

# Effects of Different Velocity Loss of Resistance Training with Equated Volume on Muscle Strength and Sport Performance

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## Summary

For strength-trained individuals, eight weeks of equal-volume back squat training with lower or higher VL threshold produced similar improvement in muscle strength and sport performance.

## Introduction

Velocity-based training (VBT) could monitor fatigue by controlling the velocity loss (VL) of the movement. Previous study suggests that a lower VL threshold (e.g., 10-20%) during resistance training had greater improvements in muscle strength and sport performance, while a higher velocity threshold (e.g., 30-40%) elicited a greater hypertrophy (Pareja-Blanco et al., 2017). However, high velocity thresholds are accompanied by higher total training volume (Pareja-Blanco et al., 2017), and the effect of long-term different VL resistance training with equal volume is still unclear. This study aims to compare the effects of different VL thresholds of resistance training with equal volume on muscle strength and sport performances.

## Methods

Twenty-four young men was recruited and randomly assigned to either a lower velocity threshold (VL10) or a higher velocity threshold group (VL30), and both groups was received 8 weeks of progressive back squat resistance training (70-85% 1RM) at equal volumes for 2 sessions per week (16 sessions total). Muscle strength (one-repetition maximal, 1RM), sport performance (10 and 20 m sprint, countermovement jump, CMJ) was measured pre- and post-the 8-week training. All variables was analyzed by two-way ANOVA (mixed design) to test the group factor (VL10, VL30) x time factor (pre and post-).

## Results and Discussion

After eight weeks of different velocity loss back squat training with equal volume, both groups showed significant improvements in back squat 1RM, 10 and 20m sprint times, and CMJ heights. However, there was no significant difference in the magnitude of improvement between the VL10 and VL30.

**Table 1:** Descriptive characteristics of the back squat training

	VL10	VL30
VL (%)	13.1 ± 1.3	31.4 ± 2.4
Total Reps	568 ± 7.2	573 ± 18.3

## Conclusions

Previous studies suggest that low velocity loss is beneficial for explosive performance and can result in similar gains in muscle strength with lower training volumes compared to high velocity loss (Rodríguez-Rosell et al., 2021). However, there is a dose-response relationship between muscular strength and total training volume. In conclusion, eight weeks of equal-volume back squat training with different rates of velocity loss (10% and 30%) resulted in similar gains in muscle strength and explosive performance for strength-trained men.

## Acknowledgments

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## References

- [1] Pareja-Blanco et al. (2017). *SJMSS*, **27**: 724-735.
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- [3] Rodríguez-Rosell et al. (2021). *SJMSS*, **31**: 1621-1635.

**Table 2:** Changes in neuromuscular performance from pre- to post-training for each group

	VL10 (n = 12)				VL30 (n = 12)				VL10 vs. VL30	P-value	P-value group
	Pre	Post	Δ (%)	ES (95%CI)	Pre	Post	Δ (%)	ES (95%CI)	ES (95%CI) (VL10-VL30)	Time effect	x time Interaction
Back squat 1RM (kg)	128.9 ± 26.1	145.8 ± 29.1 <sup>#</sup>	13.2 ± 6.8	0.60 (-0.29 ~ 1.51)	128.1 ± 21.1	146.6 ± 19.8 <sup>#</sup>	15.1 ± 7.8	0.90 (-0.02 ~ 1.82)	-0.183 (-1.06 ~ 0.7)	< .0001	.659
CMJ height (cm)	42.5 ± 8.4	46.0 ± 7.6 <sup>#</sup>	9.6 ± 10.0	0.45 (-0.44 ~ 1.34)	43.8 ± 7.6	46.5 ± 8.0 <sup>#</sup>	6.4 ± 6.0	0.35 (-0.53 ~ 1.24)	0.27 (-0.61 ~ 1.16)	< .0001	.520
T10 (s)	1.85 ± 0.19	1.76 ± 0.02	-3.9 ± 6.7	-0.56 (-1.46 ~ 0.33)	1.80 ± 0.09	1.76 ± 0.07 <sup>#</sup>	-2.29 ± 3.03	-0.50 (-1.40 ~ 0.38)	-0.35 (-1.24 ~ 0.53)	.014	.393
T20 (s)	3.13 ± 0.19	3.08 ± 0.16 <sup>#</sup>	-1.6 ± 2.0	-0.28 (-1.17 ~ 0.59)	3.09 ± 0.14	3.04 ± 0.13 <sup>#</sup>	-1.6 ± 2.1	0.36 (-1.25 ~ 0.52)	-0.025 (-0.9 ~ 0.85)	.001	.952

Note: 1RM = one repetition maximum; CMJ = countermovement jump; T10 = 10-m sprint time; T20 = 20-m sprint time, <sup>#</sup> = intra-group significant differences from Pre- to Post-training,