UNIVERSITY OF BRESCIA

PhD Program
in
TECHNOLOGY FOR HEALTH

IDENTIFICATION OF INNOVATIVE TOOLS FOR THE ELECTROMECHANICAL EVALUATION OF THER NEURO-MUSCOLART FUNCTION IN PATIENTS WITH ALTERED MOTOR CONTROL DURING DAILY-LIFE ACTIVITIES AND ADAPTED PHYSICAL ACTIVITIES

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Background

The neuromuscular system function is to produce the adequate torque through the joint in order to create the movement of the bone segments. The dynamic or static contraction depends on the prevalence of the torque over the resistance. The intensity of contraction is influenced from two factors: 1. the flow of motor commands from the central nervous system (CNS) towards the motor units (MU) and 2. the efficiency of the muscle fibres (MF) contraction. Therefore, the development of force is influenced by the model of activation of the MUs and the neuro mechanical characteristics of the transducer; a possible output deficit could be caused both from central or peripheral dysfunctions. The electromyogram (EMG) is a biological signal, detectable at the muscle surface, generated by the summation electrical activity of the recruited motor units. Amplitude and frequency content of the EMG signal provide information about MU activation strategy; that enables to collect information about the muscle electromechanical efficiency and motor control properties

Objectives

The aim is to understand the differences of the neuromuscular activation and deactivation strategy in healthy subject and in patient with altered motor control. Furthermore, to evaluate the physical fitness in children, in adults and in subjects with functional limitations.

Methodologies

Tools for neuromuscular function evaluation: the bi-polar EMG (Fig. 1) and the innovative high definition (HD) EMG (Fig. 2). These may reveal several features of the neuromuscular activation pattern. Through sundry experimental set-ups (Fig. 3) will be possible to study motor control in different muscle s in different conditions.

Tools for physical fitness estimation. The physical fitness evaluation will be assessed with the support of physical test batteries and tools like bioelectrical impedance analysis (BIA) or portable metabolic system.

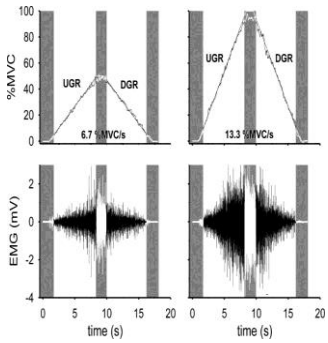

Figure 1. Example of EMG signal

Figure 2. HDEMG matrices

Figure 3. Experimental set-up

Expected Results and Impact

The possibility to describe (by means of EMG signals) the features of central nervous system MU activation/deactivation strategy and its possible changes in patients with altered motor control.