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## Lab - The Effect of Exercise on Breathing Rate and Heart Rate

Purpose: To look for evidence of the connection between the respiratory system and the circulatory system. Materials:

- Stopwatch/timer
- Graph paper
- Heart Rate monitor (app)
- Smartwatch


## Procedure 1 - Measuring Resting Heart Rate:

1. Take your partners pulse $\rightarrow$ locate the artery in your partner's wrist. Gently press your index finger and one or two other fingers against the artery.
2. Count the number of pulses in 15 seconds.
3. Multiply that number by 4 . This will give you the number of times the heart beats in 1 minute, which is the heart rate (number of beats per minute). Record this number in the data table.
4. Repeat steps 1-3 two more times. Add the three values together, and divide by three. This will give you your partner's average resting heart rate.

|  | Trial 1 <br> Partner \#1 / Partner \#2 |  | Trial 2 <br> Partner \#1 / Partner \#2 |  | Trial 3 <br> Partner \#1 / Partner \#2 |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Number of pulses in 15 <br> seconds |  |  |  |  |  |  |
| Multiplied by 4 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| Total $=$ | A1 | B1 | A2 | B2 | A3 | B3 |

** To calculate average BPM : Add A1 + A2 + A3 divide by 3
OR Add B1 + B2 + B3 divide by 3
Calculate average BPM (beats per minute) for Partner \#1 $\qquad$ BPM and Partner \#2 $\qquad$ BPM

## Procedure 2 - Measuring Resting Breathing Rate:

1. Count the number of times your partner breaths (one inhale and one exhale) in 30 seconds.
2. Multiply that number by 2 . That will give you the number of times your partner breathed in 1 minute, which is the breathing rate (breaths per minute). Record this number in the data table.
3. Repeat steps $1-2$ two more times. Add the three values for breathing rate together and divide by three. This will give you your partner's average resting breathing rate.

|  | Trial 1 <br> Partner \#1 / Partner \#2 |  | Trial 2 <br> Partner \#1 / Partner \#2 | Trial 3 <br> Partner \#1 / Partner \#2 |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Number of breaths in 30 <br> seconds |  |  |  |  |  |  |
| Multiplied by 2 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| Total $=$ | A1 | B1 | A2 | B2 | A3 | B3 |

$\qquad$ bpm and Partner \#2 $\qquad$ bpm

Hypothesis: I think that it will take my partner $\qquad$ (amount of time) for heart rate and breathing rate to return to their resting rate after light, medium, and intense exercise.

What will you use for the light, medium, and intense exercises? $\qquad$

| Hypothesis: I think that after_"exercise"__ it <br> will take <br> rate and breathing rate. to | Time to return to resting <br> HEART rate | Time to return to resting <br> BREATHING rate |
| :--- | :--- | :--- |
| Light exercise: |  |  |
| Medium exercise |  |  |
| Intense exercise |  |  |

## Procedure 3 - Recovery Time:

1. Have your partner complete 1 minute of light exercise, measure their heart rate and breathing rate for 15 seconds. Record your observations in the data chart.
2. Wait 30 seconds and measure their heart rate and breathing rate again.
3. Wait another 30 seconds and repeat.
4. Repeat until your partner's heart and breathing rate have returned to resting levels.
5. Repeat same procedure for medium and intense exercise.
6. Allow your partner to make observations on you as well.

## Observations:

Partner: $\qquad$
Resting Heart Rate: $\qquad$ bpm

Resting Breathing Rate: $\qquad$ bpm

| Exercise intensity | HR upon <br> completion <br> of exercise | +30 s | +30 s | +30 s | +30 s | +30 s | +30 s | +30 s | +30 s | +30 s | +30 s |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Light |  |  |  |  |  |  |  |  |  |  |  |
| Medium |  |  |  |  |  |  |  |  |  |  |  |
| Intense |  |  |  |  |  |  |  |  |  |  |  |
| Exercise intensity | BR upon <br> completion <br> of exercise | +30 s | +30 s | +30 s | +30 s | +30 s | +30 s | +30 s | +30 s | +30 s | +30 s |
| Light |  |  |  |  |  |  |  |  |  |  |  |
| Medium |  |  |  |  |  |  |  |  |  |  |  |
| Intense |  |  |  |  |  |  |  |  |  |  |  |

Graph your Data in two graphs, one for heart rate and one for breathing rate. Put time ( $\mathbf{m i n}$ ) on the $\mathbf{X}$-axis and heart/breathing rate on the $\mathbf{Y}$-axis. Be sure to include a descriptive title.

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## Questions for Analysis:

1. Interpret your graphs. What patterns do you see in your graphs? Are the patterns that you observe what you would have expected? Explain why or why not.
2. What factors were not controlled for in your investigation? (What factors might have influenced your results?)

## Conclusion:

- Re-write the purpose of your experiment.
- It was hypothesized that..
- Summarize your findings.

