METABOLIC AND CARDIOVASCULAR RESPONSES DURING WHOLE BODY VIBRATION (WBV) EXERCISE: A PILOT STUDY.

Amy Mark, Maureen MacDonald, Mark Rakobowchuck, Christopher Gordon*, Cameron Blimkie.

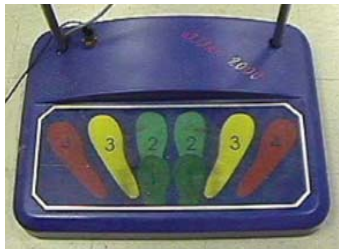
Department of Kinesiology and *Department of Radiology, McMaster University, Hamilton ON, L8S 4K1

INTRODUCTION

- Whole body vibration (WBV) is currently being researched for potential therapeutic and sport performance benefits (4).
- Little is known about the psychological and physiological effects of WBV on humans.
- WBV results in increased gravitational loading (g forces) - as a result of stretch reflex activation.
- Previous studies have found WBV load dependent increases in VO_2, BP, HR and RPE (2,3).
- Increases in blood flow in the popliteal artery using power and colour Doppler (1) and in the calf and foot using cutaneous laser Doppler flow (2) have also been reported.
- No studies have examined the simultaneous effect of WBV on both central and peripheral cardiovascular variables in combination with assessment of psychological stress.

PURPOSES

- To examine the influence of WBV on peripheral and central cardiovascular responses.
- To examine the influence of graded WBV on metabolic stress (VE, VO_2, RER).
- To examine the influence of WBV on psychological stress (RPE).



METHODS

- Six healthy college age females (24.2 ± 3.1 y; 165 ± 3.5cm; 56 ± 2 kg).
- Four 3-minute stages of WBV separated by three minutes of rest (Fig 1).
- Increasing vibration challenge was achieved by varying frequency of WBV and foot placement on WBV platform- Galileo 2000.
- Measures of HR, MAP, femoral artery diameter (FAD) and flow (FAF), VE, VO_2, RER and RPE were taken at the end of each rest and WBV cycle.

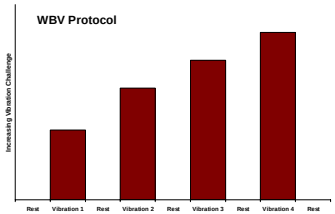


Figure 1: Schematic representation of the testing protocol

RESULTS

- WBV resulted in increased flow at the highest vibration challenge compared to rest.
- No change in femoral artery diameter.
- HR was higher at final two rest stages compared to first two WBV stages.
- No change in MAP.
- No change in RER or VE but VO_2 approached significance (p=0.07).
- Increase in RPE at final vibration challenge with large variability.

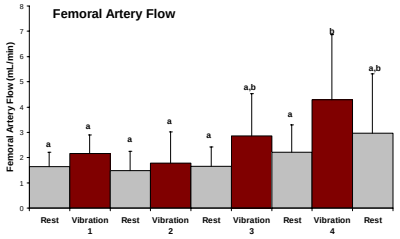


Figure 2: Influence of WBV on Femoral Artery Flow; Letters designate differences from Rest 1 (p<0.05)

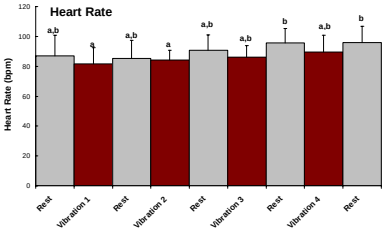


Figure 3: Influence of WBV on Heart Rate: Letters designate differences from Rest 1 (p<0.05)

This work was supported by STRATEC, a Division of Orthometrix Inc. White Plains, NY

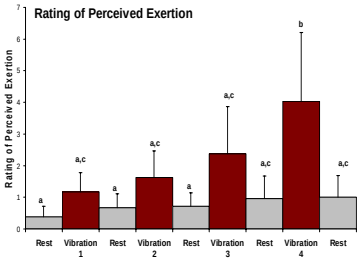


Figure 4: Influence of WBV on Rating of Perceived Exertion; Letters designate differences from Rest 1 (p<0.05)

CONCLUSIONS

- Moderate intensity WBV results in increased femoral artery blood flow without a significant change in artery diameter.
- Variability in RPE among participants suggesting wide range of tolerance for WBV and a possible training effect of vibration causing a decrease in perceived exertion.
- Significant small increases in HR and a trend towards VO2 showing mild physiological strain of WBV at higher loading.
- WBV using this protocol results in mild cardiovascular and metabolic stress, but significant and highly variable psychological stress.
- The psychological stress of WBV exercise may limit individual tolerance to this exercise modality.

REFERENCES

1. Kerschan-Schindl, K. et al., *Clin. Physiol.* 21(3): 377-382, 2001.
2. Rittweger, J. et al., *Clin. Physiol.* 20(3): 134-142, 2000.
3. Rittweger, J. et al. *Eur. J. Appl. Physiol.* 86: 169-173, 2001
4. Rittweger, J. et al. *Int. J. Sports Med.* 23: 428-432, 2002