EFFECT OF A MULTI-INGREDIENT PRE-WORKOUT SUPPLEMENT ON PACING DURING A 15-MINUTE HIGH-INTENSITY FUNCTIONAL TRAINING WORKOUT IN EXPERIENCED MEN

Ian Burks, Britton Rellinger, Christopher Staples, Jacob Fanno, Ashley Hines, James Henley, Wysmark Chaves, Holden Young, Colton Sheetz, Jacob Grazer, Tiffany A. Esmat, John McLester J, and Gerald T. Mangine.
Department of Exercise Science and Sport Management, Kennesaw State University, Kennesaw, GA

KENNESAW STATE UNIVERSITY
OFFICE OF RESEARCH
Undergraduate Research

INTRODUCTION

High intensity functional training workouts (HIFT) that require 'as many repetitions as possible' (AMRAP) of a circuit within an allotted time are scored by repetitions completed (2, 8). Performance in these types of workouts might be improved through adaptations in exercise technique, anaerobic capacity and power, aerobic endurance, and/or transitions (between exercises) efficiency (7). Collectively, these adaptations would enhance energy availability and may be developed through training.

Several ingredients commonly found within pre-workout supplements may also enhance energy availability (1, 4, 5, 6, 9, 11), and are therefore be relevant to HIFT performance. An acute dose of caffeine (6 mg·kg^{-1}) aided local muscular endurance in HIFT-trained athletes (1), while others noted improved performance in the second workout of back-to-back HIFT workouts after 6 weeks of supplementing with a multi-ingredient (MIPS) pre-workout supplement (10). However, no study has examined the effect of any MIPS formulation on acute HIFT performance.

PURPOSE

To determine the effect of acute ingestion of a multi-ingredient pre-workout supplement on pacing during a 15-minute AMRAP.

METHODS

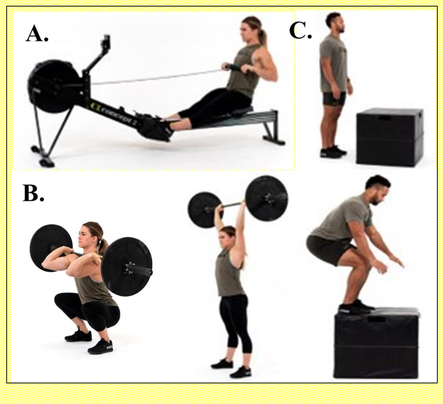
Men (n=7: 29±7 years, 173±9 cm, 83±17 kg) with CF experience (≥2 years) completed 4 fasted (2-3 hours) workout trials in cross-over fashion, once per week over 4 consecutive weeks at their normal workout time.

Participants randomly consumed either supplement (S, Maximum Pre-workout Formula, Shifted, LLC, Eugene, OR – see Table 1) or a non-caloric placebo (P), rested 40 minutes, and then randomly completed either a 5- or 15-minute AMRAP.

Video recordings from the 5-minute trials were analyzed to calculate the average, standard deviation (SD), and slope of time spent performing and transitioning between each exercise. Breaks and failed repetitions were also quantified.

Figure 1. Workout structure

Within a 15-minute time limit, participants repeated a circuit of **(A.)** rowing for nine calories on an ergometer, **(B)** six barbell thrusters at 95 lbs. (43.1 kg), and **(C)** three 24-in box jumps while maintaining technical movement standards (2).



RESULTS

Table 1. Supplement ingredient list

Serving Size: 1 scoop (30 g)		
Ingredients	**Amount per serving**	**% DV**
Calories	5	
Total Carbohydrate	1 g	≤1%*
Niacin (as Nicotinic Acid)	15 mg	94%
Vitamin B6 (as Pyridoxine HCl)	1 mg	59%
Vitamin B12 (as Methylcobalamin)	100 mcg	4167%
Iron	1 mg	6%
Magnesium (from Red Spinach Leaf Extract and Dimagnesium Malate)	9 mg	2%
Sodium (as Pink Himalayan Sea Salt)	40 mg	2%
Potassium (from Red Spinach Leaf Extract and Potassium Chloride)	248 mg	5%
L-Citrulline	8 g	**
Creatine Monohydrate	5 g	**
Taurine	3 g	**
Beta-Alanine (as CarnoSyn®)	2.5 g	**
Betaine Anhydrous	2.5 g	**
L-Tyrosine	2 g	**
Red Spinach Leaf Extract (as Oxystorm®)	1 g	**
Beet Root Extract	1 g	**
Alpha-GPC (Alpha-Glycerol Phosphoryl Choline 50%)	300 mg	**
Caffeine Blend Caffeine Anhydrous (250 mg) zümXR® Delayed Release Caffeine (50 mg)	300 mg	**
L-Theanine	150 mg	**
ElevATP® (Ancient Peat and Apple Fruit Extract)	150 mg	**
Pink Himalayan Sea Salt	100 mg	**
Rhodiola rosea (root) Extract	100 mg	**
Co-Enzyme Q10	25 mg	**
AstraGin® [Astargalus membranaceus (root) Extract & Panax notoginseng (root) Extract]	25 mg	**
BioPerine® (Black Pepper Fruit Extract)	5 mg	**

