrotherapy. He is invited frequently to share his interest and knowledge with clinicians throughout the USA and around the world. Dr. Alon’s current research focuses on FES in Neuro-rehabilitation. Dr. Alon published 29 research articles, over 160 abstracts, proceedings in professional journal and serves as reviewer to 7 scientific journals.

### **Session 4: Deployment and Outcome Measurement of Functional Electrical Stimulation Systems in the Neurorehabilitation Setting**

Functional electrical stimulation (FES) systems for use in Neurorehabilitation are evolving. To maximize benefit systems need to have the versatility for utility in both the clinic and in the community setting. The Bioness L300 foot drop system and H200 hand rehabilitation system have brought refinement to surface FES applications. Advancements in the technology have lowered some of the barriers to the integration of FES into practice, but challenges still exist. In addition to improved utility, identifying and assessing clinical outcomes is a critical to continued growth of the technology. Recent findings following FES application in patients with neurological disorders are helping to expand the evidence-base. Selecting and tracking appropriate outcomes measures is critical to the future success of FES.

Participants of this workshop will learn about technological advancements in FES hand rehabilitation and foot drop stimulation systems. Methodology for effective deployment of FES in the clinical setting as well as managing a home program will be discussed across a variety of diagnoses. Participants will learn to identify key outcome measures to assess efficacy of these systems in home-program users.

**Keith McBride**, MPT, DPT is the Director of Clinical Support and Education of Bioness, Inc. as well as an assistant professor at the University of Maryland. His research efforts included geriatric hip fracture, stroke presentation and outcomes measurement, as well as FES interventional studies in stroke and spinal cord injury.

### **Session 5: FES Clinical Service Provision: The UK Experience**

This presentation will focus on the practicalities of providing a clinical FES service to neurological patients at a UK district general hospital. For the past 12 years the Dept of Medical Physics at Salisbury District Hospital has been a leader in the development of FES devices and the provision of a dedicated FES service to stroke, MS, spinal cord and other patient groups. To date approximately 2500 patients have been treated for foot drop with additional stimulation channels employed to augment walking in 25% of referred patients. Initially, external surface devices were offered but over the last 2 years the service has been expanded to include implanted devices for dropped foot and a feasibility study for an implanted upper limb device has just been completed. Practical examples of FES device fitting will be given together with guidelines for successful application and service provision in clinical practice. Clinical audit data will be presented and new promising developments for upper limb training in stroke described.

The objective of this workshop is to demonstrate the benefits that FES can offer towards improved function, mobility and quality of life in patients who have suffered a stroke or other neurological impairment.

**Paul Taylor** is lead Clinical Engineer at the National Clinical FES Centre in Salisbury, UK. He is experienced in developing, testing and teaching FES techniques for upper and lower limb applications in stroke, MS and spinal cord injury patients. His work and collaboration with other UK clinicians, engineers and researchers has lead to the establishment of a routine clinical FES service within the UK's National Health Service (NHS).