The relationship between changes in joint kinematics parameters and mechanomyographic signals during non-isometric contraction in human skeletal muscle

Yoichi Ohta*

Faculty of Health and Medical Sciences, Department of Sports and Health Sciences, Aichi Shukutoku University, Japan

Abstract: The present study determines the effects of summation of contraction on joint kinematics in human ankle and mechanomyography (MMG) signals during non-isometric contraction. The excursion and angular velocity of dorsiflexion and eversion were measured during several summation profiles during non-isometric contractions. The joint kinematics parameters and MMG responses to 1–8 pulses at a constant interval of 10 ms were recorded to investigate the effects of different numbers of stimuli. In an examination of two-pulse trains with different inter-pulse intervals, the joint kinematics parameters and MMG responses to inter-pulse intervals of 10–100 ms were recorded from the tibialis anterior muscle. The main finding was that facilitating effects of subsequent stimulation were limited to angular velocity of eversion during the contribution of a second stimulus, suggesting that facilitating effects of second stimulus reflect angular velocity but not joint angle excursion. A comparison with MMG signals clarified that MMG signals poorly correlate with changes in the joint kinematics parameters (excursion and angular velocity) when the inter-pulse intervals or numbers of stimuli are increased. These findings will provide useful information for assessing the muscle contractile properties with evoked MMG signals during non-isometric contraction.

key words: functional electrical stimulation, twitch; tibialis anterior muscle, MMG, summation of contraction