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Effects of strength training on jump performance in dancers and aesthetic sports practitioners: A systematic review and meta-analysis

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ADMINISTRATIVE INFORMATION

Support - None.

Review Stage at time of this submission - Data analysis.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 19 August 2025 and was last updated on 19 August 2025.

INTRODUCTION

Review question / Objective Review question: What are the effects of strength training interventions on jump performance in dancers and aesthetic sports practitioners?
Objective: This study aims to evaluate the effects of strength training on jump performance in dancers and aesthetic sports practitioners through a systematic review and meta-analysis. It seeks to determine whether, and to what extent, strength training can effectively enhance jump performance in this population. By synthesizing and analyzing relevant controlled trials and intervention studies, this study intends to provide evidence-based recommendations for dance educators, coaches, and training program designers to optimise training strategies, improve performance, and reduce potential injury risks.

Rationale Strength training, as a core approach to improving muscular strength and power, has been widely shown to enhance vertical jump height, flight time, and lower limb neuromuscular control (Markovic & Mikulic, 2010; Suchomel et al., 2016). For dancers and aesthetic sports practitioners, it not only increases lower limb strength reserves to improve jump performance (Angioi et al., 2009; Annino et al., 2007), but may also reduce injury risk through better muscle coordination and joint stability (Wu et al., 2011). Previous studies have demonstrated its benefits for jump height, rotational stability, and aesthetic quality of performance (Brown et al., 2007; Du, 2020; Pei, 2023). However, findings remain inconsistent: while some studies report significant improvements (Ambegaonkar et al., 2014; Mirela et al., 2014; Sozbir et al., 2014), others suggest limited or context-dependent effects (Roussel et al., 2014). A recent systematic review with meta-analysis confirmed that strength training improves dancers' physical fitness, particularly muscular strength (ES = 1.84) and power (ES = 0.64) (Yang et al., 2025), yet no review has specifically addressed jump performance. Therefore, a systematic review and meta-analysis focusing on this outcome is warranted.

Condition being studied Condition being studied: Jump performance (e.g., vertical jump height, flight time) in dancers and aesthetic sports practitioners, with specific attention to the effects of strength training interventions.

METHODS

Search strategy A comprehensive literature search was conducted in PubMed, Web of Science Core Collection, Scopus, SPORTDiscus, and the Cochrane Library from inception to June 1, 2025. The search strategy combined terms related to the population (dancers and aesthetic sports practitioners), the intervention (strength or resistance training), and the outcome (jump performance), using both controlled vocabulary (e.g., MeSH terms in PubMed) and free-text keywords. The main search terms included dance, aesthetic sports, ballet, ballroom, jazz, rhythmic gymnastics, figure skater, artistic swimmer, artistic gymnast, strength training, weight training, resistance training, plyometric training, power training, jump, jump performance, vertical jump, explosive strength, and explosive power. These terms were combined using Boolean operators (AND/OR), and an example of the PubMed search string was: "((strength training OR weight training OR resistance training OR plyometric training OR power training)) AND ((jump OR jump* performance OR vertical jump OR explosive strength OR explosive power)) AND ((dance* OR aesthetic sports OR ballet OR ballroom OR jazz OR rhythmic gymnastics OR figure skater OR artistic swimmer OR artistic gymnast))". In addition, Google Scholar was used for supplementary searches. Reference lists of the included studies and relevant reviews were also manually screened to identify additional eligible studies.

Participant or population Dancer and aesthetic sports practitioners.

Intervention Strength training interventions, including resistance training, plyometric training, weighted training, or core strength training, either alone or in combination with regular practice.

Comparator Control group performing regular dance or sport-specific training, general physical training, or no additional intervention.

Study designs to be included Randomized controlled trials (RCTs) or other controlled trials.

Eligibility criteria Eligible studies were randomized controlled trials or controlled trials involving dancers or aesthetic sports practitioners, in which strength training was applied as the primary intervention. Studies were required to report at least one objective jump performance outcome (e.g., vertical jump height, countermovement jump height, flight time). Full-text articles written in English or Chinese and providing sufficient data for analysis were included. Studies were excluded if they were non-controlled designs, reviews, conference abstracts, dissertations, or if the intervention effects of strength training could not be isolated.

Information sources A comprehensive literature search was conducted in PubMed, Web of Science Core Collection, Scopus, SPORTDiscus, and the Cochrane Library from inception to June 1, 2025. In addition, Google Scholar was used for supplementary searches. Reference lists of the included studies and relevant reviews were also manually screened to identify additional eligible studies.

Main outcome(s) Primary outcome(s): Jump performance, including (1) general jump tests (e.g., vertical jump height, countermovement jump, squat jump, flight time, jump power) and (2) sport-specific jump performance assessed through validated or standardized dance/aesthetic sports movements.

Quality assessment / Risk of bias analysis The risk of bias of randomised controlled trials (RCTs) was independently assessed by two reviewers (MA, SL) using the Cochrane Risk of Bias tool version 2 (RoB 2). For non-randomized studies of interventions (NRSIs), the Risk Of Bias In Non-randomized Studies of Interventions (ROBINS-I) tool was applied. Any disagreements between reviewers were resolved through discussion or consultation with a third reviewer (KGS) when necessary.

Strategy of data synthesis All statistical analyses will be performed using Comprehensive Meta-Analysis (CMA) software, version 3.7. Effect sizes (ES) will be calculated based on post-intervention data of the experimental and control groups. For studies with multiple intervention groups, the sample size of the control group will be evenly divided across the experimental groups to avoid double-counting. When studies do not directly report mean and standard deviation values, data will be converted into the required format using standard formulas. To account for small sample sizes, Hedges' g will be used as the standardized effect size. Forest plots will be generated to illustrate pooled effect sizes and heterogeneity estimates. Meta-analyses will only be performed

when at least three studies report the same outcome. A random-effects model with a 95% confidence interval (CI) will be applied in all meta-analyses. The magnitude of the effect size will be interpreted as follows: trivial (ES < 0.2), small (0.2 ≤ ES ≤ 1.2), large (1.2 < ES ≤ 2.0), very large (2.0 4.0). Heterogeneity will be quantified using the I^2 statistic, with values of 75% indicating low, moderate, and high heterogeneity, respectively. Publication bias will be examined using Egger's regression test. When the number of included studies exceeds 10, funnel plots will be additionally inspected to visually assess asymmetry.

Subgroup analysis None.

Sensitivity analysis In cases of high heterogeneity, sensitivity analyses will conduct by sequentially removing individual studies to assess the robustness of the findings.

Country(ies) involved Malaysia and China.

Keywords Strength training, Jump performance, Dancers, Aesthetic sports, Systematic review, Meta-analysis.

Contributions of each author

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