

ABSTRACT

The purpose of this study was to determine if differences exist between exercise modalities and the measured maximal fat oxidation rates in college-aged females. Seven healthy moderately trained females (24.8 ± 6.22 y) were assessed during a graded treadmill and a graded cycle ergometer test to exhaustion to determine maximal oxygen consumption (VO_{2max}) (33.26 ± 5.7 ; 24.56 ± 3.0 ml kg min, $p=0.002$) and the maximal fat oxidation rate (FatMax). During two subsequent exercise testing sessions, subjects performed an exercise protocol equating to incremental increases in speed and grade every 3 minutes until a respiratory exchange ratio (RER) of 1.0 was reached. Testing was administered within a two-week period, allowing a minimum of 48 hours between assessments, with similar conditions existing between tests. Standard gas measurements were collected and analyzed during all tests. The absolute FatMax was found to be 0.43 ± 0.102 g min and occurred at 56.5% VO_{2max} on the treadmill and 0.26 ± 0.053 g min (55.2% VO_{2max}) on the cycle. Paired-samples t-tests found a significant difference in FatMax between modalities ($p=0.004$), however FatMax occurred at roughly the same relative exercise intensity ($p > 0.05$). Considering that VO_{2max} was significantly different between modalities, the difference could be related to the amount of active skeletal muscle recruited with each exercise modality.

OBJECTIVES

FatMax is the rate of oxidation that consists of the greatest contribution of fatty acids and occurs usually between 25% and 85% of maximal oxygen consumption.¹ In males, FatMax rates has been found to be higher during treadmill compared to cycle exercise, however, this has not been seen in females². Therefore, the purpose of this study is to determine if the exercise intensity that elicits FatMax differs between the treadmill and the cycle ergometer in a population of college-aged females.

METHODS

- This study is a repeated measures design.
- Seven moderately healthy, COVID-19 negative, college-aged females volunteered to participate in this study (Table 1). Eligible subjects filled out a PAR-Q and a 24-hour dietary recall on first visit before the tests began. They completed a health history questionnaire and signed an IRB approved informed consent. Details of the procedures were clearly outlined for each participant as well as the timeline that the tests would take place in, as well as a description of the potential risks and benefits to be expected from completing these tests.
- On two testing days, separated by one week, subjects reported to the lab after an eight hour fast and filled out a 24-hour dietary recall and submitted a urine sample. Once the participants had been seated quietly for 5 minutes, blood pressure and resting heart rate were taken. Blood lipid levels were then assessed with a finger prick sample utilizing the Cholestec LDX system (Abbott, Orlando, FL) for blood lipid profile and fasting glucose levels. On the first testing day, a Dual Energy X-Ray Absorptiometry (DXA) assessment was also completed. Subjects were then randomly assigned to either the treadmill or cycle ergometer exercise testing protocol (Table 2).
- We examined the differences in FatMax and relative exercise intensity (% VO_{2max}) using a paired samples t-test ($p < 0.05$). (IBM-SPSS, v. 25, Armonk, NY)

Table 2: Testing Protocols

Treadmill and Cycle Protocols			
TM Stage	Speed(mph)	Grade	Time
1	2	0%	3min
2	3	0%	3min
3	4	1%	3min
4	4	3%	3min
5	4	5%	3min
6	4	7%	3min
7	4	9%	3min
8	6.2	10%	until exhaustion
Cycle Stage			
Resistance(kg)	RPMs		
1	0.5	40-50	3min
2	0.5	50-60	3min
3	1	50-60	3min
4	1.5	50-60	3min
5	2	50-60	3min
6	2.5	50-60	3min
7	2.5	50-60	3min
8	3	50-60	until exhaustion

RESULTS

Table 1: Characteristics of Subject

Subject Characteristics	N=7	Mean \pm SD
Age		24.8 ± 6.22
Ht		167.6 ± 8.07
Wt		68.5 ± 4.18
BF%		35.1 ± 5.64
$VO_{2max}TM$		33.3 ± 5.7 *
$VO_{2max}Cycle$		24.56 ± 3.02

* $p < 0.05$

Figure 1: Changes in Maximal Fat Oxidation Rates

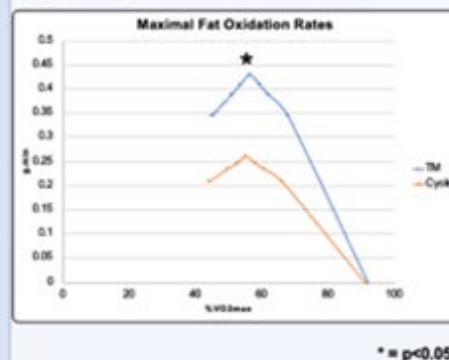
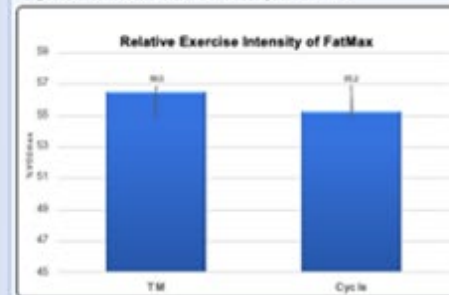


Figure 2: Relative Exercise Intensity of FatMax



CONCLUSIONS

The absolute FatMax was significantly different between the treadmill and the cycle ($p < 0.05$), however, the relative exercise intensity that FatMax occurred was not. Considering that VO_{2max} was significantly different between modalities, the difference in the rate of fat oxidation could be related to the amount of active skeletal muscle recruited with each exercise modality. We found that treadmill exercise resulted in a greater FatMax rate compared to the cycle ergometer in a sample of moderately trained college-aged females.

REFERENCES

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