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Resistance Training and Drop Jump Derived Reactive Strength Index: A Systematic Review and Meta-Analysis of Training Modality Effects

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ADMINISTRATIVE INFORMATION

Support - No support.

Review Stage at time of this submission - Completed but not published.

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 8 September 2026 and was last updated on 8 September 2026.

INTRODUCTION

Review question / Objective To systematically review and meta-analyse the effect of resistance training on drop jump derived reactive strength index (RSI) in healthy adults, and to compare the effects of plyometric, ballistic, strength, and combined training modalities on this outcome.
Population: Healthy, uninjured adults (≥18 years), including both athletic and non-athletic/ recreationally trained populations.
Intervention: Structured resistance training interventions of ≥4 weeks duration, classified as plyometric, ballistic, strength, or combined training.
Comparison: Pre- to Post- intervention RSI values within the same cohort. Effects are additionally compared across training modality subgroups.
Outcome: Bilateral drop jump derived RSI assessed under fast stretch-shortening cycle conditions (ground contact time ≤250 ms).

Rationale Reactive strength underpins fast stretch shortening cycle athletic tasks such as sprinting, jumping, and change of direction. While plyometric, ballistic, strength, and combined resistance training are all proposed to enhance reactive strength, prior meta-analyses have been limited by inclusion of heterogeneous outcomes and by classifying interventions using author assigned labels rather than a mechanistic classification of prescribed exercises. This review addresses these limitations by restricting outcomes to fast stretch shortening cycle, drop jump derived RSI and reclassifying interventions mechanistically, to clarify which training modalities most effectively develop reactive strength and whether effects are moderated by population or duration.

Condition being studied No health condition is being studied. The outcome is a strength testing metric, RSI. RSI is a ratio metric of jump height or flight time divided by ground contact time in a drop jump, rebound jump, or repeated hopping task.

METHODS

Search strategy In January 2026 the databases Web of Science, SPORTDiscus, and PubMed were searched using key phrases and search terms to identify eligible peer-reviewed English 148 language original research articles.
Category 1: "Adaptation" OR "adaptations" OR "Changes" OR "Training" OR "Longitudinal" OR "Intervention" OR "Development"
Category 2: "reactive strength" OR "drop jump" OR "depth jump" OR "drop-jump" OR "reactivity index".

Participant or population Healthy, uninjured adults (≥18 years). Both athletic (competitive/ trained) and non-athletic or recreationally trained populations were eligible.

Intervention Structured resistance training interventions of ≥4 weeks duration. Mechanistically classified as plyometric, ballistic or strength training based on ≥60% of prescribed lower-body exercises being drawn from a single modality, interventions with no single dominant modality were classified as combined training. Studies that only included unconventional methods were excluded.

Comparator A comparison of pre- and post-intervention RSI values were used within intervention groups. Additionally, plyometric, ballistic, strength, and combined training was compared. Population and intervention duration sub analysis also occurred.

Study designs to be included Randomised controlled trials, non-randomised controlled trials, and single-group (pre-post) intervention studies.

Eligibility criteria Studies were deemed eligible if they 1) involved healthy/ uninjured adults (≥18 years) 2) implemented a ≥4-week structured plyometric, ballistic, strength, or combined training intervention, 3) reported an outcome measure of bilateral RSI derived from a DJ 4) DJ testing protocols cued for maximal jump height and minimal contact time and/or GCT was reported as ≤250ms. Studies were excluded if they only included unconventional training methods (e.g., vibration, electrical stimulation, eccentric, isometric, flywheel) or lacked sufficient quantitative data for inclusion in the meta-analysis (e.g., missing group-specific sample sizes, missing measures of central tendency and variability, and or reporting results in figures alone).

Information sources Three electronic databases were searched: Web of Science, SPORTDiscus, and PubMed (searched January 2026). No additional sources (e.g., trial registers, grey literature, or direct author contact) were used to identify studies.

Main outcome(s) The primary outcome was bilateral drop jump derived RSI, standardised to $m \cdot s^{-1}$, assessed under fast stretch shortening cycle conditions (GCT ≤250 ms). Effects were calculated as the standardised mean difference (SMD) between pre- and post-intervention values, using a random-effects (multi-level mixed-effects) model accounting for dependency among effect sizes from the same study. Where multiple drop jump heights were reported, data from the height producing the highest pre-intervention RSI were used, for studies with pre-, mid-, and post-testing, only pre- and post-intervention data were included.

Data management Search results were imported into EndNote (Version 21, Clarivate, Philadelphia, USA) for title and abstract screening. Data extraction used a standardised Excel spreadsheet on an institutional password protected laptop. Each study received a unique study identifier, with separate group identifiers for individual intervention arms, allowing studies with multiple eligible arms to be extracted as separate comparisons. Extracted data included descriptive study characteristics, participant characteristics, intervention details, outcome-specific details (RSI calculation method, drop jump height, verbal cueing, instrumentation), and group-specific sample sizes and pre-/post-intervention means and SDs for drop jump RSI.

Quality assessment / Risk of bias analysis Study quality was assessed using a 10-factor scale developed by Brughelli et al. for strength and conditioning research, covering criteria such as clarity of inclusion criteria, random allocation, intervention definition, baseline group similarity, use of a control group, outcome definition, practical utility of assessments and duration, appropriateness of between-group statistics, and reporting of variability. Each factor was scored 2 ("yes"), 1 ("maybe"), or 0 ("no"), summed to a total score from 0–20. Quality score was not used as an exclusion criterion.

Strategy of data synthesis The meta-analysis was conducted using a random-effects model to account for between-study variability. Effect sizes were calculated as standardised mean differences (SMDs) with corresponding 95% confidence intervals (CIs). Statistical heterogeneity was

assessed using the I^2 statistic, τ^2, and Cochran's Q test. Prediction intervals (PIs) were also reported to estimate the range of true effects expected in future studies.
All analyses were performed using random-effects models, and statistical significance was set at $p < 0.05$.

Subgroup analysis Subgroup analyses were undertaken a priori to explore potential sources of heterogeneity. Studies were stratified by intervention type, population, and intervention duration. Differences between subgroups were evaluated using χ^2 tests for subgroup differences. Within each subgroup, pooled effect sizes, heterogeneity statistics, and prediction intervals were reported.

Sensitivity analysis No formal sensitivity analysis was pre-specified. Study quality was instead assessed descriptively via the Brughelli et al. scale.

Language restriction English.

Country(ies) involved Australia.

Keywords stretch-shortening cycle; plyometrics; ballistic exercise; neuromuscular adaptation; ground contact time; athletic performance; exercise prescription.

Dissemination plans Results will be disseminated through publication in a peer-reviewed sports science/strength and conditioning journal.

Contributions of each author

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