The Effects of a Commercially Available "Energy Drink" On Margaria-Kalamen Step Test Performance

R.A. Balderas, C.M. Hearon FACSM, and M.L. Daniel

Human Performance Laboratory, Department of Health & Kinesiology

Texas A&M University – Kingsville, Kingsville, TX

ABSTRACT

Previous research has shown that concurrent verbal encouragement improves performance on the Wingate Anaerobic Cycle Test (WACT), a 30-s supramaximal exercise protocol, in male non-athletes. This effect has not previously been examined in athletes or females. Consistently, athletes and females display a more self-determined motivational profile than non-athletes and males, suggesting verbal encouragement to be of lesser consequence to athletes and females. PURPOSE: To examine the effect of concurrent verbal encouragement on the performance of the WACT in female athletes vs. female non-athletes. METHODS: Nineteen college-age female subjects were recruited where ten of the subjects were active intercollegiate athletes (ATH, n_1=10) and the remainder were non-athletes (NON, n_2=9). The WACT was novel to all subjects and the subjects were blinded to the purpose of the study. Prior to participation in the experimental trials, subjects were measured for body composition and performed a familiarity WACT trial without verbal encouragement. Subjects then performed the WACT twice, once with concurrent verbal encouragement (VE) and once without (NVE), in a balanced cross-over design. All WACT trials were performed at least one week apart. Peak power (PP), mean power (MP), and total work (TW) were compared between ATH and NON across VE and NVE using an ANOVA (1 between, 1 within), α=0.05. RESULTS: ATH and NON did not differ significantly (p>0.05) with regard to age or body composition with the exception of fat-free mass which differed significantly (ATH=53.7±6.6, NON=46.1±5.7 kg)(p<0.05). As expected, a significant (p<0.05) main effect for ATH/NON was observed where ATH outperformed NON when pooled across VE/NVE trials for PP (ATH=13.0±1.4, NON=11.3±1.7 W·kg^{-1}), MP (ATH=7.7±1.1, NON=6.7±0.9 W·kg^{-1}) and TW (ATH=232±35, NON=201±26 J·kg^{-1}). However, when pooled across all subjects (ATH and NON), the VE/NVE trials did not differ significantly (p>0.05) for PP (VE=12.4±1.7, NVE=12.0±1.9 W·kg^{-1}), MP (VE=7.3±1.1, NVE=7.2±1.2 W·kg^{-1}) and TW (VE=219±33, NVE=215±35 J·kg^{-1}). Additionally, the ATH/NON interaction with VE/NVE was not significant (p>0.05). CONCLUSION: Concurrent verbal encouragement does not affect performance on the WACT in females, nor does it affect WACT performance in female athletes and non-athletes differently.

INTRODUCTION

Motivation has consistently been examined as an antecedent to physical performance. Concurrent verbal encouragement is often used during the Wingate Anaerobic Cycle Test (WACT)[Bar-Or, O. (1987). *Sports Med, 4*, 381-394] as an extrinsic motivational factor to encourage maximal subject performance. Previous research has revealed concurrent verbal encouragement to positively influence performance on the WACT in non-athletic males [Karaba-Jakovljevic, D., et al. (2007). *Med Pregl, 60*(5-6), 231-236]. However, this effect has not been examined in populations of females or athletes. Traditionally, females and athletes report engaging in physical activity for more intrinsic reasons (e.g., pleasure, curiosity, challenge) than males and non-athletes, who report engaging in physical activity for more extrinsic reasons (e.g., social status, material rewards) [Vallerand, R. et al. (1988). *Can J Beh Sci, 20,* 239-250]. Such findings suggest that extrinsic motivation in the form of concurrent verbal encouragement may vary based on population, and not affect female athletes in the same manner as the male non-athlete population previously examined.

PURPOSE

The purpose of the study was to examine the effect of concurrent verbal encouragement on the performance of the WACT in female athletes vs. female non-athletes.

METHODS

●**IRB Approval:** The study was approved by the Institutional Review Board (Human Subjects) at Texas A&M University-Kingsville.

●**Subjects:** All subjects provided informed consent prior to participation. Nineteen college-age volunteers were recruited from the female student population at Texas A&M University-Kingsville. Ten of the subjects were active intercollegiate athletes (ATH, n_1=10) and nine were non-athletes (NON, n_2=9). The WACT was novel to all subjects. All subjects were blinded to the purpose of the study.

●**Pre-participation Screening/Testing:** All subjects underwent a health screening according to guidelines set forth by the American College of Sports Medicine. Only subjects classified as low risk for untoward events during exercise based on these guidelines were allowed to participate. The following measurements were also made pre-participation: body mass utilizing a standard physicians scale, body stature utilizing a stadiometer, and percent body fat using whole body plethysmography (Bod Pod).

●**Wingate Anaerobic Cycle Test (WACT):** The WACT is a 30 sec cycle ergometer task where subjects pedal as fast as possible against a resistance that requires a maximal effort for the 30 sec duration. The flywheel resistance is determined as a fraction of the subject's body mass (0.097 kg·kg body mass^{-1} for female adult athletes, 0.085 kg·kg body mass^{-1} for female adult non-athletes). The test is preceded by a test specific warm-up lasting 4 min (0-1 min = 50 rpm against 0 kg; 1-3 min = 50 rpm against a resistance equal to 50% of the resistance they will be required to pedal against during the actual test where three maximal sprints lasting 3-5 sec are interspersed over the stage; 3-4 min = 50 rpm against 0 kg). Following the warm-up, subjects have a 5 min rest period before the actual 30-s test begins. Recovery from the 30 sec test includes at least 5 min of pedaling against a light-moderate resistance (1 kg). Heart rate is monitored during warm-up, exercise, and recovery for this test.

