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Using induction heating to save wasted cold water from home faucets

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Abstract

What could efficiently heat up faucet water stored in the pipes that would otherwise be wasted while the user is waiting for the hot water from the boiler to arrive. My idea was to use an induction unit connected to temperature control unit and coil to accurately heat up the present cold water in the hot faucet pipe. The wire would be wrapped around the pipe and would internally heat a metal pipe inside touching the water. The unit would be plugged into the outlet inside the cabinet and the unit itself would be fixed to the wall. The hot water pipe would have a magnet sensor at the bottom that senses when the hot water is turned on to activate the heater. Since the test didn't use an effective heating coil, the water almost stayed the same temperature. But with a new test with a thicker and longer coil, the unit was able to effectively heat a small piece of metal to become incandescent in a matter of seconds. From looking at the conclusion, a better version of this heater could be built.

Introduction

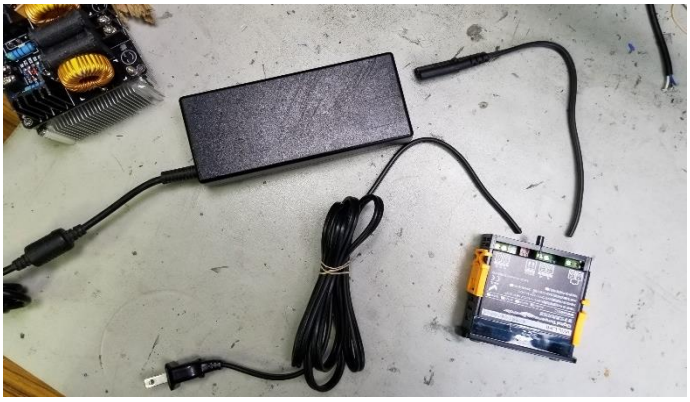
The purpose of this project is to use an efficient heating method to heat already-cold water stored in hot water Faucet pipes to allow less water to be wasted from waiting for the hot water from the boiler to reach the sink. This project is very important as it is another affective way to help save the environment, by saving water. The reason for induction heating is because it is very efficient, safe, consumes less electricity, precise, and in-expensive – Guest author. (2014 July 25). How efficient is induction cooking?

How can cold water already present in hot water pipes be heated in a safe, environmentally safe, and efficient way, to reduce as much wasted cold-water as possible? If induction was to be used as the heating method in this experiment, then it would be almost two times better than an electric-coil water heater, because induction is around 95% efficient, while gas and stove (electric wire) heating are only around 50% efficient.

Methods

Thermally connect a heatsink to an induction circuit to allow cooling. Wrap a thick copper wire in a spiral slightly thicker than diameter of faucet pipe. Attach wire to heating circuit output. Solder a switch between a 19-volt adapter and the induction unit input. Program a temperature control unit for hot water

temperature allowance of around 45 degrees Celsius. Attach temperature control circuit between electric input from wall outlet and the 19-volt adapter. Connect a magnet switch to the unit to use as a water flow sensor. Attach a pipe extension that has a small metal support for a 2-3-inch metal rod for heating the water. Underneath that, attach a piece of metal held in a space of a couple cm to allow sensing of water flow. Glue sensor to pipe and make sure it can detect water flow. Attach a water temperature sensor to the unit and the pipe. Mount a wooden board on wall behind faucet pipes to also mount induction and temperature unit, depending on the design of the cabinet. Plug wire into outlet and turn on, making sure that the water does not get too hot and that the sensor always works.



The independent variables are the methods for heating water, comparing normal faucet heat time to induction heat time, since I need to know how well it works. The dependent variable was how long the water took to reach 45 degrees celcius. The control variables are the speed of the water flow, since the faster the flow is the longer t will take to heat up, and vice versa; water consumption of other faucets, since they consume hot water, not a lot will go towards the testing faucet; and the time the water has been unused, since the water cools over time inside the pipe and would affect the outcome.

Results

Length of coil used	Time to heat up metal	Time to heat up water
Around 3 meters	30 seconds	20 seconds
Around 5 meters	20 seconds	Not tested

Heating up water inside a pipe and a small thin piece of metal

Time in minutes	Normal water heating time (seconds)
30	6
45	22
60	33

Water dropping temperature over time inside pipes

Conclusion

The hypothesis was partially correct. The only problem there was with testing was the coil. It heated up because it wasn't the right thickness. A different coil was used and was way more effective as it was able to heat a piece of saw blade to red-hot in a matter of seconds. Induction still is better than any other technique for heating water in this application. In the tests, different lengths of wire were used, although not gauge, and using the 5-meter coil to heat water was not tested.

After testing the thicker coil, the time taken for heating water inside a pipe would be dramatically reduced. The reason for the ineffective heating was because the wire itself heated up itself, enough to burn, which was the exact opposite of the reason to use a copper wire. The frequency of the AC current going to the wire could have been adjusted to work with either thin or thick copper wire.

Application

This information could be used to help save the environment by reducing wasted water. If this innovation was able to be installed in home, there would be a big amount of saved fresh water, plus less water bills. In general, heating metal is always easy with induction, so accurate heating would require a control circuit

like this one. They could improve on my errors and use their better understanding of induction to improve this project. The big picture requires an inexpensive, safe, and practical improvement of this idea, which is very possible if one were to fix the errors.

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The Effect(s) of Pets and Animals on a Human's Mental Health

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Abstract

The question investigated was how pets could affect mental health. Finding the answer to this question is important because if the results are positive, it can be an easy solution or alternative for people who have elevated levels of stress or who suffer from mental health problems such as depression and anxiety. During the process of experimenting, subjects were gathered into a room where they were told to interact with different animals such as rabbits and dogs. Questions were asked throughout the experiment to monitor the participants stress and to see any changes in emotions. The results were all participants had a decrease in stress levels and felt happier and more relaxed. All participants also felt that the pet was a good distraction and took any stress off their mind even if it was for a brief period of time. In conclusion, the results imply that animals can affect mental health in a positive way by causing the person to become happier, less stressed, more relaxed, and calmer which can help with mental health disorders such as depression and anxiety.

Introduction

The purpose of this experiment was to find out if there were other ways to deal with stress and to find out if there were any positive effects on humans when interacting with animals and pets that are seen in everyday life.

This is significant because it could be an alternate and inexpensive solution for people who suffer from various kinds of mental illnesses. Studies even suggest that playing, stroking, or simply watching and taking care of animals even as simple as a cricket, can have positive effects on the human brain. (NCBI) If the studies conducted are proved to be true, this could be an alternative to drugs, which are currently used to treat patients, as it is much less costly and could give patients an overall better treatment experience. Thus, the question created is how pets can affect mental health.

The hypothesis is that if the time a person spends and interacts with various pets is longer, then it will decrease the stress levels, help mental disorders and

improve the overall mental health of the person. This is because the connection between the person and animal could be strong enough to release hormones such as oxytocin. (NBC news) The oxytocin would then calm the person down which can help decrease stress. Also, if the person spends more time with the pet, the pet will distract the person making him/her think positive thoughts rather than negative thoughts.

Methods

Materials used in this experiment were cats, dogs, rabbits, and the Stress Survey, (Figure 1) but the pets/animals used in this experiment can be interchangeable. Although, it is recommended that common household pets and animals are used to promote the best possible results, but others can be used.

STRESS SURVEY

Section 1

1. Do you have a pet of your own?
2. How much do you like pets?
3. On a scale of 1-10, how stressed are you currently?
4. For what reasons are you stressed?

Section 2

5. After 5 minutes, what is your stress level?

Section 3

6. After 10 minutes, rate your stress level on a scale of 1-10
7. Do you feel more relaxed?
8. Were you able to take your mind off whatever is stressing you even if it was for a short period of time?
9. Do you feel happier?
10. What about the pet do you think made you feel better?
11. Do you think that this would be a good distraction from a hard or stressful day?
12. Would you think that this is a good way to relieve stress?
13. If you did this for a long period of time (ie weeks, months, years) would you think that you would see positive results?

(Figure 1) shows the Stress Survey before being filled out.

Prior to having the participants interact with the animals, the animals must be already gathered in an empty room and participants must have already answered the questions from Section 1 of the Stress Survey. One by one, participants were guided to the empty room where the animals were being held and were introduced to the pets. They were instructed to interact with them together for ten minutes. Five minutes into the experiment, the subject was asked questions from Section 2 of the Stress Survey and their responses were recorded. At the end of the experiment, subjects were asked questions from Section 3 of the Stress Survey. When the experiment ended, questions from Section 3 of the Stress Survey was then repeated to the participants who owned pets of their own. Observations, such as the way the participants looked when interacting with the animal, their responses and the results were recorded to be analyzed later. Steps were repeated with each participant as only one participant is allowed into the room at once. This experiment only included 10 participants due to the availability of participants, but more can be used to get the most accurate results. A minimum of 10 subjects should be used.

The independent variable is the people as the person tested always changes when conducting a new round of the experiment. Changing the person would ensure that the results would be more

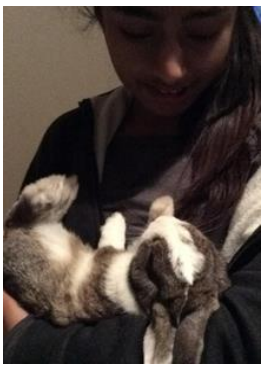
accurate and would apply to a wide range of people rather than one group of people.

Dependant variables include the difference of stress levels the person experiences and their emotions as these variables can be observed. Each participant will have different differences in stress levels and different experiences during the experiment. These variables can be used as the results at the end of the testing's.

The controlled variables include the time spent with the pet, type of pet, the pet used, and the location in which the subjects were introduced to the pets. The time the subject spent with the animals is controlled since results may differ if one person spends more time the animal. For example, the subject may feel happier or less stressed in 15 minutes than in 10 minutes. The pet(s) used are controlled since each pet may have a different personality. Location is controlled so that all participants are exposed to the same surrounding area so that nothing, but the pet can contribute to the subjects' emotions. Controlled variables are set to create consistency and the most accurate experiment as possible.

Results

After conducting the experiment, the data collected showed many things. For one, the data showed that 100% of the subjects stated that they felt happier (Figure 2), more relaxed, (Figure 3) and less stressed after playing with the animals for ten minutes.



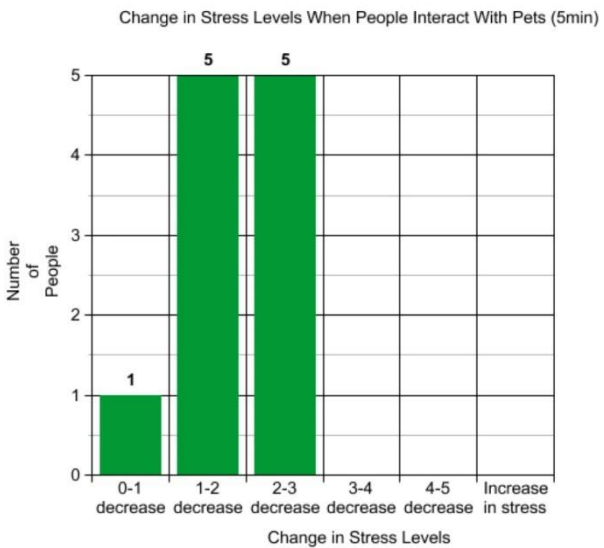
(Figure 2) and (Figure 3) shows the participants looking happier and more relaxed while interacting with the rabbit

All participants also stated that they felt that the pet acted as a good distraction even if it was for a short period of time. This allowed them to relax and feel less stressed.

40% of the participants said they felt less tired and more energetic after interacting with the pets.

30% of the participants said that interacting with the pet had helped to make them think more clearly and calmly about their problems.

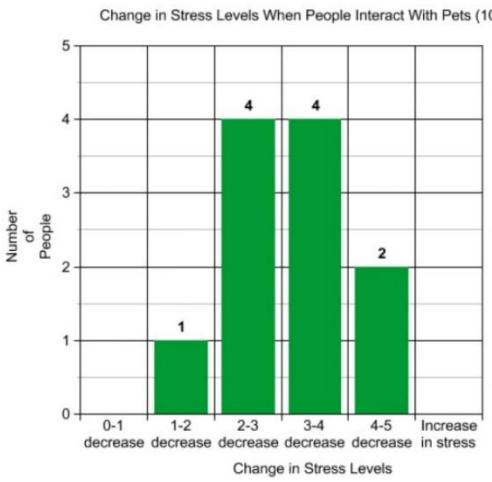
(Figure 4) shows the change in stress levels of the participants after 5 minutes of interacting with the animals. Most participants had a 1-3 decrease.



