Lab 7. Caloric Expenditure During Physical Activity

Name _____________________________________  Date _______  Section _____  Instructor ______________

**Purpose:**

The purpose of this activity is to determine the caloric expenditure while exercising at two different intensities. A secondary purpose is to determine the amount of exercise necessary to lose the equivalent of 1 pound of fat.

**Procedure**

Determine body weight in kilograms (kg).

1. Body weight (kg)  = weight in pounds ÷ 2.2

   = _________ pounds ÷ 2.2 = ___________ kg

2. Moderate (walking) HR and oxygen consumption (VO$_2$). On a level track, marked distance or treadmill (WRC, outdoor track, etc), walk at a comfortable pace for 800 meters (twice around a regular track, ½ mile) **but no faster than 6.5 minutes for the 800 meters** (6.5 minutes would be a 13 minute per mile pace) You must walk at a constant pace for the entire distance so make sure the pace you start at is one you can maintain for the entire distance. You must also determine the time (in minutes and seconds) it takes to walk the 800 meters and your HR at the end. Following the 800-meter walk, record the information below.

   Heart Rate _________ beats per minute

   (1) 800-meter time: _________ min and _________ sec

   (2) 800-meter time: _________ minutes (divide seconds by 60 and add to the minutes)

Determine the pace or speed walked for the 800 meters:

Pace in meters per minutes  = 800 meters ÷ 800-meter time in minutes

   = 800 ÷ (2) = ___________ meters/minutes

Using **Table 1** at the end of this lab, determine the VO$_2$ for the speed you walked

   \[ \text{VO}_2 = \text{_________ ml/kg}^{\text{-1}}\text{min}^{-1} \text{ for walking at ___________ meters/minutes} \]
3. Fast walking or jogging HR and oxygen consumption (VO₂). Using the same exercise mode as above, walk briskly or jog at a **comfortable** pace for 800 meters (1/2 mile). You must walk briskly or jog at a constant pace for the entire distance so make sure the pace you start at is one you can maintain for the entire distance. You must also determine the time (in minutes and seconds) it takes to walk or jog the 800 meters and your HR at the end. Following the 800-meter brisk walk or jog, record the information below.

Heart Rate ___________ beats per minute

(1) 800-meter time: _________ min and _________ sec

(2) 800-meter time: _________ minutes (divide seconds by 60 and add to the minutes)

Determine the pace or speed jogged for the 800 meters:

Pace in meters per minutes  = 800 meters ÷ 800-meter time in minutes

= 800 ÷ (2) = __________ meters/minutes

Using **Table 1** at the end of this lab, determine the VO₂ for the speed you walked or jogged
**(Note: If you walked you must use the walking columns and if you jogged you must use the jogging columns in Table 1)**

\[
VO₂ = \text{_________ ml/kg}^{-1}\text{.min}^{-1}\ 	ext{for walking/jogging at ___________ meters/minute}
\]

4. Determining Caloric Expenditure from VO₂. Because there is a direct relationship between the amount of oxygen you use and the amount of energy you expend, you can compute caloric expenditure if you know the amount of oxygen you are using performing a constant amount of exercise (i.e. the VO₂). To determine caloric expenditure from VO₂, you have to know amount of oxygen consumed in liters.

**For Walking pace:**

\[
\text{VO}_₂ \text{ in liters per minute} = (\text{VO}_₂ \text{ ml/kg}^{-1}\text{.min}^{-1} \times \text{weight in kg}) ÷ 1000
\]

\[
\text{VO}_₂ \text{ in liters per minute} = \text{_________ ml/kg}^{-1}\text{.min}^{-1} \times \text{_________ kg} ÷ 1000
\]

\[
\text{VO}_₂ \text{ in liters per minute} = \text{_________ l/min}^{-1}
\]

Calories per minute  
= VO₂ in l/min⁻¹ X 5

= __________ calories per minute

Calories for 800 meter  
= calories per minute X minutes for walk

= __________ calories per 800 meters

Calories for 1 mile  
= Calories for 800 meters X 2

= __________ calories per mile
For Brisk Walking or Jogging pace:

\[
\text{VO}_2 \text{ in liters per minute} = (\text{VO}_2 \text{ ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1} \times \text{weight in kg}) \div 1000
\]

\[
\text{VO}_2 \text{ in liters per minute} = \underline{\ldots} \text{ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1} \times \underline{\ldots} \text{kg}) \div 1000
\]

\[
\text{VO}_2 \text{ in liters per minute} = \underline{\ldots} \text{l} \cdot \text{min}^{-1}
\]

\[
\text{Calories per minute} = \text{VO}_2 \text{ in l} \cdot \text{min}^{-1} \times 5
\]

\[
= \underline{\ldots} \text{calories per minute}
\]

\[
\text{Calories for 800 meter} = \text{calories per minute} \times \text{minutes for jog}
\]

\[
= \underline{\ldots} \text{calories per 800 meters}
\]

\[
\text{Calories for 1 mile} = \text{calories for 800 meters} \times 2
\]

\[
= \underline{\ldots} \text{calories per mile}
\]

5. Exercise, Energy Expenditure and Weight Loss. In order to lose 1 pound of fat weight, you have to expend 3500 calories. By knowing the caloric expenditure for any amount of exercise, you can easily compute the amount of exercise necessary to lose 1 pound of fat performing that exercise.

How many miles would you have to walk at the speed you walked at above in order to lose 1 pound of fat?

\[
\text{Miles to loose 1 pound} = \frac{3500}{\text{calories for 1 mile walking}}
\]

\[
= \underline{\ldots} \text{miles of walking}
\]

How many miles would you have to jog at the speed you jogged at above in order to lose 1 pound of fat?

\[
\text{Miles to loose 1 pound} = \frac{3500}{\text{calories for 1 mile jogging}}
\]

\[
= \underline{\ldots} \text{miles of jogging}
\]
Table 1. Oxygen Consumption for Walking and Jogging

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<th>Speed (m/min)</th>
<th>VO₂ (ml·kg⁻¹·min⁻¹)</th>
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