●**Experimental Design:**

►**WACT Trial 1:** All subjects performed a familiarity WACT trial without concurrent verbal encouragement. Three investigators were present for this session.

METHODS, cont.

●**Experimental Design, cont.:**

►**WACT Trials 2-3:** Once becoming familiar with the WACT, subjects performed the WACT twice, once with concurrent verbal encouragement (VE) and once without (NVE), in a balanced cross-over design.

The three WACT trials were performed at least one week apart. Three investigators were present for all trials. An attempt was made to give each participant the same amount of verbal encouragement during the VE trials and for the same three investigators to be present for the VE and NVE trials within each subject.

●**Measurements:** Mean power output (W·kg^{-1}), peak power output (W·kg^{-1}), and total work output (J·kg^{-1}) were measured via computer interface with the cycle ergometer (Monark 894E).

●**Statistical Analysis:** Mean power output (W·kg^{-1}), peak power output (W·kg^{-1}), total work output (J·kg^{-1}) were compared between ATH and NON across VE and NVE using an ANOVA (1 between, 1 within), α=0.05. Age and body composition differences between ATH and Non were examined using independent *t*-tests. α=0.05

RESULTS

●**Age and Body Composition:** ATH and NON did not differ significantly (p>0.05) with regard to age (ATH=20.5±1.5, NON= 21.4±1.3 yr), body mass (ATH=70.7±8.1, NON= 64.3±9.9 kg), body stature (ATH=170±6.0, NON= 162.6±9.7 cm), BMI (ATH=24.5±2.2, NON= 24.1±2.9 kg·m^{-2}), percent body fat (ATH=24.1±4.9, NON= 27.9±5.1 %) or fat mass (ATH=17.0±4.3, NON=16.4±7.8 kg). However, the groups did differ in fat-free mass (ATH=53.7±6.6, NON=46.1±5.7 kg) (p<0.05).

●**WACT Performance:**

Figure 1a.

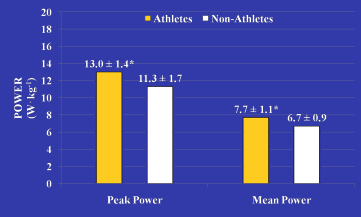

Figure 1b.

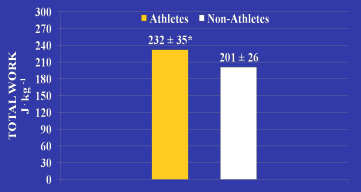

Figure 1: Athlete vs. Non-Athlete Main Effect. When pooled across VE/NVE, ATH and NON differed significantly (*p<0.05) in power output (Figure 1a.) and total work (Figure 1b.) completed during the exercise bout.

RESULTS, cont.

Figure 2a.

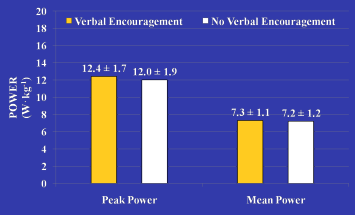

Figure 2b.

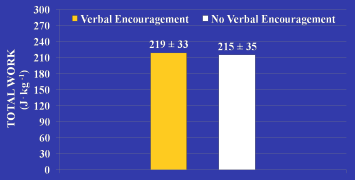

Figure 2: Verbal Encouragement vs. No Verbal Encouragement Main Effect. When pooled across ATH/NON, VE and NVE did not differ significantly (p>0.05) in power output (Figure 2a.) and total work (Figure 2b.) completed during the exercise bout.

Figure 3a.

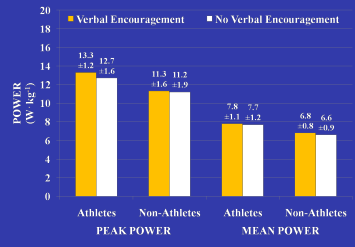

Figure 3b.

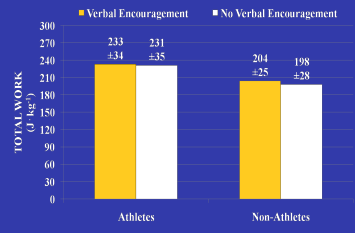

Figure 3: Athlete/Non-Athlete Interaction with Verbal Encouragement. The ATH/NON interaction with VE/NVE was not significant (p>0.05).

CONCLUSIONS

Contrary to findings with males, concurrent verbal encouragement does not affect performance on the WACT, for athletes or non-athletes, in females. These results lend support to previous research suggesting females to be more intrinsically motivated than males, whether they are athletes or not. However, while the athletes did outperform the non-athletes, as was expected given the greater fat-free mass in the athletes, the verbal encouragement did not affect the two groups differently. Given this lack of significant interaction, it could be argued that gender appears to be the key determinant of intrinsic motivation. It should be noted that all of the subjects were volunteers, and the majority of the non-athlete sample agreeing to participate, while not current intercollegiate athletes, were former athletes, most at the high school level. All of the true non-athletes who were recruited did not agree to participate in the study. This may have led to the unexpected finding showing no differences between athletes and non-athletes with regard to their performance response to concurrent verbal encouragement during the WACT, and should be explored in future research.