When questions from Section 3 of the Stress Survey was asked to the participant with pets of their own, most results were the same. For example, they all felt happier and more relaxed. When they were asked to interact with their own pets for 10 minutes, their stress level decreased even more than when they interacted with a pet that wasn't theirs.

It was also evident within the participants that the longer that the participant interacted with the pet, the larger the decrease in stress levels. When looking at the data, most participants only had a decrease of 1-3 stress levels in five minutes (Figure 4) but when participants were asked to rate their stress again at the ten-minute mark, most subjects had a decrease of 2-4 stress levels. (Figure 5)

(Figure 5) shows the change in stress levels of the participants after 10 minutes of interacting with the animals. Most participants had a 2-4 decrease in stress.



Yes, the hypothesis was correct and yes, the data supports my hypothesis. The hypothesis stated that if the time a person spends with a pet is longer, than the person will feel less stressed and it will distract the person and make him or her feel better. This was proved when the subjects were asked at intervals of five minutes what their stress level was. The results in five minutes were that the subjects stress either decreased by a little or had no change. By the time it was 10 minutes, all the subjects stress levels decreased from their initial stress level and their five-minute stress level, and claimed that they felt happier and better. The purpose was to see how interacting with pets could affect an individual's mental health. After conducting the experiment, it was concluded that interacting with a pet can affect a person's stress and emotions. It was found that

Participants said that petting the animals made them feel the most happy and calm, but they also stated that just watching the pets made them feel better.

Subjects who had rated how much they liked pets and animals lower still stated that their stress had gone down by the end of the experiment. Although it was shown that the participants who rated their liking of pets higher had a larger decrease in stress levels than those who did not like them as much.

Discussion/Conclusion

100% of the subjects felt less stressed and more happy. It was also found that pets also helped some individuals feel calmer and think more clearly. In conclusion, this experiment suggests that interacting with pets is a great way to decrease stress, acts as a good break from all stresses and worries, as subjects also said that they felt more energized after the experiment. It can also be concluded that the longer the time spent with the pet, the greater the decrease in stress.

In the data collected, it was shown that in general, the participants were much calmer, less stressed, and happier when they interacted with a pet. It was shown that even if the individual did not like pets a lot, their stress level still decreased, and they stated they still felt happier. The people who rated their liking of pets an 8 or over, or already have pets, had the greatest decrease in stress levels. They also looked the happiest and most relaxed out of all the participants. The participants said they were able to think clearer about their problems after the experiment. It was also found that no matter how much the subject liked pets, the longer the time spent interacting with the pet, the greater the decrease in stress levels and the happier and calmer they were.

The results found are consistent with what other investigators have reported because when researching for background information on the topic, other scientists had stated that pets can have many mental health benefits on humans because of the release of the hormone oxytocin in the brain. The data collected in this experiment said that the participants felt happier, less stressed, and calmer which can be the effects of oxytocin being released.

The results relate to the original question because the question was to see if pets could affect mental health. The data suggested that yes, pets can affect mental health and it leaves a positive impact on the person.

No problems arose but one thing that could have been improved was the number of people that participated in this study. Only 10 people participated but if there were more people, the more accurate the data would've been. Another way to improve this experiment would've been to have the subjects participate in the experiment more than once and over a longer period of time. This would prove if pets can improve mental health for not just a short period of time but also in a longer timeframe. Also, not all mental illnesses were addressed in this experiment as depression and anxiety were the main illnesses focused on, but further testing's would find out if pets could also help other mental illnesses such as schizophrenia.

Application

After answering the scientific question, the information found can be useful in many ways. For example, because animals can make an individual happier, less stressed, and calmer, pets and animals

can be used in places such as therapy offices and hospitals to cheer patients up. Furthermore, they can also be used to help people who suffer from anxiety and depression which is a huge problem within young people today. The use of using animals as therapy animals are gaining more and more popularity and this will probably continue to gain popularity in the future.

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MYPI: Communicating to the Future

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Abstract:

In third-world countries around the world, the settlements are small and close together. They have a sense of community that is often stronger than developed countries. These countries lack in many aspects that developed countries have and these aspects include: Communication and Education. Yet, there is still hope in the MYPI. The MYPI is a communication server system that hosts a wireless network. This network is secured with a password and virtual host. In this innovation, a raspberry pi is utilized as a IP sever and by using the raspberry pi microprocessor, more software can be downloaded and shared among the users; thus, allowing for an education system to be built on the raspberry pi. By configuring the */etc/prosody/prosody.cfg.lua* file, changes can be made by the user to satisfy their preferences. With prosody and the built up wireless adaptor on the pi, a communication system was made. The results supported the purpose in creating an affordable and portable communication system that will help people in third countries and give them a chance to become more developed. In the future, the product could become more advanced by adding education and AI interactive software to educate those in third-world countries. MYPI is the dawn of a new light in undeveloped countries.

Introduction:

In third-world countries around the world people are living in very small settlements that are very close together. MYPI aims to help people in third countries by making a localized server with downloadable and sharable information. By helping third world countries develop a means for communication and education, they will be able to become more developed and educated (Okigbo & Okigbo). As third world countries become developed, trade can occur allowing for the unification of the world. As technology is the ever-growing field of study in the modern era, microprocessors are being developed and these microprocessors will be able to help build a reliable infrastructure for data movement (Borkar & Andrew, 2011).

Through the use of meshing microprocessors, a new, affordable system for the communication of ideas can be made throughout a large area; thus, the purpose of MYPI is to utilize microprocessors to make a new system of communication. If the raspberry pi microprocessor is configured with its wireless adapter chip, then a wireless network can be programmed that would allow users to connect their devices and interact with each other because MYPI would act as server between all users.

Methods:

An operating system must be installed on the raspberry pi so that the proper software and

configuration files can be programmed. The SD card should be flashed with the image of Ubuntu Mate so that prosody can be properly configured. On raspberrypi.org, under Third Party Operating System Images, Ubuntu Mate can be installed and then flashed onto the SD card. Then, the raspberry pi should be connected to a monitor for bootup (see Figure 1).

After the raspberry pi is set up with an operating system, it needs to be set up with a wireless access point. This can be done with the code in Figure 2. The first line gets a short cut for all modules needed to activate the network card on the raspberry pi. Then, it is necessary give permission to the ap and install files so they start the connection on boot. The fourth line starts installing all the specific configurations and finally the last line includes the ssid (RPi3_HOTSPOT) and password (vmssmassey) for the network.

After the network is set up, the prosody XMPP chat system is installed to allow for users to chat and interact across the platform. Using the code in Figure 3, install prosody. Go to the configuration file through the code: sudo nano /etc/prosody/prosody.cfg.lua. This file contains all the data that users can change and personalize to suit their preferences. The standard or default configuration for MYPI is contained in Figure 4. To add users, use the command: sudo prosodyctl adduser user@localhost and then a password that the user chooses. This will add users to the system. Finally, use an XMPP IP address app and connect to the IP 192.168.42.1 and login based on the usernames, you added to the system. Then, you can add friends and chat in the raspberry pi server.

The independent variable in this project was the prosody configuration file. The dependent variable was the ability of chatting through the XMPP chat server set up by the raspberry pi. The control variables were the raspberry pi, the operating system Ubuntu, and the prosody version 10.0.1 that was downloaded.

Results:

At the end, the raspberry pi is able to create a wireless network as shown in Figure 5. By using the IP address of this network shown in Figure 6 and the users created. The users are able to communicate across the server as shown in Figure 7. A video of the working product has also been posted at _____. As MYPI accomplished the goal and purpose of the innovation, the results of MYPI were successful.

Conclusion:

In conclusion, MYPI is a communication system that is affordable and is able to connect users without the use of the Internet. My results supported my purpose because the purpose of MYPI was to make a communication system to be used in a localized environment. Short comings of MYPI include a small network radius; however, this issue can be easily fixed through the use of network adapters. Overall, the innovation shows that microprocessors are tools for data movement just as Andrew and Borkar reported (Andrew and Borkar, 2011). One problem that occurred during the construction of the infrastructure of MYPI was the

configuration of the prosody file. This issue caused a lot of time loss as the prosody file was huge and finding each mistake took a while. However, now there is a standard file that can be copied and pasted throughout other products as well. In the future, an education system can be added to the pi along with other software that can be shared throughout a community to help the community grow and develop. As these countries grow, the world will become more unified. As the world becomes unified, problems that may seem impossible to day may become possible through the cooperation and teamwork of others. For humans to take the next big step, team work is a necessity and MYPI is a tool that can help humanity gain the team work it needs.

Application

Imagine a world with unification between its people in all countries. This is possible with the new and improved MYPI. MYPI can help reach out to undeveloped countries and give them tools that will help them become developed so that they can join in trade and interactions with other countries. If humans can communicate with the countries using technology, then they can also spread awareness about other issues relating to other fields so that together the world can take steps to fix the issue. For example, the MYPI processor can help spread awareness to third world countries about pollution and climate change. This awareness propels individuals to recycle and reuse; thus, making the small steps turn into large steps for the world. Communicating to the world and interacting with other beliefs and religions will allow for the unification and solving of problems that one nation alone cannot solve and MYPI is the pathway to this unification.

Figures

Figure 1 shows that the raspberry pi needs be set up with:

- USB ports holding both the mouse and keyboard
- Ethernet port holding the direct connection so software can be downloaded from the internet
- HDMI cord to monitor to allow the screen to be displayed
- SD card in the SD card slot to allow the raspberry pi to run
- Power cord to start and run the raspberry pi

Figure 1: Raspberry Pi Setup

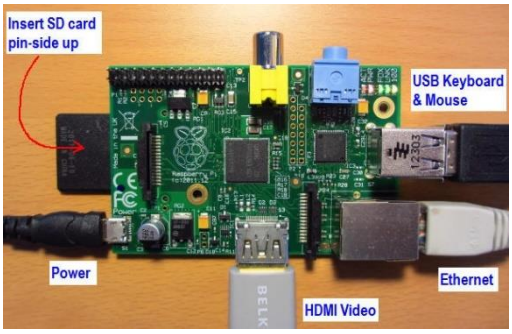

Figure 2: Wireless Access Point

```
sudo git clone http://github.com/PNPtutorials/PNP_RPi_AP.git
cd PNP_RPi3_AP
sudo chmod +x install.sh
sudo chmod +x ap.sh
sudo ./install.sh
sudo ap RPi3_HOTSPOT vmssmassey
```

Figure 3 includes the lines for downloading the raspberry pi. Line 1 includes downloads are the modules necessary by downloading them from GitHub. Line 2 – 4 allow for permission for the files to run without authorization. Line 5 downloads and compiles code needed to run the server on bootup. Line 6 makes the network with network name of RPi3_HOTSPOT and vmssmassey. These parameters can be changed to satisfy user preference.

Figure 3 shows the code to download prosody. Line 1 puts everything in the right place by making sure versions are recent and compatible. Line 2 gets the newer and more recent versions of software and Line 3 installs prosody onto the system.

Figure 3: Downloading Prosody

```
sudo apt update
sudo apt upgrade
sudo apt – get install prosody
```

Figure 4: Configuring Prosody

```
admins={}
daemonize = true;
pidfile ="var/run/prosody/prosody.pid"
c2s_require_authorization = false
c2s_require_encryption = false
c2s_secure_auth = false
authentication="internal_plane"
Include "conf.d/*cfg.lua"
```

Figure 4 shows the code to configure prosody in the /etc/prosody/prosody.cfg.lua file. This is the standard configuration, but security can easily be added by changing authorization variables to true.

Figure 5: Wireless Connection

Figure 5 shows the creation and the connecting of the raspberry pi network.

