Athletic Training

# The Effectiveness of Whole-Body Vibration on Improving Balance in Athletes with Chronic Ankle Instability

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## INTRODUCTION

Chronic ankle instability is a condition that can occur after multiple ankle injuries, or one severe ankle injury, and can effect balance, proprioception and walking mechanics[1]. This can become a never ending cycle and cause other problems along the kinetic chain[1]. Improving balance[3] can be helpful in rehabilitating those with chronic ankle instability. Whole body vibration treatment (WBV), is vibration delivered at a specific amplitude and frequency through a platform that the patient is standing on, while balance training is completing exercises at different difficulties of unstable surfaces. WBV has been used to help increase neuromuscular control and proprioception[2] in lower extremity injury rehabilitation but very little is known about WBV's effect on balance. Balance in patients with CAI has been seen to improve with balance training[2] but there is little research on the effects of using WBV in this population[2]. The purpose of this paper is to assess the effectiveness of whole-body vibration treatment improving balance in athletes with chronic ankle instability, when compared to balance training programs.

## OBJECTIVE

Does Whole-Body Vibration treatment effectively improve balance in athletes with Chronic ankle Instability more than balance training?

## SEARCH STRATEGY

**Terms Used to Guide Search Strategy**

- **P**atient/Client Group: Athletes with Chronic Ankle Instability (CAI)
- **I**ntervention/Assessment: Whole Body Vibration treatment (WBV)
- **C**omparison: Balance program and No rehabilitation (Control)
- **O**utcome: Improved Balance Using Star Excursion Balance Test

**Sources Used for Search**

- SPORTSDiscus
- PubMed
- EBSCOHost

**Terms Used for Search**

- Chronic Ankle Instability
- Whole body vibration
- CAI and Athlete
- WBV and CAI

**Inclusion Criteria**

- Studies published in English
- Studies that are public
- Studies that were published within the last 5 years
- Studies that used the Star Excursion Balance Test for primary outcome measure
- Studies that compared WBV to a control group

**Exclusion Criteria**

- Participants under the age of 18
- Studies that assessed other primary outcomes with WBV
- Studies that used an "active population"

