The Links Between Exercise Walking and Blood Pressure

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Introduction to Purpose of Experiment

The force of your blood pressing against the walls of your blood vessels is measured by blood pressure. Exercise can raise blood pressure, although the benefits are typically transient. Your systolic blood pressure rises while you exercise. The pressure in your blood vessels while your heart beats is measured by systolic blood pressure. The pressure in the blood arteries between heartbeats is measured by diastolic blood pressure. The appropriate flow of blood from the heart to the body's organs and tissues requires normal pressure. Each heartbeat pumps blood throughout the body. Pressure is greater near the heart and lower away from it. Your blood pressure will fluctuate during the day, which is typical.The time of day, activity, the foods you consume, stress, and other variables all have an impact on blood pressure. However, if your blood pressure is too high for an extended period of time, problems may occur. Your heart may work too hard and lose strength as a result of high blood pressure. Blood vessels can be damaged by the strong force of blood flow, rendering them weak, stiff, or narrower. Hypertension can impair multiple vital organs, including the heart, kidneys, brain, and eyes, over time.Maintaining a healthy blood pressure is critical since the greater your blood pressure, the more likely you are to develop health problems. The purpose of this experiment is to evaluate and determine if walking is a form of exercise that can effectively lower your blood pressure.

Background Knowledge

Effects of exercise are most noticeable during and right after a workout. Any form of exercise can lower blood pressure by reducing blood vessel stiffness so blood can flow more easily. (healthline, 2012) Walking for just few minutes a day has shown to effectively lower blood pressure in people with hypertension and improve heart health. Studies have also shown that people who engage in normal exercise typically have a lower blood pressure and a lower risk of hypertension.(Webmd, 2008)

Essential Question

How can walking for 10 minutes affect your blood pressure? Does it increase or decrease?

Hypothesis

Alternative Hypothesis: The difference in blood pressure after walking for 10 minutes in 16-17 year olds at GPCI will be slightly lower than their initial blood pressure.
Null Hypothesis: There is no significant difference in blood pressure after walking for 10 minutes in 16-17 year olds at GPCI.
Independent variable: time walking
Dependent variable: blood pressure

Methodology

Materials:

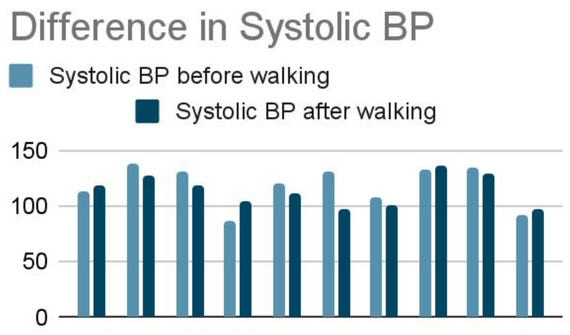
a) **blood pressure monitor**
b) **timer**

Procedure:

1) **Before you begin the experiment, if you have already been moving, rest for 5 minutes.**
2) **To begin the experiment, take your initial blood pressure by wrapping the blood pressure cuff around your arm, make sure the cuff is secured before you start the machine.**
3) **Once you have taken your blood pressure, record it in a journal.**
4) **Next set your timer for 10 minutes and begin walking.**
5) **Finally, when timer goes off, take your blood pressure immediately right after**

Data

Blood Pressure before walking	Blood Pressure after walking
114/64 mmHg	119/66 mmHg
139/71 mmHg	127/69 mmHg
131/71 mmHg	119/66 mmHg
86/67 mmHg	104/78 mmHg
1121/79 mmHg	112/56 mmHg
131/81 mmHg	97/52 mmHg
109/69 mmHg	101/49 mmHg
134/83 mmHg	137//79 mmHg
135/83 mmHg	129/83 mmHg
93/63 mmHg	97/64 mmHg



Statistical Analysis

For comparing the initial blood pressure and final blood pressure, specifically the systolic blood pressure we calculated the mean, variance, and standard deviation in both the before and after results of the study. For our study we used the equation below for our independent T-test.

$$t = \frac{(\bar{X}_1 - \bar{X}_2)}{\sqrt{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)}}$$

In comparing the initial systolic blood pressure, t=5.248

In comparing the final systolic blood pressure, t=5.297
In both calculations our t-value was more than out critical value (1.764); so we are able to reject our null hypothesis. Our data shows that there is a slight significant difference in the initial systolic blood pressure before walking and the final systolic blood pressure after walking.

Conclusion/Summary/Discussion

In this study the blood pressure, specifically the systolic blood pressure was collected from a group of 10 individuals. Of these 10 individuals who completed a 10 minute walking session after taking their initial blood pressure showed similar trends in their results. Our initial hypothesis was that after the 10 minute walk more than half, if not most of our participants will show a slight decrease in blood pressure, specifically their systolic blood pressure. Our hypothesis was supported by the data collected in our study. The data showed a slight difference between the resting blood pressure/systolic blood pressure and the blood pressure after the study. Seeing that blood pressure is is a classic vital sign and measure of health there could've been multiple sources of error but the one we took note of was the interval in time between the completion f the walking session and the final blood pressure measurement. In conclusion it can be said that 10 minutes of walking daily can lower your blood pressure and we can further assume that walking for a longer period of time may also lower your blood pressure.

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Article title: Why is Maintaining a Healthy Blood Pressure Important
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Website title:NEOFECT Blog
Date published: June 22,2020

The Mental and Physical Effects of Sleep Deprivation

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Introduction

Sleep deprivation and its effects on everyday physical and mental health are common all over the globe, some of the most serious potential problems associated with sleep deprivation are high blood pressure, diabetes, heart attack, heart failure, stroke, or a rise in unwanted emotions. Processes across the body perform suboptimally when you don't get enough sleep. Overworked neuronal networks in the brain impede thinking, inhibit physical reflexes, and leave people emotionally exhausted. These short-term consequences of sleep deprivation might derail a day's effort. Strong scientific evidence demonstrates that a brief time of true sleep, such as a nap, rather than merely a quiet moment, helps our brains recover from weariness and regain attentiveness. Short and extended sleeps can both improve alertness. A short snooze during the day is advised.

