

The Effects of Acute Whole-Body Vibration Exercise on Power, Strength, and Flexibility: A Meta-Analysis of Randomized Controlled Trials

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ADMINISTRATIVE INFORMATION

**Support** - No support.  
**Review Stage at time of this submission** - Data analysis.  
**Conflicts of interest** - None declared.  
**INPLASY registration number:** INPLASY202580067

**Amendments** - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 22 August 2025 and was last updated on 22 August 2025.

INTRODUCTION

**Review question / Objective** This meta-analysis aimed to evaluate the acute effects of WBV on power, strength, and flexibility in healthy individuals.

**Condition being studied** The acute effects of whole-body vibration (AWBV) exercise on physical performance outcomes, specifically power, strength, and flexibility, in healthy individuals across different levels of training status (recreational, trained, and elite). This review does not target clinical populations but focuses on athletic and physically active groups.

METHODS

**Participant or population** Participants were healthy.

**Intervention** The intervention was acute whole-body vibration (AWBV) exercise, which was defined as a single session of whole-body vibration

exposure, designed to elicit immediate or short-term effects on physical performance outcomes such as power, strength, and flexibility.

**Comparator** Control group underwent the same exercise as the intervention group but without vibration (sham vibration).

**Study designs to be included** RCTs.

**Eligibility criteria** (1) participants were healthy; (2) the intervention was acute whole-body vibration (AWBV) exercise, which was defined as a single session of whole-body vibration exposure, designed to elicit immediate or short-term effects on physical performance outcomes such as power, strength, and flexibility. (3) control group underwent the same exercise as the intervention group but without vibration (sham vibration); (4) outcomes related to the effects of AWBV on power, strength, and flexibility; (5) randomised controlled trials (RCTs); (6) English articles with full text.

**Information sources** Web of Science, Scopus, PubMed, and SPORTDiscus databases were queried.

**Main outcome(s)** The primary outcomes of interest are the acute effects of whole-body vibration (WBV) exercise on physical performance in healthy individuals. Specifically, this review will evaluate:

1. Power – measured by countermovement jump height (CMJH), squat jump height (SJH), and drop jump height (DJH).
2. Strength – measured by maximal voluntary contraction or functional strength outcomes (e.g., handgrip strength).
3. Flexibility – measured by standardized field tests such as the sit-and-reach test.

**Quality assessment / Risk of bias analysis** The Cochrane risk of bias tool (RoB 2) was utilized.

**Strategy of data synthesis** Data will be synthesized quantitatively using Comprehensive Meta-Analysis software (CMA, version 3). Standardized mean differences (Hedges'  $g$ ) with corresponding 95% confidence intervals will be calculated for continuous outcomes. A random-effects model will be applied to account for expected heterogeneity across studies. Statistical heterogeneity will be assessed using the  $I^2$  statistic, with thresholds of 25%, 50%, and 75% representing low, moderate, and high heterogeneity, respectively.

For crossover RCTs, when an adequate washout period ( $\geq 24$  hours) is reported, each intervention condition will be treated as an independent data point. If studies include multiple WBV intervention groups (e.g., differing in frequency or amplitude), the group showing the greatest improvement will be included to avoid multiple comparisons from a single sample.

Publication bias will be assessed through visual inspection of funnel plots and statistically by Egger's regression test. Where significant asymmetry is detected, the trim-and-fill method will be applied. Sensitivity analyses (leave-one-out approach) will also be performed to examine the robustness of pooled results.

**Subgroup analysis** Subgroup analyses will be conducted where data permit, including playing level (recreational, trained, elite), measurement time (immediate vs. delayed), vibration frequency ( $\leq 30$  Hz vs.  $> 30$  Hz), amplitude ( $\leq 3$  mm vs.  $> 3$  mm), and duration ( $\leq 3$  min vs.  $> 3$  min).

**Sensitivity analysis** A significant p-value ( $p < 0.05$ ) suggested funnel plot asymmetry and potential underrepresentation of small studies with non-significant or negative results. In such cases, sensitivity analyses were conducted, and the trim-and-fill method was used to adjust for potential bias. A non-significant p-value ( $p \geq 0.05$ ) indicated no strong evidence of publication bias.

**Language restriction** English.

**Country(ies) involved** China.

**Keywords** acute whole-body vibration; physical fitness; jump; sports.

**Contributions of each author**

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