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A Difference in Aerobic and Anaerobic Energy Costs During Weightlifting

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Abstract

Energy expenditure is usually estimated by total oxygen uptake. However, with weightlifting, very little oxygen is utilized during the lift. The majority of oxygen uptake happens during recovery (Excess Post-Exercise Oxygen Consumption, EPOC). The purpose of this study is to determine the significance of the anaerobic and EPOC phases during weightlifting exercises in estimation of total energy cost. We gathered data from 42 subjects (60 averaged trials) aging between 18 and 35 years. Each subject chose a comfortable weight and lifted to a cadence of 1.5 sec up and 1.5 sec down. Tests were given on two different occasions. We used a metabolic cart to collect oxygen consumption (VO2), and EPOC measurements. Blood lactate measurements were taken to estimate anaerobic energy costs. Our data revealed that the contribution of anaerobic and EPOC phases, had the most significant impact on the total energy cost estimation.

Introduction

Recent studies have suggested that oxygen-only measurements are not providing an accurate estimation of total energy expenditure during weightlifting. There are data that suggest oxygen-only measurements underestimate the total energy cost of the work completed. Activities such as weightlifting, not only have an aerobic component, but also an anaerobic element that requires estimation. It is hypothesized that for the resistance exercise examined, the anaerobic component not only contributes significantly to the total energy expenditure, but will be greater than the aerobic expenditure component.

Data

*Exer O2 = 5.6 + 6.5 kJ

Anaerobic = 9.6 + 9.9 kJ

EPOC = 12.9 + 13.3 kJ

Key:

TEE = Total Energy Expenditure

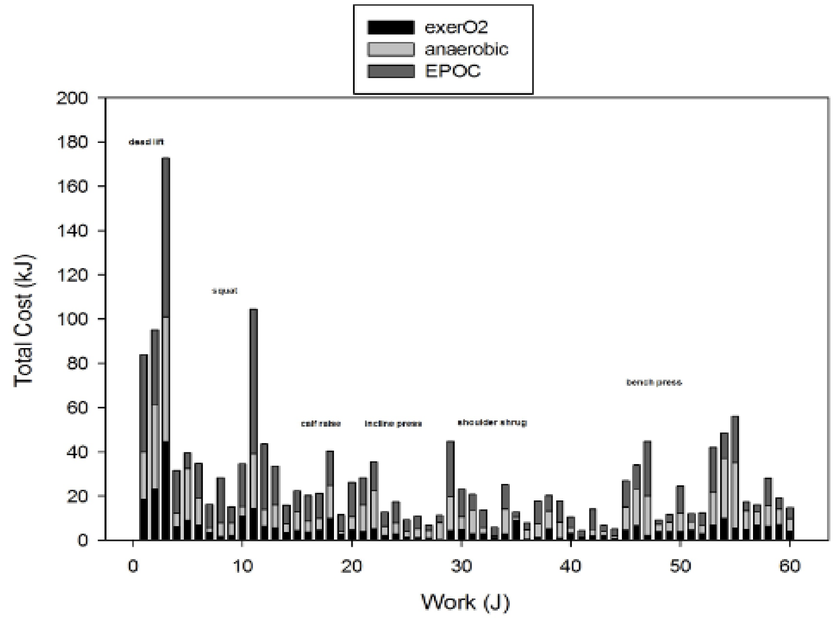
Std Dev = Standard Deviation

KJ = KiloJoules

J = Joules

Methods

Our subjects consisted of males and females between the ages of 18-30. Each subject was asked to come in for three separate visits. On the first visit, the height and weight of the subject was taken and the lifting weight was determined. The practice run was completed to ensure proper lifting weight and form following the cadence set to 1.5sec up and 1.5sec down. On the second and third visit, the subjects were attached to a metabolic cart to determine oxygen uptake during exercise and recovery. A finger prick was taken before and after exercise to measure the level of lactate in the blood. Both oxygen uptake and blood lactate were used to estimate aerobic and anaerobic energy costs, respectively. After 5 min of rest, the subject exercised for 30sec., then recovered until resting metabolic levels were achieved.



Results/Discussion

The data shows that the contribution of the anaerobic component to the total energy cost during weightlifting exercises is significant. Although there is not a significant difference between the anaerobic and EPOC (recovery oxygen uptake) phases, it is clear, that they both greatly influence the final estimation of caloric expenditure.

As you can see, the standard deviations are quite high. This is due to the variability when comparing weightlifting exercises.

Based on this research and collected data, we suggest that the anaerobic and post exercise components of weightlifting must be taken into consideration when estimating total energy expenditure.