



Usability study of a device for compensation of foot drop based on FES and surface multi-field electrodes in a clinical environment

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Introduction

Functional Electrical Stimulation (FES) has shown successful assistive and rehabilitation effects in people affected by foot drop dysfunction caused by neurological disorders [1]. Still, FES-based foot drop devices are not present in regular therapy programs of many countries due to barriers caused by technological, usability or reliability issues [2]. FES devices based on surface multi-field electrodes bring new broader stimulation possibilities and features like compensation of eversion/inversion and thus, potentially increase the configuration options. In this study, the satisfaction and usability aspects of a multi-field based FES device were analyzed in a clinical environment.

Method

The FES device used in this study was the Fesia Walk device for compensation of foot drop, which is based on a multi-field surface electrode and an inertial sensor for gait phase detection.

10 acquired brain injury subjects in chronic stage and 4 therapists participated in the study. The therapists received a two-hour training session prior to the therapy sessions. Every subject was assigned to one therapist and received 3 sessions of habituation and 6 sessions of over ground walking with the Fesia Walk during three weeks. Both therapists and users were evaluated with the Quebec User Evaluation of Satisfaction with Assistive Technology (QUEST). Additionally, the therapists were evaluated with the System Usability Scale (SUS). An individual interview was carried out with each of the participants.

Results

The device received good scores in both the QUEST and SUS scales, with mean scores of 4.14 out of 5 and 85.6 out of 100 respectively. Furthermore, most users and all therapists showed interest to continue using the device after the study.

Discussion and conclusions

This usability study indicated that it is possible to include surface multi-field based FES devices for the compensation of foot drop in practical therapeutic programs and that they can be used as regular tools by therapists in clinical environments.

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[1] Michal Kafri and Yocheved Laufer. "Therapeutic effects of functional electrical stimulation on gait in individuals post-stroke." *Annals of biomedical engineering* 43.2 (2015): 451-466.

[2] Gad Alon. "Functional Electrical Stimulation (FES): Transforming Clinical Trials to Neuro-Rehabilitation Clinical Practice-A Forward Perspective." *Journal of Novel Physiotherapies* 3.176 (2013): 2.