Week 8 In-Lab

BIOE 320 Systems Physiology Laboratory

Experiment 1

Data Analysis

1. Complete the table. The tidal volume is the peak-to-peak volume measurement of a normal breath cycle. Calculate the Tidal Volume for three different breaths and take an average. Determine IRV, ERV, and VC for one breath.

Volume title	Volume (L)
Tidal volume (TV) - breath 1	
Tidal volume (TV) - breath 2	
Tidal volume (TV) - breath 3	
Tidal volume (TV) - average	
Inspiratory Reserve Volume (IRV)	
Expiratory Reserve Volume (ERV)	
Vital Capacity (VC)	

2. Calculate the capacities listed in the table assuming a Residual Volume (RV) of 1 L.

Capacity	Volume (L)
Inspiratory (IC)	
Expiratory (EC)	
Functional Residual (FRC)	
Total Lung (TLC)	

3. How would the volume measurements (TV, IRV, and ERV) change if data were collected after vigorous exercise?

4. In this lab, equations for vital capacity (VC) were presented. Using the data provided, determine an equation for VC in the following form:

$$VC = b_0 + b_1 x_1 + b_2 x_2 + b_3 x_3 \tag{1}$$

where b_n is a regression parameter, x_n is a variable (such as height). *Hint: use a program that can perform multiple regression.*

5. Qualitatively assess your equation. How do the variables (such as height) affect the VC? Is each of the parameters positively or negatively correlated to VC? What do the magnitude and sign of the regression parameters imply?

Experiment 2

Data Analysis

1. Estimate the Vital Capacity using a p-p measurement.

2. Calculate FEV_1, FEV_2, and FEV_3.

FEV_X	Measured FEV p-p (L)	FEV/VC $\times$ 100 (%)	Average values
FEV_1 (0-1 sec)			83%
FEV_2 (0-2 sec)			94%
FEV_3 (0-3 sec)			97%

3. How do your calculated fractions of air expelled during the three listed time intervals compare with "normal" (average) values?

4. Is it possible for a subject to have a vital capacity within normal range, but a value for FEV_1 below normal range? Explain.

5. Using the data collected for the Maximal Voluntary Ventilation (MVV) measurements, calculate the respiratory rate (RR) over a 12-second interval. Do so by calculating the number of cycles in the 12-second interval and *not* by highlighting the whole section and selecting Frequency.

6. Complete the table with a measurement for each cycle. Complete only for the 12-second interval used above (the table may have more rows than you need). Calculate the average volume per cycle (AVPC).

Cycle number	p-p volume (L)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

7. Calculate the MVV using the following formula:

$$MVV = AVPC \times RR \tag{2}$$

8. Bronchodilator drugs open airways and clear mucous. How would these drugs affect the FEV and MVV measurements?

9. MVV decreases with age. Why?