

## 等尺性膝関節運動時における筋電図周波数と時間応答の解析手法

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## Analytical Methods of EMG Frequency and Time Response during Isometric Exercise of the Knee

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**Abstract:** In recent years there has been increasing interest in frequency analysis of EMG (Electromyography) signals. The frequency of EMG signal has a possibility of showing muscle property of fiber types (slow twitch type or fast twitch type). In particular the wavelet transform method for time-frequency analysis of the EMG signals has been conducted to examine time dependent exercises. We are interested in properties of knee extensor and flexor muscles and muscle fiber types. Since the study of frequency analysis of EMG by wavelet transform method and FFT (Fast Fourier Transform) method for knee muscles have not been sufficiently carried out yet, we measured EMG signals during SLR (Straight leg raising) exercise and isometric muscle contractions for knee extension/flexion, and compared above two methods. The subjects were 16 healthy young women (mean age 27.2 years). As the muscle fiber type is related to the way of muscle contraction, we measured knee extension/flexion force simultaneously with EMG signal measurement and obtained muscle response time by using first-order lag system model. The results showed that 1) the frequencies of EMG signals during SLR exercise decreased depending on time, although decreasing rates showed no significant differences among muscles, 2) the frequencies of EMG signals during isometric knee muscle contraction were significantly different among several muscles, 3) the muscle force-time responses were not significantly correlated with the frequencies of EMG, and 4) the analysis of EMG frequency signals seemed to be influenced by limb position in some muscles.

**Keywords:** EMG, frequency analysis, knee muscles, fiber types