

Effects of Pre-Workout Supplements on Maximal Concentric and Eccentric Force Production During Lower Body Resistance Exercise

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ABSTRACT

Due to claims of increased sport performance and decreased fatigue, “pre-workouts” are some of the most popular dietary supplements being sold today.

PURPOSE: The purpose of this study was to determine if two commercially available pre-workout supplements are effective at increasing peak concentric and eccentric force production during lower-body resistance exercise on a mechanized squat device.

METHODS: Three conditions were implemented: caffeinated pre-workout (C; Pre-Jym), non-caffeinated pre-workout (NC; Carbon Prep), and placebo (P). Participants served as their own control in a counterbalanced fashion, and the study was double blind (i.e. the participants and researchers were blind to the supplement being taken). Thirty minutes after supplement ingestion, each participant completed one 3-repetition maximal effort test (first repetition at 50% maximal effort, and the last two repetitions at maximal voluntary effort), along with five sets of six repetitions on an isokinetic squat machine (Exerbotics eSq, Tulsa, OK) with attached force analysis system. The maximal concentric forces produced during the second and third repetitions were averaged and one-way repeated measures ANOVA was performed to compare the three supplement conditions. Identical procedures were followed to analyze the peak eccentric forces.

RESULTS: Twenty-one participants completed the study (12 F, 9 M). There were no statistically significant effects of supplementation on concentric and eccentric force production during the maximal force production test ($p = .323$ and $p = .631$). However, maximal concentric force production was 4.4% and 7.9% higher than placebo in the NC and C conditions, respectively. Additionally, maximal eccentric force production was 3.8% and 4.0% higher in the NC and C conditions. Corresponding Cohen’s d effect sizes for force production, representing the effect of the supplement as compared to placebo, ranged from $d = .13$ to $d = .28$.

CONCLUSIONS: There were not any deleterious effects of the pre-workout supplements used in this study on peak power output on a mechanized squat machine. Although it cannot be definitively concluded that the pre-workout supplements utilized in this study have a positive effect on improving peak power output (eccentric and concentric) during lower-body resistance training, average force production during the supplementation conditions was 4 to 8% higher than placebo. The largest effect was

seen with the caffeinated supplement during concentric muscle action. Additional research is needed to determine the potential of commercially available pre-workouts to increase exercise performance.

