Effects of Seated Vibration Training on Dynamic Postural Control and Power in Young Adults

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Introduction

- Previous training protocols have typically required participants to stand while vibration is administered[1], which is challenging for some individuals.
- Seated vibration training may be a feasible alternative in some instances; however, seated vibration training on dynamic postural control and lower extremity power has not been examined.

Purpose

The purpose of the study was to examine the effects of seated vibration training on dynamic postural control and lower extremity power in young adults.

Methods

Participants:

- 16 healthy participants (10 females, 6 males), 21 to 34 years of age.

Mean Age	Mean Height	Mean Weight
24.8 ± 3.0 y	1.74 ± 0.08 m	72.98 ± 9.3 kg

- *Protocol:*
- Participants performed a seated leg press protocol while receiving vibration to their bare feet for 10 minutes, twice a week, for four weeks. We used VibeTech (VibeTech, Inc, Sheboygen, WI) to administer mechanical vibration (Frequency: 30 Hz, Amplitude: 0.25 mm) (Figure 1).
- Average sway velocity (Movement Velocity) and maximum sway excursion (Maximum Excursion) of limits of stability were measured in the forward, backward, right, and left directions at baseline (pre) and after the 4-week training period (post), using Bertec's computerized dynamic posturography system (Bertec Corp, Columbus, OH) (Figure 2), to assess dynamic postural control.
- Peak lower extremity power during a maximal vertical jump was measured pre- and post-training. Vertec was used to measure jump height. Lower extremity power was calculated based on the following formula: P= (√4.9x (weight) x √D)
- Post-training measurements were collected 24-hrs after the training.

Methods (Continued)

Figure 1: Vibetech Vibration System

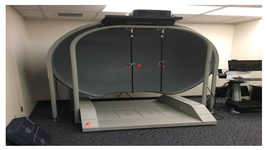


Figure 2: Bertec

Analysis:

- We analyzed sway velocity and sway excursion using a Two-way ANOVA with within-factors of direction and time.
- We used a paired t-test to compare lower extremity power (post vs. pre).
- We used SPSS (Version 26, IBM Corp. Armonk, NY) to analyze data. The Alpha was set to .05.

Results

- There were no direction-by-time interaction effects for sway velocity or sway excursion (p≥.361); however, there were main effects of time for the sway velocity (p=.049) and sway excursion (p=.016) measures.
- Both the sway velocity and sway excursion increased in all four directions following training (Figure 3 and 4).

Figure 3: Means of Sway Velocity by Time and Direction

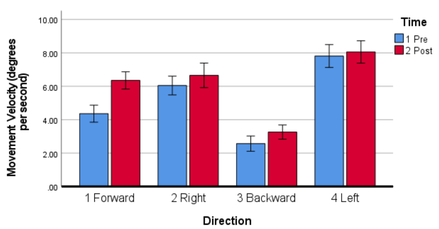
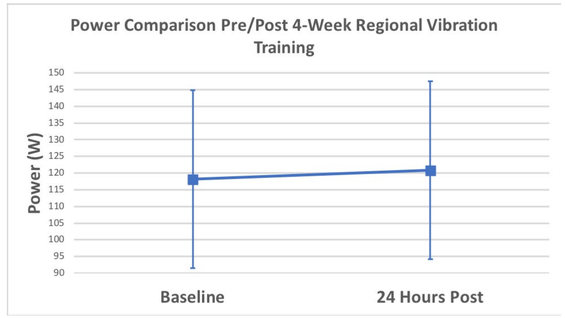


Figure 4: Means of Sway Excursion by Time and Direction

Results (Continued)

- Peak lower extremity power during jumping also increased by 2.3% following training (p=.011).



Discussion

- Limits of stability is the ability to intentionally move the center of gravity (COG) to a maximum distance in multiple directions without losing balance.[2,3]
- Reduced sway velocity and maximum excursion may indicate neuromuscular impairments.[2]
- Reduced lower extremity power also has been associated with increased risk for falls.[4]
- Mechanical vibration has known to improve strength and power. Mechanical vibration through the oscillation of vibrating platform has been reported to produce muscle contractions as a reflex mechanism.[5–7]
- Increased sway velocity, sway excursion, and lower extremity power from our study aligns with these other research findings. Thus, our study suggests that combining resisted exercise while receiving mechanical vibration in a seated position may improve dynamic postural control and balance.

Conclusions and Implications

Seated mechanical vibration may be a viable alternative to standing mechanical vibration to promote improvements in dynamic postural control and lower extremity power.

Suggestion for future studies

- Using a control group may improve the validity of the study results
- Controlling subjects not to exercise on the days of data collection may reduce the confounding effects.

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