Effect of Acute Exercise Mode on Test Anxiety: Aerobic vs. Resistance

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INTRODUCTION

Test anxiety is a specific type of state anxiety when a person experiences pressure to excel on an exam. Bouts of aerobic exercise prior to test taking have been shown to decrease test anxiety, but can the same be said for bouts of resistance training? The research has focused on how aerobic exercise has been associated with the highest effects of the delayed anxiolytic effects of exercise on the body which in turn is a possible cause of decreased test anxiety.[1] When taking exams or doing tasks that require a complex thinking skills both types of anxiety are aroused which cause and response in both physiological and behavioral responses.[4] Test anxiety will be looked at as a situation specific type of anxiety that contributes to if that individual will already be predisposed to having a high arousal response when presented with a stressor. Due to this, those with a higher trait anxiety when given the stressor of taking a test greatly impedes how well you perform cognitively.[4] Many students struggle with test anxiety, and the population most affected by anxiety is females. Is it estimated that 10–35% of college students experience functionally impairing levels of test anxiety, which are negatively associated with academic performance,[2] with females consistently scoring higher than their male counterparts in almost all academic levels of middle, high school and college.[3] It has also been suggested that resistance exercise might affect anxiety differently in that it may take longer to activate, but after the first 75 minutes they were able to see differences in the state anxiety of the subjects.[5]

PURPOSE

The purpose of this study was to examine the effects of two different modes of acute exercise (aerobic and resistance) before taking an examination on test anxiety.

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 testing. Six female subjects (*N*=30) were recruited from the student/staff population at Texas A&M University-Kingsville.

Testing Sessions. Each subject underwent four testing sessions:

Pre-participation Screening/Pre-experimental Testing (Day 1): Screening was conducted at the Human Performance Laboratory or one of its associated sub-laboratories at Texas A&M-Kingsville. All subjects underwent a health screening according to the American College of Sports Medicine's guidelines for exercise testing and prescription. Only subjects who did not require medical clearance prior to engaging in moderate exercise were allowed to participate in this study. Additionally, subjects who were sedentary, pregnant, or taking anti-anxiety medication or medication that may alter exercise heart rate were excluded from participating. Subjects currently engaging in performance related strength training were also excluded. Lastly, subjects were introduced to the specific exercises to be conducted during the experimental trials

Experimental Trials (Days 2-4): All experimental trials were conducted in the Human Performance Laboratory or one of its associated sub-laboratories at Texas A&M-Kingsville. The experimental trials were conducted in a balanced crossover fashion and were separated by at least 3-7 days. On each of the experimental trial days (AER, RES, CON), subjects completed a brief warm-up bout on a stationary cycle ergometer (5min at 25W). During the AER trial, the subjects performed a moderate intensity exercise bout (65-75% HRmax) on a stationary cycle ergometer for 20 min. During the RES trial subjects performed 4 exercises: push-ups, bent over rows (with resistance bands), shoulder press (with resistance bands), and squat press (with resistance bands) where the exercise rate was altered throughout to yield a moderate intensity (65-75% HRmax) and the exercise sets continued until fatigue. The RES exercises were rotated and continued for 20 min. During the CON trial, the subjects rested quietly for 20 min.

METHODS, cont.

Testing Sessions, cont.

Experimental Trials (Days 2-4), cont: After each of the AER, RES, and CON bouts were completed, subject were taken to a quiet location where they were asked to take a standardized mathematics examination during which test anxiety via the Spielberg's Test Anxiety Inventory (TAI)[6] was assessed.

Measurements.

Body mass and body stature (Day 1) was measured using a standard physician scale and stadiometer, respectively.

Heart rate (Days 1-4) was measured via telemetry during all experimental trials (AER, RES, CON) to determine exercise intensity (AER, RES), as well as during the administration of the TAI.

