

A new strategy on evaluation of the force control with Surface-Electromyogram —Comparison with first dorsal interosseous and biceps brachii—

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The purpose of this study was to investigate the pursuit ability of force and the relationships between the several force rates and the amplitude of a Surface-Electromyogram (S-EMG) for a new evaluation method of the force control. Fifty-one healthy female human subjects (20.7 ± 0.76 yr, mean \pm SD) gave their informed consent to participate in the study. In eleven right-handed females, the EMG recorded from the first dorsal interosseous (FDI) muscles. In forty-right handed females, the EMG recorded from the biceps brachii (BB) muscles. The S-EMGs were recorded while subjects isometrically abducted the index finger and flexed the forearm against a force transducer. The subjects were asked to increase linearly the contractions with each index finger or forearm at difference force rate. The slope of the linear regression and the correlation coefficient were calculated for normalized EMG and force level. The standard error of estimate (SEE) was calculated for the pursuit ability. All statistical comparisons were tested with a significance level of $P < 0.05$. Results were as follows. The SEE tended to be influenced when the force rate was increased. The slope of the linear regression of FDI was different tendency in 50%MVC and 60%MVC. Reversely the ratio of the change in the slope of the linear regression of BB was not the change among all force level. There was no difference between right and left of the slope of the linear regression of FDI and BB. Though FDI and BB are similar in their proportion of muscle fiber types they have differences in the mechanism of the force control. On increasing force of FDI, rate coding is more important role than motor unit recruitment. And motor unit recruitment of FDI has finished until about 50%MVC. Reversely motor unit recruitment of BB occurred until high target force level. In this study the relation between force and the S-EMGs amplitude were verified by using their different characteristic. These finding suggest that this method of evaluation of the control ability and the relationship between the force and S-EMGs is valuable for evaluation of the force control.