

BISC208-081

Lab 5 – VO<sub>2</sub> Examination

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## **Introduction**

Oxygen levels at which uptake is greatest before the body begins anaerobic cell respiration is known as the “Max VO<sub>2</sub>.” “Max VO<sub>2</sub>” is dependant on the type of exercise being performed and is specific to individuals and being affected by age, gender, physical condition, and genetics. Typically males with better physical conditioning will have a higher “Max VO<sub>2</sub>.” This will allow an individual in healthier physical shape to operate in aerobic conditions longer before lactic acid begins to cause a decrease in physical performance. Once the “Max VO<sub>2</sub>” point is reached, lactic acid production begins and increases because it is a byproduct of anaerobic respiration. This point is reached when the ratio of VO<sub>2</sub> and VCO<sub>2</sub> uptake is equal to one, causing a buildup of lactic acid and a decrease in athletic performance do to anaerobic operation. The difference in “Max VO<sub>2</sub>” was examined in regards to physical condition. The difference in health status in regards to physical performance was the subject of this examination.

## **Results**

Two subjects were tested in the following VO<sub>2</sub> experiment: one known to have been well conditioned, the other known to be more dormant. Both subjects were nineteen years of age and male. Cardio Kinetics informed the lab study group of the projected “Max VO<sub>2</sub>” for each subject based on their stated physical condition. The healthy subject was projected to have a “Max VO<sub>2</sub>” of 49ml/kg/min, while the unhealthy individual was projected to have a “Max VO<sub>2</sub>” of 55ml/kg/min because this estimate was not based on the health status of the subject, but simply on the physical characteristics.

VO<sub>2</sub> was found to increase with an increase in physical activity. The healthy individual’s “Max VO<sub>2</sub>” was found to have been 65.5ml/kg/min, while the unhealthy subject achieved a “Max VO<sub>2</sub>” of only 32.6ml/kg/min (Fig. 1, 4.) The longevity of exercise also supports the fact that healthier individuals will be able to exercise longer, thus having a greater “Max VO<sub>2</sub>.” The unhealthy individual reached his “Max VO<sub>2</sub>” of 32.6ml/kg/min at ten minutes, while the healthy subject had only reached a VO<sub>2</sub> of 39.6ml/kg/min (Fig. 1, 4.) “Max VO<sub>2</sub>” was not achieved for the healthy subject until sixteen minutes (Fig. 1.) This correlates to how important physical conditioning is for the performance of the human body. Similarly, VCO<sub>2</sub> was found to increase with an increase in physical activity. Once this point was reached and the ratio of VO<sub>2</sub> and VCO<sub>2</sub> equaled one (Fig. 2, 5), the unhealthy individual was only able to continue for approximately three minutes, while the healthy individual was able to continue for approximately six minutes (Fig. 1, 4.)

Additionally, heart rate was found to have been correlated to physical condition. The fit subject was projected to have a maximum heart rate of 201beats/min (220 beats –19 years of age) determined by age, which he almost reached at 200beats/min (Fig. 3.) While the unhealthy subject’s exact heart rate was not recorded, he fell far short of the same expected 201beats/min and the rate at which his rate elevated was far greater.

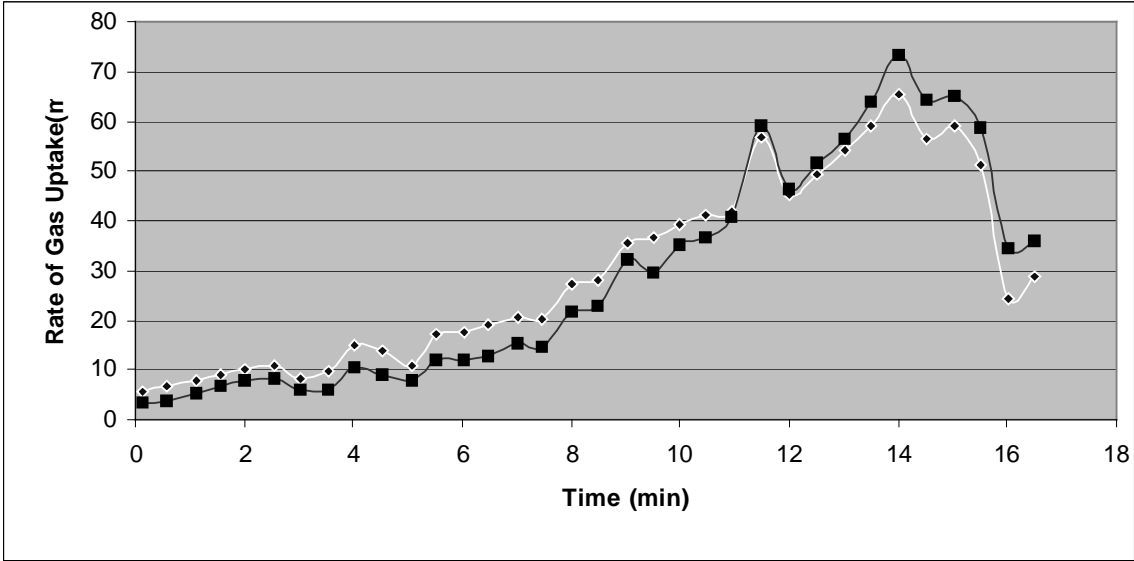


Figure 1: Healthy Subject -  $\text{VO}_2$  and  $\text{VCO}_2$  versus time.