Perception of test anxiety (Days 2-4) was measured during the mathematics examination using the previously validated TAI which is a 20- item rating scale that yields a total anxiety score and two factor scores of worry and emotionality.

Statistical Analysis. ANOVA with repeated measures was used to analyze for differences in exercise bout heart rate between experimental trials (CON, AER, RES) across time (10 min, 20 min). Friedman's ANOVA was used to analyze for differences in TAI scores (total, worry, emotionality) between experimental trials (CON, AER, RES). Appropriate *post-hoc* tests were used to make all pairwise comparisons for specific differences across trials and/or time points. The experimentwise error rate (α=0.05) was maintained throughout all *post-hoc* tests for specific differences.

RESULTS

Table 1: Subject Demographics

Variable	Mean	SD	Range
Age (yr)	22.5	4.3	19.0 - 37.0
Body Mass (kg)	79.1	15.3	53.6 - 107.5
Body Stature (cm)	161.1	6.8	148.0 - 179.0
Body Mass Index ($kg \cdot m^{-2}$)	30.6	6.1	18.9 - 43.1

Table 2: Exercise Heart Rate: Exercise Mode x Time Interaction

Exercise Modes	Exercise Time			
	10 min		20 min	
	Mean	SD	Mean	SD
Control	79.3*	11.1	76.3*	10.2
Aerobic	133.6	3.8	133.5	3.3
Resistance	133.0	4.1	134.3	3.5

*Significant interaction (*p*=0.0001) where heart rate was not different across time within any of the conditions (confirming a steady state), but CON heart rate was significantly lower at each time point than AER and RES which were not different from each other (confirming similar intensities).

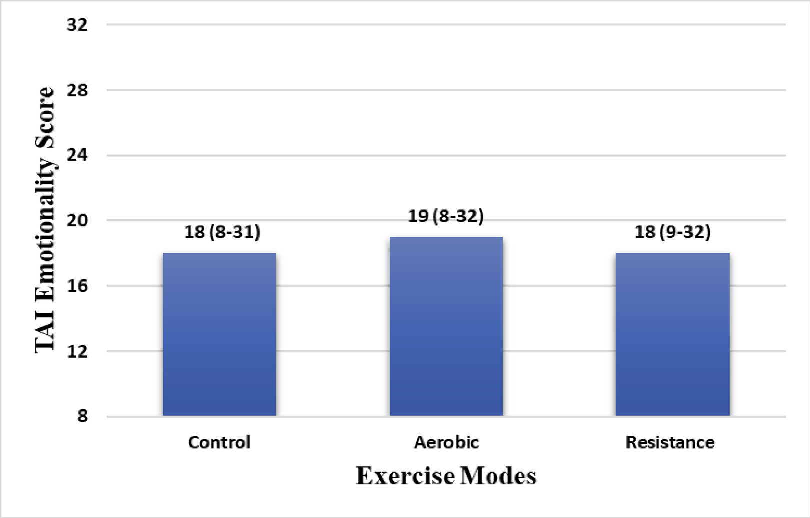

Figure 1: Emotionality During Math Exam Taken After Different Exercise Modes. Median (Range), no significant differences were seen between exercise modes for emotionality score (*p*=0.7880).