Background

Individuals who sleep 8-10 hours every night say they feel healthier, lively, able to control their emotions and can focus easily on their day-to-day tasks. That being said an individual is recommended to sleep 7-9 hours every night to prevent not being able to think clearly, anger, and depression (samsha.gov 2019). It is was recorded that Poor sleep can negatively affect a student's grades, increase the odds of emotional and behavioral disturbance, and students who lacked sleep performed poorly compared to students who have a well-set sleep schedule. (aasm.org 2020)

Methodology

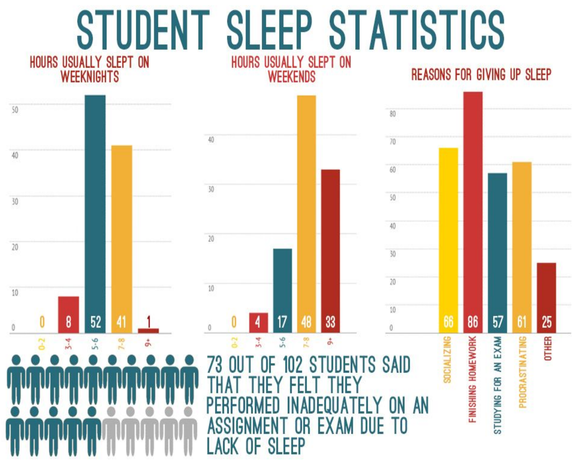
What you need:

- At least 12 test subjects
- A notebook to record results
- Two Groups
- Time
- A doctor ready to provide physical and mental examination
- Tests of hand-eye coordination, activeness, and concentration.

Procedure:

- Separate two groups by a random deciding way to prevent bias
- Get one of the two groups to sleep well for the next two weeks getting about 8-10 hours of sleep a night
- Make the other group sleep irregular and late, getting about 3-5 hours of sleep a night.
- Monitor mental and physical health during the trials in case of emergency
- After two weeks get subjects to get a physical examination and do various tests that test concentration, hand-eye coordination, agility, and liveliness.
- Record results of all subjects from each group
- Compare results and deduce if a lack of healthy sleep a night affects a person well being.

Data



Statistical Analysis

For comparison of resting heart rate and resting systolic blood pressure, we calculated the mean, variance (S2), and standard deviation (S) in both groups (those that claim to be sleep deprived versus those that do not). Our sample sizes were of the same quantity, so we used the following equation for the independent t-test:

$$t = \frac{(\bar{X}_1 - \bar{X}_2)}{\sqrt{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)}}$$

In comparing resting heart rate, t = 1.926

In comparing resting systolic blood pressure, t = 2.576

In both calculations, our t- value was greater than our critical value (1.746); therefore, we reject our null hypothesis. Our data show that there is a significant difference in the resting heart rate and resting systolic blood pressure in people that are sleep deprived and those that are not.

Conclusion, Summary, and Description

In this study, sleep deprivation and its effects mentally and physically were collected from a group of 12 individuals. Of these individuals, half got 8-10 hours of sleep every night that and 12 reported that they did not sleep well and got under 6 hours of sleep every night for two weeks. Our initial hypothesis, which was that individuals who report that they slept well every night would show their mental and physical health to be stronger than the other half that did not sleep well, This was supported by the data collected in this study. Our data showed a significant difference between the well-rested groups' mental and physical health and the sleep-deprived group. Considering that Mental health and the physical conditions of the body are classic measures of health as supported by our research and medical literature, It is no wonder why people who took care of themselves were more attentive, active, didn't experience mood swings, and felt lively. In the survey that we used to collect personal data, we only included two possible answers for exercise: “I slept 8-10 hours” and “I slept less than 6 hours.” Since these two statements can be subjective from person to person depending on the exact amount they slept and that person's mental and physical resolve, it would have been better to quantify this data with maybe more select and similar people. Furthermore, this data was self-reported rather than collected by the researchers, and it would have been more accurate to measure the exact amount of sleep and how the individuals acted on the day to day and not just a set day where anything could've hindered their mental or physical attentiveness.

Citations

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How Do Workouts Affect Females and Males Differently?

David Romo and Dylan Lindsay

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Hypothesis

Null Hypothesis: Workouts cause equal cardiovascular change (heart rate) in females and males.

Alternative Hypothesis: Workouts cause females have greater cardiovascular change than males.

Variables and Results

There were many variables that could contribute to data not being 100% accurate. A few of these could include activeness, height, potential incorrect reading of devices used to take our data, and underlying illnesses.

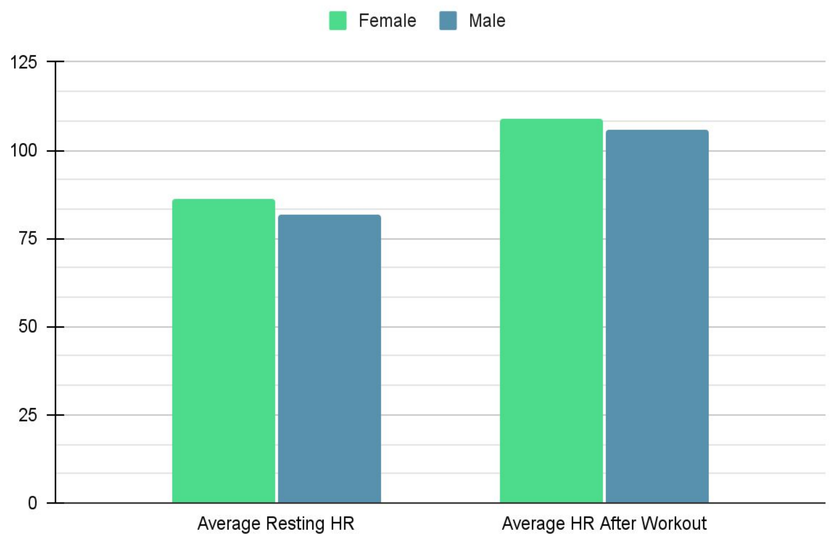
Here are our results as a visual:

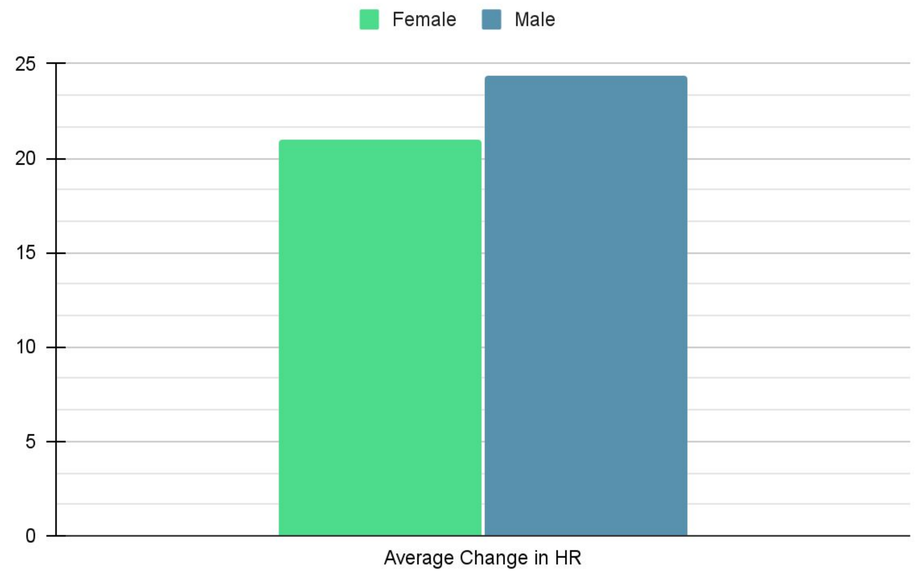
Purpose of our Research

With our research we hoped to find any differences in heart rates between male and female after a 1 minute cardio exercise.

Cardio exercises, also known as aerobic exercises, is an exercise or activity that increases heart rate into your target heart rate zone which is 50-80 percent of your maximum heart rate.

Sex	Resting HR	After Workout HI	Change in HR
Female	83	96	13
Female	80	102	22
Female	90	120	30
Female	104	136	22
Female	75	92	17
Female	85	107	22
Male	89	105	16
Male	67	96	29
Male	70	92	22
Male	96	124	28
Male	87	113	26
Male	81	111	30





How we Conducted our Experiment

Our steps for our experiment and data collection are as follows:

- Obtain 12 test subjects roughly around the same age with 6 being female and 6 being male.
- Take their heart rate before jogging.
- Make them jog in place for 1 minute.
- After one minute of rest take their heart rate.
- Calculate the difference between the heart rate before and after jogging.
- Repeat for each subject.
- Calculate the results.

Our Calculations/Analysis of Data

We calculate the mean between the change in females and males separately. We then use the formula: to calculate our variance $s^2 = \frac{\sum (x - \bar{x})^2}{n - 1}$ This results in our variance being 32.8 in females and 20.14 in males. We then move onto calculating our standard deviation using the formula: $s_x = \sqrt{\frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n - 1}}$ This results in our standard deviation being 5.727 in females then 4.488 in males.

Independent t-test

The t-test we use is an independent t-test because we tested each group independently from each other more specifically Welch's t-test because are variances are not equal, the formula is as follows: $\frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\frac{s_1^2}{N_1} + \frac{s_2^2}{N_2}}}$ After calculations we get a t-score of -1.144.

Conclusion

Our t-value is -1.144 which is less than our critical value of 1.860. This means that we fail to reject our null hypothesis and our results are not statistically significant. However, there are multiple ways to improve this experiment, due to covid restrictions we had a very small sample size, we would first start off with a larger sample size, secondly we would have a move efficient way of gathering our data as we believe there was too much room for error. Lastly, we would use people who are more alike in multiple aspects, such as height and age, etc.

Citation: *Welch's t-test: When to use it + examples*. Statology. (2020, December 20). Retrieved January 20, 2022, from https://www.statology.org/welchs-t-test/

The Impact of Age on Reaction Times

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Introduction to Purpose

Despite not being acknowledged much, reflexes are an important part of everyday life. They can allow people to respond quickly to potentially dangerous situations and can indicate that someone has good sensorimotor coordination and can perform well. Without these quick reflexes, people can find themselves in scenarios where they are not quick enough to react, or are not able to even stand up or remain active.

Background

Different factors can lead to slowed down reaction times, but in this experiment the correlation between age and reaction times will be explored. There are reports that due to aging the nerves that are responsible for these quick responses can change. All nerves are connected to each other through areas in them called synapses. Synapses are responsible for receiving and transmitting chemical or electrical signals from neuron to neuron, telling them to perform a certain action. As the years pass, the fibers near the synapse are of the neuron begin to wear down slowing down conduction between neurons. This means that the electrical signals can no longer pass through neurons as easily and quickly and neurons may resort to chemical synapses which are slower than electrical synapses.

Experimental Question

How does age impact reaction times?

Hypotheses

Null Hypothesis:
The reaction time of those in their teenage or early adulthood years will be the same or similar to the reaction times of those in their later years (50-75)

Alternative Hypothesis:
The reaction times of those in their teenage or early adulthood years will be significantly shorter/lower than those in their later years.

