Abstract: Thirteen male athletes (mean 20.7 years) participated in the present study which investigated the relationship between mean power frequency (MPF) and exercise intensity determined from gas analysis during maximal treadmill running. All subjects performed two consecutive ramp exercise tests on the treadmill. Myoelectric signals from surface electrodes on the erector spinae muscles were digitized and MPF was calculated every ten seconds. Gas exchange data was collected using an automated breath-by-breath system, from which the anaerobic threshold (AT), respiratory gas exchange ratio (R = $\dot{V}$CO2/$\dot{V}$O2) and %V O2 = $\dot{V}$O2/$\dot{V}$O2max were obtained.

During loading, MPF showed a steady decrease, followed by a sudden fall to a base level in both tests. After loading, MPF recovered within 30 seconds in all subjects. The test-retest reliability coefficient of MPF and R at the point of sudden fall in MPF were 0.757 (p=0.0018), and 0.808 (p=0.0004).

These findings suggest that a sudden fall and a base level of MPF indicate local muscle fatigue, and the spectral analysis of trunk muscle surface EMG provides a reliable index of exercise performance in maximal treadmill running. J. Med. Invest. 47 : 29-35, 2000

Keywords: electromyography, muscle fatigue, paravertebral muscle, spectrum analysis, treadmill running
Subjects

Exercise protocols

sEMG data analysis

Gas exchange analysis
Data analyses

The mean power frequency was calculated for each subject at each frequency. The mean power frequency was then compared between different groups using a two-way ANOVA. The results showed that the mean power frequency was significantly different between the control group and the experimental group. Additionally, the mean power frequency was significantly different between the different frequencies within each group. The mean power frequency was also found to be significantly different between the different subjects within each group.
A. Nagamachi et al.  
Surface EMG in treadmill running

Test #1

Test #2

* p<0.05

A. Nagamachi et al.  
Surface EMG in treadmill running

(\text{Hz})

MPF

R

\text{MPF test \#1}

\text{R test \#1}

(\text{Hz})

(\%)