Figure 6: Account Set Up

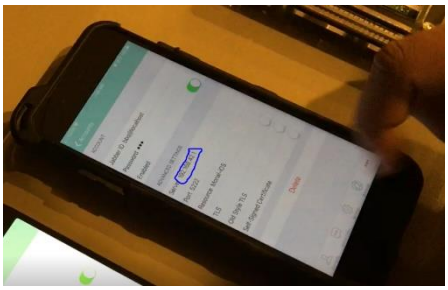

Figure 6 shows how to enter the username and password into the XMPP chat app and in the blue circle is the IP address of the raspberry pi.

Figure 7: The Result

Figure 7 shows how users can chat through the system.

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People Who Work Out Daily Are Less Stressed

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Abstract

How does fitness affect our mood? The purpose of this question is to find out what can make a person happy and too enjoy life in a better view. When the mood is not positive there whole day is affected as well in a negative response compared to when the mood is happy. So, there were test subjects that were required to jog or walk at their comfortable pace. Test their heart rates before the workout and 15 minutes after the workout for one straight week. Measuring the heart rate before and after shows the if the anxiety level has dropped or hasn't changed at all. The higher the heart rate the higher the anxiety level and the lower the heart the lower the anxiety level is. The heart rate for each test subject dropped a minimum of only 4 beats per minute compared to before the workout and after. Everyday there would be a different heart rate drop but one of the test subjects had a 7 beat per minute drop almost every time which meant this test subject was more stressed compared to the other test subjects! When the anxiety levels are less it means the stress are less which results in being happy! In conclusion when doing fitness daily the mood is affected greatly in a positive way which makes life ten times better and happiness occurs!

Introduction

How does fitness affect our mood?

Does fitness affect our mood greatly? If so this would mean that if everyone was fit they would feel ten time better. Feeling better results in being able to have an open mind and loving their lives for the way it is and being grateful for the capabilities that others don't have. Such as being able to control the mood the person has or have an of understanding other people's situations which allows them to make the others happy as well! Fitness is used to reduce depression, anxiety, and stress that people must deal with in our daily lives.

The hypothesis is that If a person exercises on a daily compared to the average person Then this will result in the person that exercises to have a better mood and an overall better life. This is because a person that does daily exercise gains an increased amount of brain cells, increasing in learning and memory abilities, Improved circulation, and finally Improved mood based on increasing the amount of serotonin in our brain. When the serotonin in our brain increases exercise

is an action the person loves to do and helps reduce stress and anxiety levels. That's why they tell people to walk for 20 minutes before doing a exam so the serotonin levels are basically increasing allowing the person to think better and apply better.

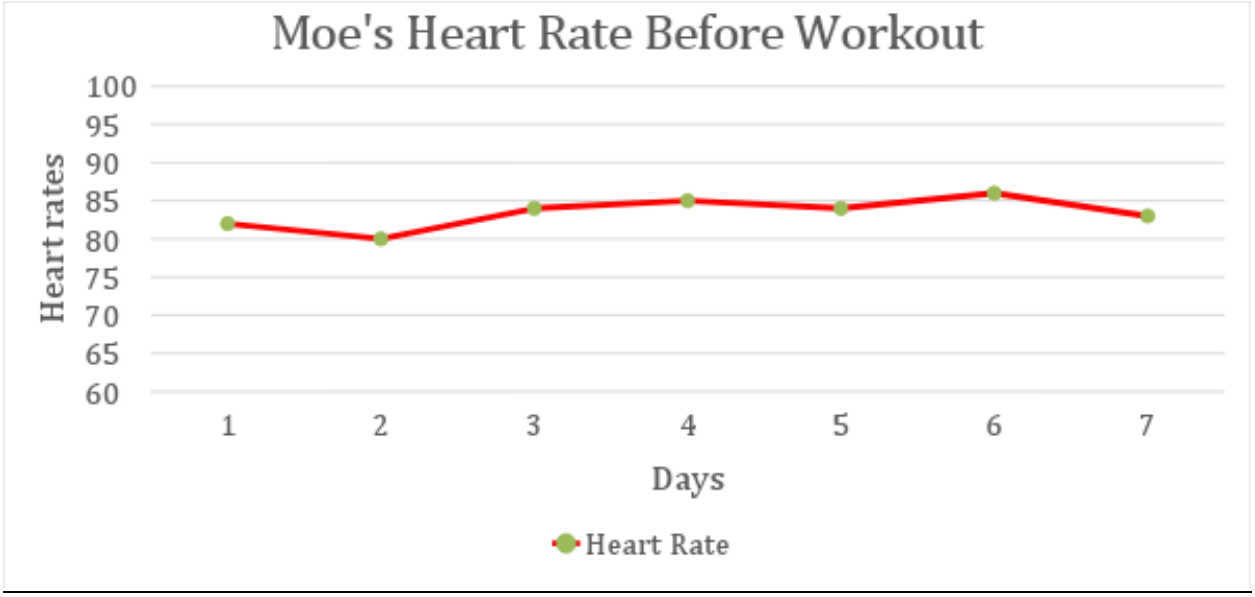
Methods

The experiment is testing how fitness affects our mood by using people's heart rates to see the differences of their moods from when they don't do fitness and when the start doing fitness. This experiment will need at least Three teenagers. Also a gym that has a treadmill for fitness activities to work on the persons cardio and their skeletal muscles to show better results in the heart rate at the end. Use an Apple watch to use the heart rate app to see the person's heart rate. Have Water for hydration. Get the three or more teenagers that are willing to come to the gym for a solid week to jog or walk on a treadmill at their own pace.

Make sure to Arrange times in the week where the three teenagers are willing and able to come. Create a separate chart for each person to input their results using any Microsoft program. Make Days, their heart rate before, After_the columns. Should be After, measure each teenagers heart rate on the day before testing happens so there is a base heart rate for each person by using the apple watch. Do stretches such as knees to chest, Side trunk, side and forward lunges, Seated trapezius stretch, and shoulder overhead and posterior, etc... Do this for 10 minutes so their muscles are warmed up. For each stretch listed do each one 5 times for 2 sets each and a 30 second break in between each set.

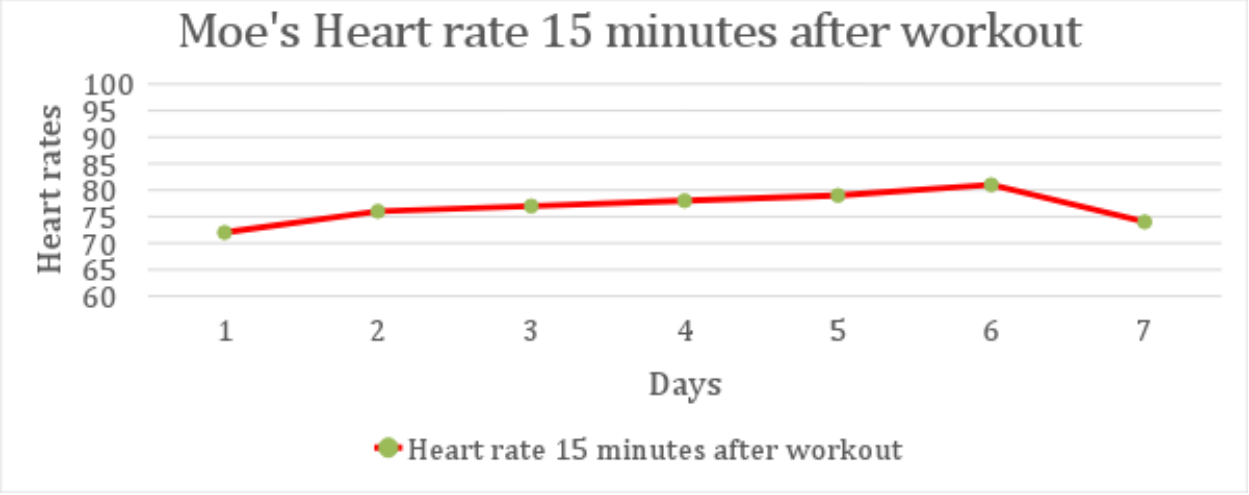
Each person will be required to go on the treadmill and do 15 minutes of jogging, running, or walking at their own pace. Measure their heart rates 15 minutes after they are finished jogging or walking on the treadmill has been finished by using the apple watch. Input the data for each person in the chart. Input all the gathered information. Create a graph for each person showing their heart rates before in blue dots and heart rate after in red dots. Show the days as well and title it with the person name and then "heart rate before and after physical activity". Ex. John's heart rate before and after the workout. The independent variable is the amount of fitness done because it is something that would not be changed. Every person is required to do 15 minutes of exercise and will not change, and that time and amount will not be affected. For the dependent variables are things that aren't usually the same. Everyone's heart rate, and mood will always be affected and change no matter what. Also, if the person doesn't make it to the gym that day which means that can be affected as well.

Graph 1



As shown in the graph 1 for subject 1 it starts off high and consists on staying in 80-85 beats per minute range.

Graph 2



As shown in the graph 2 for subject 1 after the workout it point started at a lower heart rate and is always lower than the heart rate before the workout. The graph shows that the heart beat ranges from 80-70 per minute

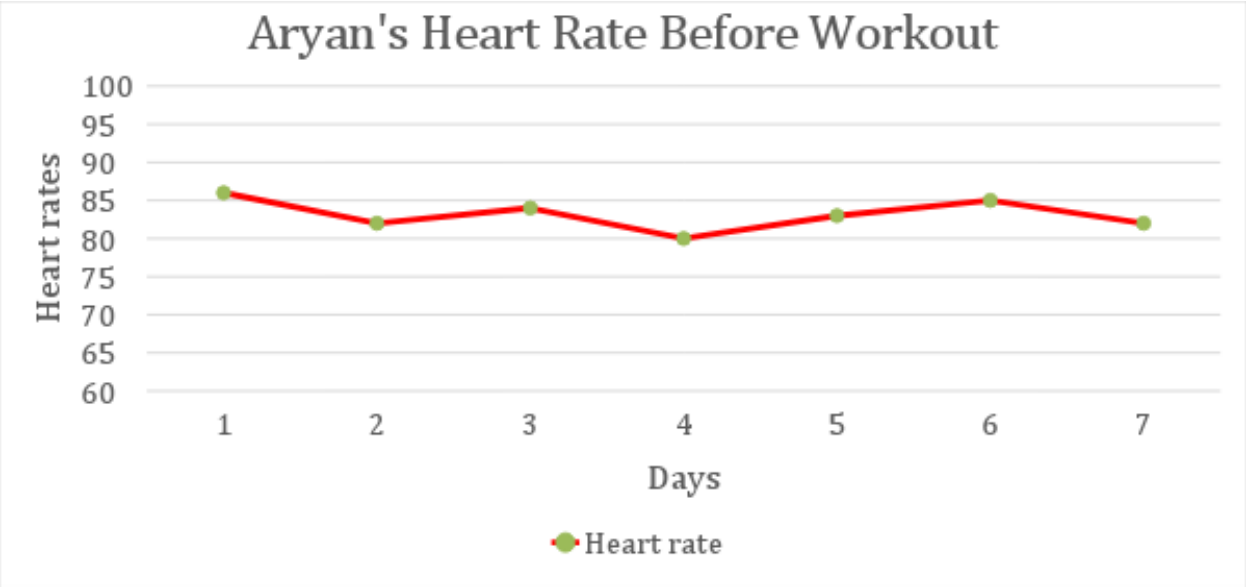
Table 1

Subject 1's Heart Rate/Minute Before and 15 min After the Workout

Days	Before the workout	15 min After the Workout
1	82	72
2	80	76
3	84	77
4	85	78
5	84	79
6	86	81
7	83	74

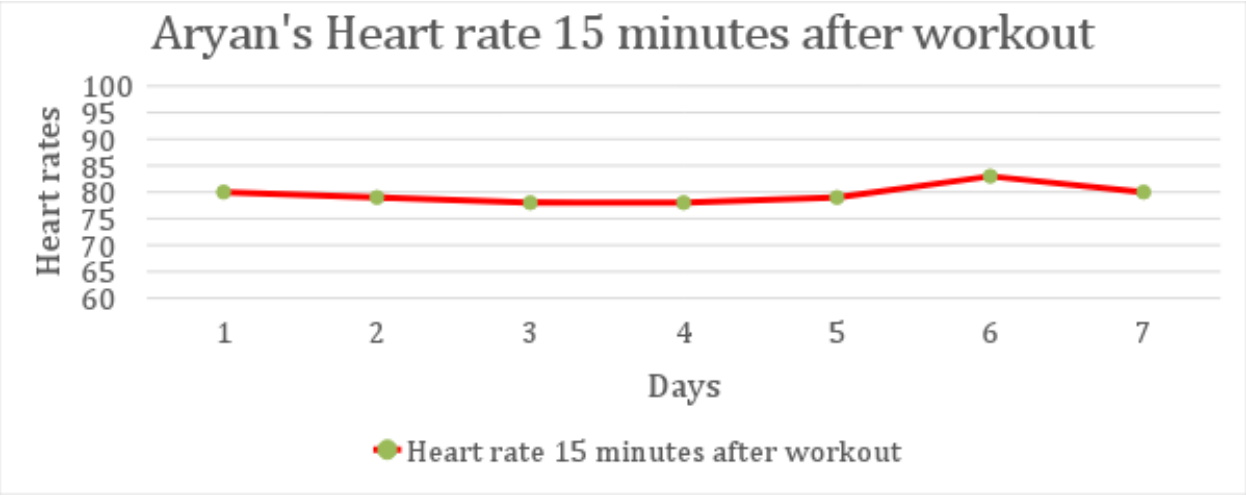
This is subject 1's heart rate before the workout started and as shown the heart rates average for before the workout is approximately 83 beats per minute. This is subject 1's heart rate 15 minutes after the workout has finished and as shown the heart rates average for 15 minutes after the workout is approximately 77 beats per minute.

