

The Influence of a Pre-Exercise Sports Drink on Indices of Aerobic Power

Poster Presentation at the Scripps Center for Integrative Medicine's 6th Annual Natural Supplements Conference, San Diego, California. January 22-25, 2009.

Allyn Byars, Susan Keith, Steve Snowden
Human Performance Laboratory, Angelo State University, San Angelo, TX

ABSTRACT

CONTEXT: Pre-exercise sports drinks (PRX) are commonly used as ergogenic aids in athletic competitions requiring aerobic power. However, in most cases, claims regarding their effectiveness have not been substantiated. In addition, the ingredients in PRX products must be deemed acceptable by the athletic governing bodies that regulate their use in training and competition. **OBJECTIVE:** To examine the effects of a modified PRX formulation from an earlier investigation on indices of aerobic performance during a graded exercise test. The modification consisted of removing creatine to meet the compliance standards set forth by various athletic organizations that regulate the use of nutritional supplements. **SETTING:** Human Performance Laboratory, Angelo State University. **DESIGN:** Randomized, double-blind, placebo-controlled trial. **PARTICIPANTS:** 29 male and female college students varying in levels of aerobic fitness. **INTERVENTIONS:** Randomized crossover administration of PRX (containing 14 g/serving of fructose, medium-chain triglycerides, and amino acids mixed with 8 oz. of water) and placebo (PL) to participants 30 minutes prior to performing a treadmill test, with approximately one week separation between the trials. **MAIN OUTCOME MEASURES:** Maximal oxygen consumption (VO_{2max}), maximal heart rate (HR), time to exhaustion (Time), and percentage estimated non-protein fat substrate utilization (FA) during two *a priori* submaximal stages of a graded exercise testing were evaluated. **RESULTS:** The VO_{2max} mean value of the PRX trial was significantly greater than the PL trial ($p < 0.01$). The mean value for Time was also observed to be greater for the PRX trial compared to PL ($p < 0.05$). Additionally, percentage of FA during submaximal stages of the exercise test was greater for PRX trial in comparison to PL ($p < 0.01$). **CONCLUSIONS:** The modified PRX formulation utilized in this investigation supports the previous investigation and its efficacy for enhancing indices of aerobic performance (specifically VO_{2max} , Time, & FA) during graded exercise testing.

INTRODUCTION & PROBLEM

BACKGROUND: Previously, research has demonstrated

that carbohydrate (CHO) ingestion during aerobic exercise can improve performance during exercise sessions lasting longer than 90 minutes performed at intensities greater than 70% VO_{2max} by preventing a decline in blood glucose concentration, whereas the timing and type of CHO ingestion following exercise influences muscle glycogen restoration.^{1,2} In addition, there is evidence suggesting that a mixture of CHO and medium-chain triglycerides (MCTs) results in increased aerobic function as marked by increases in length of time trials to exhaustion.³ Pre-exercise sports drinks (PRX) are commonly used as ergogenic aids in athletic competitions requiring aerobic power. However, in most cases, claims regarding their effectiveness have not been substantiated. In addition, the ingredients in PRX products must be deemed acceptable by the athletic governing bodies that regulate their use in training and competition. Currently there are many sport drinks that help the body replenish CHO levels during exercise, including pre-exercise formulas designed to promote the sparing of CHO by facilitating FA during exercise. EM-PACT® sports drink (Mannatech, Incorporated, Coppell, TX) is an energy and endurance PRX purported to increase oxygen consumption and improve fat utilization during aerobic activity. In a previous study, ingestion of EM-PACT® significantly enhanced indices of aerobic performance when compared to a water placebo.⁴ **PURPOSE:** The purpose of this study was to examine the effects of a modified EM-PACT® formulation on indices of aerobic performance during a graded exercise test. Specifically, VO_{2max} , HR, Time, and FA during two *a priori* submaximal stages of a graded exercise testing were evaluated. The modification consisted of removing creatine monohydrate to meet the compliance standards set forth by various athletic organizations that regulate the use of nutritional supplements.

