# Effects of power*BIKE*™ on the Cardio-Vascular and Pulmonary response


UNIVERSITY of GREENWICH

**D Filingeri, M Jemni, J Matheroo, A Jimenez**

POWER PLATE® RESEARCH INSTITUTE

**Power Plate Research Institute**

**Centre for Sports Science & Human Performance, University of Greenwich, UK**


## 1.Background

Whole body vibration (WBV) is used in different sporting, fitness and rehabilitation contexts (Rittweger *et al.,* 2000). It is also widely recognized as an alternative method to traditional training (Nordlund *et al*., 2007).

Power Plate International has recently developed a specific training device which is a "**vibrating bike**". Called the "p**ower*BIKE*™**", it represents the first mechanical training ergometer specifically designed for applying vibration training (VT) to endurance performance. Due to a patented mechanism placed in the crank, the bike is able to generate vibrations through the pedals during cycling.

The focus of this study was to evaluate the cardio-vascular and cardio-pulmonary responses related to adding vibration to cycling exercise, compared to a non vibration condition.

## 2. Methods

Eight participants volunteered to participate in this study (height 1.79 ± 0.04m, mass 74 ± 9 kg). The tests have been previously approved by the University's Research Ethics Committee and participants signed a consent form to participate. Each participant performed two sub-maximal tests on the power*BIKE* in a random order (with or without vibration). The mechanical vibration was cadence-related being equivalent to 20, 23.3, 26.7 and 30 Hz vibration respectively. The subjects cycled with a fixed resistance for three min at each cadence: 60, 70, 80 and 90 rpm.

**Respiratory Gases** [Oxygen uptake (VO2), Carbon Dioxide production (VCO2)], Respiratory Exchange Ratio (RER) and Minute Ventilation (VE) were measured using an online gas analyzer (CPX Medical Graphics) continuously throughout the exercise protocol. Values were collected and averaged for the last 30 sec. **Heart rate** was monitored using a Heart Rate Monitor (Polar). **Rates of Perceived Exertion** were recorded at the end of each stage during the test by asking the subjects their perceived fatigue using the BORG´s scale (6 to 20).

## 3. Statistics

A Paired T-tests Differences was used to analyse the differences between vibration and no vibration conditions using Microsoft Excel 2007. Statistical significance was accepted for $P<0.05$.

## 4. Results

Oxygen Consumption ($VO_2$) during vibration and non vibration conditions is shown in figure (Fig. 1). A significant increase in the $VO_2$ was observed during the vibration trial when compared to cycling without vibration ($P<0.05$). Heart rate (HR) values were significantly higher ($P<0.05$) in all stages of the vibration trial compared to the non vibration (Fig. 2) and similarly for the subjects' perceived exertion (RPE) (Fig. 3).

