THE ACUTE EFFECT OF ACCENTUATED ECCENTRIC LOADING ON VERTICAL JUMP PERFORMANCE: A PRELIMINARY ANALYSIS

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Introduction

Accentuated Eccentric Loading (AEL) is a training method using eccentric loads in excess of the concentric load during eccentric-concentric coupled movements with minimal disruption to natural movement mechanics (5). AEL has been seen to improve jump height, force, velocity, and power acutely (3) as well as improve jumping and power characteristics chronically (2). Furthermore, a study examining the acute effect of repetitive AEL jumps noticed an acute increase in both braking force and rate of force development suggesting a positive effect of added load during the accentuated condition (1).

A previous study demonstrated that the initial repetition of an AEL squat may consequently improve the eccentric component of following repetitions (5). The purpose of this study was to determine the acute effect of an AEL countermovement jump (CMJ) followed by four rebound jumps (RJ) on vertical jump force-time characteristics to determine if a similar effect exists during a jumping task.

Methods

- 14 Resistance-trained participants, 7 men (body mass = 82.5 ± 11.0 kg, height = 176.9 ± 7.4 cm, relative one repetition maximum (1RM) back squat strength = 1.97 ± 0.38 kg·kg^{-1}) and 7 women (body mass = 69.9 ± 8.2 kg, height = 169.4 ± 7.0 cm, relative 1RM back squat strength = 1.41 ± 0.24 kg·kg^{-1}) with previous back squat and jumping experience participated in two separate testing sessions.
- The first testing session was used to determine the 1RM back squat and familiarization with the AEL CMJ and RJs. The following testing session required subjects to perform two trials of a baseline CMJ with four RJs following a dynamic warm-up. The potentiation protocol required the subjects to perform one set each of an AEL CMJ followed by four RJs using loads equated to 10, 20, and 30% of the subject's body weight using dumbbells that were released at the bottom of the initial CMJ and followed by four consecutive RJs with the subjects body weight only.
- The force-time data were used to calculate CMJ and RJ braking mean force (BMF) and duration (BDur) and propulsion mean force (PMF) and duration (PDur).
- A series of paired sampled t-tests were used to determine the differences between baseline jump performance and the performance using 30% of the subject's body weight. Hedge's *g* effect sizes were used to examine the magnitude of the differences between conditions.

Results

Table 1. Accentuated eccentric loaded countermovement (CMJ) and rebound jump (RJ) force-time characteristics (mean ± SD).

	CMJ BMF (N·kg^{-1})	CMJ BDur (s)	CMJ PMF (N·kg^{-1})	CMJ PDur (s)	RJ BMF (N·kg^{-1})	RJ BDur (s)	RJ PMF (N·kg^{-1})	RJ PDur (s)
Baseline	17.8 ± 2.0	0.16 ± 0.04	21.7[b] ± 2.7	0.25[b] ± 0.06	34.1[b] ± 4.0	0.11 ± 0.02	31.9 ± 4.4	0.13 ± 0.03
30% BW	21.5[a] ± 2.2	0.22[a] ± 0.05	19.4 ± 2.3	0.21 ± 0.06	31.9 ± 3.4	0.18 ± 0.22	29.8 ± 4.2	0.20 ± 0.22
g	1.67	1.29	0.89	0.70	0.59	0.44	0.47	0.45

BW = body weight; BMF = braking mean force; BDur = braking duration; PMF = propulsion mean force; PDur = propulsion duration; a = significantly greater than the baseline condition; b = significantly greater than the 30% condition.

Figure 1. Release of the dumbbells at self-selected depth.

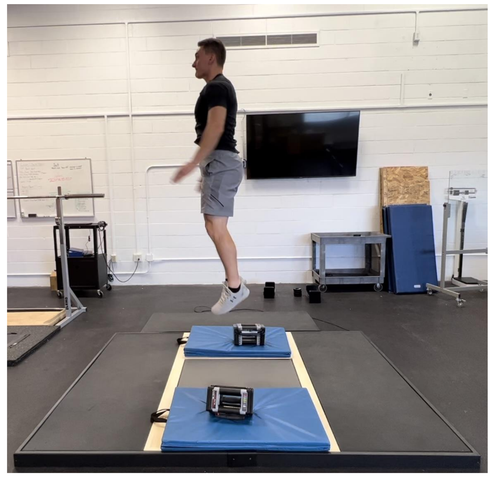

Figure 2. Maximal jump following release of the dumbbells.

Conclusions

- There were large increases in CMJ BMF and BDur during the loaded condition compared to the baseline performance.
- There were moderate decreases in CMJ PMF and PDur during the loaded condition.
- Specific to subsequent RJ performance, only small differences for each variable existed between the baseline and loaded conditions.

Practical Applications

- Strength and conditioning practitioners should be wary when adding heavier loads to AEL CMJ if they are seeking a potentiation effect as the current results suggest that heavier loads may increase the amount of force and the duration during the braking phase but may fail to enhance the propulsion phase of the CMJ.
- Additional load may negatively impact subsequent RJ performance; however, further research using the current potentiation stimulus is needed to confirm these results.

References

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