

Introduction

Accentuated eccentric loading (AEL) is a training tactic in which the eccentric load is greater than the concentric load during a movement that requires both eccentric and concentric actions to be performed (2,3). An example would be an AEL countermovement jump (CMJ) where the individual performs a countermovement with dumbbells, drops the dumbbells at the lowest point of the countermovement, and then jumps as high as possible without the weight. Although researchers have shown that jump height and power output can be improved after training with AEL CMJs (1), there is limited research that has examined the differences between male and female force production characteristics. The purpose of this study was to examine the braking and propulsive force-time characteristics of AEL CMJ between men and women using percentages of their one repetition maximum (1RM) back squat. It was hypothesized that males would produce greater braking and propulsive forces over shorter durations.

Methods

- 14 resistance-trained men (body mass = 77.6 ± 10.9 kg, height = 174.1 ± 6.8 cm, relative 1RM back squat = 2.0 ± 0.4 kg/kg) and 14 resistance-trained women (body mass = 69.6 ± 7.7 kg, height = 164.6 ± 6.3 cm, relative 1RM back squat = 1.4 ± 0.2 kg/kg) participated in 2 separate testing sessions.
 - Session 1: subjects performed a 1RM back squat and AEL CMJ familiarization
 - Sessions 2: subjects performed 3 sets of AEL CMJ with dumbbell weight equating to either 10%, 20%, and 30% of their 1RM back squat.
- All AEL CMJ were performed on a force platform and the force-time data were used to calculate mean braking force (MBF), braking duration (BDur), mean propulsive force (MPF), and propulsive duration (PDur).
- A series of 2 (sex) x 3 (load) repeated measures ANOVA were used to compare each variable between conditions.
- Hedge's g effect sizes were used to examine the magnitude of the differences.

Results

Table 1. Accentuated eccentric loaded countermovement jumps sex comparison of braking and propulsive force-time characteristics between men and women.

Load (%1RM)	BMF (N/kg)*	BDur (s)	PMF (N/kg)*	PDur (s)
	Men			
10%	21.6 ± 1.7	0.18 ± 0.03	21.6 ± 2.0 ^{bc}	0.22 ± 0.05 ^{bc}
20%	22.5 ± 1.9	0.25 ± 0.04 ^a	19.8 ± 2.7	0.17 ± 0.06
30%	22.2 ± 3.7	0.27 ± 0.08 ^a	17.9 ± 4.0	0.15 ± 0.06
Women				
10%	20.3 ± 2.3	0.18 ± 0.03	18.3 ± 2.1 ^{bc}	0.25 ± 0.05 ^{bc}
20%	20.8 ± 1.9	0.22 ± 0.04 ^a	17.3 ± 2.5	0.19 ± 0.05
30%	20.6 ± 2.3	0.26 ± 0.08 ^a	16.5 ± 2.6	0.15 ± 0.08
Hedge's g	0.52-0.89	0.13-0.58	0.42-1.60	0.10-0.57

BMF = braking mean force, BDur = braking duration, PMF = propulsive mean force, PDur = propulsive duration, g = Hedge's g effect size across all loads; a = significantly greater BDur between loads ($p < 0.001$); * = significantly greater load-averaged value for men compared to women ($p < 0.05$); a = significantly greater than 10% ($p < 0.05$), b = significantly greater than 20% ($p < 0.001$); c = significantly greater than 30% ($p < 0.001$)



Figure 1. Bottom position of descent of AEL CMJ.

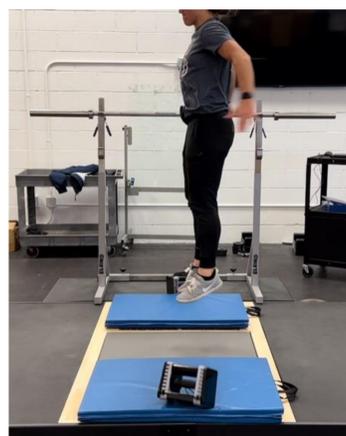


Figure 2. Propulsion and flight of AEL CMJ.

Conclusions

- Resistance-trained men produced greater BMF and PMF compared to resistance-trained women
- No statistical significance in BDur and PDur existed between sexes.
- Heavier loads significantly impacted PMF, BDur, and PDur, but there were no differences in BMF across loads.

Practical Applications

- AEL CMJ may provide a novel training stimulus to both men and women compared to traditional CMJ for braking and propulsive force production.
- Men may display more rapid force production characteristics over the braking and propulsive phase of the CMJ compared to women.

References

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- 3) Wagle JP, Taber CB, Cunanan AJ, Bingham GE, Carroll KM, DeWeese BH, Sato K, Stone MH. Accentuated eccentric loading for training and performance: A review. *Sports Med* 47: 2473-2495, 2017.



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