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# Gender Differences Between Overall Resistance Work and Overall Energy Costs

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Exercise, Health & Sport Science

# Gender Differences Between Overall Resistance Work and Overall Energy Costs

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## Abstract

The purpose of this study was to determine the total energy costs of 5 exercises: squats, deadlift, incline bench press, shoulder shrugs and calf raises, in a comparison between 20 trials with men and 16 trials with women, completing a total of 36 trials. A Smith weight lifting machine was used to measure work output. We measured and compared oxygen uptake during lifting. Blood lactate measurements were taken after exercise to estimate anaerobic energy costs and energy expenditure (oxygen uptake) after the cessation of resistance. Men performed more work than women at a greater overall energy costs. Moreover our data revealed significantly larger anaerobic energy expenditure in men as compared to women. However, in a relative perspective, there were no significant differences.

## Introduction

This research project will look at the total energy cost using five different exercises; squats, inclined bench press, deadlift, calf raises, and shoulder shrugs. Total energy expenditure takes into account blood lactate (anaerobic) and exercise and recovery oxygen uptake energy costs (aerobic). While comparing these two components, as well as exercises, subjects must make a visit to the lab a minimum of two times to perform a 30 second lifting protocol. This research study compared gender differences between overall work for all lifts and overall energy costs. We hypothesize that there will be differences with women having a lower energy costs for each exercise, perhaps because of a lower body mass.

## Methods

Our study consisted of male and female subjects between the ages of 18 and 30 years old. The subjects were required to visit the lab, one at a time, on three separate occasions. The first visit was an overview of the protocols and records (health history, lifting weight, height and weight). The second visit began the exercise testing procedure. After resting blood lactate was obtained, the subject was hooked up to the metabolic cart that measured oxygen uptake. Depending upon the exercise, a five minute standing or seated rest period occurred. The subject then began lifting for their selected exercise weight to the beat of a metronome at 3 seconds per repetition for 30 seconds of exercise. After the subject completed the set, they racked the weight and immediately sat down. After two minutes of rest, peak blood lactate was obtained and recorded while the subject continued to rest until their oxygen uptake fell below standing resting levels. The trials were averaged, and then values were calculated and compared between men and woman.



## Absolute Data

	Work (J)	Exer O2 (kJ)	Lactate (kJ)	EPOC (kJ)	Total Cost (kJ)
Men	239 ± 280	8.7 ± 10.2	13.7 ± 13.4	20.5 ± 18.3	42.6 ± 40.3
Women	98 ± 70	3.9 ± 3.0	4.4 ± 2.6	10.5 ± 6.7	18.8 ± 10.5
p value	0.02 *	0.04 *	0.002 *	0.06	0.01 *

## Results/Discussion

The absolute data shows significant differences between overall work and energy costs in men and women. This could be attributed to the greater amount of work performed by men, as compared to women. Looking at the data in a relative perspective, there was no major differences between aerobic and anaerobic energy costs between men and women. This point of view is more accurate based on creating an equal standard via percentage comparisons. We conclude that there is no notable differences in the extent of aerobic and anaerobic energy costs between men and women.

## Relative Data (p = 0.09)