Graph 3



As shown in the graph 3 for subject 2 it starts off high and consists on staying in 80-86 beats per minute range.

Graph 4



As shown in graph 4 for subject 2 after the workout it starts at a lower heart rate and it is consistent but still lower than the heart rate before the workout. The graph shows that the heart beat ranges from 84-80 per minute

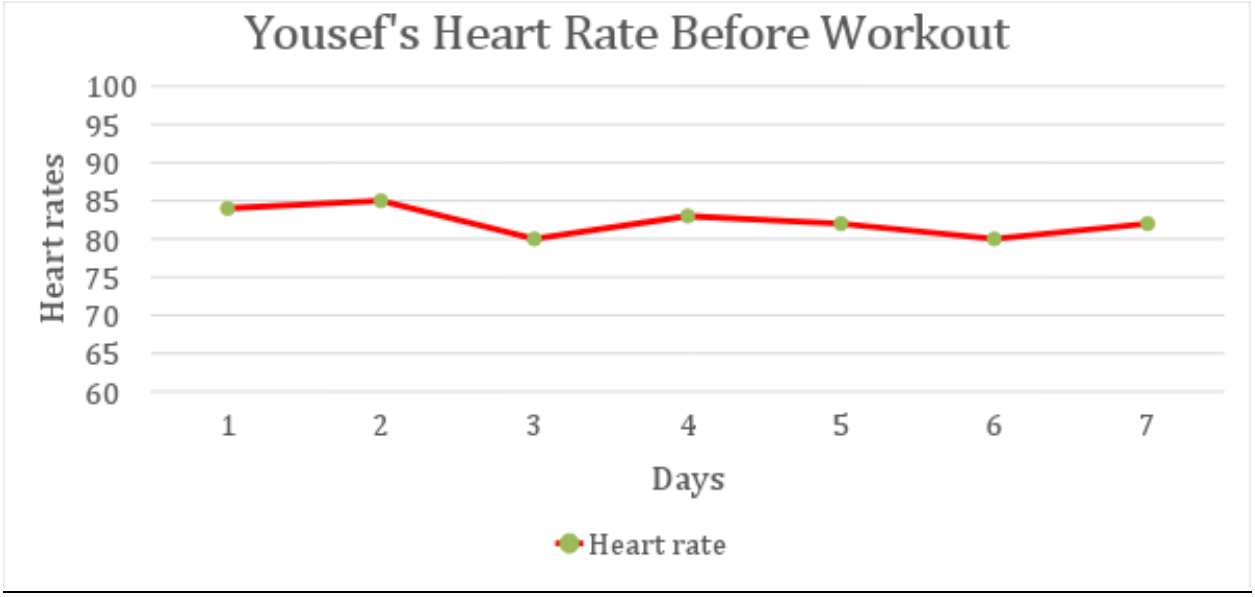
Table 2

Subject 2's Heart Rate/Minute Before and 15 min After the Workout

Days	Before the workout	15 min After the Workout
1	86	80
2	82	79
3	84	78
4	80	78
5	83	79
6	85	83
7	82	80

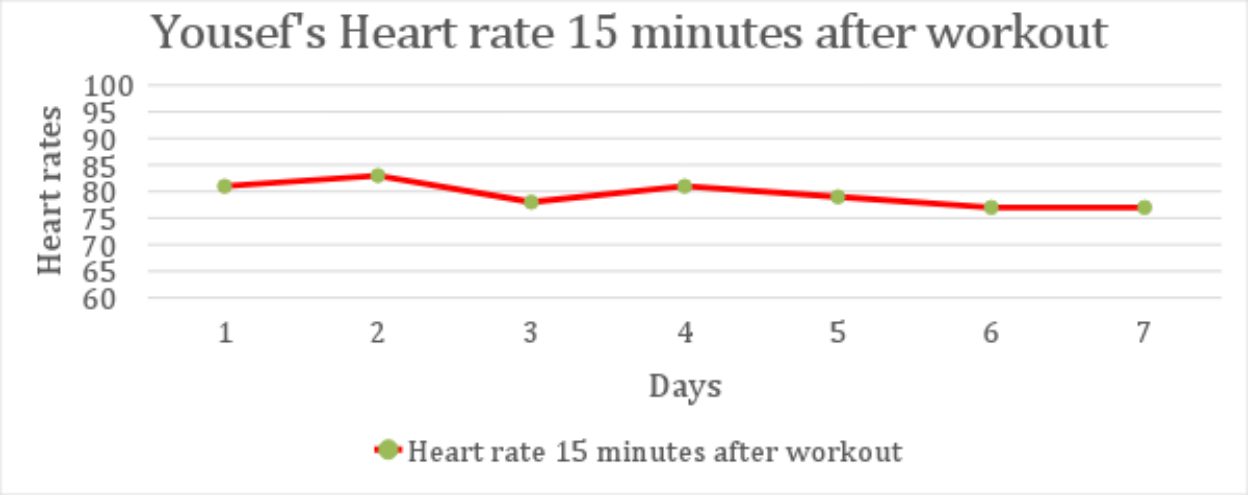
This is subject 2's heart rate before the workout started and as shown in table 2.The heart rates average for before the workout is approximately 83 beats per minute. This is subject 2's heart rate 15 minutes after the workout has finished and as shown the heart rates average for 15 minutes after the workout is approximately 80 beats per minute.

Graph 5



As shown in the graph 5 for subject 3 it starts off high and consists on staying in 80-85 beats per minute range.

Graph 6



As shown in the graph 6 for subject 3 after the workout start at a lower heart rate and is always lower than the heart rate before the workout. The graph shows that the heart beat ranges from 84-76 per minute

Table 3

Subject 3's Heart Rate/Minute Before and 15 min After the Workout

Days	Before the workout	15 min After the Workout
1	84	81
2	85	83
3	80	78
4	83	81
5	82	79
6	80	77
7	81	77

This is subject 3's heart rate before the workout started and as shown the heart rates average for before the workout is approximately 82 beats per minute. This is subject 3 heart rate 15 minutes after the workout has finished and as shown the heart rates average for 15 minutes after the workout is approximately 79 beats per minute.

Conclusion

When analyzing the results, it shows that people's heart rates before the physical activity are always higher than after the physical activity is done. There are always different results for the heart rates before and after for each person and is never the same because the heart rate is not dependent and change depending on how stressed they are. The heart rates for 15 minutes after the exercise (jogging, running, or walking) given are always decreasing by a minimum of 4 beats per minute for all test subjects compared to the heart rates before the workout. But test subject 1 had 10 beats per minute difference for one day compared to the heart rate before the workout which was impressive! That test subject 1 results had the biggest difference of heart rate change compared to the other test subjects.

The hypothesis was correct. A summary of the hypothesis was that physical activity on a daily increases a person's life and mood. In the results the heart rates before the workout were greater then after the workout. This heart rate decrease could have been because of someone's anxiety levels being high or not having a clear train of thought.

Not only does working out give a clear train of thought but it allows people to live a healthy and stress-free life as proven in the results! When finished everyone was way more energetic and happy compared to when they start to workout.

Application

This field of study will apply to anything in the medical field because this all relates on how the body works and helps us become better. People would use this information to become healthy, live a better life, and to also experience another benefit of working out that can motivate them to succeed .Imagine a world where everyone was happy and were experiencing life the way its suppose it's be experienced with joy and healthiness. The world would be a better place with a decreasing death rate, a better society, and overall a great life for each person!

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Addition of Amide Side-Chains into Polymers to Increase Stretchability

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Abstract

In the rapidly developing industry of wearable electronics, the next step is to integrate the wearable electronics into bodily systems. By increasing the amount of amide side chains into a conjugated polymer, it is hypothesized that the stretchability would be increased. The amide side chains create hydrogen bonds, which help hold the material together when it is stretched. The polymers are synthesized with varying amounts of amide side chains, and stretch tests are conducted to determine the crack onset, and the elastic modulus. It is determined that the lowest crack onset is 40% strain at 0mol%, and the largest is 105% strain at 10mol%. Similarly, the elastic modulus is lowest at 10mol%, and largest at 0mol%, showing that the polymer with 10mol% is more stretchable. It is also noticed that at 20mol%, the crack onset is smaller than that of 10mol%, and the elastic modulus is larger. This shows that when too many amide side chains are added, too many hydrogen bonds are created, making the polymer increasingly brittle.

Introduction

The purpose of the project is to increase the usefulness of conjugated polymers in wearable electronics. Materials in wearable electronics must be conductive and stretchable (Printz, 2016). They must be conductive so that the electrical components can operate, and stretchable so that the material can conform and move with the flexible human body. Conjugated polymers are very conductive, which make them appealing for use in wearable electronics. However, they are extremely brittle, and would break when stretched (Lei, 2014).

Hydrogen bonds can be caused by various moieties, and could increase the stretchability of the polymer by creating bonds that would break before the actual material, therefore preserving the material (Yao, 2016). The main question of the experiment is to determine whether or not the stretchability of a polymer would be increased with the addition of hydrogen-bonding functional groups.

It is hypothesized that if hydrogen bonding functional groups are integrated into the polymer, then it will become more stretchable. This would happen because of the transient strength of the hydrogen bonds and thus allow the polymer to undergo higher levels of stress without degrading (Ahner, 2017). The effect of hydrogen bonding moieties in the polymer will be studied through assessing the formation and propagation of cracks.

Methods

Using a scalpel, a section of polydimethylsiloxane (PDMS) is cut that is slightly smaller than the silicon wafer with octadecyltrimethoxysilane (OTS) which it will be affixed to (0.2 cm space of wafer on all edges). The PDMS is affixed to the wafer using tweezers, however the edges of the wafer cannot be covered. The samples to be plasma cleaned are placed on the tray inside of the cleaner, and then they are placed under vacuum. Once the pressure falls below 200 mtorrs, oxygen gas (O_2) is added to the cleaner, and the plasma discharger is initiated for one minute. Once a minute has passed, the plasma cleaner is turned off, and the pressure is allowed to stabilize. Finally, the vacuum is released, and the samples are removed from the cleaner. Using tweezers, the PDMS is peeled off of the samples. Each sample is cleaned by rinsing with copious amounts of toluene, isopropyl alcohol (IPA), and acetone, in that respective order. Then, they are dried with a nitrogen blower for 10 seconds.

The speed on the spin-coater is set to 1500 rates per minute, and the acceleration to 742 rates per second for 1 minute. A polymer solution with a specific amount of amide side chains to use for the specific trial is chosen. Four different trials are attempted. Trial one P1, tests a polymer with 0mol% amide side chains, trial two makes use of P2, which has 5mol% amide side chains. Trial three tests P3 with 10mol% amide side chains, and trial four is based around P4, which has 20mol% amide side chains. Then, the polymer solution is spin coated onto the wafer, and the sample is removed from the spin-coater.

