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Meta-Analysis Sports Med. 2025 Apr;55(4):923-936. doi: 10.1007/s40279-024-02169-z.

Epub 2025 Jan 10.

# Comparison of Muscle Growth and Dynamic Strength Adaptations Induced by Unilateral and Bilateral Resistance Training: A Systematic Review and Meta-analysis

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PMID: 39794667 DOI: 10.1007/s40279-024-02169-z

## Abstract

**Background:** Currently, great debate exists over the proposed superiority of some resistance exercises to induce muscular adaptations. For example, some argue that unilateral exercise (meaning one limb at a time) is superior to bilateral exercises (meaning both limbs). Of note, an evidence-based answer to this question is yet to be determined, particularly regarding muscle hypertrophy.

**Objective:** This systematic review and meta-analysis aimed to compare the effects of unilateral versus bilateral resistance training on muscle hypertrophy and strength gains.

**Methods:** A thorough literature search was performed using PubMed, Scopus, and Web of Science databases. The Cochrane Risk of Bias tool 2 (RoBII) tool was used to judge the risk of bias. Meta-analyses were performed using robust variance estimation with small-sample corrections.

**Results:** After retrieving 703 studies, 9 met the criteria and were included in the meta-analyses. We found no significant differences in muscle hypertrophy between bilateral and unilateral training [effect size (ES): - 0.21, 95% confidence interval (95% CI): - 3.56 to 3.13, P = 0.57]. Bilateral training induced a superior increase in bilateral strength (ES: 0.56, 95% CI: 0.16-0.96, P = 0.01). In contrast, unilateral training elicited a superior increase in unilateral strength (ES: - 0.65, 95% CI: - 0.93 to - 0.37, P = 0.001). Overall, studies presented moderate risk of bias.

**Conclusion:** On the basis of the limited literature on the topic, we found no evidence of differential muscle hypertrophy between the two exercise selections. Strength gains appear to follow the principle of specificity.

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