# Total work and acute fatigue responses to combined accentuated eccentric loading and rest redistribution

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## INTRODUCTION

Accentuated eccentric loading (AEL) (10) using weight releasers requires alternative set structures such as rest redistribution (RR) (7) when multiple AEL repetitions are executed within a set (8,9). Although AEL increases acute fatigue due to eccentric overload, it augments mechanical work and might not elicit excessive fatigue if it is combined with RR due to intra-set rests (1,2,4,6).

## PURPOSE

The purpose of this study was to explore the effect of combined AEL and RR (AEL + RR) on total work (TW), mechanical fatigue [mean velocity and power loss (MVL) (MPL)], and neuromuscular fatigue [countermovement jump height loss 0 kg (CMJL 0) and 20 kg (CMJL 20)] during and after high-volume back squat (BS) exercise in resistance-trained men.

## METHODS

Twelve men [25.6 ± 4.4 years, 1.77 ± 0.06 m, 81.7 ± 11.4 kg, and 152.4 ± 27.8 kg BS one-repetition maximum (1RM)] volunteered for this study. On the first visit, subjects completed BS 1RM testing and weight releaser familiarization. On the second, third, and fourth visits, subjects completed one of the following conditions on each session in a randomized and counterbalanced manner.

(a) AEL + RR 5: 110/60% eccentric/concentric for every other repetition
3 sets × (5 × 2) repetitions with (4 × 15) s intra-set and 90 s inter-set rest
(b) AEL + RR 2: 110/60% eccentric/concentric for every 1st and 6th repetition
3 sets × (2 × 5) repetitions with (1 × 15) s intra-set and 135 s inter-set rest
(c) Traditional set (TS): 60/60% eccentric/concentric for every repetition
3 sets × 10 repetitions with 150 s inter-set rest

The TW, mean velocity, and mean power were measured for each repetition using dual force plates synchronized with four linear position transducers (3). Countermovement jump height 0 kg and 20 kg were collected pre-exercise and 25 minutes post-exercise using dual force plates (5). The absolute data were used to calculate MVL, MPL, CMJL 0, and CMJL 20. The 1-way (CMJL 0 and CMJL 20; 3 conditions) and 2-way (TW, MVL, and MPL; 3 conditions × 3 sets) repeated measures analysis of variance were conducted using resampling techniques (R for Statistical Computing 4.2.1).

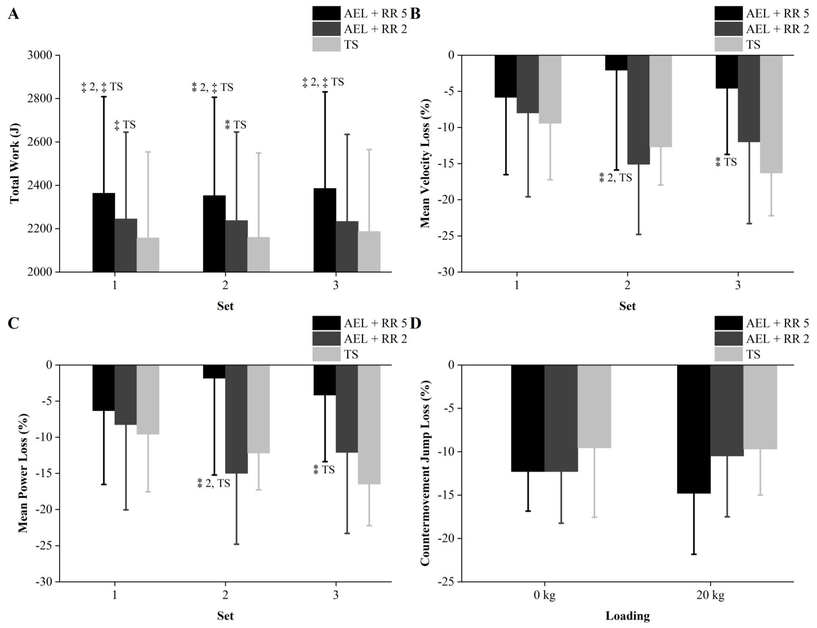
(a) MVL and MPL
[(Repetition 10 – Repetition 1) / Repetition 1] × 100
(b) CMJL 0 and CMJL 20
[(Post-exercise value – Pre-exercise value) / Pre-exercise value] × 100

## RESULTS

A main effect of condition reported that AEL + RR 5 resulted in statistically ($p$ < 0.05) greater TW and lower MVL and MPL compared with AEL + RR 2 ($g$ = 1.44, 0.82, and 0.83, respectively) and TS ($g$ = 1.59, 0.81, and 0.81, respectively). A statistical significance was not achieved for condition by set interaction (TW, MVL, and MPL) or main effect of condition (CMJL 0 and CMJL 20).

## MAIN FINDINGS

Figure 1. Between condition effect sizes




Data are presented as mean ± SD

‡ 2 = large ($g$ = 1.20–2.00) effect size compared with AEL + RR 2

⁂ 2 = moderate ($g$ = 0.60–1.20) effect size compared with AEL + RR 2

‡ TS = large ($g$ = 1.20–2.00) effect size compared with TS

⁂ TS = moderate ($g$ = 0.60–1.20) effect size compared with TS

Note = trivial or small effect size between conditions unless otherwise specified

AEL + RR = combined accentuated eccentric loading and rest redistribution, TS = traditional set

## MORE FINDINGS

## CONCLUSIONS

AEL + RR 5 allows for the greatest TW and the lowest MVL and MPL among all three BS exercise conditions without affecting CMJL 0 and CMJL 20.

## PRACTICAL APPLICATIONS

Coaches can prescribe multiple AEL repetitions to help athletes augment mechanical work without excessive acute fatigue when using an AEL + RR 5.

## ACKNOWLEDGMENTS

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