*Original Research*

# Concurrent Verbal Encouragement and Wingate Anaerobic Cycle Test Performance in Females: Athletes vs. Non-Athletes

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ABSTRACT

***International Journal of Exercise Science 5(3) : 239-244, 2012.*** To examine the effect of concurrent verbal encouragement on the performance of the WAnT in female athletes vs. female non-athletes. College-age female subjects were recruited where ten of the subjects were intercollegiate athletes (ATH, $n_1$=10) and the nine were non-athletes (NON, $n_2$=9). The WAnT was novel to all subjects and the subjects were blinded to the study's purpose. Prior to the experimental trials, subjects were measured for body composition and performed a familiarity WAnT trial without verbal encouragement. Subjects then performed the WAnT twice, once with concurrent verbal encouragement (VE) and once without (NVE), in a balanced cross-over design. Peak (PP) and 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. ATH and NON did not differ ($p$>0.05) in 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). 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$^{-1}$). When pooled across all subjects (ATH and NON), the VE/NVE trials did not differ ($p$>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$^{-1}$). The ATH/NON interaction with VE/NVE was not significant ($p$>0.05). Concurrent verbal encouragement does not affect performance on the WAnT in females, nor does it affect WAnT performance in female athletes and non-athletes differently.

KEY WORDS: Extrinsic motivation, maximal exercise, power output, sex, work output

## INTRODUCTION

One exercise test widely used to estimate anaerobic capacity is the Wingate Anaerobic Cycle Test (WAnT) (3). The WAnT is a 30-s cycle ergometer sprint against a resistance yielding a maximal intensity for the duration of the exercise bout. The use of concurrent verbal encouragement during the WAnT as an extrinsic motivational factor to encourage maximal subject performance is commonplace (3).

Motivation has consistently been examined as an antecedent to physical performance. Some studies have shown no effects of extrinsic motivation on anaerobic capacity test performance while others have shown positive effects (3). Likewise, researchers have utilized different forms of motivation by means of environmental manipulations (e.g., presence of audience, competition among individual participants, competition among groups, punishment, reward, group association, and social responsibility) (7) while others have utilized concurrent verbal encouragement (8-10). Previous research has revealed concurrent verbal encouragement to positively influence performance on the WAnT in male non-athletes (8). 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) (2,14). Likewise, it has been suggested that athletes have the ability to push themselves to true fatigue with or without external motivation (6). Such findings suggest that the effect of 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. Therefore, the purpose of this study was to examine the effect of concurrent verbal encouragement on the performance of the WAnT in female athletes vs. female non-athletes.

## METHODS

*Participants*

All subjects provided informed consent prior to participation. Twenty college-age volunteers were recruited from the female student population at Texas A&M University-Kingsville. One subject withdrew during the data collection due to medical concerns resulting in the final sample size ($N$=19). Ten of the subjects were active intercollegiate athletes (ATH, $n_1$=10) and 9 were non-athletes (NON, $n_2$=9). The WAnT was novel to all subjects and all subjects were blinded to the purpose of the study. The study was approved by the Institutional Review Board (Human Subjects) at Texas A&M University-Kingsville.

*Protocol*

**Pre-participation Screening/Testing:** All subjects underwent a health screening according to guidelines set forth by the American College of Sports Medicine (1). 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 physician's scale, body stature utilizing a stadiometer, and percent body fat using air displacement plethysmography (Bod Pod, COSMED USA, Inc., Concord, CA).

**WAnT:** The 30-s cycle ergometer task (3) required subjects to voluntarily pedal as fast as possible against a resistance requiring a maximal effort for the duration of the bout. The flywheel resistance was 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 was preceded by a test specific warm-up lasting 4 min (min 1 = 50 rpm against 0 kg; min 2-3 = 50 rpm against a resistance equal to 50% of the actual test resistance where three maximal sprints lasting 3-5 s were interspersed over the stage; min 4 = 50 rpm against 0 kg). Following the warm-up, subjects were given 5 min rest period before the actual 30-s test began. After the 30-s sprint, subjects engaged in active recovery including at least 5 min of pedaling against a light-moderate resistance (1 kg). Heart rate was monitored during warm-up, exercise, and recovery for the test (1). Mean power output ($W \cdot kg^{-1}$), peak power output ($W \cdot kg^{-1}$), and total work output ($J \cdot kg^{-1}$) were measured via computer interface with the cycle ergometer (Monark Ergomedic 894e, HealthCare International, Inc., Langley, WA).

**Data Collection:** All data were collected at the Human Performance Laboratory at Texas A&M University-Kingsville. All subjects performed a familiarity WAnT trial without concurrent verbal encouragement (WAnT Trial 1). Once becoming familiar with the WAnT, the subjects performed the WAnT twice (WAnT Trials 2-3), once with concurrent verbal encouragement (CVE) and once without (NVE), in a balanced cross-over design. The three WAnT trials were performed at least one week apart. Three investigators were present for all trials. An attempt was made to have same three investigators present for the CVE and NVE trials within each subject, and to give each participant the same quantity and quality of verbal encouragement during the CVE trials. The verbal encouragement was personalized (i.e., the subjects were names were used) and positive in nature (e.g., "go, go, go!", "you can do it!", "push through it!", etc.).