*Percent Daily Values (DV) are based on a 2,000-calorie diet
** Daily value not established

OTHER INGREDIENTS: Citric acid, Natural Flavor, Calcium Silicate, Malic Acid, Silicon Dioxide, Sucralose, Spirulina Powder

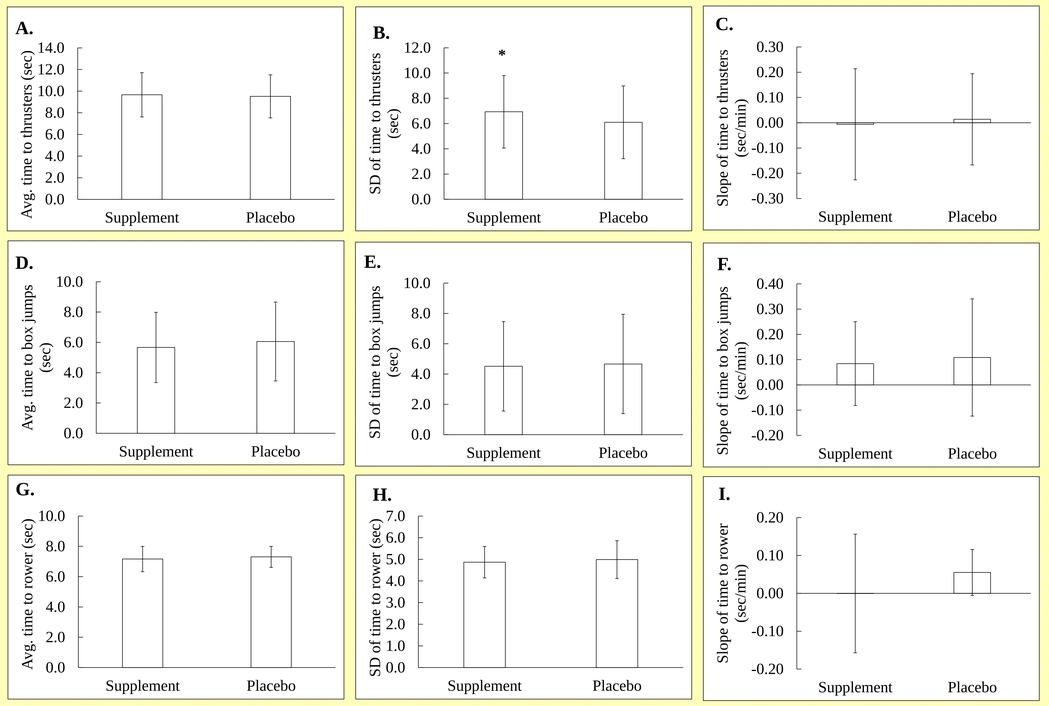
Independent sample t-Tests revealed:

- No differences in repetition completion rate for any of the individual exercises regarding their average time, standard deviation, or slope (see Table 2).
- Time spent transitioning between rowing and thrusters was more variable ($p < 0.05$) during the Supplement trial (SD = 6.93 ± 2.87 sec) compared to Placebo (SD = 6.10 ± 2.88 sec)
- **No breaks were taken (within an exercise set) nor were any failed repetitions observed during either condition.**

Table 2. Differences in overall and individual exercise repetition completion rate characteristics.

