THE ANALYSIS OF PEDALING FORCE AND LOWER EXTREMITY EMG USING DIFFERENT PEDALING RATES AND LOADS

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KEY WORDS: pedaling force, pedaling rate, load

INTRODUCTION: In cycling, the pedaling rate and load will affect the rider's performance and the enjoyment of riding. Previous studies usually analyzed the lower extremity EMG with different pedaling posture and pedaling rate, but mostly by professional cyclists (Neptune & Hull, 1999). However, most riders are recreational riders, therefore the results of previous studies are not suitable for the untrained persons, there were no results of lower extremity EMG and pedaling force in the study of pedaling rate and load. The purpose of this study was to analyze the effect of the different pedaling rates and loads on pedaling force and lower extremity EMG.

METHODS: Twelve untrained and healthy subjects (24.5±0.9 years; 174.2±4.3 cm; 73±8.3 kg) were recruited. All subjects completed the maximum exercise test on Lode ergometer by Vmax 29 in first stage, and setting up 3 exercise intensities (50%; 65%; 80% VO_2 max) for each subjects. In stage 2, all subjects completed 9 exercise tests [3 intensity/3 velocity (60; 75; 90 rpm)]. Pedaling force (left pedal) and lower extremity EMG (VM; RF; VL; BF; TA; GM; GL) were captured via 1000 Hz sampling rate using Vicon motion analysis system. A two-way ANOVA within repeated measures was used to perform statistical analysis.

RESULTS: The following figures show results of the IEMG and impulse of pedaling force.

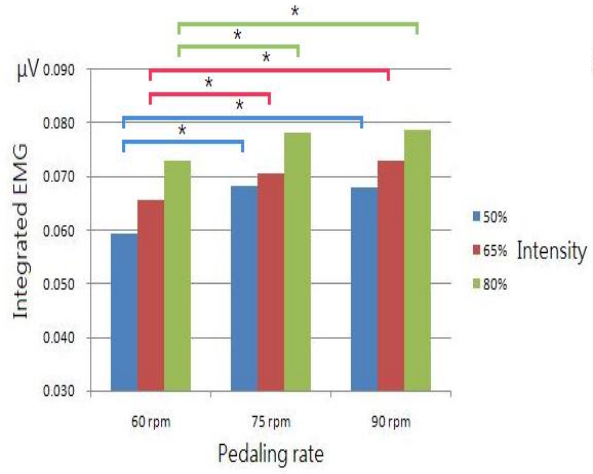

Fig 1:Lower extremity IEMG

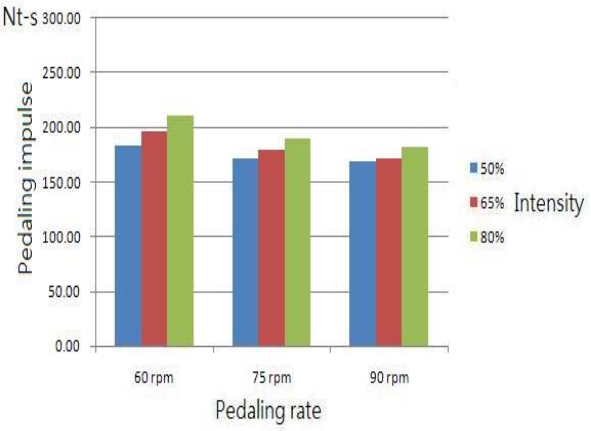

Fig 2:Impluse of pedaling force

DISCUSSION: The IEMG in 60 rpm were significantly lower than 75 rpm and 90 rpm in three exercise intensities (Fig 1), and had no significant difference between 75 rpm and 90 rpm. EMG showed that the optimum cadence of untrained person was 60 rpm, which is much slower than 90 rpm by profession cyclist indicated in previous studies (Neptune & Hull, 1999).

CONCLUSION: The optimum cadence is 60 rpm on untrained person by analyzing IEMG. Optimum cadence for untrained person shouldn't be analyzed only by EMG, but also by adding more factors, such as pedaling force.

REFERENCES:

Neptune, R. R., and Hull, M. L. (1999). A theoretical analysis of preferred pedaling rate selection in endurance cycling. Journal of Biomechanics, 32(4), 409-415.