THE EFFECT OF LOAD ON ACCENTUATED ECCENTRIC LOADED BACK SQUAT PERFORMANCE IN RESISTANCE-TRAINED WOMEN

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Introduction

Accentuated eccentric loading (AEL) is form of eccentric training that involves overloading the the eccentric action during exercises involving the complete stretch-shortening cycle: both eccentric and concentric movement (3). If programmed at the proper load, this can give a more advanced athlete a novel training stimulus. Researchers have examined eccentric tempo utilizing accentuated eccentric training; however, limited research has examined the effect load has on the downward phase duration. Douglas et al., (1) looked at both slow and fast tempo resistance training incorporating AEL back squats. In this study fast tempo was considered one second while slow tempo was considered three seconds. It was found that max strength, 40-meter sprint time, and maximal velocity improved with slow tempo AEL while drop jump contact time and reactive strength improved with fast tempo AEL. Though this provides insight into programming utilizing tempo it does not indicate a change in tempo based upon loading conditions. Suchomel et al., (2) examined barbell velocity and force-time characteristics between traditional, maximal AEL, and supramaximal AEL back squats in a study done on resistance trained men. The primary finding of this study was that significantly greater braking impulses were produced in maximal AEL and supramaximal AEL back squats compared to traditional back squats, however there were no significant differences between braking duration. While these studies may provide a starting point, further research is needed to indicate how the load can affect duration during both the braking phase phase of an AEL back squat in women. Therefore, the purpose was to compare the downward phase duration of traditional back squats to maximal and supramaximal accentuated eccentric loaded (AEL) back squats in resistance-trained women. It was hypothesized that downward phase durations would be similar across AEL and traditional loading conditions, but the phase duration would be altered based on the load used.

Methods

- 14 resistance-trained women (age = 23.6 ± 2.6 years, height = 166.5 ± 6.5 cm, body mass = 70.3 ± 8.4 kg, relative one repetition maximum back squat [1RM BS] strength = 1.50 ± 0.19 kg/kg) participated in four testing sessions.
- During the first session, subjects performed 1RM BS testing and were familiarized with weight releasers.
- The following three testing sessions were performed in a randomized order with various squat conditions.
  - The traditional loading scheme required subjects to perform sets of three BS repetitions each with 50, 60, 70, 80% of their 1RM (TRAD).
  - During the AEL conditions, the same TRAD loads were loaded on the barbell; however, weight releasers were added on the first repetition of each set to equate either 100 (AEL 100) or 110% (AEL110) 1RM, respectively.
  - Each BS set was performed on a force platform and the force-time data were used to calculate the downward phase duration of the first repetition of each set, which combines the unweighting and braking phase durations.
- A 3 (condition) x 4 (load) repeated measures ANOVA test was used to compare downward durations between the TRAD, AEL100 and AEL110 conditions. In addition, Hedge's g effect sizes were calculated to examine the magnitude of the differences between the conditions.

Figure 1. Starting position of the participant on the force platform.

Figure 2. Bottom position of the participant during the squat.

Results

Table 1. Downward phase durations of traditional and accentuated eccentric loaded (AEL) back squats.

Condition	50% Duration (s)	60% Duration (s)	70% Duration (s)	80%* Duration (s)
Traditional	0.87 ± 0.12	0.90 ± 0.10	0.90 ± 0.13	1.00 ± 0.15
AEL100	0.92 ± 0.15	1.00 ± 0.15	0.98 ± 0.14	1.01 ± 0.17
AEL110	0.91 ± 0.18	0.91 ± 0.12	0.99 ± 0.15	1.01 ± 0.16
g	0.07- 0.36	0.09 – 0.77	0.06-0.61	0.01-0.07

Note: Loads listed are those performed during the concentric phase of the back squat and are based on percent of 1RM back squat; AEL100 = eccentric phase performed with 100% 1RM; AEL110 = eccentric phase performed with 110% 1RM; *g* = Hedge's *g* effect size range between loads; * = significantly greater duration compared to 50% 1RM (p = 0.041).

Conclusions

- The load added to the barbell had a significant effect on downward phase duration.
- The downward phase durations were consistent between TRAD and AEL conditions in resistance-trained women.

Practical Applications

- Downward phase duration may not differ between TRAD and AEL back squats. Because of this, strength and conditioning practitioners should consider implementing AEL using the natural movement tempo of an individuals back squat to provide the most effective training stimulus.
- However, it is important to consider the prescribed loads as the downward phase duration may change.

References

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