FORCE-TIME CHARACTERISTICS DURING ACCENTUATED ECCENTRIC DUMBBELL JUMPS USING PERCENT SQUAT LOADS IN MULTI-SET CONDITIONS-PRELIMINARY FINDINGS

Jack B. Chard[1], Conor J. Cantwell[1], Adam Sundh[1], and Timothy J. Suchomel[1]
[1]Department of Human Movement Sciences, Carroll University, Waukesha, WI, USA

Introduction

Accentuated eccentric loading (AEL) is a training mechanism that overloads the eccentric action during exercises involving the complete stretch shortening cycle: both eccentric and concentric movement (1). An example of this would be AEL countermovement jumps (CMJ) which could be effective when prescribing plyometric exercises for enhancement of strength and power characteristics. AEL CMJs have shown to display greater increases in power and velocity compared to non-AEL jumps (2)

There is currently limited research regarding AEL jumps across multiple sets analyzing its effect on strength and power characteristics. Because of this, the purpose of this study was to examine differences in force-time characteristics across multiple sets of accentuated eccentric loaded (AEL) countermovement (CMJ) and rebound jumps (RJ) with a prescribed load of 20% the subjects' 1-repetition (1RM) back squat (BS).

Methods

- Six resistance-trained males (age: 27.3±5.4 years, body mass: 81.7±13.3 kg, height: 176.0±8.4 cm, relative 1RM back squat: 2.0±0.5 kg·kg^{-1}) and eight resistance-trained females (age: 22.3±2.2 years, body mass: 70.1±8.7 kg, height: 169.4±7.5 cm, relative 1RM back squat: 1.4 ± 0.3) participated in two testing sessions
- Session one: 1RM back squat followed by familiarization of AEL CMJ and RJ.
- Session two: subjects performed three sets of an AEL CMJ with dumbbells equating to 20% of the subject's 1RM BS followed by four consecutive RJ.
- A force platform and the force-time data were used to calculate braking mean force (BMF) and duration (BDur) and propulsion mean force (PMF) and duration (PDur) for both the single CMJ and each of the four RJ performed within each set.
- A series of one-way repeated measures ANOVA tests were used to compare the CMJ and RJ braking and propulsion force-time characteristics across sets. In addition, Hedge's *g* effect sizes were calculated to determine the magnitude of the differences between each set.

Results

Table 1. CMJ and RJ braking and propulsive mean force, duration, and peak force

Set	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)
1	21.1 ± 2.4	0.24 ± 0.05	18.7 ± 2.1	0.20 ± 0.07	33.8 ± 4.5	0.11 ± 0.02	31.3 ± 4.9	0.13 ± 0.03
2	21.7 ± 2.9	0.24 ± 0.06	19.0 ± 2.5	0.19 ± 0.07	32.2 ± 4.6	0.15 ± 0.12	30.2* ± 5.2	0.14 ± 0.04
3	21.3 ± 2.6	0.25 ± 0.07	18.7 ± 2.1	0.20 ± 0.06	33.0 ± 3.4	0.11 ± 0.02	31.4 ± 4.9	0.13 ± 0.03
g	0.04-0.21	0.06-0.21	0.01-0.13	0.04-0.13	0.18-0.35	0.05-0.47	0.02-0.24	0.02-0.30

Note: BMF = braking mean force; BDur = braking duration; PMF = propulsion mean force; PDur = propulsion duration; *g* = Hedge's *g* effect sizes across all sets; # = significantly different from set 3

Figure 1. Bottom position of descent of AEL jump.

Figure 2. Propulsion and flight of initial AEL jump and RJ.

Conclusions

- CMJ and RJ braking and propulsion force-time characteristics were maintained across three sets of AEL CMJ using 20% of the subject's 1RM back squat followed by four RJ.
- RJ PMF dropped significantly during set 2, but the performance during the final set showed no differences compared to set 1 indicating that the level of performance was maintained.
- There were no practically meaningful differences across sets for any variable as indicated by the effect sizes.

Practical Applications

- AEL jumps may provide a novel stimulus for individuals with plyometric and resistance training experience compared to performing traditional CMJ.
- Prescribing AEL Jumps utilizing 20% of an individuals 1RM back squat may allow individuals to maintain their force-time characteristics during the initial CMJ and subsequent RJs.
- Further research is necessary to examine the impact of different prescribed loads relative to an individual's 1RM back squat across multiple sets to improve training prescription.

References

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@Jack.Chard27

Jackchard27@gmail.com