**Introduction**

*Aim:*

This report will address how teenagers resting heart rate can be affected by the number of hours of sleep the night before.

*Background Research*

The resting heart rate is the number of times the heart beats per minute while at rest. There are many factors that can affect the resting heart rate. Factors such as the amount of exercise, amount of caffeine intake, hours of sleep, dietary, or body size. A normal range of resting heart rate for a teenager and adult is said to be between 60-100 beats per minute. If the resting heart rate is below 60 beats per minute, it can be identified as bradycardia. Although bradycardia can be normal when in a sleeping state or an athlete, it can cause problems as the heart is pumping at a very slow rate meaning it can’t pump enough oxygen blood to the body and places where it needs to be. This can lead to dizziness, shortness of breath, or the body being very tired or weak as the brain or other organs of the body are oxygen deprived. In other cases, having a low resting heart rate can generally mean that your heart is healthy and in good conditions as it can maintain a steady beat. If the resting heart rate is above 100 beats per minute, it can be identified as tachycardia. This can cause problems as if the heart is beating very rapidly, it can pump less efficiently. The rapid heartbeats can also build up pressure in the lungs which can lead to fluid accumulation, making it difficult to breathe.

Research in Washington, D.C has found that not getting enough sleep increased the heart rate in all their participants (American College of Cardiology, 2021). The research consist of one group of participants being restricted to less than 5 hours of sleep and the other group being allowed to sleep more than 5 hours. The group of participants being restricted to 5 hours and less have a higher heart rate average than the other group of participants. People who sleep less than the required amount of sleep needed have a higher amount of heart rate as “Poor sleep, including abrupt awakening can generate a sharp uptick in heart rate. Research has also found that people with sleeping problems are more likely to complain of an irregular heartbeat” (Suni, 2022). Sleep is an essential as it is the time for the body to “recuperate”. During this period, also known as the NREM stages, “heart rate slows, blood pressure drops, and breathing stabilizes” (Suni, 2022). This reduces the stress on the heart, allowing the heart to recover from waking hours. Without enough sleep, a person doesn’t get enough rest, not allowing the heart to benefit.

**Hypothesis:**

The hours of sleep being more than five hours, results in a lower resting heart rate in teenagers.

**Independent Variable:**

* Hours of sleep from participants

**Dependent Variable:**

* Resting heart rate

**Controlled variables:**

* Resting time (1 minute) for participants
* Time measured for resting heart rate.
* Place of pulse taken

**Materials:**

* Participants (their heart and wrist)
* Timer
* Devices (such as laptops or phone) or table sheet
* Grid paper
* Calculator
* Pens, pencil, erasers, highlighters, ruler (basic stationary)

**Methods:**

1. Participants (**15 to 16 years old**) were required to sit down to ensure they are in a resting position.
2. Set a timer for one minute on a timer (or devices), and participants are to rest within the time (no talking, no sudden movements, no laughing). This is to keep the participants at a resting heart rate.
3. One experimenter is then to take the participants wrist and press until a pulse is found.
4. The second experimenter is then to set a timer for 30 seconds, while the first experimenter is counting the number of beats of the pulse until the timer goes off.
5. Once the timer goes off; the first experimenter is to get the number of result and times it by two as the heart rate is measured by beats per minute.
6. The result is then needed to be recorded on a device or table sheet.
7. Steps 2-5 is then needed to be repeated on the same participant for another two trials. This is to get an average and ensure reliability.
8. Once the participant has done three trials, the result from the trial is to be averaged by adding all three results and diving by three.
9. Experimenters are to ask the participants how many hours of sleep they got **the night before.**
10. Experimenters are then to take (20 minimum) participants results, repeating steps 1-9 if the experiment hasn’t been done for them.

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|  |  | Resting Heart rate (beats/minute) | | |  | GENDER |
| Subject | Sleep | 1 | 2 | 3 | Average | Gender |
| 1 | 8hrs | 82 | 70 | 92 | 81.3 |  |
| 2 | 9hrs | 82 | 86 | 82 | 83.3 |  |
| 3 | 8hrs | 86 | 90 | 84 | 86.7 |  |
| 4 | 6hrs | 87 | 83 | 88 | 86 |  |
| 5 | 8.5hrs | 77 | 76 | 75 | 76 |  |
| 6 | 9hrs | 64 | 72 | 80 | 72 |  |
| 7 | 6hrs | 80 | 76 | 77 | 77.7 |  |
| 8 | 5hrs | 86 | 82 | 56 | 74.7 |  |
| 9 | 7hrs | 80 | 88 | 90 | 86 |  |
| 10 | 4hrs | 78 | 60 | 70 | 69.3 |  |
| 11 | 7hrs | 77 | 62 | 66 | 68.3 |  |
| 12 | 6hrs | 64 | 71 | 77 | 70.7 |  |
| 13 | 8hrs | 85 | 77 | 77 | 79.7 |  |
| 14 | 8hrs | 72 | 64 | 70 | 68.7 |  |
| 15 | 8.5hrs | 70 | 68 | 58 | 65.3 |  |
| 16 | 9.5 hrs | 78 | 78 | 80 | 78.7 |  |
| 17 | 8.5hrs | 62 | 62 | 64 | 62.7 |  |
| 18 | 8hrs | 72 | 76 | 70 | 72.7 |  |
| 19 | 8.5hrs | 76 | 80 | 72 | 76 |  |
| 20 | 6hrs | 96 | 78 | 92 | 88.7 |  |
| 21 | 5hrs | 82 | 98 | 86 | 88.7 |  |
| 22 | 8.5hrs | 72 | 64 | 74 | 70 |  |
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| Sleep (hrs) | Averages |
|  |  |
| 3-5 | 77.6 |
| 5-7 | 79.6 |
| 7-9 | 74.5 |
| 9+ | 78.7 |

**Outlier:**

* The outlier would be the person who slept 9+ hours as there was only one person to average.
* Within the 5-7 hours of sleep, two participants had their last trialled resting heart rate dropped dramatically compared to their first two results

**Reference:**

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