

The effects of whole body vibration on the physiological responses to one bout of resistance training in healthy individuals



Nitish Mathew, Dr. Glynis Longhurst
Centre for Sport Science and Human Performance
Wintec, Hamilton, New Zealand



Background

- Whole body vibration (WBV) machine also widely known as Vibrator machine/ Power Plate is used as a rehabilitation tool in Physiotherapy and Sports Science, all over the world presently.
- But the physiological responses experienced in general population while using this modality is still not evident.

AIM OF THE STUDY

To determine the effects of whole body vibration on the physiological responses to resistance exercise in normal healthy population, so that it can be used as a guideline for unhealthy population who intend to use WBV for rehabilitation.

Rationale

- 17 students (11 males, 6 females) from Waikato Institute of technology participated in the study (22.5±3.6 years old, 1.7±0.06 m, 72.7±13.5 kg).
- Clients with previous experience in WBV training, musculoskeletal/ cardiovascular issues and contraindications for WBV, were excluded from the study.
- On the control day, participants performed 3 sets of 45 second static squat exercise (with 1 minute intervals), with knees flexed 90 degrees and feet 40 cm apart, over the WBV platform without the machine switched on.
- On the intervention day, they performed the same exercise with the WBV machine switched on low intensity.
- Heart rate, blood pressure, oxygen consumption and rate of perceived exertion were recoded throughout the test.

Statistical Analysis

Table 1. Significant physiological changes observed

CHANGE	WITHOUT WBV	WITH WBV
Increase in heart rate	10	7
Increase in oxygen consumption	11	6
Increase in systolic blood pressure	9	8
Diastolic blood pressure	↑ 5	Equal for n=7 ↑ 5
Rate of perceived exertion	↑ 4	Equal for n= 6 ↑ 7

Fig 1. ↑ IN HEART RATE

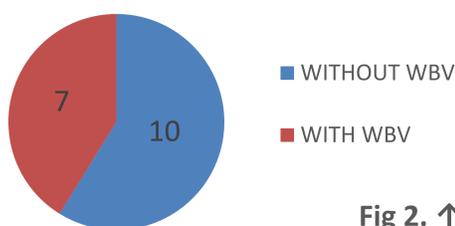


Fig 2. ↑ IN OXYGEN CONSUMPTION

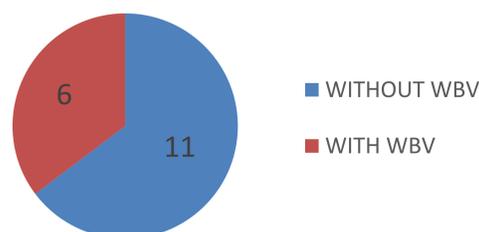
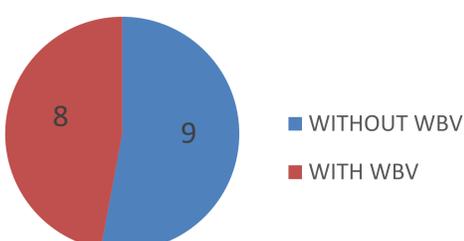


Fig 3. ↑ IN SYSTOLIC BLOOD PRESSURE



Discussion

- When comparing the mean increase in heart rate, it was observed that there were lesser subjects who experienced this increase after the session with whole body vibration supporting the results of Hazell (2010), Robbins, Yoganathan and Goss- Sampson (2013). However, higher heart rates were observed with WBV in a similar study by Osawa & Oguma (2011). But at the same time, they state that the results were not significant enough to prove that WBV has the potential to increase the heart rate if the intensity, type of vibration and duration of the session is progressed as per the capacity of each client. This statement is supported by Liston, et. al (2014) after their study which proved that heart rate increases only with higher vibration frequency.
- It was also observed that the mean oxygen consumption recorded for the subjects after the session with whole body vibration was lesser than that without WBV. The methodology by Osawa and Oguma (2011) is synonymous with that of the present study, however, they had observed higher VO2 values in the first and second set of exercises with WBV compared to that without WBV. In the study by Hazell (2010), it was noted that the total oxygen consumption increased by 23% with the resistance exercise in whole body vibration machine in comparison to that without WBV. Perhaps Osawa had performed the study using a 3 axial WBV with frequency set at 35 Hz and amplitude at 2mm. On the other hand, the study by Hazell involved a longer period of resistance exercise on WBV. This gives an estimate that WBV set at suitable modes and frequency may cause less exertion and fatigue for individuals.
- There was no significant data observed on the variation in blood pressure for both sessions. There was an equal distribution of data for resting and exercise blood pressure in the session with WBV in comparison to the control day. The study by Robbins, et. al. (2013) and Medeiros, et. al. (2011) also supports this statement, giving an estimate that WBV provides the same physiological responses of change in blood pressure when compared to that of normal resistance exercises.
- In addition to these results, it was also observed from the final comments of participants that WBV produced almost the same exertion or little exertion in comparison to resistance exercise without WBV.
- It was observed from the present study that WBV creates general physiological responses which are experienced while doing any physical activity. However, these responses are either lesser or almost same to that of a resistance exercise, if WBV is prescribed as per the condition of an individual. Keeping in mind, WBV produces the musculoskeletal benefits as the market claims of, it is thus suggestive to be introduced for special populations as well, after performing extensive investigations for dynamic exercises over the WBV platform in different intensities.

Conclusions

This study provides data which pointed out change in physiological responses in a bout of resistance exercise on whole body vibration machine. However, when comparing the increase in each responses for the participants on both days, it was seen that most participants experienced less fatigue and discomfort in the session on WBV. Therefore a resistance exercise with whole body vibration could be prescribed for general population, provided the intensity and duration is progressed as per the capacity of the subject.

References

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