Using the scalpel, a strip of PDMS is cut that is longer, but narrower than the wafer. The PDMS is placed on the wafer with the polymer facing upwards. Then, the PDMS is quickly peeled off of the wafer, removing the polymer as well. The length of the polymer that is removed is measured using the calipers. The polymer is stretched to the appropriate length depending on the strain being induced.

The stretched PDMS is placed onto a silicon wafer without OTS, and the tweezers are used to apply pressure to the PDMS to transfer the polymer to the silicon wafer. The wafer is observed with the optical microscope to determine the stretchability of the polymer, and with the atomic force microscope (AFM) to determine the microcrack depth.

The independent variable in the experiment is the amount of amide side-chains that were added. These were changed from trial to trial. These

side chains create hydrogen bonds, which affect the stretchability of the polymer.

The dependent variable in this experiment is the stretchability of the polymer. As mentioned earlier, this variable is dependent on the amount of amide side chains present in the polymer. It is tested by stretching the polymer to different lengths.

Some of the controlled variables in this experiment include the purity of the chemicals which were used, the amount that the polymers were stretched to in each trial, the brightness of the room and the microscopes, the temperature of the location where the experiment is conducted, and the humidity of the location where the experiment is conducted.

Results

Table 1: Amount of H-Bonding moieties (mol%), the elastic modulus (GPa), and the crack onset of each polymer (% strain).

Polymer	H-Bonding moieties (mol %)	Elastic Modulus (GPa)	Crack Onset (% strain)
P1	0mol%	1.6	40%
P2	5mol%	1.4	85%
P3	10mol%	0.9	105%
P4	20mol%	1.35	45%

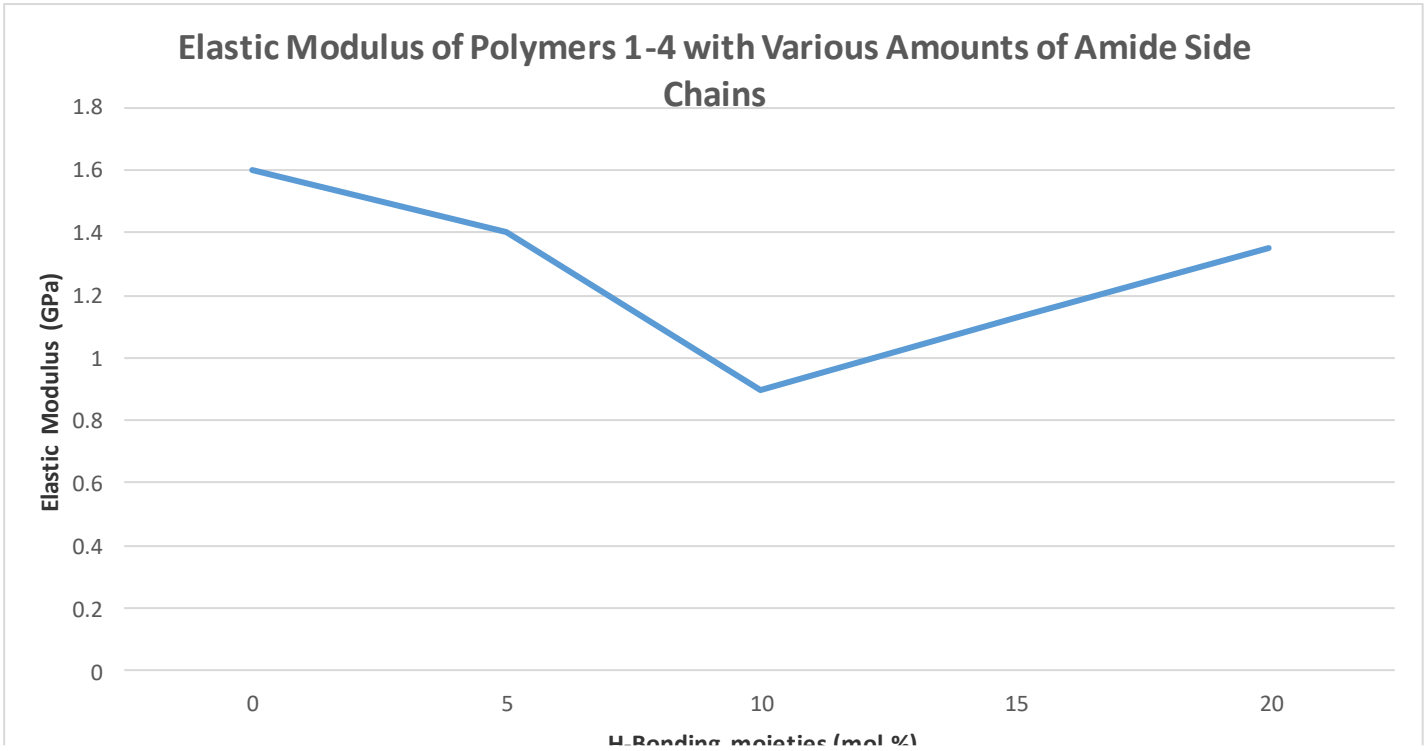
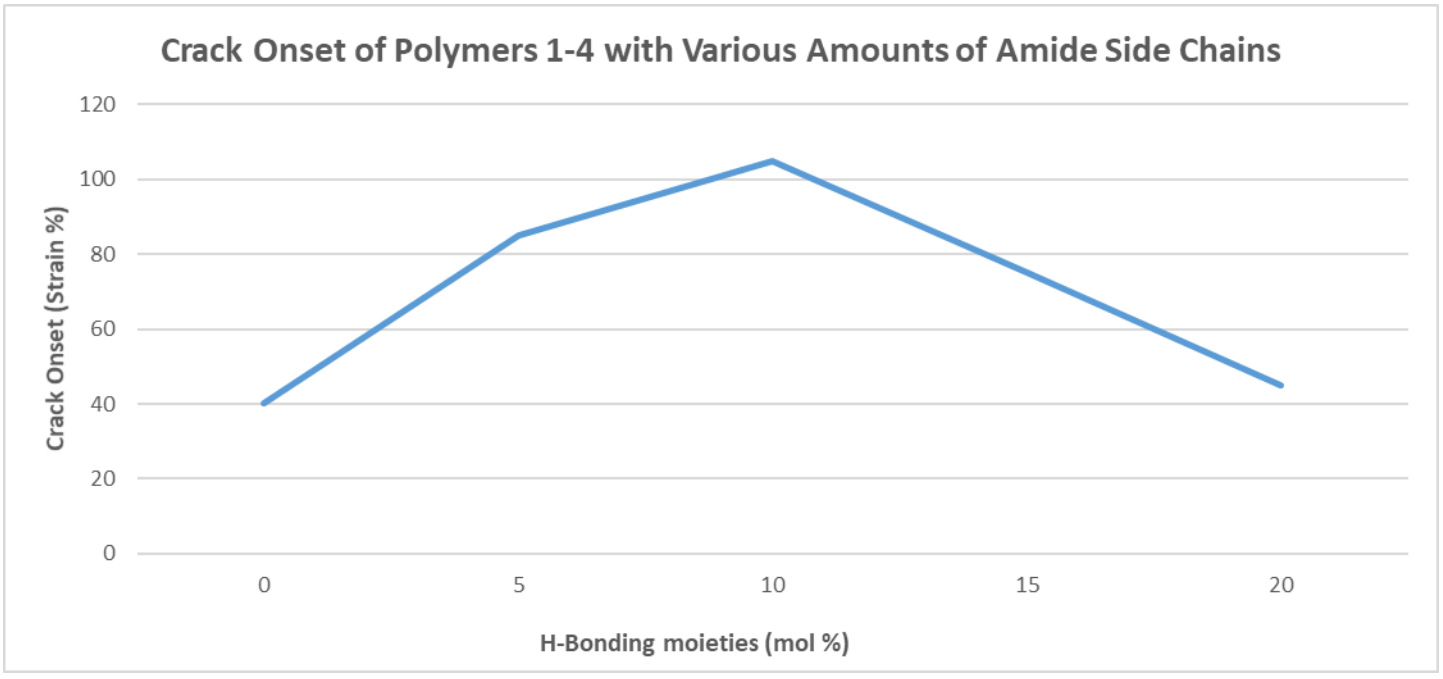


Figure 1: A graph showing the elastic modulus of each polymer with differing amounts of amide side chains, measured in GPa.

Figure 2: A graph showing the crack onset of each polymer with differing amounts of amide side chains, measured in strain %.



The stretchability of the experimental polymers are characterized using the crack onset determination (smallest amount of induced strain at which point microcracks begin to be observed) and elastic modulus (tensile stress divided by the induced external strain). As determined by the definition of elastic modulus, a highly stretchable material has a smaller elastic modulus as compared to a brittle

material. The crack onset of P1 (0mol% amide) is 40% strain. The crack onset continues to increase until the amount of H-Bonding moieties is greater than 10mol%. At this point, the increased proportion of hydrogen-bonding moieties results in further cross-linking, inhibiting the stretchability of the materials. In turn, P4 (20mol% amide) is significantly more brittle and susceptible to cracks as compared to P3 (10mol% amide). Elastic modulus is a measurement of the stiffness or stretchability of a material. The elastic modulus of P1 is determined to be 1.6 GPa. From this result, it is determined that P1 is fairly brittle and thus the formation of cracks is seen upon minimal stress. P3 has an elastic modulus of 0.9 GPa, which demonstrates that the polymer stretches quite easily, and does not form cracks easily. However, once 20 mol% H-Bonding moieties are achieved, the elastic modulus increases. **Conclusion**

Four polymers are synthesized over the course of the experiment. These materials differ based on the incorporated portion of hydrogen-bonding moieties. Specifically, amide side chains are utilized as the hydrogen-bonding moiety for the studied materials.

The hypothesis is that if hydrogen bonding functional groups are integrated into the polymer, then it will become more stretchable. This will occur because the transient nature of hydrogen bonds will allow the polymer to withstand increased stress without microcrack formation. The hypothesis is partially correct. When hydrogen bonding moieties are added in small amounts, the stretchability is increased. However, upon addition beyond 10mol% amide groups, the materials become more brittle due to the enhanced cross-linking of the hydrogen bonds. The purpose of the project was to determine the effect on the stretchability of novel conjugated polymers upon addition of hydrogen-bonding moieties, specifically amide functional groups. It is determined that the stretchability can be enhanced up to a determined point based on the amide functional group integration. Upon incorporation of 5-10mol% amide group, the stretchability of the fabricated materials increases as compared to the reference polymer which did not contain any amide groups (P1). However, upon incorporation of 20mol% amide groups within the polymers, the stretchability decreases as determined by the elastic modulus calculations. This is a result of increased cross-linking which resulted in greater material brittleness and susceptibility to microcrack formation.

Errors that could occur include the purity of the chemicals that are used, and the measurement of the polymers during stretch tests. The less pure that the chemicals are that are used in the synthesis of the polymer, the less accurate that the results will be. This is due to the fact that the composition of the polymer would be changed, and it would not behave as it would if all the chemicals were pure. Also, if measurements are not accurately taken

during stretch tests, then the results could be inaccurate.

Application

Polymers with amide side chains have uses in many fields, but the main field is wearable electronics. The amide side chains have made polymers stretchable while not compromising their conductivity. The synthesized conjugated polymers have uses in printable electronics, wearable devices, and regenerative medicine. The field of wearable electronics has been rapidly evolving in recent years. For example, the novel development of synthetic epidermis with sensing capabilities is an important innovation that is the culmination of several decades of research in the fields of wearable electronics and organic synthesis (O'Connor, 2015).

Acknowledgements

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External Factors Affecting Concentration

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I. ABSTRACT

How do surrounding factors affect a person's ability to concentrate on a task and how can efficiency and accuracy be maximized? Subjects complete identical tests in different environments with different amounts of noise and types of music. The results are recorded, averaged and compared. Subjects preform the worst when working in a room with noise and chatter, but the best when tested with classical music playing in the background. When words were prominent within the surroundings, results display that the performances were weaker than without. Subjects' performance was peaked when classical music was playing while tests are simultaneously completed.

