EFFECTS OF 8 WEEKS INGESTION OF PRE-WORKOUT SUPPLEMENT WITH AND WITHOUT SYNEPHRINE ON COGNITIVE FUNCTION, AND PERCEPTIONS OF READINESS TO PERFORM

YP Jung, M Cho, A O'Connor, C Chang, M Koozehchian, C Goodenough, N Barringer, F Ayadi, D Walker, S Simbo, E Galvan, R Dalton, K Levers, E Garcia, C Mitchell, C Rasmussen, M Greenwood, P Murano, CP Earnest, RB Kreider, Exercise & Sport Nutrition Lab, Department of Health & Kinesiology, Texas A&M University, College Station, TX 77843

Abstract

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. Caffeine supplementation prior to exercise have shown to counter the cognitive and physical degradation associated with an overnight period of sustained wakefulness for military and athletes. The ergogenic effects of caffeine have been reported to decrease the perception of pain and effort. 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, shorten reaction time, improved strength and power, and delayed fatigue. Our previous study have also shown pre-workout supplement ingestion prior to exercise promoted modest thermogenic response, enhanced perceptions of readiness to perform and cognitive function. The purpose of this study was to examine the effects of 8 weeks ingestion of pre-workout supplement with and without synephrine on cognitive function, and perceptions of readiness to perform.

Methods

In a double-blind, crossover, randomized and placebo-controlled manner; 78 apparently healthy and recreationally active men (21.76±3.59 yr, 15.29±6.19% fat, 25.60±4.03 kg/m^2) 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, 2.0 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), cognitive function (CF) was measured by Stroop Color and Word test, and perceptions of readiness to perform measured by rate of readiness via a visual analogue scale (RTP-VAS). The Stroop Color and Word test consists of a Word page with color words printed in black ink, a Color page with 'Xs' printed in color, and a Color-Word page with words from the first page printed in colors from the second page. The participants went down each sheet reading words or naming the ink colors as quickly as possible for 45 seconds. RTP-VAS was assessed before exercise tests by using visual analog scales ranging from 1 ("Strongly disagree") to 5 ("Strongly agree") for subject's perceptions of readiness to perform. Participants repeated the experiment at 4 weeks and 8 weeks. We used a GLM covaried for respective baseline measures to assess changes in CF and RTP-VAS at weeks 4 and 8. Data are presented as mean ± SD and mean change ± 95% CI when appropriate.

Results

We observed a significant increase in CF for the word test at 4 weeks for PWS+S (5.64 count; 2.09, 9.19) and PLA (3.9 count; 0.39, 7.45), and 8 weeks for PWS (7.55 count; 4.14, 10.97), PWS+S (9.93 count; 6.48, 13.37) and PLA (6.74 count; 3.31, 10.16). Similar patterns in CF for the color test were noted at 4 weeks for PWS (5.05 count; 2.72, 7.38), PWS+S (2.56 count; 0.24, 4.88), PLA (2.76 count; 0.43, 5.09) and 8 weeks for PWS (8.3 count; 5.76, 10.89), PWS+S (5.07 count; 2.51, 7.63) and PLA (4.89 count; 2.32, 7.4). Decrease ratings of feelings about "I am optimistic about my future performance" were observed in all groups at 4 & 8 weeks.

Conclusion

Ingesting a PWS containing beta alanine, creatine nitrate, arginine AKG, N-Acetyl Tyrosine, caffeine, and Mucuna pruriens improved cognitive function at 4 week and 8 week in comparison to a placebo. Results indicate that the pre-workout supplement can promote cognitive function and have a positive effect of exercise performance.

Rationale

Among active young and athletes, multi-ingredient pre-workout supplements are extremely popular [1, 2], and a number of nutritional strategies have been developed to optimize nutrition delivery prior to exercise [3, 4]. Synephrine is widely used in dietary supplements for sports performance, and it also extensively consumed in various juices and foods derived Citrus species [5]. In a 60 days doudble-blind and placebo-controlled study, adverse effects of Citrus aurantium were not found [6].