METHODS

SUBJECTS: In this investigation, twenty male and nine female recreationally active college students ($n = 29$), ages 19-29 years (21.79 ± 2.73), volunteered as subjects. Subjects signed university approved informed consent statements in compliance with the institution's research

review board on the campus in which the study was conducted. **TESTING PROTOCOL:** Subjects involved in this study were asked to submit to two VO_{2max} tests with approximately one week separation between the trials. Subjects were required to perform each test on a motor-driven treadmill using a graded exercise protocol in which the speed and incline were increased every three minutes.⁵ Expired lung gases were examined for the purpose of determining the amount of oxygen utilized during exercise for energy metabolism. During the test, HR, VO_{2max} , Time, and perceived exertion were continuously measured. In this crossover design, each subject arrived thirty minutes prior to each exercise trial and was given either the recommended dosage of the PRX or a placebo (PL) exactly thirty minutes prior to the test. Administration of the PRX and PL trials was double-blinded and randomized, with half of the participants ingesting the PRX (14 g mixed with 8 oz. of water) during the first trial and the PL (8 oz. of water with similar flavor) during their second trial, with the order reversed for the remaining subjects. Total participation time for each test was approximately one hour. The PRX supplement contains the following ingredients: aloe vera extract, calcium citrate, L-carnitine, choline bitartrate, citric acid, fructose, lecithin, lemon oil powder, magnesium aspartate, magnesium succinate, MCTs, potassium aspartate, potassium succinate, silicon dioxide, gum ghatti, arabinogalactan, and glucosamine hydrochloride. **DATA ANALYSIS:** Data were analyzed using a 2 x 2 (groups by trials) repeated measures ANOVA. VO_{2max} , HR, Time, and FA during two *a priori* submaximal stages of a graded exercise testing were the dependent variables examined ($p < 0.05$). Data are presented as means \pm standard deviations (SD) for PRX and PL trials.

RESULTS

Descriptive characteristics of subjects are presented in TABLE 1. Initial results indicated significant mean differences in VO_{2max} ($ml \cdot kg^{-1} \cdot min^{-1}$) between PRX (50.49 ± 10.02) and PL (48.49 ± 9.91) trials for the total group ($p=0.007$), and was not affected by gender ($p>0.05$). Overall differences in VO_{2max} and FA are depicted in FIGURE 1. No significant mean differences in maximal HR (beats $\cdot min^{-1}$) were found between the PRX (188.66 ± 9.48) and PL (189.66 ± 9.49) trials for all subjects nor for either

Table 1

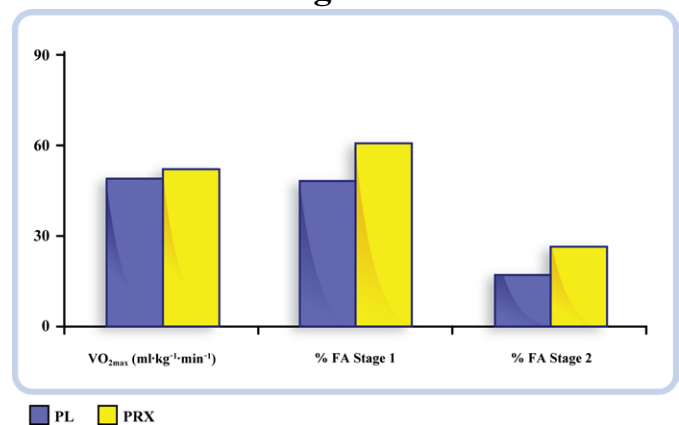
Variable	Mean \pm Standard Deviation
Age (years)	
Male (n=20)	22.15 \pm 2.43
Female (n=9)	21.00 \pm 1.73
Total (n=29)	21.79 \pm 2.73
Height (cm)	
Male (n=20)	180.73 \pm 7.73
Female (n=9)	166.29 \pm 4.21
Total (n=29)	176.24 \pm 9.58
Weight (kg)	
Male (n=20)	84.26 \pm 15.73
Female (n=9)	68.02 \pm 12.78
Total (n=29)	79.23 \pm 16.52
Body Mass Index	
Male (n=20)	25.79 \pm 4.42
Female (n=9)	24.75 \pm 5.74
Total (n=29)	25.47 \pm 4.79

