

## 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 stronger men and weaker men relative to their body mass and back squat 1RM on their force production characteristics. The purpose of this study was to examine the braking and propulsive force-time characteristics of AEL CMJ performed using relative back squat percentages between stronger and weaker men. It was hypothesized that stronger men would produce greater braking and propulsion forces over shorter durations.

## Methods

- Participants were separated into two groups of  $\geq 2x$  BW for 1RM and  $< 2x$  BW for 1RM. 8 stronger (body mass =  $78.5 \pm 9.6$  kg, height =  $174.1 \pm 6.3$  cm, relative one repetition maximum [1RM] back squat =  $2.3 \pm 0.2$  kg/kg) and 6 weaker (body mass =  $77.0 \pm 13.4$  kg, height =  $174.2 \pm 8.2$  cm, relative 1RM back squat =  $1.7 \pm 0.2$  kg/kg) resistance-trained men 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 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 (strength) 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

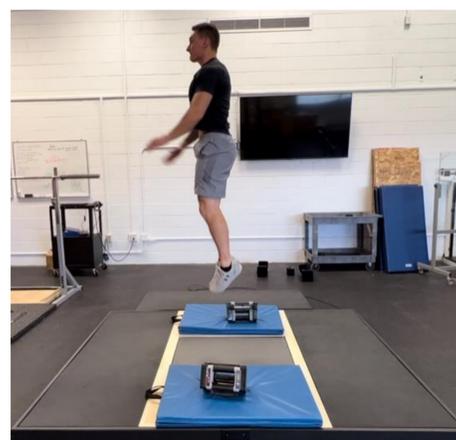
**Table 1.** Accentuated eccentric loaded countermovement jump propulsive and braking force-time characteristics of stronger and weaker men.

Load (%1RM)	BMF (N/kg)*	BDur (s)	PMF (N/kg)*	PDur (s)
	<b>Stronger</b>			
10%	22.1 ± 1.6	0.17 ± 0.03	22.9 ± 1.4 <sup>bc</sup>	0.20 ± 0.04 <sup>bc</sup>
20%	23.6 ± 1.9	0.24 ± 0.05 <sup>a</sup>	21.4 ± 2.2	0.14 ± 0.02
30%	23.7 ± 3.2	0.25 ± 0.07 <sup>a</sup>	20.1 ± 3.6	0.15 ± 0.06
<b>Weaker</b>				
10%	20.9 ± 1.8	0.20 ± 0.04	20.0 ± 1.4 <sup>bc</sup>	0.25 ± 0.06 <sup>bc</sup>
20%	21.2 ± 0.9	0.26 ± 0.03 <sup>a</sup>	17.7 ± 1.6	0.22 ± 0.07
30%	20.2 ± 3.4	0.29 ± 0.10 <sup>a</sup>	15.1 ± 2.4	0.15 ± 0.07
Hedge's g	1.04-2.50	0.39-0.63	1.32-1.90	0.01-1.68

BMF = mean braking force, BDur = braking duration, PMF = mean propulsive force, PDur = propulsive duration, g = Hedge's g effect size across all loads; \* = significantly greater values for stronger men compared to weaker men ( $p < 0.05$ ), a = significantly greater than 10% ( $p < 0.001$ ), b = significantly greater than 20% ( $p < 0.01$ ), c = significantly greater than 30% ( $p < 0.01$ )



**Figure 1.** Bottom position of descent of AEL CMJ.



**Figure 2.** Propulsion and flight of initial AEL CMJ.

## Conclusions

- Relatively stronger men ( $\geq 2x$  BW) produced greater magnitudes of BMF and PMF compared to relatively weaker men.
- There were no significance or meaningful differences between relatively stronger and weaker men for BDur and PDur.
- The relative 1RM load had a significant impact on BDur, PMF, and PDur, but did not appear to affect BMF to a great extent.

## Practical Applications

- Relatively stronger men may receive a unique training stimulus when using percentages of their 1RM during AEL CMJ
- Lighter loads of 1RM should be prescribed for weaker men ( $< 2x$  BW) during AEL CMJ

## References

- 1) Sheppard JM, Hobson S, Barker M, Taylor K, Chapman D, McGuigan M, Newton RU. The effect of training with accentuated eccentric load counter-movement jumps on strength and power characteristics of high-performance volleyball players. *Int J Sports Sci Coach* 3: 355-363, 2008.
- 2) Suchome<sup>6</sup> TJ, Wagle JP, Douglas J, Taber CB, Harden M, Haff GG, Stone MH. Implementing eccentric resistance training—part 1: A brief review of existing methods. *J Funct Morphol Kinesiol* 4, 38, 2019.
- 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.



@eauds2



eaudley2t4n@gmail.com