Variables:
Independent Variable: Age
Dependent Variable: Reaction time in milliseconds

Methodology

Materials:

a. A computer with a reaction test website
b. Sample population of 30 people
c. Calculator

Procedure:

a. Ask 30 people from ages 15-75 to participate in our experiment. Their data would be divided into 2 groups; one of those ages 15-40 (composed of 15 individuals), which were considered the test group of teens and young adults, and also the group of ages 50-75 (composed of 15 individuals) which were considered the group of older adults.
b. Open the reaction time test, at humanbenchmark.com
c. One by one, have each test subject take the test by clicking on the screen whenever it turned green. The website would make the subject touch the screen 5 times and at the end, present us with an average reaction time.
d. Have the subjects take the test a total of 3 times for more consistent results.
e. Make 2 charts based on the test groups; one for those 15-40 and another for those 50-75.
f. Based on their average reaction times, the test subject's data would be inputted into the graph along with their age. This would be done for the subjects of both groups.
g. Calculate the mean/average reaction time of each group by adding the reaction times and dividing by the number of people.
h. Based on the mean calculations, calculate the difference or deviation by subtracting the mean from each reaction time in the tables and squaring the result.
i. Calculate the variance of each group by dividing the sum of the differences of each group by the size of the sample minus 1.
j. Calculate the standard deviation of each group by taking the square root of the variances.
k. Determining what t-test to use based on the sample size and whether the experiment was independent or dependent.
l. Calculate the t-statistic
m. Calculate the degrees of freedom.
n. Using an alpha value of 0.05, and based on the degrees of freedom, find the critical value.
o. Determine whether or not the null hypothesis can be rejected and whether the results are statistically significant.

Data

Age Of Test Subjects	Reaction Time
17	360ms
16	276ms
38	365ms
16	345ms
24	340ms
15	278ms
32	423ms
18	306ms
20	375ms
15	301ms
25	357ms
18	270ms
10	287ms
30	316ms
40	388ms

Age Of Test Subjects	Reaction Time
66	502ms
69	502ms
62	470ms
75	582ms
55	548ms
52	525ms
59	479ms
67	541ms
71	512ms
55	489ms
51	541ms
66	563ms
56	577ms
58	583ms
57	503ms

Statistical Analysis

To compare the data of both age groups and also to determine whether or null hypothesis could be rejected, we calculated the mean ($\bar{x}$), variance (s^2), standard deviation (s), t-statistic, and degrees of freedom of our data.

1. The mean ($\bar{x}$) values of each group were calculated. This resulted in a $\bar{x}$ of **332.466** for the 15-40 age group and a $\bar{x}$ of **527.8** for the 50-75 age group.
2. We calculated the differences for each test subject in each group. These differences were added and then divided by 14 to give us the variances (s^2) of each group. For the 15-40 age group, we had a s^2 of **2129.123** while for the 50-75 age group, we had a s^2 of **1416.6**
3. We calculated the standard deviation (s) of each group by taking the square root of the s^2 of both groups. This gave us a s of **46.142** for the 15-40 age group and a s of **37.637** for the 50-75 age group.
4. Since our samples were independent of each other and the sample sizes were equal we decided to use independent t-test #2. This allowed us to calculate the t-statistic.

$$t = \frac{|(\bar{x}_1 - \bar{x}_2)|}{\sqrt{\frac{1}{n}(s_1^2 + s_2^2)}}$$

$$\frac{|(332.466 - 527.8)|}{\sqrt{\frac{1}{15}(2129.123 + 1416.6)}} = 12.7048$$

Since our t-statistic was more than our critical value of 1.701, this meant that we could reject the null hypothesis and determine that our results were statistically significant.

Conclusions & Summary

In this study, we collected data from 2 groups of subjects; 15 of these subjects were ages 15-40 while the other 15 were ages 50-75. Using a reaction time test online, we gathered data about each subject and used this to test our hypothesis that there was a relationship between age and reaction times, and that the older the subject, the slower the reaction time would be. By conducting calculations in our experiment and finding the t-statistic and critical value at the end, we were able to show that our results were statistically significant and that we could reject the null hypothesis that stated that the reaction times of those in their teenage or early adulthood years would be the same as the reaction times of those in their later adult years. Despite the fact that scientists and medics agree with the fact that reaction times can slow over time and our study proves this, we could conduct this experiment again with more trials per subject to create an even more reliable and accurate conclusion that can also tell us the numerical difference between the reaction times between both groups.

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The Effects Of Eating Ice on Heart Rate

Lawrence Castro and Melanie Cazares Ortiz

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Introduction To Purpose

The human body is sensitive to external stimuli, especially changes in temperature. Cold weather causes blood vessels to constrict, which restricts the circulatory system (Kliner, 2014). This leads to the heart having to work harder to pump blood, causing an increase in heart rate (Baillie, 2019). Because changes in external temperature affects a person's heart rate, the purpose of this study is to determine if changes in internal temperature affect heart rate.

Background

In general, change in temperature leads to a change in heart rate. Because of this, it is expected for the heart rate of individuals to change after consuming something cold, such as ice.

Experimental Question

How does eating ice affect heart rate?

Hypothesis

Non-Directional Alternative Hypothesis (H_a)

After consuming ice, a patient's heart rate will be significantly different than before.

Null Hypothesis (H_o)

After consuming ice, a patient's heart rate will be the same as before.

