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The Effects of Whole-Body Vibration Training on Physical Fitness and Skilled-Related Performance on Basketball Players: A Systematic Review and 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: INPLASY202530013

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 4 March 2025 and was last updated on 4 March 2025.

INTRODUCTION

Review question / Objective This systematic review and meta-analysis aimed to evaluate the effects of WBV training on physical fitness and skill-related performance in basketball players, synthesizing evidence from randomized controlled trials.

Condition being studied WBV training has been widely studied across sports and populations. For instance, reviews show it boosts lower-limb power in athletes, strengthens muscles in older adults, and improves flexibility in gymnasts, suggesting broad applicability. Despite this robust evidence, no systematic review has investigated the effect of WBV on basketball players, a population requiring both peak physical fitness and refined skills like shooting and dribbling. While individual trials hint at benefits, such as enhanced jump performance or strength, these findings remain fragmented and are not synthesized.

METHODS

Participant or population Basketball players.

Intervention Whole-Body Vibration Training.

Comparator Without Whole-Body Vibration Training.

Study designs to be included RCTs.

Eligibility criteria (1) studies published in English with accessible full text; (2) participants were basketball players, with no restrictions on basic fitness level or experience; (3) the intervention involved whole-body vibration training (WBV); (4) control groups either engaged in regular training without WBV or studies that lacked control groups; (5) outcomes assessed the impact of WBV on physical fitness (e.g., strength, power, speed) and basketball performance (e.g., passing, shooting, dribbling); (6) included randomized controlled trials (RCTs) or non-controlled trials.

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

Main outcome(s) Physical Fitness and Skilled-Related Performance.

Quality assessment / Risk of bias analysis To assess the risk of bias in randomized controlled trials (RCTs), two authors applied the Cochrane risk of bias tool (RoB 2).

Strategy of data synthesis Studies that provided three or more baseline and follow-up data points for the same variables, along with a control group, were included in the meta-analysis using Meta-analysis software (version 3), with a significance level set at $p < 0.05$. Studies with outcomes that could not be compared to others, such as those using different measurement methods or scales for the same variables, were only included in the systematic review.
In the meta-analysis, the between-group effect sizes (ES; Hedge's g) were computed (mean ± SD). A random-effects model with inverse-variance weighting was employed in the meta-analysis to account for heterogeneity among studies. The I^2 statistic was used to evaluate heterogeneity, with values categorized as low (75%). Group effect sizes (ES) were calculated using Hedge's g, and 95% confidence intervals (CIs) were provided for ES measurements. The effect sizes were classified as follows: trivial (0.6 - 1.2), large (>1.2 - 2.0), very large (>2.0 - 4.0), and extremely large (>4.0) (Hopkins et al., 2009). When authors did not provide adequate data, attempts were made to contact the corresponding author. The outcomes were excluded from the analysis if the data could not be obtained. WebPlotDigitizer software was used to extract numerical data when the data were only presented in figures or images (Drevon et al., 2017).
The extended Egger's test assessed the risk of publication bias across studies (Egger et al., 1997). A sensitivity analysis was conducted when Egger's test yielded a low p-value ($p < 0.05$), suggesting significant asymmetry in the funnel plot. This indicated that smaller studies with non-significant or negative results might be underrepresented in the meta-analysis (Egger et al., 1997). A higher p-value ($p \geq 0.05$) showed a symmetrical funnel plot, suggesting no strong evidence of missing studies based on size and effect (Egger et al., 1997). When bias was detected, the trim and fill method was applied. Stratification of the meta-analyses was conducted for each factor, with a significance level of $p < 0.05$ used to determine statistical significance (Shuster, 2011).

Subgroup analysis Subgroup analysis is conducted when heterogeneity ($I^2 > 50\%$) is present or when investigating how specific study characteristics influence the effect size.

Sensitivity analysis Sensitivity analysis assesses the robustness of the results by checking whether findings remain consistent after removing studies with potential bias or outliers.

Language restriction English.

Country(ies) involved China, Malaysia.

Keywords WBV, baskebtall, sports, exercise, power.

Contributions of each author
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