*Statistical Analysis*

Mean power output ($W \cdot kg^{-1}$), peak power output ($W \cdot kg^{-1}$), total work output ($J \cdot kg^{-1}$) were compared between ATH and NON across CVE and NVE using an ANOVA with repeated measures (1 between, 1 within), $\alpha=0.05$. Age and body composition differences between ATH and NON were examined using independent *t*-tests, $\alpha=0.05$. All analyses were conducted using IBM SPSS Statistics (Version 19, Armonk, NY).

## RESULTS

*Age and Body Composition*

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

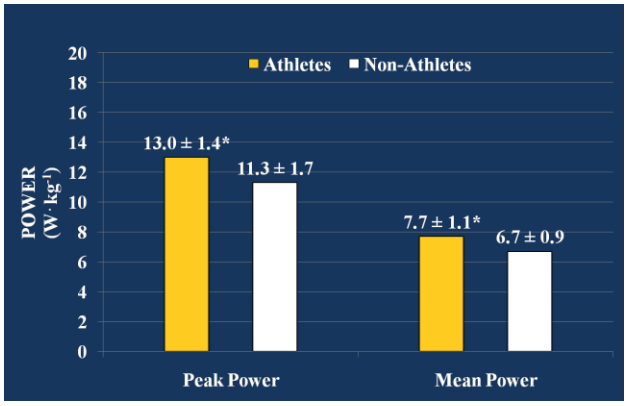
*Athlete vs. Non-Athlete Main Effect*

When pooled across CVE/NVE, ATH and NON differed significantly ($p<0.05$) in power output (Figure 1a.) and total work completed (Figure 1b.) during the exercise bout.

*Verbal Encouragement vs. No Verbal Encouragement Main Effect*

When pooled across ATH/NON, CVE and NVE did not differ significantly ($p>0.05$) in

power output (Figure 2a.) and total work completed (Figure 2b.) during the exercise bout.



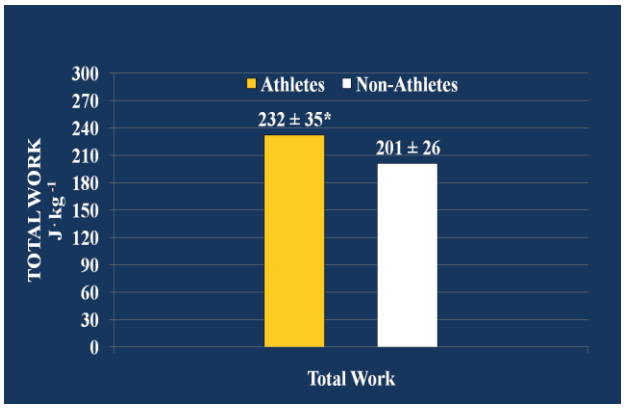
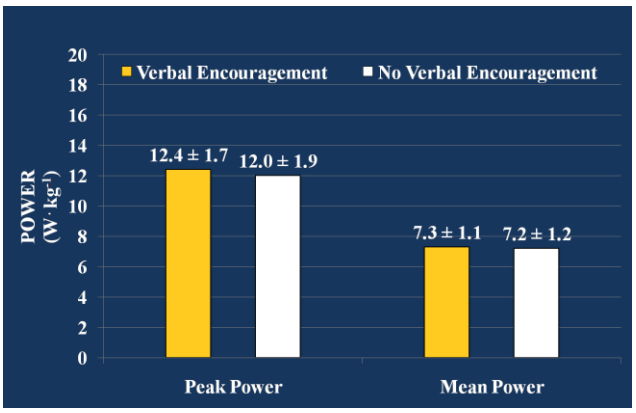




Figure 1a. Peak and mean power output from the Wingate anaerobic cycle test in female athletes *vs.* feamle non-athletes when pooled across trials with and without concurrent verbal encouragement. *denotes significant differences between athletes and non-athletes for the dependent variable ($p<0.05$). Figure 1b. Total work output from the Wingate anaerobic cycle test in female athletes *vs.* female non-athletes when pooled across trials with and without concurrent verbal encouragement. *denotes significant differences between athletes and non-athletes for the dependent variable ($p<0.05$).

*Athlete/Non-Athlete Interaction with Verbal Encouragement*

For both power output (Figure 3a.) and total work completed (Figure 3b.) during the exercise bout, the ATH/NON interaction with VE/NVE was not significant ($p>0.05$).



