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Oxygen Uptake in Whole-Body Vibration Exercise: Influence of Vibration Frequency, Amplitude, and External Load

J. Rittweger[1,2], J. Ehrig[2], K. Just[2], M. Mutschelknauss[2], K. A. Kirsch[1], D. Felsenberg[2]
[1]Institut für Physiologie, Freie Universität Berlin, 14195 Berlin, Germany
[2]Center of Muscle and Bone Research, University Hospital Benjamin Franklin, Freie Universität Berlin, 12200 Berlin, Germany

Abstract

Vibration exercise (VbX) is a new type of physical training to increase muscle power. The present study was designed to assess the influence of whole-body VbX on metabolic power. Specific oxygen uptake ($sV\dot{}O_2$) was assessed, testing the hypotheses that $sV\dot{}O_2$ increases with the frequency of vibration (tested in 10 males) and with the amplitude (tested in 8 males), and that the VbX-related increase in $sV\dot{}O_2$ is enhanced by increased muscle force (tested in 8 males). With a vibration amplitude of 5 mm, a linear increase in $sV\dot{}O_2$ was found from frequencies 18 to 34 Hz ($p < 0.01$). Each vibration cycle evoked an oxygen consumption of approximately 2.5 µl _ kg^{-1}. At a vibration frequency of 26 Hz, $sV\dot{}O_2$ increased more than proportionally with amplitudes from 2.5 to 7.5 mm. With an additional load of 40 % of the lean body mass attached to the waist, $sV\dot{}O_2$ likewise increased significantly. A further increase was observed when the load was applied to the shoulders. The present findings indicate that metabolic power in whole-body VbX can be parametrically controlled by frequency and amplitude, and by application of additional loads. These results further substantiate the view that VbX enhances muscular metabolic power, and thus muscle activity.

Key words

Indirect calorimetry - exercise physiology - rehabilitation