Variables

Controlled Variable - Temperature & Quantity of Ice

Dependent Variable - Participants' Heart Rate

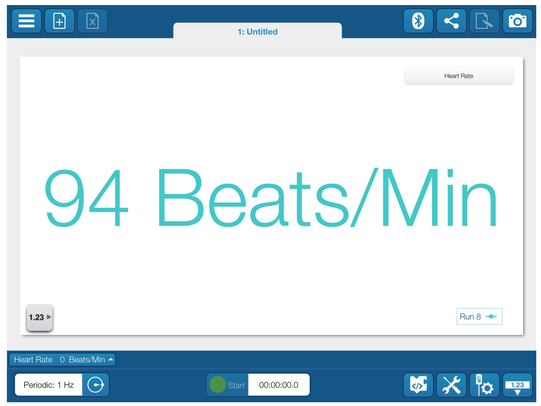
Methodology

Materials

- Heart Rate Monitor Device
- Device with Sparkvue Software
- Cup for Ice Storage
- Ice Cubes (4 per participant)

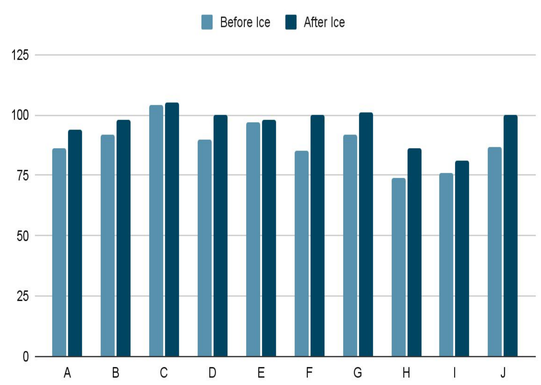
Procedure

1. Activate heart rate monitors
2. Open up Sparkvue software
3. Connect heart rate monitor to Sparkvue software
4. Take resting heart rate of participants
5. Give participant 4 ice cubes
6. Allow patient to fully consume ice
7. Take participants heart rate immediately after chewing ice
8. Repeat steps 5-7 with rest of participants



Data

Participant	Heart Rate Before Consuming Ice	Heart Rate After Consuming Ice
A	86	94
B	92	98
C	104	105
D	90	100
E	97	98
F	85	100
G	92	101
H	74	86
I	76	81
J	87	100



	Range 1 (Before)	Range 2 (After)
Mean	883 / 10 = 88.3 bpm	963 / 10 = 96.3 bpm
Variance	80.68	54.46
Standard Deviation	8.98	7.38

Statistical Analysis

After running a Dependent T-Test, we found that the T-Statistic is 5.289. There are 10 participants in this experiment, so there are 9 degrees of freedom. Since there are 9 degrees of freedom and the alpha value is 0.025 (originally 0.05, but the alternative hypothesis is non-directional), the critical value is 2.262.

The critical value is lesser than the T-Statistic, which means the results are statistically significant. The null hypothesis is rejected; consuming ice has a significant effect on a person's heart rate.

Conclusion, Summary, and Discussion

In this study, we collected the heart rates of 10 individuals before and after they consumed ice. Our initial hypothesis was supported by the data collected in our study. Our data showed a significant difference between the initial heart rate of participants and their heart rates after having consumed the ice. While we believe our data to be accurate, there were a couple sources of error in our study which could have caused disparities. A possible source of error involves the Sparkvue Software. There may be some discrepancies between the recorded data and the participants' actual heart rate. Additionally, the participants all consumed the ice at different rates. This could potentially skew the results.

Citations

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The Effects of Exercise on Blood Pressure

Ashley Boscco and Briana Herrera

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Introduction to Purpose

In an purely biological sense, blood pressure is the force of the blood on the artery walls when blood goes to the other parts of the body. The measurement of blood pressure is a crucial indication of health since it can indicate proper circulation and flow of oxygen to both the heart and the other organs. Blood pressure is measured in two ways: systolic blood pressure and diastolic blood pressure. While systolic blood pressure measures the pressure on the arteries when the heart beats, the diastolic blood pressure measures the pressure on the arteries between these beats. In terms of health, these are two important values since they can predict health problems that range from cardiovascular disease, a heightened risk of stroke, etc (CDC, 2021). For example, a high systolic blood pressure but normal diastolic blood pressure could indicate to health professionals that the person has isolated systolic hypertension, a serious condition that can result in increased risk for strokes, heart disease and kidney disease (Mayo Clinic, 2021). Therefore, our purpose is to determine what effects exercise has on blood pressure on the short term.

Background Information

Exercise has been scientifically proven to help the heart pump blood into circulation more effectively and efficiently due to increased oxygen delivery and an increased perfusion of bodily tissues and organs. Specifically aerobic exercise such as jogging, is especially beneficial to the heart and lungs as overtime they pump blood more efficiently which allows for more oxygen flow to muscles and organs. (LumenLearning, n.d.) Regular exercise has also proven to lower blood pressure as a strong heart will decrease the force on your arteries. (Mayo Clinic, 2021)

Experimental Question

How does physical activity or exercise affect blood pressure?

Hypotheses

Alternative Hypothesis (H_a):
After a one-minute jog, the participant's blood pressure will be higher than the resting blood pressure.
(H_a: $\mu_1 < \mu_2$)

Null Hypothesis (H_0):
After a one-minute jog, the participant's blood pressure will be the same as the resting blood pressure.
(H_0: $\mu_1 = \mu_2$)

μ_1 = Resting Blood Pressure μ_2= Blood Pressure after exercise

Variables:
Independent Variable: Exercise/Physical Activity
Dependent Variable: Blood Pressure (mm/Hg)

Methodology

Materials:

a. Automatic Medline Blood Pressure Monitor
b. A Complementary Cuff with tubing to connect to Monitor
c. A sample population of 10 people

Procedure:

1. Connect the cuff to the blood pressure sensor through the tubing in the side
2. Bring the participant to the designated testing area
3. The participant will sit and have the BP cuff adjusted snuggly to their arm with the tubing in line with their middle finger.
4. Press the start button and wait until it rings an alarm and the data shows up on the screen.
5. Record this as the resting blood pressure. The systolic BP is at the very top and the diastolic BP is below it
6. The participant will then jog for 1 minute.
7. Measure the participant's blood pressure again (with the same procedure as the resting BP). Make sure that the participants are resting their arms, are not moving, and are not talking.
8. Record the measurements in the trial 1 category.
9. Let the participant rest for 3 minutes in the same position and not moving much.
10. The participant will then jog for another minute.
11. Measure the participant's blood pressure again (with the same procedure as before)
12. Record this result in the trial 2 category.
13. Let the participant rest for another 3 minutes (with the same procedure as before).
14. The participant will then jog for the final minute.
15. Measure the participant's blood pressure for a final time (with the same procedure as before).
16. Record this result in the trial 3 category.
17. Repeat steps 2-16 for every participant.
18. Ask some questions to the participants:
    a. What is their age?
    b. What is their biological sex?
    c. Are there any prior health conditions of note?

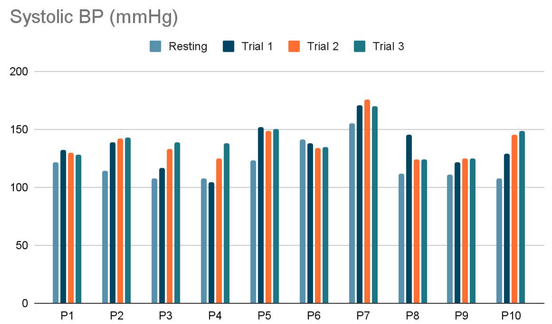
Data

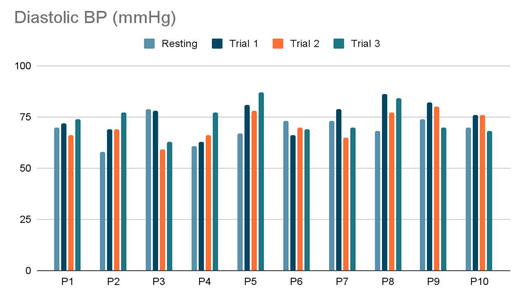
Systolic Blood Pressure Data

Participant (Sex and Age)	Resting Systolic BP (mm/Hg)	Systolic BP after Trial 1 (mm/Hg)	Systolic BP after Trial 2 (mm/Hg)	Systolic BP after Trial 3 (mm/Hg)
1: 1F (17)	122	132	130	128
2: 2F (16)	114	139	142	143
3: 1M (16)	108	117	133	139
4: 3F (16)	108	104	125	138
5: 4F (16)	123	152	149	150
6: 2M (16)	141	138	134	135
7: 3M (16)	155	171	176	170
8: 4M (17)	112	145	124	124
9: 5F (16)	111	122	125	125
10: 6F (16)	108	129	145	149

Diastolic Blood Pressure Data

Participant (Gender and Age)	Resting Diastolic BP (mm/Hg)	Diastolic BP after Trial 1 (mm/Hg)	Diastolic BP after Trial 2 (mm/Hg)	Diastolic BP after Trial 3 (mm/Hg)
1: 1F (17)	70	72	66	74
2: 2F (16)	58	69	69	77
3: 1M (16)	79	78	59	63
4: 3F (16)	61	63	66	77
5: 4F (16)	67	81	78	87
6: 2M (16)	73	66	70	69
7: 3M (16)	62	80	65	70
8: 4M (17)	68	86	77	84
9: 5F (16)	74	82	80	70
10: 6F (16)	70	76	76	68





Data Analysis

In order to compare the resting blood pressure of the two categories (systolic and diastolic) with the results after each trial, we calculated the mean, variance (S^2), and standard deviation (S). Since we have three trials, we decided to find the t-statistic of the resting BP and all three trials each. Because our samples are the same size and we used paired samples, we decided to use the dependent test number 1 formula depicted below:

$$t = \frac{|\sum D|}{\sqrt{\left[\frac{n(\sum D^2) - (\sum D)^2}{(n-1)}\right]}}$$

In the systolic category, the t-statistic for resting BP and trial one is 3.7033, the t-statistic for resting BP and trial two is 4.6546, and the t-statistic for resting BP and trial three is 4.4636.
Between the three systolic trials, the average t-statistic, t = 4.2738.

In the diastolic category, the t-statistic for resting BP and trial one is 2.7075, the t-statistic for resting BP and trial two is 0.8068, and the t-statistic for resting BP and trial three is 1.4883.
Between the three diastolic trials, the average t-statistic, t = 1.6675.

In our calculations, our t-value was more than our critical value (1.833) for the systolic category while our t-value was less than our critical value (1.833) in the diastolic category. Therefore, we fail to reject our null hypothesis for the diastolic category while we reject our null hypothesis in the systolic category. Hence, our data shows that there is a significant difference between the resting systolic blood pressure and the systolic blood pressure after exercise while there is no significant difference in the resting diastolic blood pressure and the diastolic blood pressure after exercise.

Conclusion and Summary Paragraph

In this study, the resting systolic and diastolic blood pressure were collected from a sample size of 10 people. In this group, most were sixteen to seventeen years old, and there were 6 females and 4 males due to availability. Our initial hypothesis was that participants will experience a difference in their blood pressure after a minute of exercise. However, our collected data does not supports this because, while the systolic blood pressure did show a significant increase, the diastolic blood pressure did not. Nevertheless, we have found that there could possibly be errors in the system and execution of our experiment since, through peer-reviewed research, many other experts have found that both systolic and diastolic blood pressure increase immediately after exercise. One such error could be how, since we did not have access to a treadmill, the speeds at which the participants jog at are different, which could lead to different blood pressure results. Furthermore, there could potentially be malfunctions with the monitor we used or some participants may not have followed the protocols.

