Background
A number of nutritional strategies have been developed to optimize nutrient delivery for recreational and competitive athletes prior to, during, and post exercise, and many nutritional interventions were used by coaches, trainers, and athletes over the various sport fields. Current literatures have reported a combination of creatine, beta alanine, caffeine, and amino acid as effective supplements for improving performance. Additionally, consuming carbohydrate (CHO) and protein (PRO) beverage in the hours prior to the events is one of methods for maximizing glycogen stores and potentially influencing its utilization during exercise. As a result, a number of pre-workout supplements have been developed to increase energy availability, promote vasodilation, and/or positively affect exercise capacity. Some studies regarding pre-workout supplement ingestion have reported enhanced performance, shorter reaction time, improved strength and power, and delayed fatigue. Our previous study have also shown pre-workout supplement ingestion prior to exercise promoted modest increases in performance response, enhanced perceptions of readiness to perform and cognitive function. The purpose of this study was to examine the effects of ingesting a pre-workout dietary supplement with and without synephrine for 8 weeks on muscular strength, anaerobic power, and body composition.

Methods
In a double-blind, crossover, randomized and placebo-controlled manner, 78 apparently healthy and recreationally active men (21.76±3.9 yr, 15.29±6.19% fat, 25.60±4.3 kg/m²) were recruited for the study participation. Participants then were stratified in a randomized and counterbalanced manner a dextrose flavored placebo (P), a pre-workout supplement (PWS) containing 3.0 g of beta alanine, 2 g of creatine nitrate, 2.0 g of arginine AKG, 300 mg of N-acetyl tyrosine, 270 mg of caffeine, 15 mg of Mucuna pruriens, or the PWS with 20 mg of synephrine (PWS+S). At baseline testing (0 week), body composition was measured by dual-energy X-ray absorptiometry (DXA). Muscular strength was measured by one repetition maximum test (1RM) for the leg press (LP) and the bench press (BP). Participants had 3 sets with 50% 1RM to 1st set, 70% 1RM to 2nd set, and 90% 1RM to 3rd set, and then 1RM was measured to the both test (LP & BP). Participants had 2 minutes rest between at each set, and then following 5 minutes rest of strength test, participants had a 30sec Wingate test to measure peak power (PP), mean power (MP), and total work (TW). The 30s Wingate test was performed with a computerized cycle ergometer; 1 minute warm-up and 30 second all-out pedaling with breaking torque 0.75 Nm. Participants repeated the experiment at 4 weeks and 8 weeks. We used a GLM covared for respective baseline measures to assess changes in performance and body composition at weeks 4 and 8. Data are presented as mean ± SD and mean change ± 95% CI when appropriate.

Results
Statistical analysis revealed a significant increase in LP 1RM at 4 weeks for PWS (61.83 kg; 24.96, 98.75) and PWS+S (44.89 kg; 8.3, 81.5) and 8 weeks for PWS (79.23 kg; 39.9, 118.5), PWS+S (89.53 kg; 50.6, 128.5) and PLA (43.28 kg, 4.1, 82.4). Similar patterns in BP 1RM were noted at 4 weeks for PWS (6.94 kg; 0.6, 13.3), PWS+S (8.17 kg; 1.9, 14.5) and 8 weeks for PWS (13.83 kg; 7.8, 20.0) and PWS+S (13.83 kg; 7.8, 20.0) and PLA (7.18 kg; 1.0, 13.4). We observed a significant increase in PP for PWS+S and PLA at week 4; however, we observed no significant differences at 8 weeks, between group differences throughout the study or an additive benefit from including synephrine.

Conclusion
Ingesting a PWS containing beta alanine, creatine nitrate, arginine AKG, N-Acetyl Tyrosine, caffeine, and Mucuna pruriens increased LP and BP 1RM at 4 week and 8 week in comparison to a placebo. Results indicate that the pre-workout supplement can promote strength and anaerobic power over the 8 weeks; however, it did not show body composition change.

Acknowledgements and Funding
Supported by Nutrabolt International Inc., Bryan, TX

RB Kreider serves as a university approved scientific advisor to Nutrabolt, and CP Earnest serves as Research Director for Nutrabolt. Other authors report no Col's.