II. INTRODUCTION

The average concentration span for a person is approximately 20 minutes (Alex En, n.d). Distractions surrounding a person are the reason for low levels of productivity and efficiency. How are a person's concentration levels affected by their surrounding environment and how can people improve their concentration spans? External factors are changed to test which surrounding is the best and worst for the brain's concentration.

It is hypothesized that if someone is studying in a quiet environment rather than one with noise and chatter, their ability to concentrate is better and they are able to retain more information than the latter. This is because while you study, your brain is concentrated on one main thing, and the background noise subconsciously increases general stress levels and encourage headaches. Research with noise levels showed that most people studying in quiet environments preformed with higher results than those studying with background noise, therefore it is theorized that having noises in the background distracts the brain and causes a drop in performance.

III. METHODS

Prepare four different math tests with the same level of difficulty throughout the four questions and provide environments to test the subject in. The subject is tested in four different environments: one with classical music in the background, hip hop music in the background, a completely silent room, and one with plenty of noise and chatter surrounding the subject. Seven

subjects are needed between the ages 14-16 with a variety of grade levels. The time the subject uses to complete the test will be recorded as well as the score received when done the test. Methods are repeated for all four different environments with the four different math tests for seven different subjects.

The independent variable in this experiment is the noise that surrounds the subject as the test is simultaneously completed. The dependent variable is the amount of time the subject uses to complete the test. The controlled variable is the person taking the test, the type of noise present in the testing room, and the type of test given to the subject in a particular room. To use the same person throughout the length

of the test guarantees results are not changed by individual aptitude, but by external factors. The type of test given when in a specific environment ensures that no one had an advantage to the different questions on each test, making certain results can be compared accurately.

IV. RESULTS

CLASSICAL ROOM (**Table 1**):

NAME	**SCORE (out of 4)**	**TIME (minutes)**
Ellen	4	3.40
Jessica	1	3.17
Annie	3	2.59
Sahana	4	3.00
Judy	4	4.35
Nour	2	9.47
Abuk	3	5.06

Table 1: Scores and recorded time usage for seven subjects completing the test while in an environment when classical music plays in the background

SILENT ROOM (**Table 2**):

NAME	**SCORE (out of 4)**	**TIME (minutes)**
Ellen	3	5.13
Jessica	2	5.02
Annie	2	5.01
Sahana	2	4.33
Judy	4	6.40
Nour	1	6.24
Abuk	3	6.45

Table 2: Scores and recorded time usage for seven subjects completing the test while in an environment when absolute silence.

HIP HOP ROOM (**Table 3**):

NAME	**SCORE (out of 4)**	**TIME (minutes)**
Ellen	4	4.44
Jessica	1	4.39
Annie	1	4.41
Sahana	3	3.46
Judy	4	6.20
Nour	0	10.39
Abuk	2	6.16

Table 3: Scores and recorded time usage for seven subjects completing the test while in an environment when hip hop music plays in the background.

NOISY ROOM (**Table 4**):

NAME	**SCORE (out of 4)**	**TIME (minutes)**
Ellen	2	5.42
Jessica	1	5.02
Annie	1	4.21
Sahana	1	4.27
Judy	3	7.30
Nour	0	9.23
Abuk	1	4.21

Table 4: Scores and recorded time usage of seven subjects completing the test while in an environment with lots of noise and chatter within the room.

(**Figure 1**)

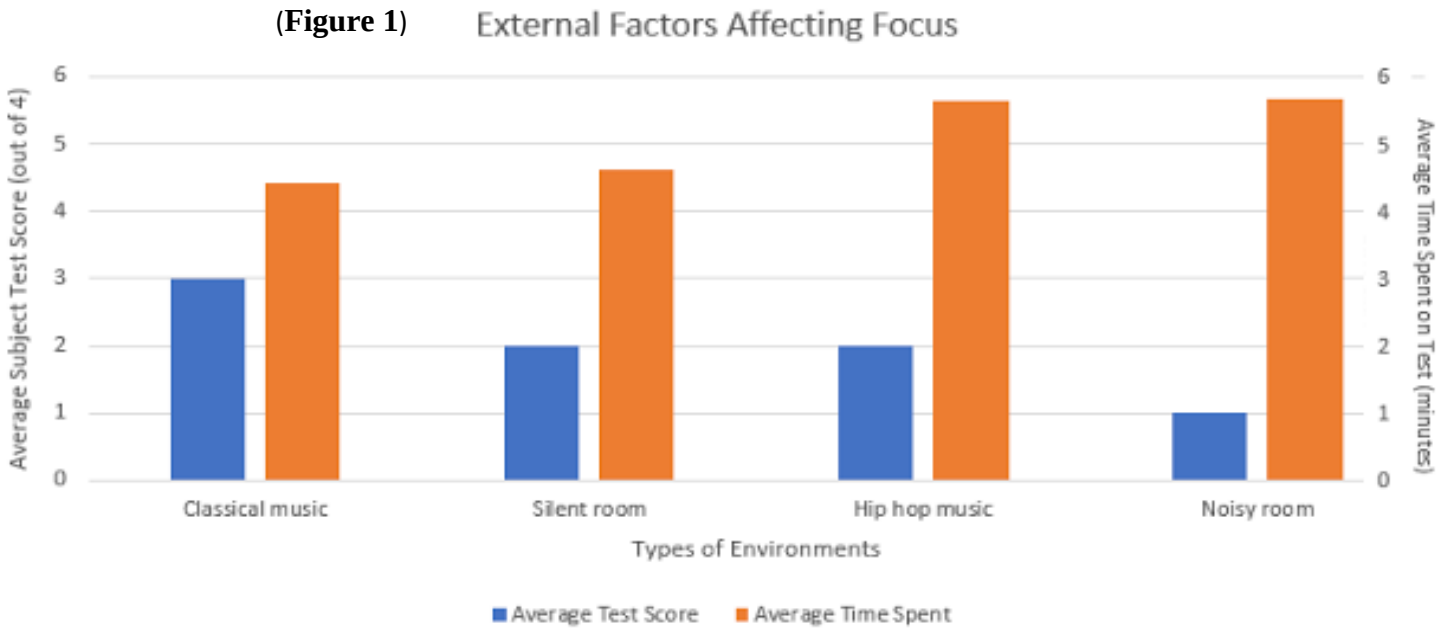

Figure 1: Average of all the scores and recorded times in every individual type of change in external environment. Placed on a graph together for easy comparison.

V. DISCUSSION/CONCLUSION

The hypothesis was incorrect. It was hypothesized that the result would be better for someone working in a quiet environment free of noise, but the data collected shows that the highest and most efficient test scores were when subjects were given classical music to listen to while simultaneously doing the test.

The data collected is categorized into two parts. One for the accuracy of the subjects thinking process (the score of their test) and their efficiency (the time it took to complete the test). The results of the collected data display that subjects perform the highest on the test, in both sections, when listening to classical music with an average accuracy of 75%. When the test was completed in the completely silent room, the accuracy and the efficiency were both lowered compared to the completion with classical music by 33%. While completing the test simultaneously while listening to hip hop music, compared to results from the silent room, subjects performed with the same accuracy of 50% but with less efficiency. When subjects were asked to complete the test in a noisy room, accuracy was lowered to an average of 25% and the efficiency was the lowest compared to the other tests. The initial purpose of this experiment was to see how a person's levels of concentration was affected by their surrounding environment and to see in what ways someone can improve it. The collected data shows that the level of concentration is most negatively affected when in a room complete with noise and chatter. Accuracy was around the same when working in a silent room and listening to hip hop music, but efficiency was higher in the silent room. The facts show that to have the highest level of concentration, accuracy, and efficiency, the subject should listen to classical music while completing their work.

In a study done in 2015 a group of students were monitored while given classical music and hip-hop music while studying. The results display that hip-hop music has an interference with the brains ability to concentrate on a singular task for extended periods of time. (Mark A. W. Andrews, 2010)

Some problems and sources of error that may have affected the results is the stress of being timed. When the subjects were told they are being timed during the test, stress levels rose, and they rushed to complete the test shifting some of their attention to the time. If subjects had not known about the timing of their test they would have preformed without the stress factor and results could have been more accurate.

VI. APPLICATION

This information would be valuable to the general public because concentrating on a task is one of the things that people must face everyday. People suffer from lack of concentration on a task and their mind will spend hours, wandering away when a deadline lies looming ahead. With this new information being applied into a normal life productivity levels would increase, and more time could be left for enjoyment purposes. If classical music is played while concentrating, accuracy and efficiency will be maximized.

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The Effects of Practice on an Individual Practicing a Specific Skill Set

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Abstract

The purpose of this study is to find out if practicing a given skill will improve that skill and how long it will take for the skill to show improvement. The skill studied skill to determine the results is shooting accuracy in hockey using different shots. Four targets are placed in the corners of a hockey net, the test subject than shoots fifteen shots from 10ft, 15ft, 25ft, and 35 feet while aiming for the corners. This process is used for wrist shots, slap shots and snap shots. After the shots are taken the average amount of pucks shot into the corners is averaged out to yield the shooting average. Results are recorded over a one-month period and analyzed afterwards. The resulting trend in data after one month is a continual upward trend in all three shots' shooting accuracy. Improvement in shooting accuracy is shown almost immediately and continues upward after almost every practice session. The conclusion of this study is that practice plays a significant role in the development of a skill and improvement can be seen almost immediately and consistently after consistent practice.

Introduction

The purpose of this study is to determine if practice is really a useful method of improvement. Determining this would allow for better use of time and more efficient paths to achieving a skill. If the success point is unknown, it is much harder to know when and how a goal will be achieved. In hockey, professional players practice hours per day but are also naturally gifted. Young players may not be quite as gifted but are just as committed and it is important to know how much progress can be made over a given period to set proper goals. "One properly-run practice is the equivalent of 11 games when it comes to puck touches," says ADM (American Development Model) Regional Manager Ty Hennes. By finding out if practice is the real key to improvement it is possible to format practice schedules towards a more specific point to increase effectiveness. This then begs the question; how does practice affect the skill that being practiced? If it improves the given skill, how long will it take to show improvement?

The hypothesis for this study then is; If consistent practice shooting a puck is achieved, then improvement will show in shooting ability. Practice involves constant repetitions, "Repetition will make the motions seem natural,"" The key is repetition, repetition, repetition." (Stephenson, M) If consistent practice schedules are not followed and practice

becomes less and less frequent, improvement will slow and potentially regress. Since the “10 years and 10,000 hours of purposeful practice for an individual in ANY field to achieve expert mastery” (Neeld, K.) will not be reasonable, mastery of the skill can not be achieved but substantial progress can.

Methods

The methods for the study are very simple and can be repeated as many times as there is a need for data. It is also important to remember that this process can be used for wrist shots, snap shots, and slap shots. To begin the board that the hockey pucks will be shot from needs to be placed 10ft from the front of the hockey net. After the board is set 15 hockey pucks are to be shot from the board, aiming for the targets set in the corner of the net. After the shots are taken make note of the amount of shots that hit the targets and proceed by moving the board back another 5ft, so it is fifteen feet from the goalmouth. Repeat the shooting sequence once again shooting 15 pucks and tallying the amount shot into the corners. This method is then repeated for shooting pucks from a board 25ft and 35ft from the front of the net. Once the shooting is finished and all the results are tallied, calculate your overall shooting average by adding all the pucks shot into the corner targets and dividing them by the total amount of shots taken.

The variables for this study are outlined here and should be followed closely to yield the most accurate results. The independent variables consist of the distance from the net when shooting and the type of shot used. The dependant variable is the shooting accuracy of the test subject. The control variables are the size of the targets, amount of shots taken, net size, stick used, regulation pucks used, shooting board used and the ground conditions at the time the shots were taken (wet/dry etc.). The control of the regulation pucks allows a guarantee that the pucks all weigh the same, therefor not skewing results. The ground conditions are also controlled to ensure that there is always the same amount of friction on the puck when it is shots because water from the ground could get onto the pucks and shooting board.