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The Effects of Burning Questions Asked on Blood Pressure

Jacquelyn Ha, Caroleena Danab, and Olivia Gilbert

PLTW - Biomedical Innovations - Grand Prairie Collegiate Institute - January 2022

Introduction to Purpose

Blood pressure vitals are commonly used as a measure of a person's overall health. Systolic blood pressure measures the pressure in the blood vessels when the ventricles are contracting. High systolic blood pressure can be a major risk factor for cardiovascular disease (NHLBI 2004). Having control of one's systolic hypertension can decrease the risk of death, stroke, and heart failure events (NHLBI 2004). The purpose of this experiment is to determine whether or not there is a correlation in systolic blood pressure and resting blood pressure among individuals who were asked burning, embarrassing questions.

Background

In general, individuals who does not engage in participation of being asked embarrassing questions would not have an elevation in blood pressure. Instead, they would have a regular, resting blood pressure. However, when being asked embarrassing questions, it will elevate one's systolic and diastolic blood pressure due to one's attempt of suppressing their embarrassment. Embarrassment was associated with substantial increases in systolic and diastolic blood pressure (National Library of Medicine 2001)

Experimental Question

Does being under pressure from being asked a certain burning/embarrassing question raise or lower blood pressure?

Hypothesis

Alternative Hypothesis (H_a):

Burning questions will increase/decrease blood pressure.

Null Hypothesis (H_o):

Burning questions will have no effect on blood pressure.

Variables:

Independent variable: Burning question(s)

Dependent variable: Blood pressure (mmHg)

Methodology

Materials:

a. Medline Blood Pressure Monitor
b. Medline's complimentary tubing and cuff
c. Sample population of at least 10 people

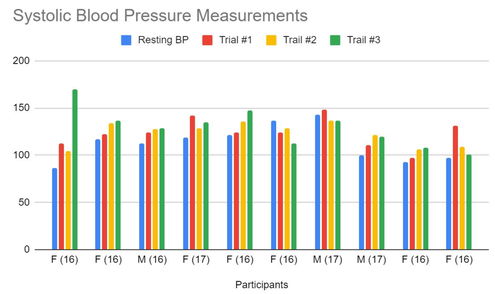
Procedure:

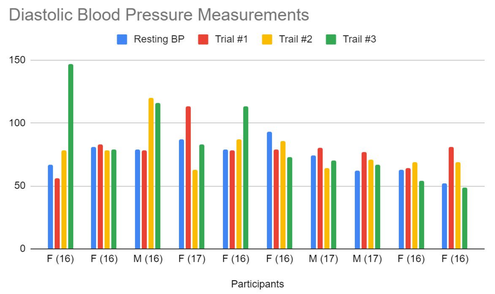
1. Collect resting heart rates and systolic blood pressure from each member in our group population.
2. Wrap the blood pressure cuff around your subjects arm. Be sure to secure the cuff around the arm very snugly. Also make sure that the arrow on the cuff is pointing toward the index finger and that the tubes run down the inside of the elbow. Do not inflate the cuff yet.
3. Position the person whose blood pressure is being taken so that they are seated with an arm resting on the table. It is important for the person to be quietly resting for a few minutes before the measurement is taken. Another important thing to take into consideration is making sure the individual is not crossing their legs. While the blood pressure measurement is being taken, this person should remain seated and not move.
4. Note that during this time, systolic, diastolic, and pulse will be calculated by the Medline Blood Pressure monitor.
5. Record the systolic pressure in your data table.
6. Repeat steps for each person in your study population. Do at least 10 people.

Data

Participants	Resting BP (sys)	Trial #1	Trail #2	Trail #3
F (16)	86	112	104	170
F (16)	117	122	134	137
M (16)	112	124	128	129
F (17)	119	142	129	135
F (16)	121	124	136	147
F (16)	137	124	129	112
M (17)	143	148	137	137
M (17)	100	111	121	120
F (16)	93	97	106	108
F (16)	97	131	109	101

Participants	Resting BP (dia)	Trial #1	Trail #2	Trail #3
F (16)	67	56	78	147
F (16)	81	83	78	79
M (16)	79	78	120	116
F (17)	87	113	63	83
F (16)	79	78	87	113
F (16)	93	79	86	73
M (17)	74	80	64	70
M (17)	62	77	71	67
F (16)	63	64	69	54
F (16)	52	81	69	49





Statistical Analysis

For comparison of resting blood pressure and systolic blood pressure after being asked burning questions, we calculated the mean, variance (S^2), and standard deviation (S) in the group of people of the population 3 times for three trials. Because our sample sizes were of the same quantity, we used the following equation for our dependent t-test:

$$t = \frac{(x_1 - x_2)}{\sqrt{\frac{(s_1)^2}{n_1} + \frac{(s_2)^2}{n_2}}}$$

In TRIAL 1, the t-statistic is 2.5613
In TRIAL 2, the t-statistic is 2.6941
In TRIAL 3, the t-statistic is 1.8838

After adding ALL three of the t-statistics and dividing them, we get 2.3797

In our calculations, our t- value was more than our critical value (2.262); therefore, we reject our null hypothesis. Our data show that there is a significant difference in the resting systolic blood pressure after one gets asked certain burning, embarrassing question.

Conclusion, Summary and Discussion

In this study, the resting blood pressure and systolic blood pressure were collected from a group of 10 individuals. Our initial hypothesis, which was individuals who are asked embarrassing and heart racing questions will either elevate or decline one's blood pressure. Our data showed that there was a significant difference between the resting blood pressure and systolic blood pressure of either group of individuals. Considering that blood pressure is a classic measure of health as supported by our research and medical literature, there are several possible sources of error in the design of our experiment. For instance, having more than just 10 individuals in the group and not asking the right questions. It would be more accurate if we chose the appropriate questions that resonate with our participants. That way we can truly see whether certain questions does elevate or decline one's blood pressure.

