COMPARING FORCE-TIME CHARACTERISTICS BETWEEN MEN AND WOMEN DURING ACCENTUATED ECCENTRIC DUMBBELL COUNTERMOVEMENT JUMPS USING VARIOUS LOADING SCHEMES

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Introduction

Researchers have shown that eccentric training promotes maximal neuromuscular development compared to traditional resistance training (3). While there are several eccentric training methods, accentuated eccentric loading (AEL) uses heavier loads during the eccentric phase with the goal to enhance the subsequent concentric phase within a stretch-shortening cycle movement (4). Previous research has shown that AEL countermovement jumps (CMJ) can produce favorable performance benefits both acutely (2) and chronically (1). Although AEL jumps may provide an enhanced training response compared to other jump training methods (2), it is currently unknown if men and women respond in a similar manner to AEL CMJ. Given that strength and conditioning practitioners may implement AEL during training programs for both sexes, it is important to determine if any potential differences exist. Therefore, the purpose of this study was to compare the force-time characteristics of AEL CMJ between males and females using different percentages of body weight. It was hypothesized that men would produce greater force outputs over shorter braking and propulsion phase durations compared to women.

Methods

- Resistance-trained men (n = 14, age = 24.9 ± 4.7 years, height = 174.1 ± 6.8 cm, body mass = 77.6 ± 10.9 kg, relative one repetition maximum [1RM] back squat = 2.0 ± 0.4 kg/kg) and women (n = 14, age = 22.4 ± 1.8 years, height = 164.6 ± 6.3 cm, body mass = 69.6 ± 7.7 kg, relative 1RM back squat = 1.4 ± 0.2 kg/kg) participated in two separate testing sessions.
- The first session required the subjects to complete a 1RM back squat protocol and familiarization trials of the AEL CMJ.
- The second session required each subject to perform AEL CMJ with dumbbells equating to 10%, 20%, and 30% of their body weight.
- The jumps were performed on a force platform and the force-time data were used to calculate CMJ net braking mean force (BMF) and duration (BD) as well as net propulsion mean force (PMF) and duration (PD).
- A series of 2 (sex) x 3 (load) repeated measures ANOVA were used to compare CMJ BMF, BD, PMF, and PD between the male and female subjects. Hedge's g effect sizes were calculated to examine the magnitude of the differences for each variable.

Results

Table 1. Accentuated eccentric loaded countermovement jump force-time characteristics (mean ± standard deviation) between men and women using loads of body weight (BW) percentages.

	Men				Women			
Load (% BW)	BMF (N/kg)	BD (s)	PMF (N/kg)*	PD (s)	BMF (N/kg)	BD (s)	PMF (N/kg)	PD (s)
10	20.2 ± 2.3	0.18 ± 0.04	21.7[cd] ± 2.5	0.24[cd] ± 0.04	19.2 ± 1.8	0.18 ± 0.04	18.4[cd] ± 2.0	0.26[cd] ± 0.05
20	21.1[a] ± 2.2	0.19[a] ± 0.04	21.0[c] ± 2.3	0.22[c] ± 0.05	20.5[a] ± 2.1	0.20[a] ± 0.04	18.1[c] ± 2.3	0.23[c] ± 0.05
30	22.2[ab] ± 2.0	0.21[ab] ± 0.04	20.5 ± 2.4	0.20 ± 0.05	20.7[ab] ± 1.6	0.23[ab] ± 0.05	17.4 ± 2.1	0.18 ± 0.05

BMF = braking mean force; BD = braking duration, PMF = propulsive mean force; PD = propulsive duration; * = significantly greater than women (p = 0.001); a = significantly greater than 10% body weight (p < 0.05); b = significantly greater than 20% body weight (p < 0.05); c = significantly greater than 30% body weight (p < 0.05); d = significantly greater than 20% body weight (p < 0.05)

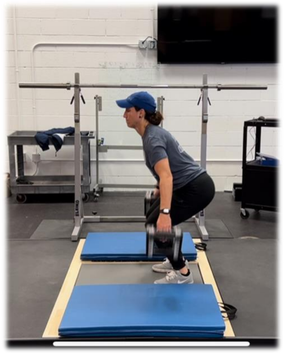

Figure 1. Bottom position of descent of AEL CMJ.

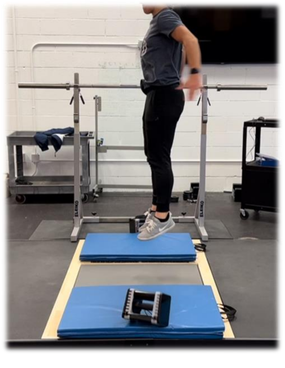

Figure 2. Propulsion and flight of AEL CMJ.

Conclusions

- There were significant and large differences (g = 1.20-1.36) favoring the men for PMF during AEL CMJ. Although not statistically significant, the men also produced small-moderately greater BMF (g = 0.26-0.81) compared to the women.
- In contrast, there were non-significant, trivial-small differences between men and women for BD (g = 0.01-0.48) and PD (g = 0.08-0.46).
- The external load may have a significant impact on the force-time characteristics produced during AEL CMJ.

Practical Applications

- Resistance-trained men may produce more peaked impulses during the braking and propulsion phases of AEL CMJ compared to resistance-trained women as characterized by greater forces during similar phase durations.
- Strength and conditioning practitioners may implement AEL CMJ with both men and women; however, they must consider the relative strength of each individual as they may respond to various percentages of body weight in a unique manner.

References

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