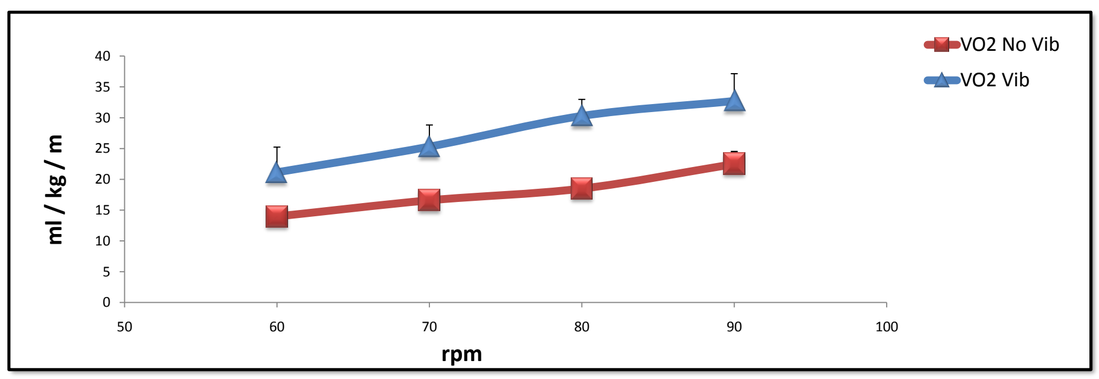


**Fig.1 Oxygen consumption during cycling with and without vibration**

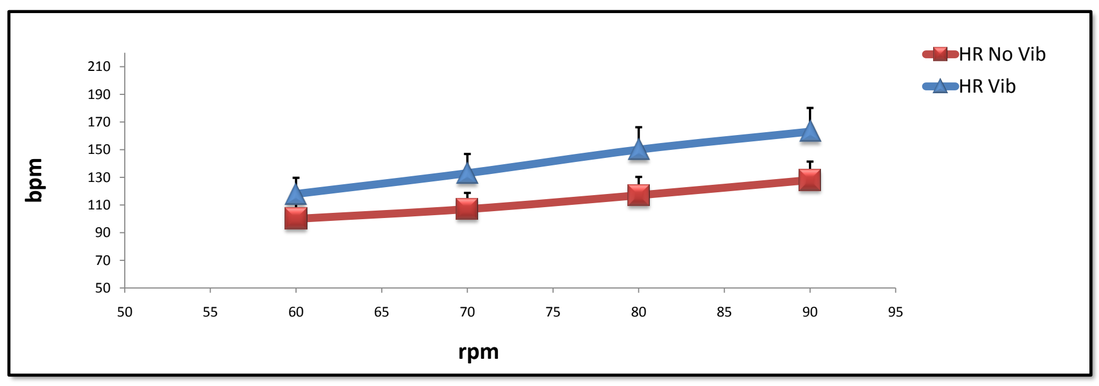


**Fig.2 Heart rate during cycling with and without vibration**

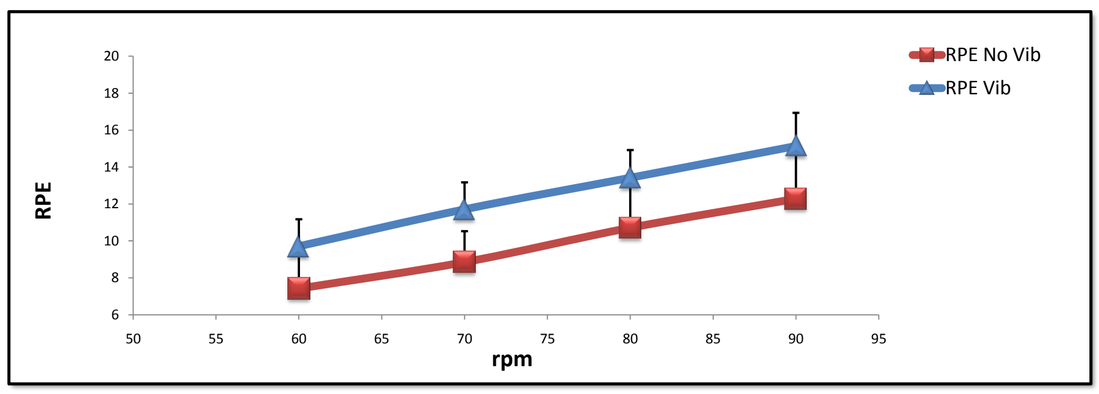


**Fig.3 Rate of Perceived Exertion during cycling with and without vibration**

## 5. Conclusion

These preliminary data show that the addition of mechanical vibration during cycling produce significant increases in the physiological demands (oxygen consumption and heart rate) probably due to increased muscle fibre recruitment. These physiological adaptations were confirmed by an increased exertion perceived by the subjects during the vibration trial. Cycling at the same cadence with vibration seems to allow higher energy expenditure.


RITTWEGER, J., BELLER, G. & FELSENBERG, D. 2000. Acute physiological effects of exhaustive whole-body vibration exercise in man. *Clin Physiol.* England.

NORDLUND, M. M. & THORSTENSSON, A. 2007. Strength training effects of whole-body vibration? *Scand J Med Sci Sports,* 17, 12–17.