1. Young & Stephens. Mil Med. 174(2), 2009.
2. Koceja & Ellis. Int J Sport Nutr. 5, 1995.
3. Kreider, Wilborn, Taylor, Campbell, Almada, Collins, Cooke, & et al. J Int Soc Sports Nutr 7(7), 2010.
4. La Bounty, Campbell, Wilson, Galvan, Berardi, Kleiner, Kreider, & et al. J Int Soc Sports Nutr 8(1) 2011.
5. Dragull, Breksa III, & Cain. J Agri Food Chem 56(19), 2008.
6. Kaats, Miller, Preuss, & Stohs. Food & Chem Toxi 55, 2013

Methods & Procedures

- A double-blind, crossover, randomized and placebo-controlled manner
- 78 apparently healthy and recreationally active men and women (21.76±3.59 yr, 15.29±6.19% fat, 25.60±4.03 kg/m^2)

Supplements

- Placebo (P): a dextrose flavored
- Pre-workout (PWS): 3.0 g beta alanine, 2 g creatine nitrate, 2 g arginine AKG, 300 mg of N-acetyl tyrosine, 270 mg caffeine, 15 mg of Mucuna pruriens
- Pre-workout with synephrine (PWS+S): PWS with 20 mg of synephrine

- At baseline (0 week), CF and perception of readiness to perform test were assessed by Stroop Color and Word test and RTP-VAS, and then at 4 week and 8 week, all tests were repeated.

Statistical Analysis

- We used a GLM covaried for respective baseline measures to assess changes in CF and RTP-VAS at weeks 4 and 8.
- Data are presented as mean ± SD and mean change ± 95% CI when appropriate.

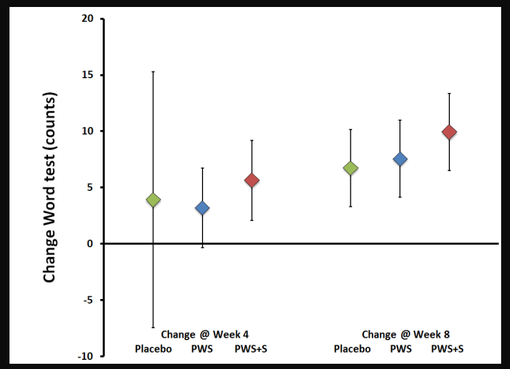
Results

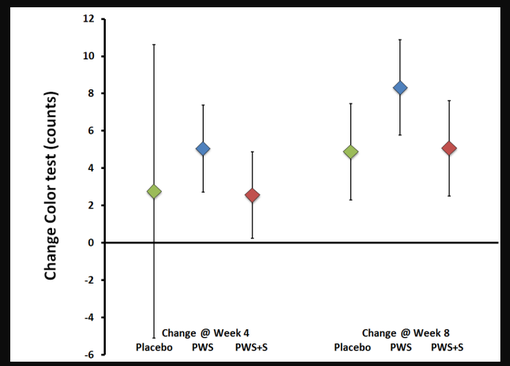
- Statistical analysis revealed a significant increase in CF for the word test at 4 weeks for PWS+S (5.64 count; 2.09, 9.19) and PLA (3.9 count; 0.39, 7.45), and 8 weeks for PWS (7.55 count; 4.14, 10.97), PWS+S (9.93 count; 6.48, 13.37) and PLA (6.74 count; 3.31, 10.16).
- Similar patterns in CF for the color test were noted at 4 weeks for PWS (5.05 count; 2.72, 7.38), PWS+S (2.56 count; 0.24, 4.88), PLA (2.76 count; 0.43, 5.09) and 8 weeks for PWS (8.3 count; 5.76, 10.89), PWS+S (5.07 count; 2.51, 7.63) and PLA (4.89 count; 2.32, 7.4).
- Decrease ratings of feelings about "I am optimistic about my future performance" were observed in all groups at 4 & 8 weeks.

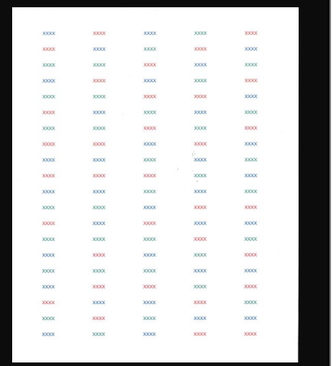
Conclusion

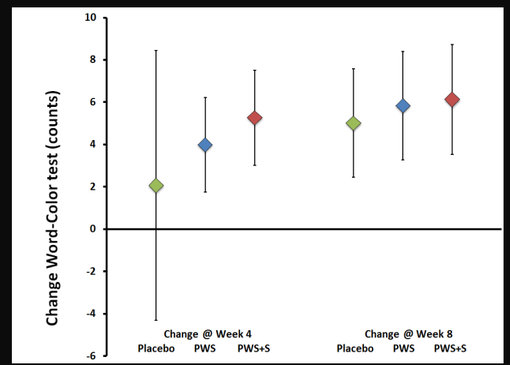
- Ingesting a PWS containing beta alanine, creatine nitrate, arginine AKG, N-Acetyl Tyrosine, caffeine, and Mucuna pruriens improved cognitive function at 4 week and 8 week in comparison to a placebo.
- Results indicate that the pre-workout supplement can promote cognitive function and have a positive effect of exercise performance.

Figures









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.