$\text{VO}_2$   
 $\text{VCO}_2$

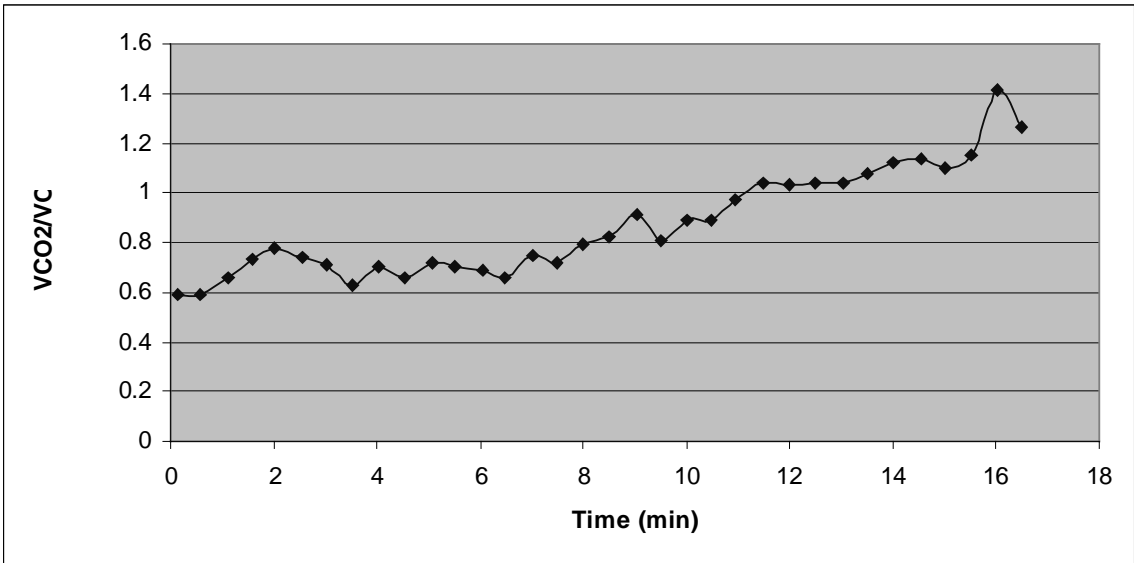


Figure 2: Healthy Subject -  $\text{VCO}_2/\text{VO}_2$  versus time

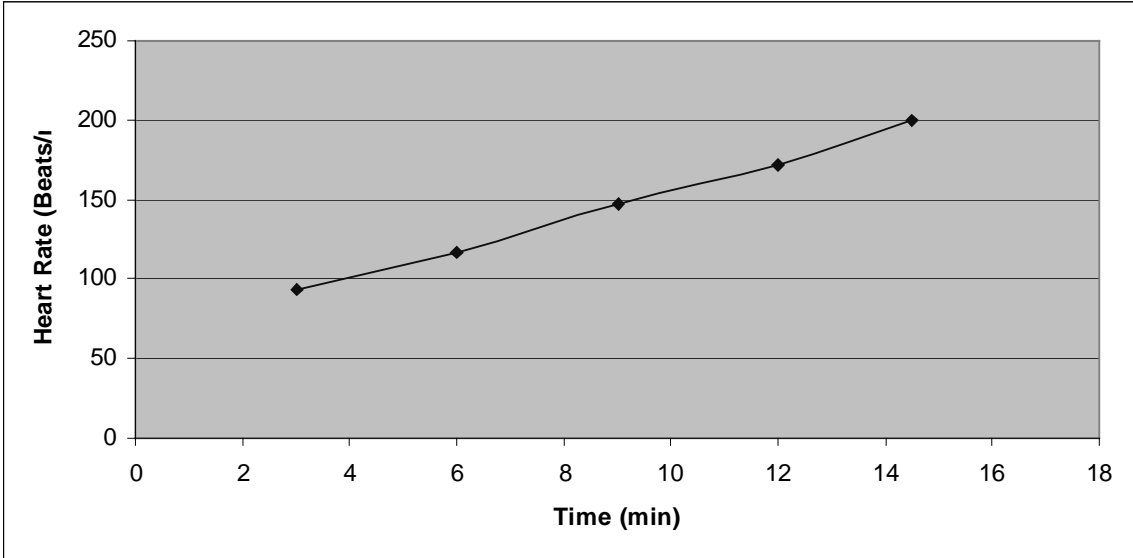


Figure 3: Healthy Subject – Heart Rate versus time

