



**HAL**  
open science

## Functional Electrical Stimulation

Christine Azevedo Coste, Milos R Popovic, Winfried Mayr

► **To cite this version:**

Christine Azevedo Coste, Milos R Popovic, Winfried Mayr. Functional Electrical Stimulation. Artificial Organs, 2017, Special Issue: Functional Electrical Stimulation, 41 (11), pp.977-978. 10.1111/aor.13052 . lirmm-01636985

**HAL Id: lirmm-01636985**

**<https://hal-lirmm.ccsd.cnrs.fr/lirmm-01636985>**

Submitted on 17 Nov 2017

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

## Guest Editorial

### Functional Electrical Stimulation

Christine Azevedo Coste<sup>1</sup>, Milos Popovic<sup>2</sup>, and Winfried Mayr<sup>3</sup>

In 2016, the International Functional Electrical Stimulation Society (IFESS) celebrated its 20th anniversary. IFESS is promoting research, applications, and understanding of electrical stimulation. This special issue is based on a selection of extended versions of articles that have been presented during the anniversary annual conference in June 2016 in Montpellier/La Grande-Motte, France. They are intended to illustrate the multiple facets of

functional electrical stimulation (FES) and recent advances in the domain. Engineers and clinicians demonstrate here the importance and potential of this very active research field. We have also invited Prof. Dejan Popovic and Dr. Thierry Keller to contribute with an article about IFESS history. The clinical applications presented in this issue cover various contexts: post-stroke hemiplegic upper limb therapy (Malesevic et al. (1), Irimia et al. (2)), complete spinal cord injuries (SCI) assisted cycling (Fonseca et al. (3), Tefertiller and Gerber (4), Andrews et al. (5)), obesity treatment (Lonys et al. (6)), Parkinson's disease (PD) gait assistance (Sijobert et al. (7)), and cerebral palsy (CP) gait assistance (Rose et al. (8)).

In their article, Tefertiller and Gerber present a walking rehabilitation program dedicated to SCI patients. This very comprehensive protocol associates electrical stimulation and ergometry to enhance neurological recovery. Rose et al. discuss the use of multichannel electrical stimulation as a very promising assistive technology to help children with spastic CP achieve a more upright and functional gait. Andrews et al. present their long experience of FES-rowing in SCI patients. The article from Malesevic et al., investigates surface motor activation zones using a multi-pad functional electrical stimulation system to produce selective wrist, finger, and thumb extension movements in therapy sessions involving hemiplegic stroke patients. In their article, Fonseca et al. present an approach for cadence tracking and disturbance rejection in FES cycling in complete paraplegic subjects. Sijobert et al. report a new strategy to assist PD gait through somatosensory cueing based on electrical stimulation of the arch foot in PD gait. Irimia et al., introduce a brain-computer interface to monitor movement imagery to real-time control FES and bar feedback during post stroke hemiplegic patients upper limb training.

Some articles of this issue are concerned with invasive approaches of FES. Lonys et al. present an in vivo validation of a less invasive procedure to stimulate the stomach with a gastrointestinal stimulator implant to activate the loss of weight in obese patients.

Overall the contributions to this special issue demonstrate how versatile FES can act as a beneficial tool for a variety of clinical applications. We are confident that this collection will be interesting for a wide community of researchers and practitioners and hope it will promote awareness for the numerous beneficial options the use of FES in diagnostic and therapeutic applications can provide.

## REFERENCES

1. Malesevic J, Strbac M, Isakovic M, et al. Temporal and spatial variability of surface motor activation zones in hemiplegic patients during 20 FES therapy sessions. *Artif Organs* 2017;41:E166–77.
2. Irimia DC, Cho W, Ortner R, et al. Brain-computer interfaces with multi-sensory feedback for stroke rehabilitation: a doi:10.1111/aor.13052 case study. *Artif Organs* 2017;41:E178–84. *Artificial Organs* 2017, 41(11):977–978
3. Fonseca LO, B\_o APL, Guimares JA, Gutierrez ME, Fachin-Martins E. Cadence tracking and disturbance rejection in functional electrical stimulation cycling for paraplegic subjects: a case study. *Artif Organs* 2017;41:E185–95.
4. Tefertiller C, Gerber D. Step ergometer training augmented with functional electrical stimulation in individuals with chronic spinal cord injury: a feasibility study. *Artif Organs* 2017;41:E196–202.
5. Andrews B, Gibbons R, Wheeler G. Development of functional electrical stimulation rowing: the Rowstim series. *Artif Organs* 2017;41:E203–12.
6. Lonys L, Vanhoestenberghé A, Huberty V, et al. In vivo validation of a less invasive gastrostimulator. *Artif Organs* 2017; 41:E213–21.
7. Sijobert B, Azevedo C, Andreu D, Verna C. Effects of sensitive electrical stimulation-based somatosensory cueing in Parkinson's disease gait and freezing of gait assessment. *Artif Organs* 2017;41:E222–32.
8. Rose J, Cahill-Rowley K, Butler EE. Artificial walking technologies to improve gait in cerebral palsy: multichannel neuromuscular electrical stimulation. *Artif Organs* 2017;41: E233–39.

---

<sup>1</sup> INRIA, LIRMM, Montpellier, France. E-mail: christine.azevedo@inria.fr

<sup>2</sup> Toronto Rehabilitation Institute – University Health Network, Toronto, Ontario, Canada

<sup>3</sup> Medical University Vienna, Center for Medical Physics and Biomedical Engineering, Vienna, Austria