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Letter to the Editor

The Efficient Estimation of Motor Unit Excitability Parameters in Needle Electromyography Experiments

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Dear Editor-in-Chief

Moving our body is the outcome of our muscles' contraction. Muscles themselves are composed of groups of muscle fibres each controlled by a single motor neuron. The motor neuron and its associated muscle fibres form the elementary functional unit of the neuromuscular system, the so-called motor unit (MU). By activating more or less MUs, the amount of generated muscle force can be increased or decreased. This is the key concept in testing muscle activities in patients with muscular disorders (1).

Motor unit activities (or equivalently, nerve excitability) can be studied by means of the so-called threshold tracking techniques, widely available by use of two widespread electrophysiological techniques; surface electromyography (SEMG) and needle electromyography (NEMG). Threshold tracking assesses excitability property of an MU by recording its response to a range of stimulus intensities required to elicit a target response (2). This experiment yields to a stimulus-response curve from which one can estimate MU's threshold (the stimulus intensity that elicits a response to 50% of the stimuli) and the range of stimulus intensities over which the MU shows a stochastic behavior. One demand, therefore, is to obtain efficient estimates of these parameters. For estimation of MU's threshold, various strategies are available (3). However, the judgments underlying these approaches are mainly subjective and statistical methods are seldom used (4).

Two main interests in threshold tracking studies are; i) to develop a novel model-based approach in order to obtain reliable estimation of the MU's excitability parameters, and ii) to obtain an efficient experimental design for both NEMG and SEMG experiments. Azadi, 2012 has addressed both issues; using statistical models for parameter estimation in NEMG experiment and a Bayesian experimental design for SEMG technique (5).

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