**Dynamic Equilibrium: Exercise, Pulse Rate, and SpO2**

**I. Experimental Design**

**Question:** How are pulse rate and blood oxygen saturation (SpO2) affected by physical activity?

**Notes from Background Reading**: (*adapted from www.healthline.com/health/pulse-oximetry/readings*)

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**Independent variable**: Amount & Duration of physical activity

**Dependent variables:** Pulse rate, blood oxygen saturation

**Hypotheses:** *(use the if… then… because… format for BOTH dependent variables. Hint: this means 2 separate hypotheses!)*

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**II. Materials and Methods**

**Procedure:**

1. In pairs, attach the pulse meter to one person’s index finger. Record your “resting” pulse in beats per minute (bpm) and your resting level of SpO2 in your notebook.
2. One person uses a stopwatch while the person with the pulse oximeter attached does jumping jacks for 2 min (hold on tight to the oximeter!). Stop every 15 seconds to read out your pulse rate and SpO2; the person with the stopwatch should write the data down.
3. After 2 minutes, stop doing jumping jacks. Continue recording pulse rate every 15 seconds for 2 minutes or until the your heart rate returns to the initial resting heart rate
4. Switch partners and repeat steps 1-3

**Data: Time vs. Heart rate**

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| --- | --- | --- |
| Time (sec) | Heart rate (bpm) | SpO2 |
| 0 |  |  |
| 15 |  |  |
| 30 |  |  |
| 45 |  |  |
| 60 |  |  |
| 75 |  |  |
| 90 |  |  |
| 105 |  |  |
| 120 |  |  |
| 135 |  |  |
| 150 |  |  |
| 165 |  |  |
| 180 |  |  |
| 195 |  |  |
| 210 |  |  |
| 225 |  |  |
| 240 |  |  |

**Graph your results:**

*(hint: each dependent variable will need to be graphed on its own scale. This means two y-axes!)*

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**III. Analysis questions:**

1. What happens to your heart rate as exercise increases?

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1. What happens to your heart rate when exercise stops?

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1. How long did it take for your heart rate to return back to normal?

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1. Why does your heart rate increase when exercise increases?

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1. What happened to your blood oxygen level during this experiment? How can you explain this result?

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1. What do you think would happen if you compared your “resting” heart rate to your heart rate while sleeping? Explain your reasoning.

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1. Qualitatively, what happened to your rate of breathing during exercise? How is this related to pulse rate and to SpO2?

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**IV. Pulse Oximetry Exit ticket (***Due tomorrow for homework if not finished in class***)**

8. While carrying out this experiment, you hear another group arguing over their results. One team member says that their pulse rate increased because the amount of oxygen in their blood decreased. Another said that the pulse rate increased to keep the oxygen level the same. You want to help, but want to make sure your answer is well supported by evidence. Write a C-E-R scientific argument below using evidence from your data to support one claim or the other.

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