	Supplement	Placebo	Difference	*p*-value
Repetitions	186 ± 19	182 ± 27	-4 ± 11	0.399
Rate (reps/min)	12.4 ± 1.2	12.2 ± 1.8	-0.2 ± 0.7	0.399
Calories				
Average	0.29 ± 0.04	0.28 ± 0.04	0.00 ± 0.01	0.233
Standard deviation	0.06 ± 0.02	0.05 ± 0.03	-0.01 ± 0.02	0.280
Slope	-0.008 ± 0.004	-0.004 ± 0.006	0.004 ± 0.005	0.092
Calories per stroke				
Average	0.62 ± 0.09	0.66 ± 0.09	0.04 ± 0.08	0.234
Standard deviation	0.11 ± 0.04	0.08 ± 0.06	-0.03 ± 0.06	0.224
Slope	-0.015 ± 0.006	-0.010 ± 0.012	0.005 ± 0.010	0.218
Thrusters				
Average	0.45 ± 0.07	0.43 ± 0.06	-0.02 ± 0.04	0.274
Standard deviation	0.09 ± 0.06	0.04 ± 0.02	-0.04 ± 0.05	0.075
Slope	-0.001 ± 0.002	-0.003 ± 0.004	-0.002 ± 0.004	0.219
Box Jumps				
Average	0.40 ± 0.08	0.40 ± 0.07	0.00 ± 0.04	0.984
Standard deviation	0.06 ± 0.03	0.08 ± 0.06	0.02 ± 0.07	0.456
Slope	0.000 ± 0.009	-0.002 ± 0.006	-0.002 ± 0.01	0.634

Figure 2. Transition time characteristics between rower and thrusters (A-C., average, SD, slope), thrusters to box jumps (average, SD, slope), and box jumps to rower (average, SD, slope).



*=Significantly ($p < 0.05$) different from Placebo.

CONCLUSIONS

Except for more variable transitions time between the rower and thrusters, MIPS did not impact repetitions completed or any other pacing variable. Caffeine (1, 5), creatine monohydrate (4), and β-Alanine (11) have all been well documented to improve exercise performance. However, the inexact caffeine dosage (300 mg regardless of body size) and lack of a loading phase for creatine monohydrate and β-Alanine may have minimized their potential effect. Previously, Outlaw and colleagues noted improved performance in a different 15-minute HIFT workout after 6-weeks ingestion of another MIPS formulation but not in an initial ~8-minute workout (10). Speculatively, it is possible that such formulations are not relevant to all HIFT workout compositions.

PRACTICAL APPLICATIONS

These data do not support consuming this multi-ingredient supplement to help better sustain pacing and improve 15-minute AMRAP pacing in men with HIFT experience.

REFERENCES

1. Caetano ML et al. (2023). The effects of acute caffeine supplementation on performance in trained CrossFit® athletes: A randomized, double-blind, placebo-controlled, and crossover trial. Science & Sports.
2. CrossFit. Open Workouts, in: CrossFit Games. 2023.
3. Curtis J et al. (2022). The Effects of a Pre-workout Supplement on Measures of Alertness, Mood, and Lower-Extremity Power. Cureus, 14 (5).
4. Kreider RB et al. (2017) International Society of Sports Nutrition position stand: safety and efficacy of creatine supplementation in exercise, sport, and medicine. Journal of the International Society of Sports Nutrition, 14 (1): 18.
5. Goldstein ER et al. (2010). International society of sports nutrition position stand: caffeine and performance. Journal of the International Society of Sports Nutrition, 7 (1): 5.
6. Gonzalez AM et al. (2020). Emerging nutritional supplements for strength and hypertrophy: an update of the current literature. Strength & Conditioning Journal, 42 (5): 57-70.
7. Mangine GT and Seay TR (2022). Quantifying CrossFit®: Potential solutions for monitoring multimodal workloads and identifying training targets. Frontiers in Sports and Active Living, 4(949429).
8. McDougle JM et al. (2023). Acute physiological outcomes of high-intensity functional training: a scoping review. PeerJ, 11, e14493.Gonzalez AM et al. (2020). Emerging nutritional supplements for strength and hypertrophy: an update of the current literature. Strength & Conditioning Journal, 42 (5): 57-70.
9. Nicoll JX et al. (2023). The effects of a caffeine containing pre-workout supplement on β2-adrenergic and MAPK signaling during resistance exercise. European Journal of Applied Physiology, 123(3), 585-599.
10. Outlaw, J. J., Wilborn, C. D., Smith-Ryan, A. E., Hayward, S. E., Urbina, S. L., Taylor, L. W., & Foster, C. A. (2014). Effects of a pre-and post-workout protein-carbohydrate supplement in trained crossfit individuals. Springerplus, 3(1), 1-7.
11. Trexler ET et al. (2015) International society of sports nutrition position stand: Beta-Alanine. Journal of the International Society of Sports Nutrition, 12 (1): 30.

ACKNOWLEGEMENTS

THIS STUDY WAS FUNDED BY SHIFTED, LLC (EUGENE, OR).