DOWNWARD PHASE DURATIONS IN ACCENTUATED ECCENTRIC LOADED BACK SQUATS IN RESISTANCE-TRAINED MEN

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Introduction

Accentuated eccentric loading (AEL) has demonstrated positive effects in strength and power characteristics different from those of traditional loading (3). While the effects of different AEL loading strategies have been investigated between traditional back squats and maximal or supra-maximal AEL squats (2), limited information exists on the downward phase duration (i.e., tempo) differs between conditions. Given that AEL squats performed at different eccentric tempos may lead to different performance adaptations (1), it is important for practitioners to understand the differences in the natural movement tempos between traditional and AEL squats. Therefore, the purpose of this study was to compare the downward phase duration of the back squat between traditional and AEL back squats performed with maximal and supramaximal AEL loads in resistance-trained males.

Methods

- 16 resistance-trained men (age = 24.7 ± 3.9 years, height = 176.9 ± 7.8 cm, body mass = 84.6 ± 12.7 kg, relative one repetition maximum back squat [1RM BS] = 2.04 ± 0.28 kg/kg) participated in four testing sessions.
- Session one: 1RM BS testing and a familiarization with weight releasers that were used in later sessions
- The remaining three testing sessions were performed in a randomized order
  - Traditional back squat: three BS repetitions with 50, 60, 70, and 80% of their 1RM BS
  - Maximal AEL (AEL100): three BS repetitions with 50, 60, 70, and 80% of their 1RM BS while performing the eccentric phase of the first repetition with 100% 1RM
  - Supramaximal AEL (AEL110): three BS repetitions with 50, 60, 70, and 80% of their 1RM BS while performing the eccentric phase of the first repetition with 110% 1RM
- Each BS set was performed on a force platform where the raw force-time data were used to calculate the downward phase duration of the first repetition of each set. The downward phase duration was determined as the combined duration of the unweighting and braking phases of the BS
- A three (condition) by four (load) repeated measures ANOVA test with Bonferroni post hoc tests was used to compare the downward phase durations produced during the different loading conditions
- Hedge's g effect sizes were also calculated to examine the magnitudes of the differences between the various conditions

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	0.90 ± 0.16	0.93 ± 0.16	1.00 ± 0.17	1.06 ± 0.15
AEL100	1.07 ± 0.22	0.99 ± 0.20	1.07 ± 0.15	1.09 ± 0.18
AEL110	1.03 ± 0.26	1.09 ± 0.20	1.13 ± 0.15	1.11 ± 0.15
g	0.13- 0.85	0.34 – 0.85	0.34-0.77	0.15-0.33

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 60% 1RM (p=0.043)

Figure 1. Starting position of the participant on the force platform with weight releasers on the barbell.

Figure 2. Weight releasers fall off at the bottom of the back squat reducing absolute barbell load for the propulsion phase.

Conclusions

- The downward phase durations were similar between traditional and AEL squatting conditions regardless of the added load in resistance-trained men.
- There was a general trend indicating that heavier eccentric loads, such as those provided by AEL, may increase the downward phase duration.
- There were no practically meaningful differences across sets for any variable as indicated by the effect sizes.

Practical Applications

- AEL squats may provide a novel stimulus for individuals with plyometric and resistance training experience compared to performing traditional CMJ.
- Since downward phase durations may not differ between traditional and AEL back squat conditions, strength and conditioning practitioners may consider prescribing AEL using an individual's natural movement tempo to provide the most effective training stimulus.
- Future researchers may consider examining the downward phase duration differences between stronger and weaker participants given the status of AEL as an advanced training strategy.

References

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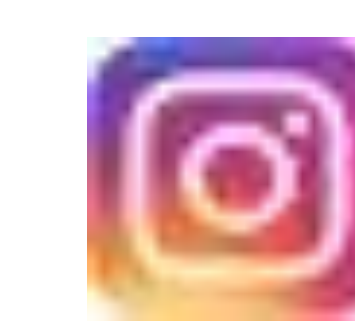
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