**INVESTIGATING CARDIOVASCULAR HEALTH IN TEENAGERS:**

**Introduction:** This report will focus on investigating cardiovascular health in teenagers and factors such as exercise that affect heart resting pulse. In order to proceed in this investigation, we need to measure the resting heart rate of teenagers between the age of 15-16. Resting heart rate is an indication of heartbeat per minute when you are at rest. There are numerous factors that affect resting heart rate pulse such as age, body size, health level and stress. However, this report will only focus on exercise. Regular exercise will contribute to reduction in resting heart rate (RHR) or increase the stroke volume (the amount of blood pump for each beat, the higher it will result in a lower resting heart rate), to reduce cardiovascular diseases such as heart failure, stroke or heart attack. During exercise the heart rate increases so that more blood gets around your body, to pump extra oxygen around working muscles and the lungs also take in air, hence heavy breathing. A normal heart rate is usually stated as 60-100 beats per minute. A lower heart rate may indicate a good sign of health such as being physically fit, but a very low heart rate can be dangerous. It is known as “bradycardia,” a heart rate slower than 60. It can be a sign of heart diseases, certain infections or high levels of potassium in the blood. On the other hand, a fast heart rate faster than 100 beats is known as “tachycardia” may be due to stress or high levels of caffeine. Diseases associated with a fast heart rate include heart problems such as cardiomyopathy, certain medications (EpiPen), low levels of potassium in the blood or asthma. The muscles in your body contract during exercise, by the use of oxygen, glucose, molecule of ATP and amino acids. In this process these compounds create waste such as carbon dioxide or lactic acids that must be taken away from the muscles. Heart rate significantly increases during exercise due to the needs of nutrients and elimination of waste product

**References:**

* Natural Library Of Medicine (2016)

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4771152/#:~:text=If%20an%20aerobic%20exercise%20is,et%20al.%2C%202015>).

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* Harvard Health Publishing. (2023). Robert H. Shmerling

<https://www.health.harvard.edu/heart-health/hows-your-heart-rate-and-why-it-matters>

* National Academy Of Sports Medicine. (2023).

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**Hypothesis:** If a participant of any gender, between the age of 15-16 exercises 3 or more times per week, the amount of the resting heart rate per minute will decrease.

**Independent variable:** Days of exercise

**Dependent variable:** Heart rate

**Controlled variable:** Age of participants

**Materials:**

* a calculator
* a ruler
* a pen
* a paper
* subjects (a total of 20 participants)- who have been rested for at least 10 minutes

**Method:**

1. Gather all materials needed—-> pen, paper, calculator to record results to perform this investigation
2. Ask participants ---> how many times they exercise a week (can include any sports club they attend, walking, exercising), controlled variable must be kept the same in this case, the age of participants-15 to 16 years of age
3. Measure their resting heart rates within 60 secs, use a timer/on device with a total of 21 participants
4. Repeat this twice (a total of 3 trials) for each person order to improve the reliability of the first few steps of the investigation
5. Record everything by setting up a graph, include amount of time they exercise, number of participants, trial 1-3, average, gender)
6. Simplify the graph by finding all average on each day
7. Produce a graph by hand include the independent, dependent variables, a title and record

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Participant | Number of times -exercise | Trial 1 | Trial 2 | Trial 3 | Average | Gender |
| 1 | 3 | 85 | 74 | 77 | 79 | F |
| 2 | 4 | 77 | 62 | 66 | 68 | F |
| 3 | 4 | 64 | 71 | 77 | 71 | F |
| 4 | 2 | 70 | 82 | 92 | 81 | F |
| 5 | 0 | 72 | 64 | 74 | 70 | F |
| 6 | 3 | 82 | 86 | 82 | 83 | F |
| 7 | 0 | 86 | 90 | 84 | 86 | F |
| 8 | 4 | 87 | 83 | 88 | 86 | F |
| 9 | 2 | 77 | 76 | 75 | 76 | M |
| 10 | 3 | 70 | 68 | 58 | 65 | F |
| 11 | 2 | 86 | 90 | 84 | 86 | F |
| 12 | 3 | 80 | 76 | 72 | 76 | M |
| 13 | 6 | 64 | 72 | 80 | 72 | M |
| 14 | 5 | 80 | 88 | 90 | 86 | M |
| 15 | 6 | 78 | 60 | 70 | 69 | M |
| 16 | 4 | 86 | 82 | 56 | 75 | M |
| 17 | 3 | 72 | 76 | 70 | 73 | F |
| 18 | 5 | 62 | 62 | 64 | 63 | M |
| 19 | 5 | 90 | 78 | 92 | 89 | M |
| 20 | 3 | 82 | 98 | 86 | 89 | M |
| 21 | 2 | 76 | 80 | 72 | 76 | M |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| No. days exercise | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Average Heart rate | 78 | 0 | 80 | 77 | 75 | 79 | 71 | 0 |
| subjects |  |  |  |  |  |  |  |  |
| 1 |  |  |  | ~~~~~ |  |  |  |  |
| 2 |  |  |  |  | ~~~~~ |  |  |  |
| 3 |  |  |  |  | ~~~~~ |  |  |  |
| 4 |  |  | ~~~~~ |  |  |  |  |  |
| 5 | ~~~~~ |  |  |  |  |  |  |  |
| 6 |  |  |  | ~~~~~ |  |  |  |  |
| 7 | ~~~~~ |  |  |  |  |  |  |  |
| 8 |  |  |  |  | ~~~~~ |  |  |  |
| 9 |  |  | ~~~~~ |  |  |  |  |  |
| 10 |  |  |  | ~~~~~ |  |  |  |  |
| 11 |  |  | ~~~~~ |  |  |  |  |  |
| 12 |  |  |  | ~~~~~ |  |  |  |  |
| 13 |  |  |  |  |  |  | ~~~~~ |  |
| 14 |  |  |  |  |  | ~~~~~ |  |  |
| 15 |  |  |  |  |  |  | ~~~~~ |  |
| 16 |  |  |  |  | ~~~~~ |  |  |  |
| 17 |  |  |  | ~~~~~ |  |  |  |  |
| 18 |  |  |  |  |  | ~~~~~~ |  |  |
| 19 |  |  |  |  |  | ~~~~~ |  |  |
| 20 |  |  |  | ~~~~~ |  |  |  |  |
| 21 |  |  | ~~~~~ |  |  |  |  |  |

**Results:**

Reliability:This investigation is reliable, due to the number of trials carried out and several numbers of participants increases the reliability of how exercise affects teenagers resting heart rate.

Validity: This investigation is not valid due to many different factors that affect a person's resting heart rate per minute. Such as the differences in body size, stress, level of fitness, lack of sleep and gender may all be a factor that affects resting heart rate on teenagers. Experiencing emotional or physical stress can cause an increase in heart rate, elevation of blood pressure and release stress hormones.