

# The Impact of Blood Flow Restriction Therapy on Chronic Ankle Instability: A Systematic Review and Meta-Analysis

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## Summary

This systematic review and meta-analysis explore the impact of Blood Flow Restriction (BFR) therapy on chronic ankle instability (CAI). BFR promotes muscle growth and strength with lighter weights, reduces joint stress, and speeds recovery. Although BFR has been studied for other injuries, its use in CAI has not been systematically studied. This study analyzed randomized clinical trials from multiple databases, comparing BFR's effects to traditional rehabilitation methods. Results indicated significant improvements in balance and patient-reported outcomes, like CAIT scores, with BFR. However, it did not show significant benefits in enhancing ankle strength (e.g., dorsiflexion or plantarflexion), though there were gains in hip strength (abduction and adduction). The analysis highlighted high variability among studies, focusing mostly on short-term effects. The review suggests BFR could benefit balance in CAI but recommends further research on its long-term impact and strength advantages.

## Introduction

Blood Flow Restriction (BFR) has demonstrated beneficial effects by enabling muscle growth and strength with lighter weights, thereby reducing joint stress [1]. This technique can benefit individuals recovering from joint injury by enhancing muscle strength without heavy lifting, potentially accelerating recovery and improving physical performance. BFR training has been studied extensively in post-ACL reconstruction, but its application in chronic ankle instability (CAI) remains underexplored. This systematic review (SR) aims to bridge this gap by investigating the effects of BFR training in individuals with CAI and comparing its benefits to traditional forms of physical therapy rehabilitation.

## Methods

Two independent reviewers conducted an extensive search of the SR database using four databases (PubMed, Scopus, CINAHL, SPORTDiscus). Studies were excluded if they were conducted before 2000, not in English, or were not randomized clinical trials. A final search was conducted on January 1, 2025.

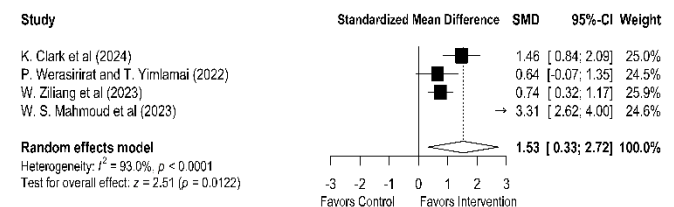
After deduplication and initial screening of titles and abstracts, nine full-length articles that met the inclusion criteria were selected for this study. Two independent raters used the Physiotherapy Evidence Database (PEDro) quality appraisal tool to assess the articles. Two reviewers independently extracted data on study design, participant

details, criteria, interventions, outcomes, and results. A random-effects meta-analysis compared intervention versus control groups from studies with at least two trials, using Standardized Mean Differences (SMDs) with 95% confidence intervals (CIs). Effects were considered insignificant if the CIs included zero.

## Results and Discussion

BFR therapy was superior to the control in significantly improving balance (SMD range = 0.33 to 2.72) (Figure 1) and patient-reported outcomes, such as CAIT measures (SMD range = 0.04 to 2.84). However, no significant superiority of BFR groups was observed for FAAM-ADL (SMD range = -0.06 to 0.68) or FAAM-Sport (SMD range = -0.18 to 0.79). We also noted significant improvements in hip abduction strength (SMD range = 0.01 to 1.13) and hip adduction strength (SMD range = 1.12 to 1.92). However, there were no significant improvements observed in ankle strength measures, including dorsiflexion strength (SMD range = -0.36 to 3.17), plantarflexion strength (SMD range = -1.00 to 4.69), inverter strength (SMD range = -1.07 to 3.28), and evertor strength (SMD range = -2.43 to 8.55).

**Figure 1:** Forest plot and meta-analysis of BFR therapy compared with control group for balance



## Conclusions

This is the first comprehensive systematic review and meta-analysis to comprehensively examine the effects of BFR in CAI compared to conventional rehabilitation. Our analysis revealed that BFR significantly improves balance based on patient-reported outcomes. Although trends favored BFR, its superiority in strength improvement was not statistically significant. Furthermore, we observed high heterogeneity across most studies included in this review. The data predominantly reflect short-term effects. Therefore, more high-quality RCTs are needed to elucidate the long-term effects of BFR in CAI.

## References

- [1] Cognetti DJ et al. (2022). *Arthrosc Sports Med Rehabil*, 4: e71-e76.