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EXTENDED ABSTRACT

Comparative Effectiveness of Velocity-Based Versus Percentage-Based Load Prescription on Strength, Hypertrophy, and Power Outcomes in Resistance-Trained Individuals or Athletes: A Systematic Review

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I. Introduction

Velocity-based load prescription (VBLP) and traditional percentage-based load prescription (PBLP) are widely used to optimize resistance training adaptations. However, their comparative impact on strength, hypertrophy, and power in trained populations remains unclear. This systematic review evaluates current evidence, quantifies differential outcomes between VBLP and PBLP, and highlights methodological inconsistencies to guide practitioners and researchers toward evidence-based resistance training recommendations [1].

II. Methods

We conducted a systematic review per a pre-specified protocol registered in PROSPERO (CRD420251053818) on 1 July 2025, adhering to PRISMA 2020 guidelines. Four databases (Web of Science, PubMed, Scopus, OVID MEDLINE) were searched using PICO-based MeSH/Emtree terms and keywords through January 10, 2025[3]. Additional hand-searching and forward/backward citation tracking ensured comprehensive coverage [2].

After duplicate removal, 1,405 records underwent title/abstract screening, of which 1,054 underwent dual screening and 524 were excluded, yielding 530 full texts for eligibility assessment. Independent reviewers resolved conflicts by consensus. Ultimately, six studies met all the inclusion criteria for comparative VBLP and PBLP analysis.

Data extraction used REDCap-piloted forms with automated range checks. Extracted items included study and participant characteristics, VBT and PBT parameters, primary strength and secondary power and hypertrophy outcomes, adherence, adverse events, and summary statistics [5]. Twenty percent of entries were independently validated. Risk of bias was assessed via RoB 2, ROBINS-I, and RoB-B-T with GRADE applied to outcome confidence [4].

III. Results and Discussion

A. Hypertrophy

Meta-analytic pooling across six randomized trials yielded a small-to-moderate effect size for muscle hypertrophy (*Hedges' g* = 0.28) with substantial heterogeneity ($I^2 \approx 58\%$) [7]. Variability in measurement protocols, imaging modalities, and velocity-loss thresholds contributed to outcome dispersion. Standardized assessment techniques and reporting guidelines are necessary to improve comparability and reduce methodological bias [6].

B. Strength

Quantitative synthesis revealed a robust effect on maximal strength gains (*Hedges' g* = 0.78) with moderate heterogeneity ($I^2 \approx 54\%$) across velocity-loss thresholds and device types. Sensitivity analyses, leave-one-out, and high-risk study exclusion confirmed stability. Publication bias assessment via funnel plots and Egger's test indicated minimal asymmetry, supporting result validity.

C. Power

Power performance improved moderately in pooled analyses, with a *Hedges' g* of 0.65 and moderate heterogeneity ($I^2 \approx 48\%$) [8]. Subgroup examinations by velocity-loss cutoff and device type demonstrated consistent enhancement in jump height, sprint velocity, and change-of-direction metrics [9]. These findings suggest both velocity-based and percentage-based prescriptions effectively augment power outputs in resistance-trained athletes.

D. Discussion

Methodological diversity in velocity-loss thresholds, device types, and intervention lengths, alongside small male-dominant samples, constrained meta-analytic synthesis and generalizability [10]. Inconsistent reporting of nutritional controls and training status further complicated interpretations. Future studies should standardize velocity-cutoff protocols, extend intervention durations beyond eight weeks, and include varied athlete populations to refine evidence-based load-prescription recommendations.

E. Figure and Table

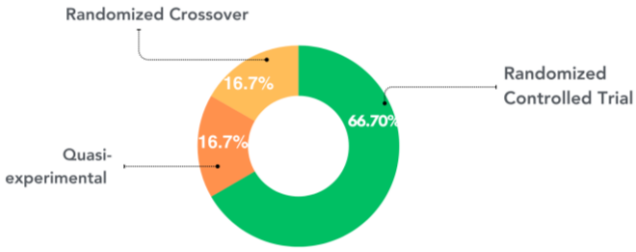

Fig. 1 A donut chart in distinct grey shades that separates Randomized Controlled Trial, Single-arm/Feasibility, and Other designs.

TABLE I
SUBJECT CHARACTERISTICS

Characteristic	Mean	Median	Min	Max
Age (yrs)	23.4	22.7	21.7	26.2
Height (cm)	174.9	179.2	168.5	181.4
Weight (kg)	69.8	67.2	59.5	89.3
BMI (kg/m2)	22.8	20.9	21	27.1

Fig. 2 shows an example of an image with country distribution. Check the country distribution to reveal the important detail in the figure.

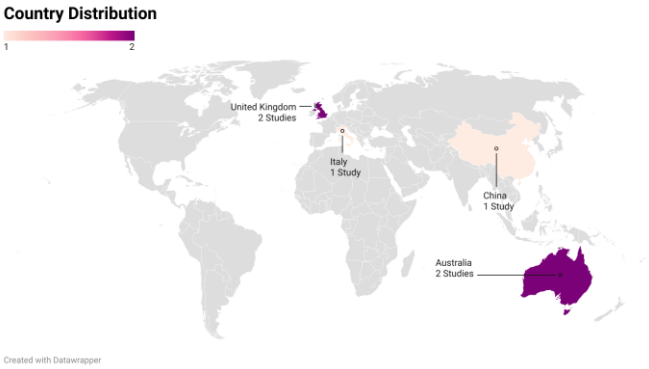

Fig. 2 Map showing the geographic origin of the 4 studies included in this systematic review. Colour intensity reflects the number of studies per country (scale 1–3).

IV. CONCLUSIONS

This systematic review demonstrates that velocity-based and percentage-based load prescriptions both enhance strength, hypertrophy, and power outcomes in resistance-trained athletes, with VBLP offering superior power gains via autoregulation. Standardization of protocols and inclusion of diverse populations are recommended to optimize prescription strategies.

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