BRAKING FORCE-TIME CHARACTERISTICS DURING ACCENTUATED ECCENTRIC DUMBBELL COUNTERMOVEMENT AND REBOUND JUMPS USING VARIOUS LOADING SCHEMES

B.A. Foster[1], E.T.A. Audley[1], J.B. Chard[1,2], A.E. Sundh[1,3], C.J. Cantwell[1,4], C.B. Taber[5], T.J. Suchomel[1]
[1]Department of Human Movement Sciences, Carroll University, Waukesha, WI, USA

Introduction

Accentuated eccentric loading (AEL) is a method of training that allows greater loads to be moved during the eccentric portion of a movement compared to the concentric portion while also minimizing the interruption between the eccentric and concentric phases (3,4). Sheppard and colleagues (2) showed that AEL training with jumps may lead to improvements in jump height and power output, indicating that AEL may be an effective training tool. While AEL countermovement jump (CMJ) performance may be benefitted acutely, limited research has examined if there are additional carry-over benefits to subsequent jumps. Gross et al. (1) indicated that repeated AEL jumps may be positively enhanced; however, it should be noted that each jump in the previous study was performed within a commercial device. Given that these devices are not always available, further research investigating the use of dumbbells should be completed. Thus, the purpose of this study was to examine and compare the braking phase force-time characteristics of AEL CMJ and subsequent rebound jumps (RJ) using different loading methods across multiple sets.

Methods

- Resistance-trained men (n=9, age=25.8±5.0 years, height=173.2±7.9 cm, body mass=76.3±9.5 kg, relative one repetition maximum [1RM] back squat=2.0±0.3 kg/kg) and women (n=9, age=22.4±2.1 years, height=168.0±8.1 cm, body mass=70.4±8.3 kg, relative 1RM back squat=1.4±0.3 kg/kg) participated in four total sessions.
- The first session included a 1RM back squat followed by familiarization with AEL CMJ followed by RJ.
- The three subsequent sessions required the subjects to perform three sets of a single AEL CMJ with dumbbells equating to either 20% body mass or 20% of their 1RM back squat or with no load followed immediately by four RJ.
- Each jump was performed on a force platform and the raw force-time data were used to calculate CMJ and RJ braking mean force (BMF) and duration (BD). The CMJ and average RJ performance within each set were used for statistical comparison.
- A series of 3 (condition) x 3 (set) repeated measures of ANOVA were used to compare BMF and BD for both the CMJ and RJ.

Results

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

	% BODY WEIGHT				% 1RM BACK SQUAT				CONTROL			
SET	CMJ* BMF (N/kg)	CMJ[a] BD (s)	RJ BMF (N/kg)	RJ BD (s)	CMJ* BMF (N/kg)	CMJ[a] BD (s)	RJ BMF (N/kg)	RJ BD (s)	CMJ BMF (N/kg)	CMJ BD (s)	RJ BMF (N/kg)	RJ BD (s)
1	20.8 ± 2.1	0.20 ± 0.04	33.8 ± 4.0	0.11 ± 0.02	21.9 ± 2.3	0.24 ± 0.05	35.6 ± 4.4	0.10 ± 0.02	17.8 ± 2.5	0.16 ± 0.05	34.1 ± 4.8	0.11 ± 0.03
2	20.7 ± 2.2	0.20 ± 0.04	34.1 ± 4.2	0.11 ± 0.02	21.9 ± 2.6	0.23 ± 0.05	34.2 ± 4.1	0.11 ± 0.02	16.8 ± 4.7	0.16 ± 0.04	33.8 ± 5.0	0.11 ± 0.02
3	20.8 ± 2.1	0.20 ± 0.04	33.4 ± 4.4	0.11 ± 0.02	21.4 ± 2.3	0.24 ± 0.06	34.5 ± 3.6	0.10 ± 0.01	17.1 ± 5.0	0.17 ± 0.04	34.2 ± 4.3	0.10 ± 0.02

BMF = braking mean force; BD = braking duration; *= significantly greater than control (p<0.02); a= significantly greater than control (p<0.001)

Figure 1. Bottom position of descent of AEL jump.

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

Conclusions

- Greater CMJ BMF and BD were produced during the AEL conditions compared to the control condition while there were no differences in RJ BMF or BD across conditions. In addition, there were no differences in CMJ or RJ performances between sets regardless of the condition.

Practical Applications

- AEL CMJ with heavier loads can provide an increased braking stimulus via greater BMF and BD compared to traditional CMJ.
- A similar training stimulus can be achieved across multiple sets using consistent loading with 20% of an individual's body weight or 1RM back squat if desired.
- The braking stimulus for RJ following either AEL or traditional CMJ does not appear to be impacted; thus, these exercises may be better implemented individually rather than paired together.

References

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bfoster@carrollu.edu