Purpose / Objective(s):
- Purpose of Lab #4 is to stress out our cardiovascular (CV) system, while running in the parking lot for 5 minutes, and then come back into lab and measure our results at specific time intervals against others in the class
- Make correlations between resting and peak elevation of cardiovascular between myself and classmates
- Observe existing trends and look at correlations between data

Hypothesis (ese):
- Heart rate (BPM or beats per minute) to be measured at sitting, standing and lying down in a supine position, and the heart rate should increase after aerobic exercise, and then theoretically decrease at longer time intervals (3 minutes, 6 minutes, 10 minutes, etc.)
- Respiratory rate (RR or amount of breaths in and out per minute) to be measured at sitting, standing, and lying down in a supine position, and the respiratory rate should increase after aerobic exercise, and then theoretically decrease at longer time intervals (3 minutes, 6 minutes, 10 minutes)
- Blood Pressure (BP or systolic pressure over diastolic pressure) to be measured at sitting, standing and lying down in a supine position, and the blood pressure should increase after aerobic exercise, and then theoretically decrease at longer time intervals (3 minutes, 6 minutes, 10 minutes)
- Theoretically, older students in the class will have higher blood pressure, and probably higher heart rates, respiratory rates due to aging conditions of their body
- Theoretically, males will show lower BMI (Body Mass Index) than females as they have leaner bodies and less adipose (fat tissue) than females
- Theoretically, males will show a higher average height than females as males tend to be taller
- Theoretically, athletes in the class will show lower BP, lower HR, lower RR than other students
- The older a student is, the higher the weight and total BMI (Body Mass Index)

Materials / Subjects / Specimens:
- In our group, we were able to get data from classmates for 3 females and 3 males from our Biology 105 class
- Data was entered for height, weight, age, and BMI for each person
- Cardiovascular statistics that were acquired are, for example, in this table, for pre-exercise, post-exercise, and timed intervals after exercise
Methods / Tools / Instrumentation / Procedures:

- **HR:** For heart rate, we utilized our fingers to press at either the inside of the wrist ulnar artery or in the neck at the carotid artery to check for heart rate of beats per minute, and calculate time either on wall clock or an iPhone using the stopwatch function, performed while sitting, standing, and laying supine, before and after aerobic activity; normal adult rate is 60-100 BPM (beats per minute) [http://www.hunterdonhealthcare.org/node/346](http://www.hunterdonhealthcare.org/node/346).

- **RR:** For respiratory rate, one student in our group would breathe in and out and the other would watch the chest inhaling and exhaling and counting repetitions and calculate time either on wall clock or an iPhone using the stopwatch function; performed while sitting, standing, and laying supine, before and after aerobic activity; normal RR is 12-16 breaths/minute for adults [http://www.hopkinsmedicine.org/healthlibrary/conditions/cardiovascular_diseases/vital_signs_body_temperature_pulse_rate_respiration_rate_blood_pressure_85,P00866/](http://www.hopkinsmedicine.org/healthlibrary/conditions/cardiovascular_diseases/vital_signs_body_temperature_pulse_rate_respiration_rate_blood_pressure_85,P00866/).

- For blood pressure, in the lab we learned how to check pressure using a stethoscope and sphygmomanometer (blood pressure cuff), and listening to hear systolic and diastolic pressure and record our findings and calculate time either on wall clock or an iPhone using the stopwatch function, performed while sitting, standing, and laying supine, before and after aerobic activity. [http://www.practicalclinicalskills.com/blood-pressure-measurement.aspx](http://www.practicalclinicalskills.com/blood-pressure-measurement.aspx) High blood pressure is greater than 140/90 mmHg [http://www.nlm.nih.gov/medlineplus/ency/article/007490.htm](http://www.nlm.nih.gov/medlineplus/ency/article/007490.htm).