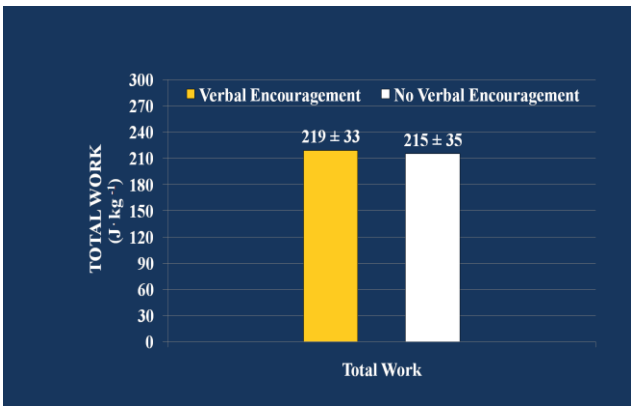
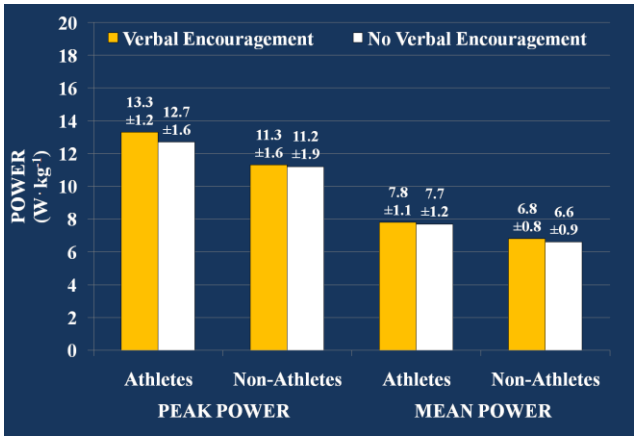




Figure 2a. Peak and mean power output from the Wingate anaerobic cycle test with *vs.* without concurrent verbal encouragement when pooled across female athletes and female non-athletes. Figure 2b. Total work output from the Wingate anaerobic cycle test with *vs.* without concurrent verbal encouragement when pooled across female athletes and female non-athletes.

## DISCUSSION

Concurrent verbal encouragement has been suggested to affect performance on the WAnT in males. A few researchers have examined anaerobic testing and exercise performance, and its relationship with extrinsic motivation (i.e., music). Such work has produced mixed results (5, 11-13). More relevant to the present study, Brooks and Brooks (4) examined the effects of

music on WAnT performance showing a positive effect of motivational music on peak power, average power, and overall anaerobic power in male and female non-athletes (pooled data). In the present study, only female subjects were examined.



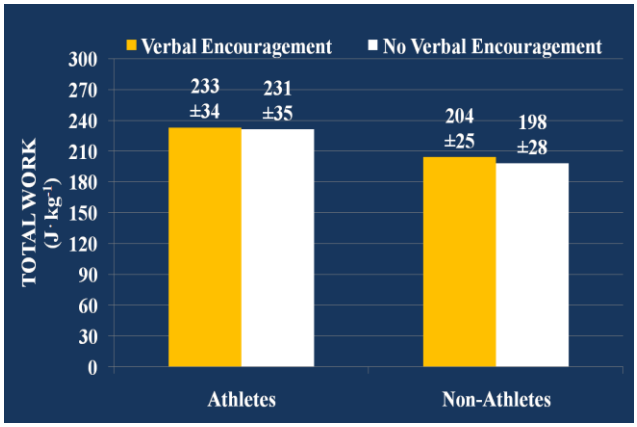




Figure 3a. Peak and mean power output from the Wingate anaerobic cycle test with *vs.* without concurrent verbal encouragement in female athletes *vs.* female non-athletes. Figure 3b. Total work output from the Wingate anaerobic cycle test with *vs.* without concurrent verbal encouragement in female athletes *vs.* female non-athletes.

Contrary to previous research in males, concurrent verbal encouragement did not affect WAnT performance, for athletes or non-athletes, in our sample of females. While the athletes did outperform the non-athletes, as was expected given the greater fat-free mass in the athletes, the concurrent verbal encouragement did not affect the two groups differently. Given this lack of significant interaction, it could be argued that sex appears to be one key determinant of intrinsic motivation. These results contribute to the growing body of literature on the use of extrinsic motivation such as concurrent verbal encouragement as motivation on the WAnT. The present results also lend support to previous research suggesting females to be more intrinsically motivated than males, whether they are athletes or not (14). Future research is warranted to test males and females, in the same study, under the same research protocol.

These results are further substantiated with the use of a familiarization trial where no verbal encouragement was given to subjects during WAnT performance. Across all trials, every effort was made to control the environment while testing in the laboratory (i.e., verbal encouragement was standardized). As such, subjects knew what to expect, thus reducing any effects of test anxiety on performance.

One limitation of the present study lies in the nature of the subjects. 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 primarily 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 WAnT, and should be explored in future research.

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