Commentaries on Viewpoint: Inappropriate interpretation of surface EMG signals and muscle fiber characteristics impedes understanding of the control of neuromuscular function

THE NEED TO NORMALIZE SURFACE EMG

TO THE EDITOR: Enoka and Duchateau (2) correctly call for caution when interpreting voluntary surface electromyography (sEMG) in terms of neural drive. If voluntary sEMG signals recorded during nonfatiguing isometric contractions depend on the number of motor units recruited, their firing rate, and their size (5), modeling found no direct association between neural drive and voluntary sEMG amplitude during simulated fatiguing contractions (1). Despite the lack of a direct relationship between voluntary sEMG and neural drive, sEMG remains one of the better methods to derive information on muscle activation levels. But for this, several technical considerations must be kept in mind. Voluntary sEMG amplitude cancellation may underestimate motor unit activity by up to 60% (3). Yet, amplitude cancellation can be reduced to <5% if voluntary sEMG is normalized to maximal voluntary sEMG (3). Peripheral changes (such as altered action potential propagation or changes at the skin-EMG electrode interface) may also influence the amplitude of the voluntary sEMG signal. This potential peripheral alteration of the voluntary sEMG signal can be circumvented by normalizing it by the maximal M wave amplitude (4).

Overall, if used appropriately and interpreted cautiously, voluntary sEMG still represents one of the better tools to assess muscle-specific neural drive. Nevertheless, changes in voluntary sEMG should be interpreted together with changes in other indexes obtained with electrical/magnetic stimulation (e.g., maximal voluntary activation level, V wave, motor evoked potentials, . . . ) to further our understanding of the control of neuromuscular function.

REFERENCES


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