

## TUNING THE NOVICE RUNNER TO RESONANCE

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ABSTRACT

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Holt et al. (1990) reported that the resonant frequency of locomotion based on a force driven harmonic oscillator model was:

$$\omega = 2\pi \sqrt{L/ng}$$

where  $n$  was an integer adjusting for the mode of locomotion and for the experience of the runner. It was suggested that the preferred frequency (PSF) of a novice runner is not as tuned to the resonant frequency (RSF) as are skilled runners with the implication that novice runners do not operate at a metabolically economical frequency. The purpose of this study was to determine if novice runners can be tuned to their RSF resulting in a lower metabolic cost at the RSF than at the PSF. Fourteen young, healthy college aged individuals who were not recreational runners served as subjects. Subjects ran on the treadmill to determine their preferred running speed and their PSF. Anthropometric measures of the lower extremity were taken and entered into a computer program to calculate the predicted RSF according to the oscillator model.

The subject then ran at the PSF while oxygen consumption was evaluated using a metabolic cart until a sub-maximal steady state was achieved. The subject returned to the laboratory for another session in which they ran the same speed at the RSF while oxygen consumption was monitored. The RSF was maintained using an electronic metronome which produced a loud "beep" for each heel contact. The results of the sub-maximal  $\dot{V}O_2$  and heart rate were not significantly different between the PSF and RSF conditions ( $p < 0.05$ ). However, in all cases the oxygen consumption values were lower in the RSF condition than the PSF condition.

The implication of these findings is that novice runners may be not tuned to their resonant frequency resulting in less economical running gait.