THE WAVELET TRANSFORM ANALYSIS OF ELECTROMYOGRAPHY AND MECHANOMYOGRAPHY RESPONSE DURING INCREMENTAL STEPPING EXERCISE

Wu Chih Min¹, Fu Cheng Sze², Lin Jeng Chang³
(National Taiwan Normal University¹, National College of Physical Education & Sports², Chinese Culture University³, Taiwan)

Many researches reveal the integrated electromyography and integrated mechanomyography (iEMG & iMMG) could reflect the exercise intensity by detecting the recruitment of motor unit. For frequency domain analysis, fast fourier transform (FFT) had been used in stationed exercise, and even in the dynamic exercise. However, there were many disamenities been revealed about the FFT procedure for dynamic exercise patterns. PURPOSE: To investigate the relationships between responses of muscle EMG and MMG during sub-maximal step exercise, and to evaluate the applicability CWT and multiscale time-frequency distribution of EMG and MMG as an exercise intensity indication. METHODS: Fourteen healthy college male students (M±SD age:20 ±1 years; height:174.3±6.8cm; weight: 69±9.8 kg) volunteered to perform an incremental stepping machine exercise test. During five-stage step exercise (started from 45 steps/min, added 15 steps/min in every three minutes of each stage), the EMG and MMG data and HR were collected in the last minute of each stage. RESULTS: The relationships among HR, iEMG, iMMG and power output were significant (r=.762; r=.538; r=.584, p<.01). in further, there were significant correlations among HR and normalized averaged mean power frequency about MMG and MMG responses was found (r=.534-.569, p<.01). CONCLUSION: The results of this study indicated positive correlation between power output and responses of the HR, wavelet center frequency of electromyography and mechanomyography patterns during incremental step exercise. These findings suggested that the continuous wavelet transform analysis method would be a better indicator for exercise intensity during dynamic exercise.

Keywords: Electromyography, Stair Use / Stair Climbing, Intensity