- For height, weight, and BMI, this information was calculated and entered on a person-by-person basis in MS Excel and emailed to fellow teammates.
Tables:

- **Table #1** Shows Height, age, weight, and BMI for males

<table>
<thead>
<tr>
<th>Notes</th>
<th>Height</th>
<th>Weight</th>
<th>Age</th>
<th>BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td>AN</td>
<td>66</td>
<td>147</td>
<td>19</td>
</tr>
<tr>
<td>M2</td>
<td>NRA</td>
<td>66</td>
<td>230</td>
<td>23</td>
</tr>
<tr>
<td>M3</td>
<td>JM</td>
<td>65</td>
<td>121</td>
<td>18</td>
</tr>
</tbody>
</table>

- **Table #2** Shows HT Rate, BP, and Resp at rest and standing for males

<table>
<thead>
<tr>
<th>Ht Rate Rest Sit</th>
<th>BP Systole Rest Sit</th>
<th>BP Diastole Rest Sit</th>
<th>Resp Rate Rest Sit</th>
<th>Ht Rate Rest Stand</th>
<th>BP Systole Rest Stand</th>
<th>BP Diastole Rest Stand</th>
<th>Resp Rate Rest Stand</th>
</tr>
</thead>
<tbody>
<tr>
<td>68</td>
<td>130</td>
<td>79</td>
<td>15</td>
<td>68</td>
<td>130</td>
<td>79</td>
<td>15</td>
</tr>
<tr>
<td>70</td>
<td>140</td>
<td>72</td>
<td>20</td>
<td>70</td>
<td>140</td>
<td>72</td>
<td>20</td>
</tr>
<tr>
<td>71</td>
<td>120</td>
<td>80</td>
<td>16</td>
<td>71</td>
<td>120</td>
<td>80</td>
<td>16</td>
</tr>
</tbody>
</table>

- **Table #3** Shows vitals at elevated for male

<table>
<thead>
<tr>
<th>Ht Rate Elev</th>
<th>BP Systole Elev</th>
<th>BP Diastole Elev</th>
<th>Resp Rate Elev</th>
</tr>
</thead>
<tbody>
<tr>
<td>87</td>
<td>132</td>
<td>80</td>
<td>22</td>
</tr>
<tr>
<td>92</td>
<td>118</td>
<td>74</td>
<td>35</td>
</tr>
<tr>
<td>90</td>
<td>136</td>
<td>81</td>
<td>51</td>
</tr>
</tbody>
</table>

- **Table #4** Shows vitals after 3, 6, and 10 min for male
Table #5 Shows Height, age, weight, and BMI for females

<table>
<thead>
<tr>
<th>Notes</th>
<th>Height</th>
<th>Weight</th>
<th>Age</th>
<th>BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM</td>
<td>51</td>
<td>170</td>
<td>23</td>
<td>33</td>
</tr>
<tr>
<td>MG</td>
<td>52</td>
<td>220</td>
<td>23</td>
<td>40</td>
</tr>
<tr>
<td>MF</td>
<td>55</td>
<td>140</td>
<td>24</td>
<td>23</td>
</tr>
</tbody>
</table>

Table #6 Shows HT Rate, BP, and Resp at rest and standing for females

<table>
<thead>
<tr>
<th>Ht Rate Rest Sit</th>
<th>BP Systole Rest Sit</th>
<th>BP Diastole Rest Sit</th>
<th>Resp Rate Rest Sit</th>
<th>Ht Rate Rest Stand</th>
<th>BP Systole Rest Stand</th>
<th>BP Diastole Rest Stand</th>
<th>Resp Rate Rest Stand</th>
</tr>
</thead>
<tbody>
<tr>
<td>64</td>
<td>110</td>
<td>62</td>
<td>14</td>
<td>71</td>
<td>121</td>
<td>80</td>
<td>16</td>
</tr>
<tr>
<td>66</td>
<td>120</td>
<td>78</td>
<td>20</td>
<td>67</td>
<td>120</td>
<td>78</td>
<td>22</td>
</tr>
<tr>
<td>69</td>
<td>120</td>
<td>80</td>
<td>18</td>
<td>73</td>
<td>125</td>
<td>85</td>
<td>16</td>
</tr>
</tbody>
</table>

Table #7 Shows vitals at elevated for female

<table>
<thead>
<tr>
<th>Ht Rate Elev</th>
<th>BP Systole Elev</th>
<th>BP Diastole Elev</th>
<th>Resp Rate Elev</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>120</td>
<td>85</td>
<td>18</td>
</tr>
<tr>
<td>82</td>
<td>131</td>
<td>83</td>
<td>37</td>
</tr>
<tr>
<td>95</td>
<td>130</td>
<td>85</td>
<td>24</td>
</tr>
</tbody>
</table>

Table #8 Shows vitals after 3,6, and 10 min for female
Graphs:

- **Figure #1**: The BMI Average of myself, mean males and mean females

- **Figure #2**: A comparison of the height in the men
• Figure #3: The Correlation of BMI and Weight for men
• Figure #4: Compares the heart rate at resting, standing, and elevated for males
- **Figure #5:** Compares the height for females

![Height comparison chart for females](attachment:height_chart.png)

- **Figure #6:** The Correlation of Weight and BMI for female

![Correlation chart](attachment:correlation_chart.png)
Figure #7 Heart Rates at rest, standing, and elevated for females
Figure #8 BP at rest, standing, and elevated for males

Systole BP for Males

BP Systole Rest Sit
BP Systole Rest Stand
BP Systole Elev

BP at Rest, standing and elevated

Male 1
Male 2
Male 3
Figure #9 BP at rest, standing and elevated for males

Figure #10 BP at rest, standing, and elevated for females
Systole BP for Females

- BP Systole Rest Sit
- BP Systole Rest Stand
- BP Systole Elev

BP at rest, standing, and elevated
Figure #11 BP at rest, standing, and elevated for females

Diastole BP for Females

- Female 1
- Female 2
- Female 3
Figure #12 Respiration at resting, standing and elevated for females

Figure #13 Respiration at resting, standing and elevated for males
Figure #14 Heart Rate at 3, 6, and 10 after elevated for males
Figure #15 Heart Rate at 3, 6, and 10 after elevated for females
Heart Rate for Females

Heart rate at 3, 6, and 10
Figure #16 Correlation of Weight and Heart rate elevated for Females
**Analysis**

**Megan:** I noticed that my BMI was very high at 40. This is because I am 220 pounds at 5’2”. This also makes me obese. My blood pressure was normal however for my size. My heart rate was also the highest of all 3 females after the exercise. It also took me the longest after the exercise to come back to my normal levels.

**Maria:** I observed that my weight was the lowest of all the females in the lab and that I had a healthy BP of 120/80. My heart rate before exercise was about the same as the other females ranging around 60 beats per minute. After the exercise, I noticed that I regulated myself a lot faster than the other females.

**Alma:** From the data recorded of heart rate, respiratory rate, and blood pressure rate of myself I noticed the my numbers didn’t have big difference when it elevated. Also out of the three females I was the only with the lowest heart rate. I want to assume that is maybe because of my height. Overall my numbers did not change a lot compared to the other females in the group.

**Other Analysis**

1. The males had the healthiest BMI’s of all subjects in this lab.
2. The males also had healthier blood pressure.
3. When all 3 males exercised, their heart rate jumped only by about 20 more beats per minute.
4. After 10 minute rest after exercise, the males had returned very quickly to their original vitals.
5. M1 and M2 had high systolic BP.
6. According to Figure 3, the higher the weight, the higher the BMI
7. According to figure 7, my heart rate (Megan) was the highest of all 3 females due to being overweight and the fact that my heart has to pump extra hard to regulate my body
8. According to figure 11, all the females’ diastolic rates stay the same before and after exercise.
**Observations/Conclusions / Further Considerations:**
In conclusion, the higher the weight, the higher the BMI. There is also a correlation between weight and heart rate, as the more weight there is, the harder the heart has to pump to regulate the body. The males had healthier weight and BMIs, and therefore were able to come back to normal after exercise. Overall, the systolic rates seemed to change more for both genders versus the diastolic. In the future, the best thing would be to gather a higher number of students to collect more data to make better correlations.

**Raw Data / Original Measurements:**
2. BMI formula [http://www.bmi-calculator.net/bmi-formula.php](http://www.bmi-calculator.net/bmi-formula.php) BMI = weight (pounds) / height in total inches x height in total inches x 703
3. How to take pulse at wrist (radial artery) and neck (carotid artery) [http://www.hunterdonhealthcare.org/node/346](http://www.hunterdonhealthcare.org/node/346)
5. How to take your blood pressure [http://www.practicalclinicalskills.com/blood-pressure-measurement.aspx](http://www.practicalclinicalskills.com/blood-pressure-measurement.aspx)

**Drawings / Diagrams / Illustrations:**
1. Taking a pulse, [http://www.hunterdonhealthcare.org/node/346](http://www.hunterdonhealthcare.org/node/346)
2. Taking blood pressure, [http://www.practicalclinicalskills.com/blood-pressure-measurement.aspx](http://www.practicalclinicalskills.com/blood-pressure-measurement.aspx)