The use of Electromyography in Physiotherapy – Application in Hydrotherapy

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Kinesiologic electromyography (KEMG) represents a method of analyzing muscle function through the use of specialized electrophysiological techniques. Physical therapists use KEMG in many applications directed at providing evidence for their daily clinical practice. KEMG is used to evaluate muscle activity for function, control, and learning. Examples of applications include, amongst others: (1) assessment of muscle function during exercise and therapeutic interventions, (2) "biofeedback" to patients, (3) evaluation of "control" by assessing muscle onset times and durations, gait analysis, evaluation the work site, and determination local muscle fatigue. Although the instruments are easily applicable, the user of KEMG need to understand the underlying principles of its signals for a correct interpretation.

Issues such as signal amplification and processing (filtering, rectification, normalization) are to be considered a priory in order to facilitate correct interpretation of KEMG data.

This paper deals with these issues and draws the attention to a new application in exercise therapy under water. Recent advances on KEMG technology capable of being used in water environment enables the usage of KEMG in Hydrotherapy, not to be confounded with thallassotherapy and balneotherapy). Hydrotherapy is often used for its physical characteristics (buoyancy, water resistance and temperature) to improve and rehabilitate (neuro) muscular and cardiorespiratory function in a variety of pathologies, ranging from fibromyalgia to post-operative anterior cruciate ligament interventions. A demonstration of using KEMG as a means of muscle function assessment in the water will be shown. The intervention using a set of biofeedback protocols providing proprioception of the correct muscle activation timing, symmetry and intensity will be presented and discussed to understand which visual and auditive stimuli provide effect to the patient during the water rehabilitation treatment.

As an example of a standard biofeedback protocol, the initial step is represented by the inspection of the signals followed by the maximum voluntary contraction. In a second step, muscular control visualisation is presented using a bar associated to the activation level of each monitored muscle. In a third step, the time synchronization of the several muscle is defined by the physical therapist and a set of movements is done while the patient learns to execute the correct muscle activation timing. In a fourth step the patient will execute the learned exercise with increasing difficulty levels. The final step presents a report with results to the physical therapist and a set of simple performance information to the patient.