Results

At the end of the data collection, all three types of shots improve substantially as can be seen in Table 1. Over 9 practice sessions with each shot, the wrist shot improves the most as can be seen in Table 2. The overall trend in the data through each session is upward though there are some abnormalities when the practice session recorded a worse shooting average than the one before it. The

wrist shot accuracy showed a 12% increase from the first practice session, the snap shot 16%, and the slap shot by 18%. The average increase shooting accuracy per session for the wrist shot was 2.63%, for the snap shot 2%, and the slap shot 2.25%. As can be seen in all 4 graphs, the initial increase in shooting percentage after the first two practice sessions was greater than the increase in the last two weeks. This shows that the increase in skill gets harder as the person's individual skill in that area increases.

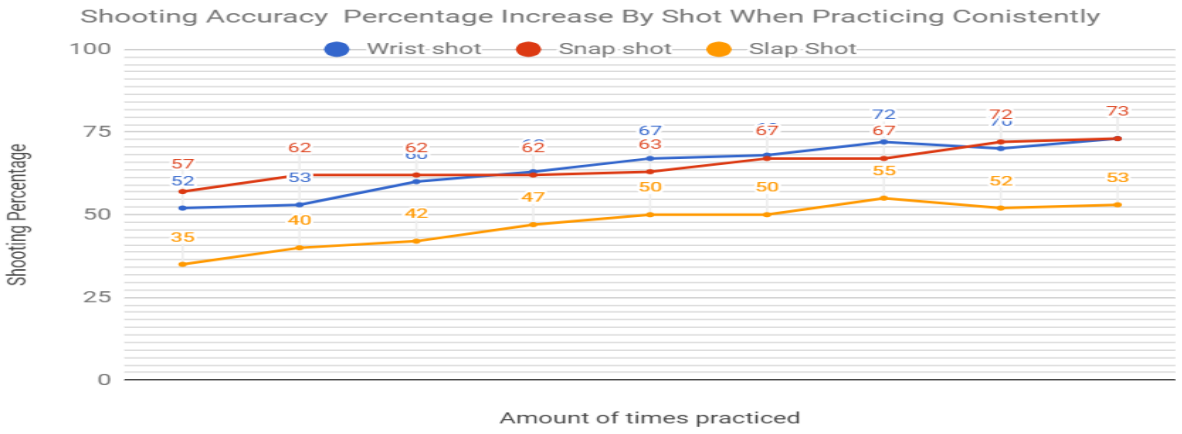

Table 1: This graph shows the overall shooting acccuracy percentage improvement for the three types of shooting over a month. Each percentage on the graph demonstrates the overall shooting accuracy for that one practice session.

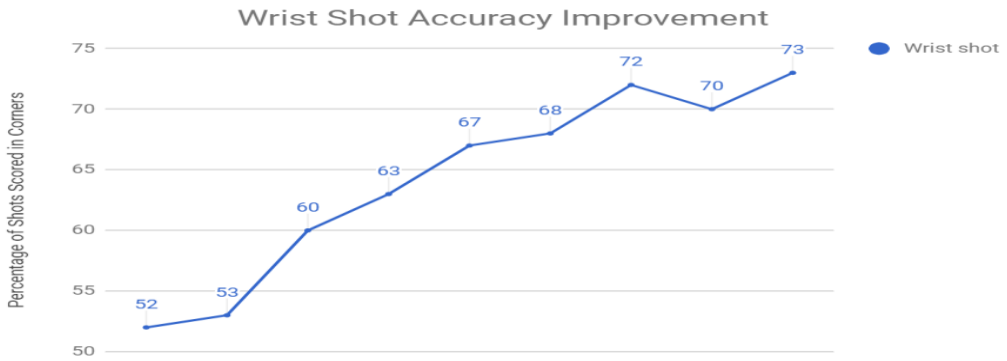

Table 2: This graph demonstrates the overall shooting accuracy increase for just wrist shots over a month. Each point on the line demonstrates the shooting accuracy for the one practice session.

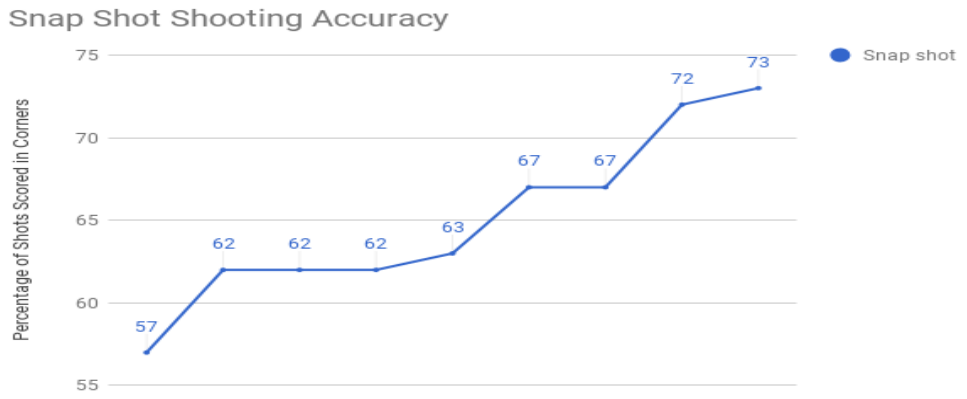

Table 3: This graph demonstrates the overall shooting accuracy increase for just snap shots over a month. Each point on the line demonstrates the shooting accuracy for the one practice session.

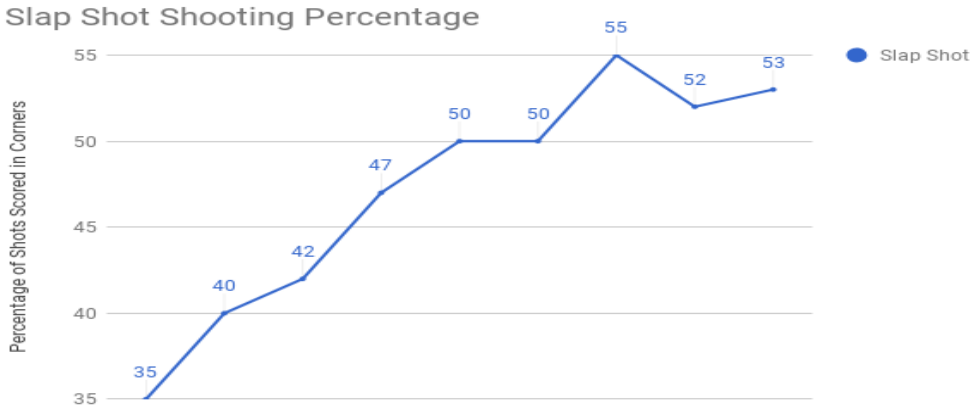

Table 4: This graph demonstrates the overall shooting accuracy increase for just slap shots over a month. Each point on the line demonstrates the shooting accuracy for the one practice session.

Conclusion

In the end the hypothesis was correct. The hypothesis stated that if consistent shooting practice is achieved, then improvement will show in shooting accuracy throughout all three types of shots. The data collected over the course of this study shows that all three shooting accuracies improved by greater than 15%. The purpose of this study was to see if practice truly improves the skill being practiced, and how long it would take to see improvement in that skill. This study answered both questions, practicing shooting did cause an improvement in the shooting accuracy of the shot types practiced. Improvement was also seen within the first two practice sessions for the shots.

The results of this study have proven that practice does lead to improvement, this is mainly due to muscle memory. As practice was achieved,

the muscle memory of the technique was developed allowing for a more consistent shot with less shots missing the targets and therefor improving the shooting accuracy. This can be seen in the data as the shooting accuracy of wrist shots, snap shots and slap shots improved and as the muscle memory was built the amount of abnormalities in the data decreased, showing that the improvement in the shot was mainly in consistency. These results resemble the results of many other investigators proving that practice does really work to improve a skill.

As every study has errors in some form it is important to identify what could be changes to further improve the accuracy of the study. Though these errors may have slightly changed the exact numbers, they do not affect the overall data trend or the results of this study. One of the errors was that the test subject's other hockey schedule was not considered, this meaning that the subject received more practice at hockey arenas that were not counted. This could have allowed them to show greater improvement in shooting accuracy than they would have otherwise. The other error was that the subject was not always equally rested when practicing, this potentially allowed for more abnormalities in the data due to fatigue.

Application

This study could be applied to many other fields outside of hockey. In any other sport this data would be equally useful and accurate as there is the capability to develop muscle memory anywhere in the body. Though the muscles affected by the practice may be different in another sport they development of muscle memory would happen there as well, resulting in improvement. These results could also be applied to manual labour such as factory work because the repetition of a task would also build muscle memory and therefor result in less errors and potentially faster completion of the task.

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The Effects of Three Distinct Case Designs with Equal Mass when Fitted on Pieces of Glass when Dropped at Certain Heights

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Abstract:

The purpose of this experiment is to observe the effect on pieces of glass when fitted with three distinct case designs and dropped at certain heights to ultimately determine the most protective design. Drop tests were conducted thoroughly with each case design. The first case design only focused its protective matter on the corners, the second case focused its protective matter on the edges and the third case focused its protective matter on the back and on the edges. It was observed that the case with its protective matter focused on the corners performed the best (a few scuffs at most) when graded on a crack-severity criteria. This is likely due to the fact that rectangular (smartphone shaped) objects rarely fall perfectly flat or on an edge but mainly on a corner and if protective matter is only put on portions where the phone is most likely to meet the ground first, the case will perform the best, as it did in the experiment having at most a few scuffs. The implications of this study are the effects on the mindset when a new case is ought to be purchased for the purpose of protecting a device. If it is known which portions of a phone case are useless (meaning the portions serve no protective functionality), it would be common knowledge to buy the right case for a device and not waste money on a case which uses an excess amount of material

INTRODUCTION

The purpose of this experiment is to observe the effect on pieces of glass when fitted with three distinct case designs and dropped at certain heights to find which case is the most protective.

This problem is important to solve because a lot of money is spent on buying bulky cases for devices even though the cases may not be very protective. According to Amazon's best-selling phone case list, two types of cases are the most popular. The first option is a case which is expensive and bulky and it is assumed that these bulky cases must be extremely protective but many popular phone case manufacturers focus on portions of the phone which serve no protective functionality causing there to be a lot of material on the case, hence its expensive price. An example would be the Otterbox Defender Series, bulky all around the edges when it should only be bulky on certain parts. The other option would be a phone case which serves absolutely no protective functionality, just aesthetically pleasing (Spigen Ultra Hybrid, #1 best seller on Amazon as of January 2018). If this problem were to be solved, money could be saved by money not being spent on purchasing expensive cases and convenience could be achieved by having a case that isn't very bulky but is also protective.

Question:

Where should the protective matter of a phone case be located in order to ensure maximum protection?

Hypothesis:

If phones rarely fall perfectly flat and usually on a corner, then a phone case which has its protective matter concentrated at the corners would be more protective than any other design because if the matter was concentrated on the place which phones tend to crack at, no material would be wasted on spots which serve no protection and maximum protection may be reached.

METHODS

Case Designs:

Case 1

Case 2

Case 3

Procedure to Make Silicone Material:

Put on a surgical mask to avoid breathing in acetic acid fumes from the silicone. Then, pour out 150 mL of silicone into a measuring cup. Measure out 10 mL of food colouring (colour does not matter) and pour it onto the measuring cup containing silicone. Mix the silicone with the food colouring using a mixing stick until all food colouring is evenly distributed within the silicone. Immediately after mixing, measure out 20-30 grams of cornstarch and add it to the silicone-food colouring mixture. Put on latex gloves and mix the cornstarch with the silicone-food colouring mixture using hands, mix the silicone-food colouring mixture and the cornstarch until there is no more visible corn starch. Now, once no cornstarch is visible in the mixture, mold the material onto a piece of glass in one of the case designs. Once the clay like mixture is molded into the desired shape, let it sit for about 5 minutes and when the mixture is rubbery, it is now ready for testing (The King of Random, 2012).

Experiment Procedure:

Put on safety glasses as there is a chance of glass breaking. Take the four corners of the first case design and fit the pieces onto a piece of glass. Then drop the piece of glass with the first case design from a height of 50 cm and note damages. Take the four corner pieces off the piece of glass and set the dropped piece of glass aside. Then, fit the four corner pieces onto another piece of glass and drop from a height of 50 cm. After noting damages, remove the four corner pieces off

the piece of glass which has just been dropped and drop test one more piece of glass with the corner pieces at a height of 50 cm. Take the second case design and fit it around a piece of glass. Drop the case from a height of 50 cm and after taking note of damages, fit the same case around a different piece of glass and drop once more at a height of 50 cm. After dropping the second case for a second time, take case two and fit it around another piece of glass and drop it for a third time at a height of 50 cm. Finally, take case three and fit it around a piece of glass and drop at a height of 50 cm and note damages. Take another piece of glass and fit case three around the new piece of glass and drop at a height of 50 cm. After noting damages, take the ninth piece of glass and fit the third case around it, drop it once more from a height of 50 cm and note damages.