Citations

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The Effects of Lying on Heart Rate

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Purpose

Heart rate is a commonly used vital measurement that can be used to measure a person's overall health. The heart rate is very important to the human body, the heart circulates the oxygen and the blood throughout the body. When the heart is not working correctly it affects almost everything. The overall purpose of this experiment was to determine if a person's heart rate significantly increased or decreased when asked a series of questions and told to lie on some of them.

Background

Lying is thought to release stress hormones that can increase blood pressure, heart rate and respiration (Botti 2013). Heart rate is measured during polygraph tests in criminal incident investigations. This is because a person's heart rate increases when they are experiencing stress or anxiety, which is common when someone is lying (APA 2004).

Experimental Question

How does lying affect heart rate?

Hypothesis

Alternative Hypothesis
A person's heart rate after lying will be higher than their heart rate at rest.

Null Hypothesis
The heart rate of a person before and after lying are the same.

Variables
Independent variables: Lying or not
Dependent variables: Heart rate

Methodology

Materials

a. iPad with SPARKvue application
b. Wireless Hand-Grip Heart Rate Sensor
c. Sample population of 9 people

Procedure

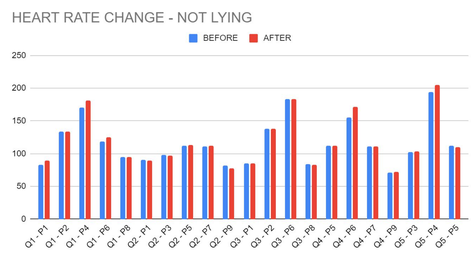
1. Open the SPARKvue app on your iPad
2. Click on *Sensor Data* to begin tracking data for the experiment
3. Connect the Wireless Hand-Grip Heart Rate Sensor to the iPad through Bluetooth
4. Select the *Table and Graph* template
5. Request that the participant lie on some of the questions that will later be asked
6. Ensure that the participant is holding the heart rate sensor
7. Click on the green *Start* button in the bottom toolbar
8. Track heart rate for 2 seconds to record resting heart rate
9. Ask the participant one of the survey questions
   i. Survey questions are:
      1. Do you have a crush on someone?
      2. Have you had any pets?
      3. Do you want kids in the future?
      4. Do you have any siblings?
      5. Do you smoke?
10. Record data for 2 seconds after the participant answers, noting the time when they answer the question
11. Repeat steps 6-10 for each question
12. Note the questions that the participant lied on
13. Repeat steps 2-12 for each person in the study population
14. Data is divided into 2 groups based on whether or not the participant has lied or not

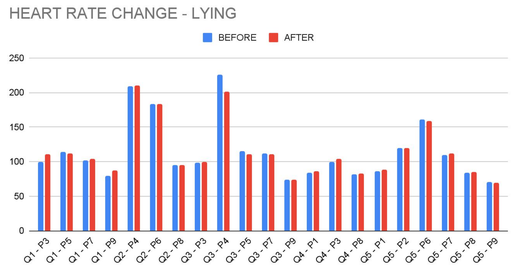
Data

Q before a number refers to the question that was being asked. P before a number refers to the participant number.

	BEFORE	AFTER
Q1 - P1	83	90
Q1 - P2	134	134
Q1 - P4	170	181
Q1 - P6	119	125
Q1 - P8	95	95
Q2 - P1	91	89
Q2 - P3	98	97
Q2 - P5	112	113
Q2 - P7	111	112
Q2 - P9	82	78
Q3 - P1	85	85
Q3 - P2	138	138
Q3 - P6	183	183
Q3 - P8	84	83
Q4 - P5	112	112
Q4 - P6	155	171
Q4 - P7	111	111
Q4 - P9	71	72
Q5 - P3	103	104
Q5 - P4	194	205
Q5 - P5	112	110

	BEFORE	AFTER
Q1 - P3	100	111
Q1 - P5	114	112
Q1 - P7	102	104
Q1 - P9	80	87
Q2 - P4	209	120
Q2 - P6	183	183
Q2 - P8	95	95
Q3 - P3	98	100
Q3 - P4	226	201
Q3 - P5	115	111
Q3 - P7	112	111
Q3 - P9	74	74
Q4 - P1	84	86
Q4 - P3	100	104
Q4 - P8	82	83
Q5 - P1	86	88
Q5 - P2	120	120
Q5 - P6	161	159
Q5 - P7	110	112
Q5 - P8	84	85
Q5 - P9	70	69





Statistical Analysis

To compare the heart rate of participants before and after lying, we calculated the mean, variance, and standard deviation in both groups.
Although our sample sizes were of the same quantity, we used the following equation for our dependent t-test since we had a paired sample.

$$t = \frac{|\Sigma D|}{\sqrt{\left[\frac{n(\Sigma D^2)-(\Sigma D)^2}{(n-1)}\right]}}$$

In comparing heart rates for lying, t = 0

For lying, our t value was less than the critical value (0.5), so we fail to reject the null hypothesis. Our data shows that there is no significant difference between the heart rate of someone who is not lying and someone who is.

Conclusion, Summary and Discussion

In this study the resting heart rates and the heart rates throughout the experiment was collected from 9 individuals. The participants were sitting down for the experiment and were asked a series of questions where they were asked to lie on some of the responses. Our hypothesis was that when a person is lying their heart rate will be higher than what their initial resting heart rate was. The data that was collected showed a slight difference in heart rate when a person was lying. While it may have been possible to determine whether a person was lying based on heart rate, our data showed no statistical significance between the heart rate of a person before and after lying. There was no significant difference in the data values, and we fail to reject the null hypothesis. Since the heart rate monitor was pretty unreliable in measuring heart rate, it would have been a bit easier to use a different device to more accurately collect data.

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