The Acute Effects of Whole Body Vibration in College-Aged Individuals

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Abstract: Whole-body vibration (WBV) training is a method of exercise where the individual is exposed to varying frequencies and amplitudes of mechanical vibratory stimuli. WBV training has shown to activate muscle spindle fibers and it has been suggested that WBV may have a beneficial effect on balance and stability. However few studies have been conducted to assess the effects of acute WBV on these parameters. Descriptive statistics were determined by matched pairs T-test for all stability assessments in degrees of movement off level (0.0°). Baseline stability measures while standing (0.43° ± 0.30°) compared to post WBV (0.45° ± 0.36°) showed no significant difference (p > 0.05).

1. Introduction

Exposure to the vibration is accomplished by performing static or dynamic exercise on the vibration platform (Rehn, 2007). The mechanical action of the vibration produces short changes in the muscle tendon complex, which leads to an activation of the tone vibration reflex (Cardinale, 2003). This reflex in conjunction with skeletal muscles attempting to dampen the vibratory waves, excite muscle spindle endings, and improve muscle performance. WBV training has shown to activate muscle spindle fibers and it has been suggested that WBV may have a beneficial effect on balance and stability (Cardinale, 2003).

Studies have also shown WBV to improve neuromuscular activity. Vibratory stimulus is perceived by sensory structures (neuromuscular spindles, skin, joints and secondary endings). This stimulates the neuromuscular system to produce the reflex muscle activation. If the stimulus is short then it created the potential for a more powerful and effective voluntary activation of skeletal muscle (Cardinale 2003).

There is little material about the effect of acute vibration on postural stability. Since WBV induces positive neurological and muscular changes, it is thought WBV should help balancing ability as well as postural stability (Cheung, 2007). Due to the possibilities for WBV intervention, it is important to assess the acute effects of WBV on balance. The purpose of this study was to assess the immediate effect of acute WBV on postural stability.

2. Experiment, Results, Discussion, and Significance

13 college aged students (23.38 ± 2.06 years) participated in a stability test before and after acute exposure to vibration. All participants were informed of the procedures and risks involved. Participants then completed a PAR Q health status questionnaire and an informed consent form approved by Wichita State University IRB. Data including gender, age and height were taken.

Participants then completed the postural stability assessment using the Biodex Balance System SD (BIODEX®) for the baseline measurement. The postural stability test included the standing position (both feet), as well as right and left legs for 30 seconds each with a 10 minute rest period between assessments. After a 5 minute rest period WBV was administered to the participants using the WAVE vibration plate (Wave®). The subjects stood with both feet flat on the vibration plate for a one time exposure to WBV for 60 seconds at a frequency of 40Hz. Immediately following WBV the subjects were again assessed for postural stability under the same protocol as the first assessment. Results for postural stability were presented relative to the normal reference data from the Biodex Balance SD. With the results being better, equal or worse than the normative values, with higher numbers representing a more unstable condition. Descriptive statistics were determined by matched pairs T-test for all stability assessments in degrees of movement off level (0.0°). Baseline stability measures while standing (0.43°±0.30°) compared to post WBV (0.45° ± 0.36°) showed no significant difference (p < 0.05). Nor was any significance observed in single leg stability assessments of the movement off level (0.0°).

Baseline stability right and left leg (1.52° ± 1.14° vs 1.61° ± 1.22° and 1.36°±0.79° vs 1.20°±0.85°, respectively).
Descriptive statistics were determined by matched pairs T-test for all stability assessments in degrees of 3.

Conclusions

Results indicate that an acute 60 second bout of WBV at 40Hz does not affect postural stability in college-aged individuals. More studies varying the duration and vibration frequency are needed to determine if and when WBV may affect balance and stability.

References