## RESULTS

| | Chang et al 2021 | Guzman et al 2018 |
|---|---|---|
| Study Design | Randomized Control Trial | Randomized Control Trial |
| Participants | n = 63 females (Age: 18-23)<br>**Inclusion**: female athletes with a history of at least one ankle sprain, lateral ankle instability of the dominant leg with a Cumberland Ankle Instability Tool (CAIT) score ≤24, and a continuous feeling of the ankle "giving way" for at least a year.<br>**Exclusion**: recent ankle sprain, a history of surgery in either leg, and any musculoskeletal diseases of the lower extremities. | n= 50 (33 males and 17 females) (Age 20-25)<br>**Inclusion**: history of at least 1 substantial ankle sprain (3+ months prior to study), 2+ episodes of the ankle "giving way" in past 6 months, and a score of ≤24 on the Spanish version of the Cumberland Ankle Instability Tool (CAIT)<br>**Exclusion**: History of previous lower extremity musculoskeletal surgery; fracture in either lower extremity requiring realignment; or acute lower extremity musculoskeletal joint injury in past 3mos before the study that affected joint integrity and function that resulted in at least 1 lost day of desired physical activity |
| Interventions Investigated | 6-week (30min session 3x/week) training program of:<br>- Whole Body Vibration (Group A, n=21),<br>- Balance Training (Group B, n=21),<br>- No training program (Group C, n=21)<br>- Both groups A and B completed the same exercises and a progression in exercises occurred at week 4 through the end of the program. | 6-week (30min session 3x/week) training program of:<br>- Whole body vibration (VIB; n= 17, 11 men, 6 women)<br>- Non-vibration (balance training) (NVIB; 10 men, 6 women)<br>- Control (CON; 12 men, 5 women).<br>- Both groups VIB and NVIB completed the same exercises and a progression in exercises occurred at week 4 through the end of the program. |
| Main Findings | **Star Excursion Balance Test:** Post hoc tests indicated no significant differences within groups before assessment in terms of composite score and individual directions (p > 0.05). Between Groups A and C, the anteromedial (p = 0.01), posterolateral (p = 0.03), and lateral (p = 0.03) directions in the SEBT were significantly different. Composite score and individual directions were higher in Group B than in Group C (all p < 0.05). A small effect size in composite score on the SEBT was observed (d = 2.34, 95% CI = 1.55–3.12).<br><br>**Joint Position Sense Test:** Post hoc tests indicated when compared with Group C, Groups A and B exhibited significant decreases for an ankle inversion of 15◦ , neutral ankle position, and an ankle eversion of 10◦ (p < 0.05). Between Groups A and C, small to medium effect sizes were also observed for an ankle inversion of 15◦ (d = −0.90, 95% CI = −1.54 to −0.27), neutral ankle position (d = −2.20, 95% CI = −2.97 to −1.43), and an ankle eversion of 10◦ (d = −0.89, 95% CI = −1.52 to −0.25)<br><br>**Isokinetic Strength Test:** Post hoc tests indicated the number of ankle invertor muscle contractions in Group C was significantly lower than those in Groups A and B for 30◦/s of CON (p = 0.01) and 30◦/s of ECC (p = 0.01 and p = 0.001, respectively). Very small effect sizes were observed in 30◦/s of CON ankle inversion after assessment in Group A (d = 1.24, 95% CI = 0.58–1.90) and Group B (d = 1.13, 95% CI = 0.47–1.78) compared with Group C.. | **Star Excursion Balance test**: Moderate to large ESs were present in several directions at Post1 between the VIB and CON groups (medial direction: ES = 0.61; posteromedial direction: ES = 0.73; composite score: ES = 0.54) and NVIB and CON groups (anteromedial direction: ES = 0.82; medial direction: ES =0.58; posteromedial direction: ES = 0.75; composite score: ES = 0.80). VIB group showed increases (P < .05) with moderate to large ESs between Pre and Post1 in the medial direction of 4.93% ±3.78% (P = .008), posterolateral direction of 5.21% ± 9.43% ( P = .04), and composite score of 3.72% ± 4.09% (P = .01). NVIB group, increases with moderate to large ESs were shown between Pre and Post1 in the medial direction of 7.36% ± 10.34% ( P < .001), posteromedial direction of 8.75% ±13.53% ( P = .002), posterolateral direction of 5.32% ±7.93% ( P = .03), and composite score of 5.51% ±6.61% (P , .001).<br><br>**Biodex Balance System test:** There were no differences among the 3 groups for any of the 3 measurements (P > 0.05). Within-group analysis showed decreases in the VIB group between Pre and Post1 in the OSI of -18.69% ±21.58% (P=0.01) and the APSI of -13.28% ±25.34% (P= 0.02) and between Pre and Post2 in the OSI of 20.14% ±24.62% (P= .003) and the APSI of 15.34% ±27.42% (P = .03).<br><br>**Body Composition**: No differences occurred among groups before or after the training (P> 0.05) |
| Level of Evidence | 1b | 1b |
| Validity Score | PEDro= 7/10 | PEDro= 7/10 |
| Conclusions | While both groups A and B improved in all primary outcomes when compared to the control group, Group A, the WBV treatment, did not significantly improve when compared to Group B, the balance training group. These results show that whole body vibration can affect improvements in balance for athletes with CAI but cannot effectively improve balance more than balance training. | When comparing the WBV group (VIB) to the balance training group (NVIB) only the VIB group showed improvements on the Biodex Balance System, both groups displayed better performance on the SEBT. These results show that while dynamic balance will be equally improved for WBV and balance training, WBV had a significantly affected static balance and center of pressure for athletes. |

## CONCLUSION

The present studies investigated the effectiveness of whole-body vibration treatment on improving balance in patients with chronic ankle instability. When compared to balance training, WBV did not significantly improve balance in those with chronic ankle instability. Whole body vibration has been used to help improve neuromuscular control and proprioception[2], both of which are aspects of balance, but has not been shown to effect balance directly. While dynamic balance ability improvements were significant when compared to the control groups[3], there was no significant improvement when compared to balance training[3]. The studies did show that balance training, completing balance exercises on an unstable surface, can still improve balance in athletes with CAI[2]. WBV platforms can be expensive, causing very few clinics to have access, and this research shows that for chronic ankle instability, the platform is unnecessary. There have been very few studies completed on this topic and the results show a need for future research to better understand the effects of whole-body vibration on improving balance. Further research should include assessing if WBV can reduce risk for recurrent ankle sprains in those with CAI[3]. The future research should also include the effect of whole-body vibration treatment on other populations, such as non-athletic or even geriatric populations. The focus for this paper was athletes, but many other patients in non-traditional settings can suffer from CAI[1] and could possibly benefit from a less traditional treatment, like WBV. It is unknown if athletes have a better sense of proprioception and neuromuscular control that help with the mechanisms of balance, when compared to someone of the general population, who could utilize this therapy more. While this paper did not give us the conclusion that was expected, we have still learned from the results and how we can better affect our practice.

## RECOMMENDATION

There is moderate evidence that indicates that WBV does help improve balance but does not improve balance more than a balance training in athletes with CAI. While recent, there is limited research on this topic at this time.

*Strength of recommendation: B (Strength of Recommendation Taxonomy- SORT)*

## REFERENCES

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