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Velocity Loss Thresholds and Lower-Body Explosive Power: A Dose-Response Meta-Analysis

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ADMINISTRATIVE INFORMATION

Support - None.

Review Stage at time of this submission - Data extraction.

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 4 May 2026 and was last updated on 4 May 2026.

INTRODUCTION

Review question / Objective What is the dose-response relationship between velocity loss (VL) thresholds during velocity-based resistance training and changes in lower-body explosive power?

Rationale Previous meta-analyses have confirmed VBT effectiveness, but the optimal VL threshold for explosive power remains unclear due to limited statistical power in existing reviews . This review addresses this gap through a dedicated dose-response meta-analysis with expanded sample size.

Condition being studied Lower-body explosive power adaptations following velocity-based resistance training with different VL thresholds in healthy adults.

METHODS

Search strategy Databases: PubMed, Web of Science, SPORTDiscus, Scopus, CNKI. Keywords: velocity-based training, velocity loss, countermovement jump, sprint, explosive power. Period: inception to May 2026. Grey literature: ProQuest, ECSS/NSCA/ACSM abstracts. Citation tracking.

Participant or population Healthy adults (>=18 years), any training background (untrained, recreational, athletes). Excluded: clinical populations, older adults (>65 years), injured individuals.

Intervention Velocity-based resistance training with barbell velocity monitoring. VL threshold 0-45% explicitly reported. Program duration >=4 weeks, >=2 sessions/week.

Comparator Different VL thresholds compared within studies. Continuous VL% as moderator. Categorical: Low VL (20%).

Study designs to be included Randomized controlled trials with multiple VL groups; within-group pre-post designs with VL reporting; VBT vs. PBT RCTs where VBT group VL is specified.

Eligibility criteria IN: VBT with explicitly reported VL + lower-body explosive power outcome + pre-post mean +/- SD available. EX: VL not reported, upper-body only, acute studies, non-human studies.

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Main outcome(s) Primary: countermovement jump (CMJ) height. Secondary: squat jump (SJ), standing long jump (SLJ), sprint time (10-30m), power output (W/kg), reactive strength index (RSI). Effect size: within-group Hedges' g.

Data management Standardized Excel extraction forms. Two independent reviewers for screening and data extraction. Disagreements resolved by consensus or third reviewer. Cochrane RoB 2 tool for risk of bias. Data archived for transparency.

Quality assessment / Risk of bias analysis Cochrane Risk of Bias 2 (RoB 2) tool, adapted for within-group pre-post designs. Five domains. Two independent reviewers. Overall rating: low risk, some concerns, high risk.

Strategy of data synthesis Random-effects dose-response meta-regression (REML estimator). Cluster-robust variance estimation (CR1/CR2). Restricted cubic splines for nonlinearity testing. Categorical subgroup: Low VL (20%). Heterogeneity: I-squared, Cochran's Q, tau-squared. R software (metafor, clubSandwich).

Subgroup analysis (1) Outcome type: jump (CMJ+SJ+SLJ) vs sprint; (2) Sex: male, female; (3) Training status: athletes vs non-athletes; (4) Intervention duration: =8 weeks; (5) Data quality: full vs estimated; (6) CMJ only; (7) Sprint only.

Sensitivity analysis (1) Leave-one-study-out; (2) Exclude estimated/approximated data; (3) Exclude high risk of bias studies; (4) Pre-post correlation sensitivity (r = 0.5, 0.9); (5) Fixed-effect model; (6) Exclude extreme VL (0%, >=40%); (7) Exclude female-only samples; (8) Exclude small samples (n < 8 per group)..

Language restriction English and Chinese only. No restrictions on other languages if sufficient abstract/data available.

Country(ies) involved China.

Keywords velocity-based training; velocity loss; dose-response; explosive power; countermovement jump; sprint performance; meta-regression; strength and conditioning.

Dissemination plans Peer-reviewed sport and exercise science journal. Conference presentation.

Contributions of each author

Author 1 - hanlin huang - conceived study, designed protocol, conducted literature search, performed data extraction and analysis, drafted manuscript.
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Author 2 - zhiting zeng - independent screening, risk of bias assessment, data verification, reviewed manuscript.