

# INPLASY

## Effects of velocity-based training (VBT) on athlete's physical fitness: a systematic review

INPLASY202670015

doi: 10.37766/inplasy2026.7.0015

Received: 6 July 2026

Published: 6 July 2026

### Corresponding author:

Ma Kui

gs65924@student.upm.edu.my

### Author Affiliation:

Universiti Putra Malaysia.

Kui, M.

### ADMINISTRATIVE INFORMATION

**Support** - Self-funded.

**Review Stage at time of this submission** - Formal screening of search results against eligibility criteria.

**Conflicts of interest** - None declared.

**INPLASY registration number:** INPLASY202670015

**Amendments** - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 6 July 2026 and was last updated on 6 July 2026.

### INTRODUCTION

**Review question / Objective** This study aims to analyze the impact of speed-based training (VBT) on athletes' physical performance.

**Condition being studied** Athletes.

### METHODS

**Participant or population** Athletes or player.

**Intervention** VBT and no other training is scheduled.

**Comparator** Two or more groups and single-group trials.

**Study designs to be included** Rct or Non-Rct.

**Eligibility criteria** (1) Full-text, peer-reviewed studies published in English that describe the use of athletes and explore the effects of VBT training

interventions on physical fitness, including randomized controlled trials (RCTs), two or more non-randomized controlled trials (Non-RCTs), and single-arm trials with pre- and post-test designs; (2) This study only includes studies that involve planned and organized VBT training interventions to improve or maintain physical fitness; (3) The study investigates the effects of VBT training on athletes' physical fitness and assesses the results of at least one component of physical fitness; (4) There are no restrictions on sample size, study location, or intervention duration for included studies.

**Information sources** SCOUPS, PubMed, EBSCOhost (SPORTDiscus), Web of Science and Google scholar.

**Main outcome(s)** The primary outcomes of this systematic review are measures of physical fitness in athletes following a velocity-based training (VBT) intervention, including: (1) muscular strength, assessed via one-repetition maximum (1RM) tests (e.g., bench press 1RM, squat 1RM) or handgrip

dynamometry; (2) lower-limb explosive power, assessed via countermovement jump (CMJ) height, squat jump (SJ), or standing long jump (SLJ); (3) sprint speed, assessed via 10 m, 20 m, or 30 m linear sprint time using electronic timing gates; (4) agility and change-of-direction speed, assessed via Illinois Agility Test, T-test, or modified 505 test; (5) balance, assessed via Y-Balance Test (YBT) or single-leg stability protocols; and (6) neuromuscular coordination, assessed via wall-toss test or upper-limb reaction time instruments. All outcomes will be extracted as pre- and post-intervention means and standard deviations for both VBT and control groups. Effect sizes (Hedges'  $g$ ) with 95% confidence intervals will be computed for all outcomes where sufficient data are available ( $\geq 3$  studies).

**Quality assessment / Risk of bias analysis** The methodological quality of each included study will be independently assessed by two reviewers using the Physiotherapy Evidence Database (PEDro) scale, a validated and reliable instrument comprising 11 criteria with a maximum score of 10 (excluding criterion 1, external validity). Quality thresholds will be applied as follows:  $\leq 3$  points = poor quality; 4–5 points = moderate quality; 6–10 points = high quality. Discrepancies between reviewers will be resolved by consensus, with a third reviewer consulted as necessary. Studies rated  $\leq 3$  will be excluded from the analysis. Additionally, the certainty of the body of evidence for each outcome will be evaluated using the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) framework, with evidence downgraded based on risk of bias, inconsistency ( $I^2 > 75\%$ ), indirectness, imprecision ( $< 400$  participants or wide CI), and risk of publication bias (Egger's test  $p < 0.05$ ).

**Strategy of data synthesis** Meta-analyses will be performed when a minimum of three studies report sufficient data for effect size calculation. Effect sizes will be computed as Hedges'  $g$  using pre- and post-intervention means and standard deviations, standardised using post-intervention standard deviations. A random-effects inverse-variance model will be used to pool effect sizes, with a fixed-effects model computed additionally to evaluate analytical robustness. Effect sizes will be interpreted as: trivial (ES 4.0). Statistical heterogeneity will be assessed using the  $I^2$  statistic (low: 75%). Publication bias will be assessed using the extended Egger's test, with sensitivity analysis performed when significant. Where insufficient studies preclude meta-analysis ( $< 3$  studies), findings will be presented in narrative format. All analyses will be performed using Comprehensive

Meta-Analysis software (Version 3.0; Biostat, Englewood, NJ, USA), with a significance threshold of  $p < 0.05$ .

**Subgroup analysis** Subgroup analyses will be conducted to examine potential moderating factors affecting VBT-induced physical fitness adaptations. The following moderators will be examined where a minimum of three studies per subgroup are available: (1) programme duration ( $\leq 8$  weeks vs.  $> 8$  weeks); (2) velocity loss threshold ( $\leq 20\%$  vs.  $> 20\%$ ); (3) training frequency ( $\leq 2$  sessions/week vs.  $> 2$  sessions/week); (4) total number of training sessions ( $\leq 14$  vs.  $> 14$  sessions); (5) participant sex (male vs. female); (6) competitive level (youth/collegiate vs. elite/national); and (7) sport discipline (aesthetic/technical sports vs. team/court sports). A median split approach will be applied to stratify continuous moderator variables. Between-subgroup statistical significance will be determined at  $p < 0.05$ .

**Sensitivity analysis** Sensitivity analyses will be performed in cases where the extended Egger's test yields a statistically significant result ( $p < 0.05$ ), indicating potential publication bias. In such cases, the study identified as the primary source of asymmetry in the funnel plot will be removed from the pooled analysis, and the meta-analysis will be recalculated to determine whether the pooled estimate and its significance remain stable following exclusion. If the pooled effect size and direction remain consistent after the sensitivity analysis, the original result will be retained and reported alongside the sensitivity result. Additionally, sensitivity analyses will be conducted by restricting the analysis to high-quality studies (PEDro score  $\geq 6$ ) to assess whether study quality moderates the pooled effect size estimates.

**Language restriction** English.

**Country(ies) involved** China.

**Keywords** velocity-based training; VBT; physical fitness; athlete.

#### Contributions of each author

Author 1 - Ma Kui.

Email: gs65924@student.upm.edu.my