EFFECTS OF A PRE-WORKOUT SUPPLEMENT ON REPETITIONS AND TOTAL WORKLOAD COMPLETED DURING A HIGH-INTENSITY FUNCTIONAL TRAINING WORKOUT

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INTRODUCTION

Performance in the 'as many repetitions as possible' (AMRAP) format that is commonly programmed for high-intensity functional training (HIFT) is optimized by maintaining a consistently faster pace over the duration of exercise (8, 9). Anaerobic energy pathways will predominantly supply energy for a faster pace but are limited by metabolite accumulation and will quickly result in fatigue (7). Since HIFT workouts typically range between a few to 20+ minutes (8), effort is commonly vigorous but not "all out" (9). Athletes must differentially balance their physiological capacity to maintain a steady supply of energy supply for the given demands of each unique workout. This ability can physiologically and strategically be improved by training (7 – 9) but might also be enhanced via nutritional supplementation. Several individual ingredients that might be found in various pre-workout formulations are known to affect blood flow and nutrient supply to exercising muscle, provide energy itself, and/or mitigate the effects of metabolite accumulation (1, 4 – 6, 10 – 11), all of which might aid in HIFT performance.

Currently, however, information on the effect of such formulations on HIFT performance is extremely limited. The only study to have examined the effect of any pre-workout formulation on HIFT performance (11) did so longitudinally. Outlaw and colleagues (2014) studied regular consumption of a formulation (extracts of pomegranate, tart cherry, green and black tea) for 6 weeks and noted improved aerobic capacity, anaerobic power, and performance in the second of two consecutive HIFT-style workouts. Acute performance was not assessed. Meanwhile, studies that have assessed the acute effects of the specific formulation under investigation (see Table 1) have reported improved bench press volume completed over five sets (1) but not vertical jump performance (3). As neither of these endeavors are comparable to the energy demands of a typical HIFT workout, it stands to reason that acute supplementation might aid in repetitions and workload completed during HIFT, especially as exercise duration increases.

PURPOSE

To examine the acute effects of a pre-workout supplement and exercise duration on repetitions and total workload completed in a HIFT workout.

METHODS

Men (n=12) and women (n=10) with HIFT experience (≥2 years) (29.3 ± 7.1 years, 171 ± 7 cm, 80.5 ± 15.6 kg) completed four randomized visits after fasting 2-3 hours, once per week, over 4 consecutive weeks at their normal workout time.

Participants randomly consumed supplement (S, Maximum Pre-workout Formula, Shifted, LLC, Eugene, OR) or non-caloric placebo (P), rested 40 minutes, and then completed a workout (Figure 1). Total rounds, repetitions and workload completed over the entire workout and each exercise were tracked.

Workload (in kg) calculations: Rowing calculated from average watts, split time, and distance tracked by the Concept2 (Model D) microcomputer. Thrusters calculated as load times repetitions completed. Box jumps calculated as mean force measured in Newtons by in-ground force plates (Accupower, AMTI) and converted to kilograms.

A 2-way (Condition x Sex) Repeated Measures ANOVA was used for comparisons with least significant difference procedure for post-hoc analysis.

RESULTS

Table 1. Supplement ingredient list

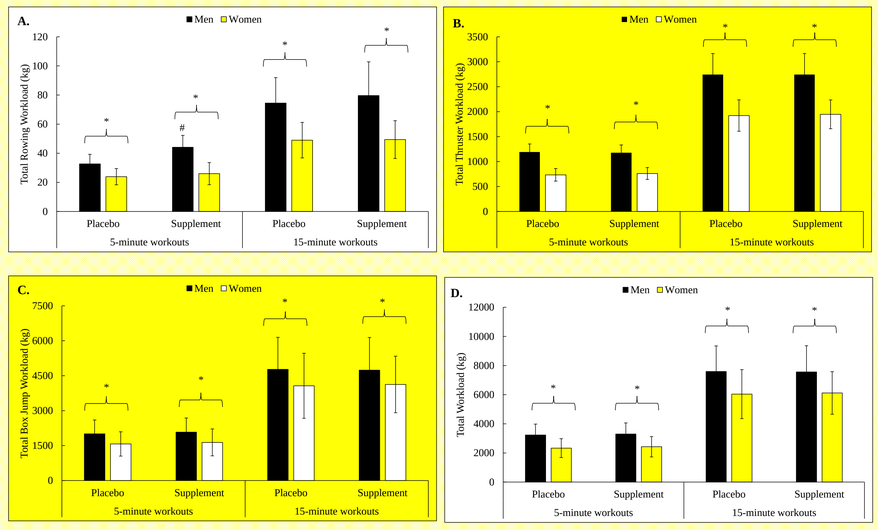
Serving Size: 1 scoop (30 g)		
Ingredients	**Amount per serving**	**% DV**
Calories	5	
Total Carbohydrate	1 g	≤1%*
Niacin (as Nicotinic Acid)	15 mg	94%
Vitamin B6 (as Pyridoxine HCl)	1 mg	59%
Vitamin B12 (as Methylcobalamin)	100 mcg	4167%
Iron	1 mg	6%
Magnesium (from Red Spinach Leaf Extract and Dimagnesium 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) zimXR® 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

