Physiological responses during maximal incremental cycling test on the power*BIKE*™ – a case study

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1. Background

Over the last two decades, research into whole body vibration (WBV) training has shown it can improve several physiological biomarkers such as strength, flexibility, balance, bone mineral density.

In this field, Power Plate International has developed a new '**vibrating bike'** called the '**power*BIKE*™'**, representing the first application of the vibration concept directly to cycling performance.

The focus of this case study was to monitor the body's physiological responses to maximal cycling exercise with and without vibration.

2. Methods

An active male endurance runner volunteered to participate in this pilot study (32yrs, 177cm, 72 kg). The test has been previously approved by the University's Research Ethics Committee and the participant provided a consent form to participate. He performed two maximal incremental cycling tests on the power*BIKE* in a random order (with or without vibration). He started with a four minute warm-up at 70 RPM followed by an increasing cadence of 10 RPM every 3 min until exhaustion. The mechanical vibration was cadence-related being equivalent to a range between 23.3 and 40 Hz.

Respiratory exchange gases and **heart rate** were continuously measured using an online gas analyzer (CPX Medical Graphics) and a heart rate monitor (Polar) respectively. A 25 µL blood sample was collected in the last 30 seconds of each stage from the finger tip and immediately analyzed for the **blood lactate** (BL) concentration using Biosen 5030 lactate analyzer. The subject's **rate of perceived exertion (RPE)** was recorded at the end of each stage during the test using the BORG´s scale (6 to 20).

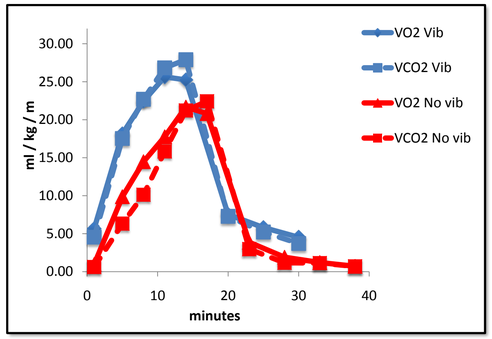

Fig 1. VO_2 and VCO_2 during maximal tests with and without vibration

3. Results

Oxygen Consumption (VO_2) and Carbon Dioxide production (VCO_2) during vibration and no vibration conditions are shown in (Fig. 1). A significant increase in the VO_2 was observed during the vibration trial compared to the non vibration condition. Blood lactate concentration was significantly higher from the start to the end of the vibration condition when compared to the non vibration (Fig. 2). Similar patterns were noticed in the cardiac response and the RPE with the subject reaching 176 bpm and 17 respectively in the vibration condition.

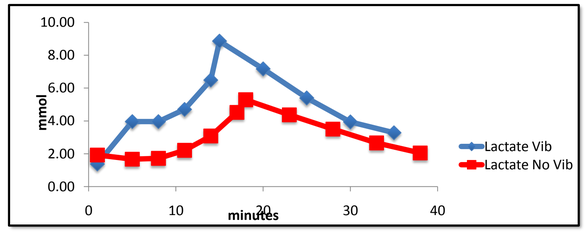

Fig 2. Lactate production during maximal tests with and without vibration

4. Conclusion

The outcomes of this case study show that the addition of mechanical vibration during cycling imposes a significant increase in the physiological and metabolic biomarkers of the aerobic performance. This suggests an increased muscle activation that results an increased energetic cost of the cycling exercise performed at similar cadence. Further studies with larger samples are currently being undertaken to deeply appraise the mechanisms behind those adaptations.

References

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