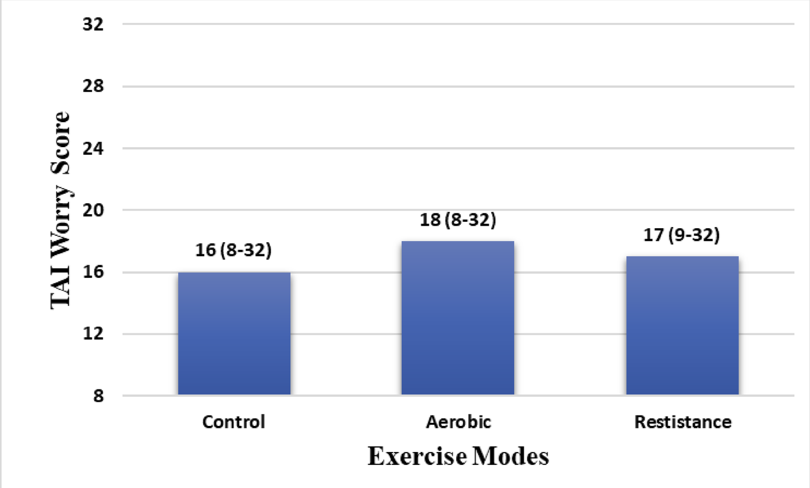

Figure 2: Worry During Math Exam Taken After Different Exercise Modes. Median (Range), no significant differences were seen between exercise modes for worry score. (*p*=0.7480).

RESULTS, cont.

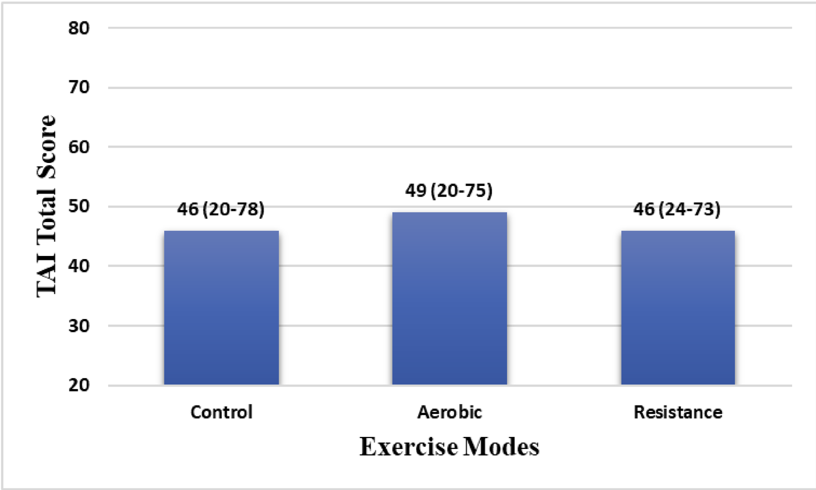

Figure 3: Overall Anxiety During Math Exam Taken After Different Exercise Modes. Median (Range), no significant differences were seen between exercise modes for overall test anxiety score. (p=0.3580).

CONCLUSIONS

The results of this study suggest that overall, AER and RES didn't decrease test anxiety levels (emotionality, worry, and overall) significantly more than that seen in the CON condition in the recreationally active young females who participated in the study. This is partially contrary to previous research that has demonstrated the effectiveness of AER in reducing test anxiety.

The conflicting findings may have been affected by a lack of ability to induce the amount of test anxiety subjects would feel in a real-life situation. There was an attempt to simulate the test anxiety by telling the subjects that they would have 30 minutes to complete all questions and that they would be classified based on how they performed (good, average, poor). Also, this study followed previous procedures that claimed to simulate test anxiety, but there is the possibility that the methods employed here did not mimic the real-life anxiety that would come from a true examinations stress. Additionally, the present study did not utilize a post-exercise recovery prior to starting the math examination/TAI administration, which prevented the use of variables such as heart rate to assess anxiety level. While O'Connor et al. used a post-exercise break in their study and saw an aerobic exercise effect on test anxiety, Mavilidi et al.,[4] similar to the present study, did not use a post-exercise break and also did not observe an exercise effect on test anxiety. Therefore, it is possible that a post-exercise break is critical to being able to observe an exercise effect, possibly allowing time for post-exercise arousal to subside and preventing subjects' from interpreting that arousal as symptoms of anxiety, thereby impacting the assessment of test anxiety. Lastly, the TAI, which has a reported a reliability coefficient of Cronbach alpha of .77,[6] is used to measure test anxiety. There may be more accurate measurements currently that could measure state test anxiety rather than trait test anxiety.

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