Figure 1. Workout designs

Participants completed a circuit of **(A.)** rowing calories (men = 9, women = 7), **(B)** six barbell thrusters (men = 95 lbs. [43.1 kg]; women = 65 lbs. [29.5 kg]), and **(C)** three box jumps (men = 24 in [0.61 m]; women = 20 in [0.51 m]) for either a 5- or 15-minute AMRAP while maintaining previously described movement standards (2).

Figure 2. Comparisons between workloads for A) rowing load, B) thruster load, C) box jump load, and D) total workload.



= Significantly ($p < 0.05$) different from placebo; * = Significantly ($p < 0.05$) different between men and women.

Table 2. Rounds and repetitions completed comparisons

		5-minute workouts		15-minute workouts	
		Placebo	Supplement	Placebo	Supplement
Total Rounds					
	Men	4.69 ± 0.57	4.74 ± 0.53	10.75 ± 1.65	10.87 ± 1.72
	Women	4.35 ± 0.64	4.48 ± 0.71	10.94 ± 1.69	11.09 ± 1.63
	Total	4.53 ± 0.61	4.62 ± 0.61	10.83 ± 1.63	10.97 ± 1.64
Total Repetitions					
	Men	84.3 ± 10.3	85.3 ± 9.5	193.4 ± 29.6	195.7 ± 30.9
	Women	69.6 ± 10.2	71.7 ± 11.3	175.0 ± 27.1	177.4 ± 26.1
	Total	77.6 ± 12.5	79.1 ± 12.3	185 ± 29.4	187.4 ± 29.7
Rowing calories (kcal)					
	Men	43.7 ± 5.0	44.8 ± 4.5	98.3 ± 15.2	100.3 ± 16.5
	Women	32.6 ± 4.4*	33.5 ± 5.5*	77.9 ± 11.1*	78.8 ± 11.9*
	Total	38.6 ± 7.3	39.6 ± 7.5	89.0 ± 16.8	90.5 ± 18.0
Thruster repetitions					
	Men	27.7 ± 3.7	27.3 ± 3.6	63.7 ± 9.8	63.7 ± 9.8
	Women	24.9 ± 4.3	25.8 ± 4.0	65.2 ± 10.6	66.0 ± 9.8
	Total	26.4 ± 4.1	26.6 ± 3.8	64.4 ± 10.0	64.7 ± 9.6
Box jump repetitions					
	Men	13.0 ± 2.3	13.3 ± 2.0	31.5 ± 4.9	31.8 ± 4.9
	Women	12.1 ± 2.0	12.4 ± 2.0	31.9 ± 5.5	32.6 ± 4.7
	Total	12.6 ± 2.2	12.9 ± 2.0	31.7 ± 5.0	32.1 ± 4.7

= Significantly ($p < 0.05$) different from placebo; * = Significantly ($p < 0.05$) different between men and women

CONCLUSIONS

The multi-ingredient pre-workout supplement led to men completing a greater rowing workload during the 5-minute bout. Rowing required participants to sustain effort longer than the other three exercises, and thus, was most likely to be affected because several of the supplement's ingredients are known to improve sustained effort (4 – 6, 11). While this did not alter the final score, the cumulative force expression might be indicative of a greater potential to sustain effort over longer sets within a different HIFT-style workout. Less rowing calories were prescribed per round than is usual, especially in women (2, 8, 9), and could therefore have limited the influence stronger rowing had on total rounds and repetitions completed.

Differential effects within the present workout is consistent with mixed outcomes of previous reports (1, 3). The present formulation did not improve vertical jump performance (3) but enabled more repetitions to be completed across 5 sets of bench press (1). This may be due to differences in sustained effort across various modalities (described above) or could be related to dosage. For instance, acute benefits are often seen whenever caffeine is involved but this is modulated by body size and habitual consumption (5). Meanwhile, other historically beneficial ingredients (e.g., creatine and beta-alanine) typically require habitual usage and are also affected by body size (4, 11). Though participants were asked to maintain their typical nutritional supplementation habits, it is unclear how those habits compared to this study's single standardized dosage.

PRACTICAL APPLICATIONS

The data suggests the supplement may have value for men in shorter-duration HIFT-style workouts that pair more aerobically-focused modalities (e.g., rowing) with low-repetition plyometric and resistance training exercises.

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ACKNOWLEGEMENTS

This study was funded by SHIFTED, LLC (Eugene, OR) and the Kennesaw State University Office of Undergraduate Research.