Table 2

Variable (n=29)	PRX	
	PL	PRX
	Mean \pm Standard Deviation	Mean \pm Standard Deviation
VO_{2max} ($ml \cdot kg^{-1} \cdot min^{-1}$)	48.49 \pm 9.91	50.49 \pm 10.02**
Time (minutes)	11.44 \pm 1.65	11.74 \pm 1.72*
HR (beats $\cdot min^{-1}$)	188.66 \pm 9.48	189.66 \pm 9.49
FA (%) Stage 1	47.62 \pm 17.08	60.30 \pm 18.11**
FA (%) Stage 2	16.42 \pm 12.37	25.79 \pm 16.11**

* $P < 0.05$, ** $P < 0.01$

Figure 1



gender ($p > 0.05$). Significant mean differences in Time were found between the PRX (11.74 ± 1.72) and PL (11.44 ± 1.65) trials for all subjects ($p = 0.034$) and was not affected by gender ($p > 0.05$). Significant mean differences in FA were found between PRX (60.30 ± 18.11) and PL (47.62 ± 17.08) in stage 1 (3rd minute, $p = 0.009$) and in stage 2 (6th minute, $p = 0.008$), PRX (25.79 ± 16.11) and PL (16.42 ± 12.37) of the graded exercise protocol for all subjects and was not affected by gender ($p > 0.05$). Overall differences in the two stages are depicted in FIGURE 1. Differences in mean values among all of the reported variables are displayed in TABLE 2.

CONCLUSIONS

As a result of these findings, it was concluded that aerobic performance, specifically VO_{2max} , Time, and FA may be significantly improved by ingestion of PRX 30 minutes prior to exercise testing. The modified PRX formulation utilized in this investigation supports the previous investigation and its efficacy for enhancing indices of aerobic performance (VO_{2max} , Time, and FA) during graded exercise testing, indicating that creatine monohydrate is not necessary for product effects. During aerobic exercise bouts, the combined results of this investigation may provide meaningful practical applications for coaches and athletes alike regarding ergogenic hydration options. Future research is warranted investigating the efficacy of PRX with further emphasis on other variables such as fuel substrate utilization, gender differences, fitness levels,

comparisons with other products, as well as use under various environmental and competitive conditions.

ACKNOWLEDGEMENT

The authors would like to thank Mannatech, Incorporated for providing the PRX and funding this study.

REFERENCES

1. Sherman WM, Jacobs KA and Leenders N. Carbohydrate metabolism during endurance exercise. In: *Overtraining in Sport*, edited by R. Kreider AF, & M. O'Toole. Champaign: Human Kinetics, 1998; p. 289-293, 300-302.
2. Zachwieja JJ, Costill DL and Fink WJ. Carbohydrate ingestion during exercise: effects on muscle glycogen resynthesis after exercise. *Int J Sport Nutr* 1993; 3: 418-430.
3. Jeukendrup A.E., et al. Effect of medium-chain triacylglycerol and carbohydrate ingestion during exercise on substrate utilization and subsequent cycling performance. *Am J Clin Nutr* 1998; 67: 397.
4. Byars, A., Greenwood, M., Greenwood, L., and Simpson, W. The effectiveness of a pre-exercise drink on indices of maximal cardiorespiratory fitness. *Int J Sport Nutr* 2006; 3: 56-59.
5. American College of Sports Medicine. *Guidelines for Exercise Testing and Prescription* (7th edition). 2006; Philadelphia, PA: Lippincott, Williams, and Wilkins.