UNIVERSITY OF BRESCIA

PhD Program
in
TECHNOLOGY FOR HEALTH

Effects of a myoelectrical-controlled functional electrical stimulator on upper limb rehabilitation after stroke

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Background

Upper limb motor impairments caused by a stroke are among the major causes of functional limitations in a patient's daily independence. For this reason, rehabilitation treatment is fundamental in trying to maximize the recovery of motor function, and the integration of new technologies can play a supportive role both for therapists, in conducting rehabilitation sessions, and for patients, in making the most of their residual abilities. The use of functional electrical stimulators can actively and functionally support movement, following an adaptive approach that takes residual capacities into account. The device under study is able to record the subject's residual muscle activity during the execution of movements, and at the same time, is able to superficially stimulate synergic muscles. The stimulation intensity is proportional to the muscular activity measured simultaneously, implying an active participation of the subject that is fundamental to improving their recovery.

Objectives

The aim of this project is to evaluate the effects of a myoelectrical-controlled functional electrical stimulation device, applied on upper limb motor rehabilitation of post-stroke subjects. The device-based treatment will then be compared to the traditional rehabilitation process, and a cost-effectiveness analysis will be carried out.

Methodologies

The project will comprise two phases. In the first phase, ten healthy subjects and ten post-stroke subjects will be recruited to assess the usability and acceptability of the device (Figure 1). Questionnaires will be submitted to evaluate the device's perception. In the second phase, a randomized controlled study will be carried out on post-stroke subjects, who will follow a rehabilitation treatment of fifteen sessions and will be assessed before starting the protocol and after the completion of the protocol. Recruited patients will be randomized into an experimental group, which will use the device during rehabilitation sessions, and a control group, which will execute the same sessions but without the help of

Figure 1. FitFES device: two electromyographic channels and one stimulation channel.

the device. Analysis will be executed to evaluate the effects of the device on upper limb rehabilitation, compared to traditional rehabilitation.

Expected results

From the first phase of the study, the usability and acceptability of the device are expected to be high in both populations recruited and especially for post-stroke subjects, as it will allow the voluntary execution of movement otherwise inefficient and limited. If not, the device will be modified and simplified to suit the needs and suggestions of primary and secondary users. From the second phase, a better improvement in the experimental group that used the device is expected, with respect to the control group.