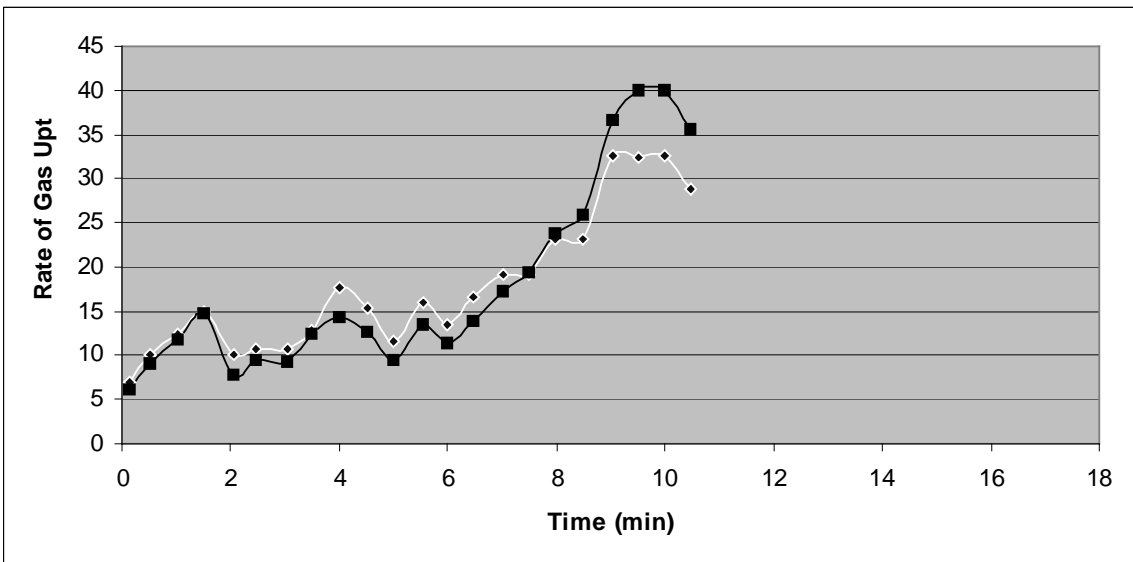


Figure 4: Unhealthy Subject - VO<sub>2</sub> and VCO<sub>2</sub> versus time

VO<sub>2</sub>  
VCO<sub>2</sub>

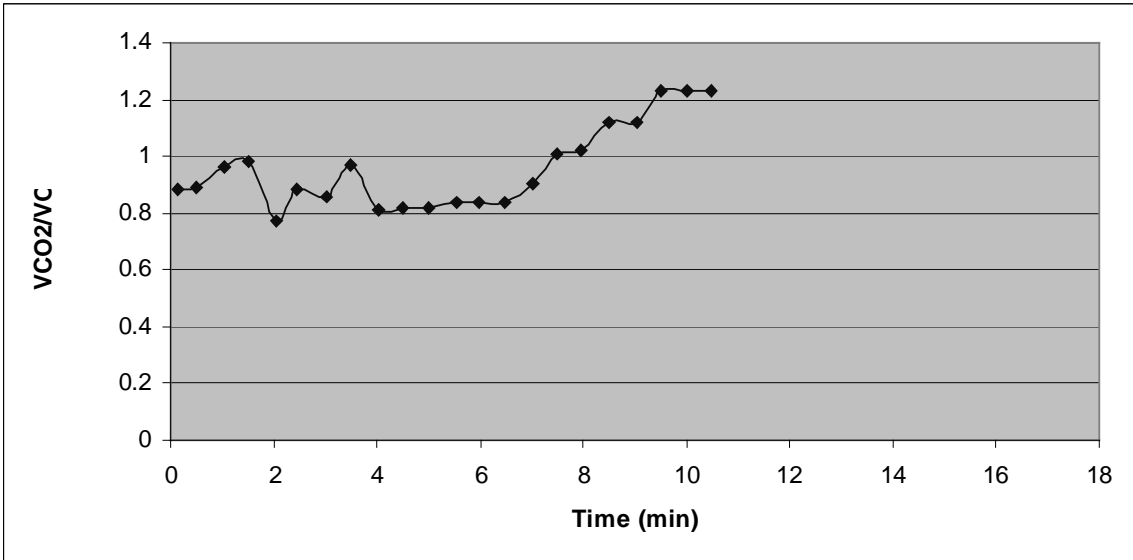


Figure 5: Unhealthy Subject: VCO<sub>2</sub>/VO<sub>2</sub> versus time