ESTIMATION METHOD OF THE NUMBER OF MOTOR UNITS BY PROCESSING MASS ELECTROMYOGRAM

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Abstract

The new method of estimating the number and the size of active motor units by processing mass electromyogram (EMG) is devised. This method is based on a model of mass EMG generation, which is founded on the knowledge of the mode of motor units activities. This model is described as follows. (1) Mass EMG is the sum of all active motor units action potential trains. (2) An input of each motor unit is a statistically independent random pulse train. (3) Motor units are divided into groups by their threshold force for recruitment. (4) The firing rate is the function of force. By using the theory of the shot noise, the number and the size of motor units of each group are expressed as a function of the second and fourth moment of mass EMG and firing rate. This estimation starts from the lowest threshold force group.

This method is applied to the human brachialis muscle and the human extensor digitorum communis muscle. The estimated results agree to the size principle and the physiological knowledge of the relation between the threshold force and the number of motor units. This agreement confirms the propriety of this estimation method.

Keywords: motor unit, EMG, brachialis, extensor digitorum communis