Finally, repeat previous paragraph but dropping at a height of 100 cm for every drop test for a total of 18 drops.

Independent: In this experiment, the independent variable is the case around the glass. The purpose of the experiment will be to see how the different shapes of a case can affect the protection of the glass piece, so the case design will be changed.

Dependent: The variable being measured in this experiment is the condition of the glass after the drop. How many cracks/deepness of cracks.

Controlled: The controlled variables in this experiment are the glass manufacturer, height for every sequence of tests, surface being dropped on, and the material which the case is made of. The material in each case used is the same mass.

The piece of glass was controlled because some glass manufacturers may have thicker or denser glass than another manufacturer causing one type of glass to be stronger than the next. The pieces of glass used in the experiment were from Dollarama photo frames (all frames purchased were the exact same). The height of every drop was controlled because the higher an object is dropped from, the faster its speed will be the moment before it drops, meaning the piece of glass will have a harder impact when falling on the ground and be more damaged than a case which was dropped at a shorter height. The material was regulated due to the fact that some materials absorb shock better than others, the type of material could not change as it could skew results.

RESULTS

Figure 1 is a criteria which is used to quantify the severity of damages of pieces of glass when dropped. Refer to criteria for numbers in Table 1 and Table 2

1	2	3	4	5
Completely Shattered into Many Pieces	Many Cracks, Shattered into a Few Pieces	Multiple Cracks	Parts are Scuffed	No Damage Done

Figure 1: This criteria above is referred to as the “crack severity criteria”.

Severity of Drops at 50 cm	Case 1		Case 2		Case 3
Severity of Drop 1	5		4		3
Severity of Drop 2	5		4		3
Severity of Drop 3	5		4		2

Table 1: The table above refers to the severity of drops at the height of 50 cm.

Severity of Drops at 100 cm	Case 1		Case 2		Case 3
Severity of Drop 1	4		4		2
Severity of Drop 2	5		3		1
Severity of Drop 3	5		3		1

Table 2: The table refers to the severity of drops at the height of 100 cm.

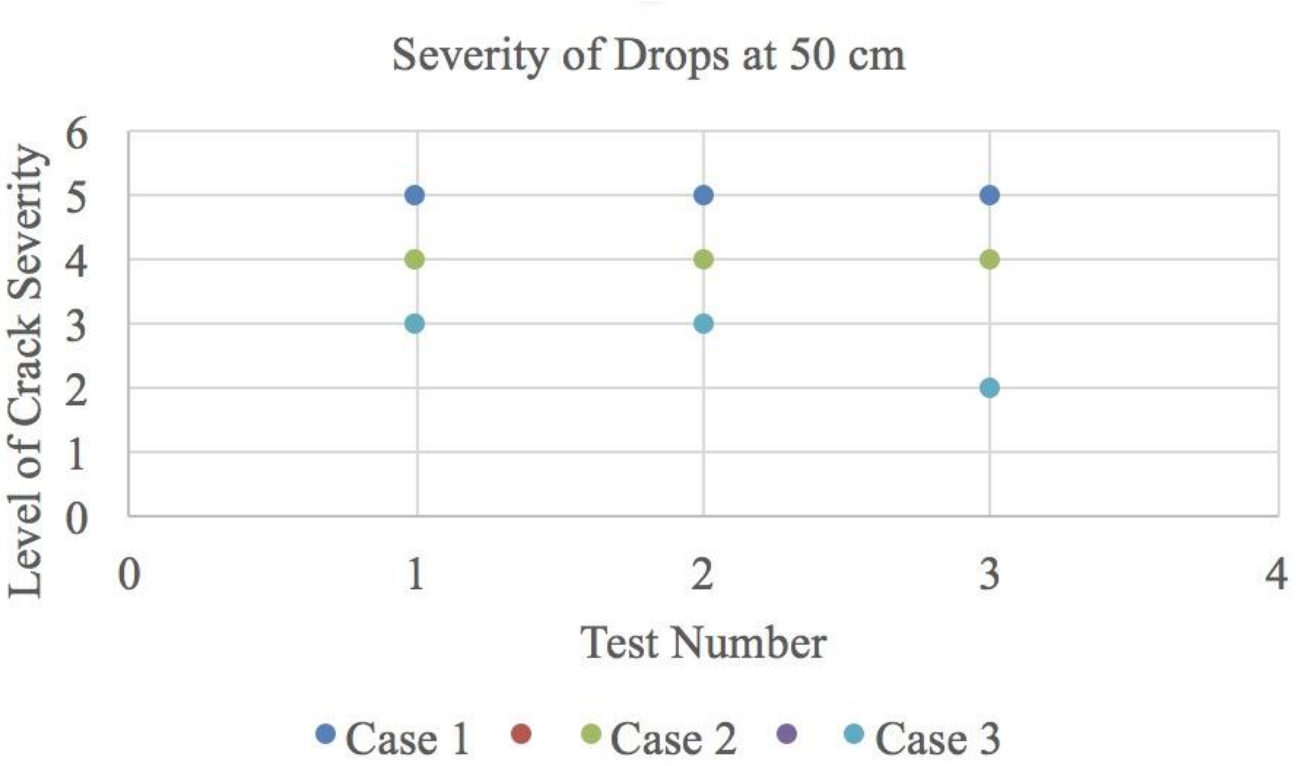

Figure 2: Graphical form of **Table 1**

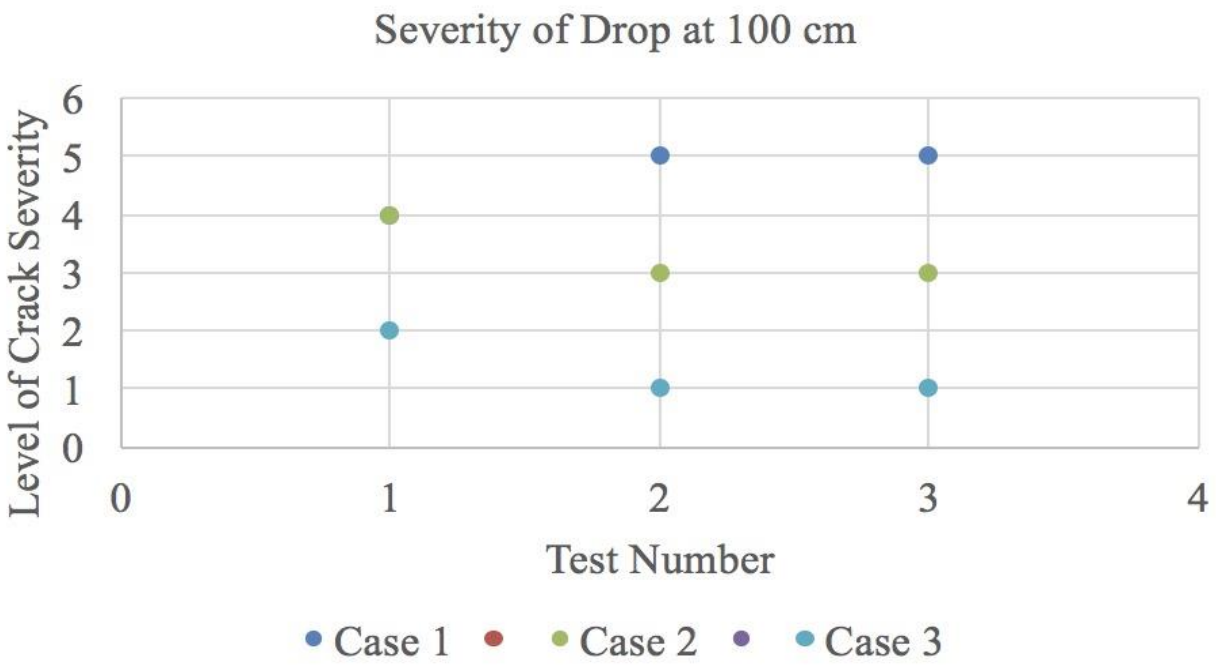

Figure 3: Graphical form of **Table 2**

	NUMBER OF TOTAL CRACKS
CASE 1	0
CASE 2	7
CASE 3	>15

DISCUSSION/CONCLUSION

The hypothesis is correct. The case which has its protective matter concentrated on the corners performed the best. In all tests, the first case design had no cracks but occasional scuffs. The initial problem was that when buying a phone case for the purpose of protection, cases would be bought which focus the protective matter on portions which served no functional purpose (determined to be anywhere but the corners). If case manufacturers focused all of their material on the corners of phones, lots of money could be saved. Most case manufacturers that promise the best protection bulk up the edges of their phone cases which can add unnecessary weight.

The results of the experiment proved that the design of the first case was the most effective

meaning that a device case manufacturer should focus the protective matter of the created cases only on corners. To minimize the margin of error, the same amount of material was used for all three case designs (114g – 118g) and it was observed that the third case was extremely obsolete and broke at every drop. This was because the protective matter was spread across a wide surface which left all parts of the phone prone to breaking as no spot was specifically strong. Although it did not perform the best, the second case was the most visually appealing and would be the perfect sacrifice, nice looking and moderately protective. The measures taken to ensure minimal error were that the material is the same on every case, the amount of materials which ultimately make up the final material were the same, the surface on which the pieces of glass landed on, and the technique of drop were all regulated as well. The slight difference in each case was that each case design used a different type of food colouring (case one used red food colouring, case two used orange food colouring, and case three used a light orange food colouring) due to the limited supply of food colouring.

APPLICATION

Now that it is determined that the best location to put protective matter is on the corners of a device, it must be pondered which case manufacturer is putting an excess amount of material on a product (Otterbox) or which case manufacturer is being efficient with materials by not putting protective matter on edges and back (Utomic). In the following images, Otterbox (Figure 4) focuses much the protective matter for its case on the edges, similar to case two (which was proven to be not as effective as focusing mass on corners), furthermore, Griffin (Figure 5) focuses substantially on the corners as well as a little bit on the edges (protective matter on edges proven to not serve any protective functionality) and finally, Utomic, which produces cases that only focus on corners (Figure 6). To a degree, both Griffin and Otterbox put protective matter on portions which are proven to be considered useless. This could be done for the sole purpose of having an excuse to charge a higher cost for a product (excuse being that there is more material).

Figure 4 **Figure 5** **Figure 6**

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Figure 4:

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Figure 5:

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Figure 6:

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The Reason For Poor NBA Team Performances

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Abstract

NBA Teams are very interesting. Some of them are amazing and some of them are bad. Fans of the NBA hate it when their team loses despite knowing that the team is bad. Why are these professional teams doing poorly and how can they be fixed?. À simple simulation using NBA2K could give these teams à clue on why their team is doing poorly. Setting the season standards at 82 games and turning injuries off is the best possible method of testing this experiment. The results that were acquired through this experiment provided some interesting details. Teams with à higher offensive rating had won on average 10 more games than teams with à higher defensive rating. Even if the teams higher offensive emphasis had à sub-par defense, they were still very successful. According to these findings, teams would prefer to look at the offensive stats or rating of à player when scouting rather than the Defensive rating and an offense that is more

Introduction:

This is a major problem within the NBA. Currently only five NBA teams have a legitimate chance at winning the championship. These five teams have at least 1 superstar player, therefore making the rest of the NBA and their fans watching their team lose multiple games. As fans want to find a method that helps smaller and weaker teams succeed without spending too much money or praying for the draft lottery. According to basketball reference, all of the superstars from the best team make the most money and therefore deprive other teams of their star power. An example are the Golden state warriors who finished with a record 67-15 while having 3 all stars in Stephen Curry, Kevin Durant and Klay Thompson last year while the Brooklyn Nets suffered a painful 20-62 record with their best player being Jeremy Lin.

The Cleveland Cavaliers are also one of the best teams in the NBA with a 51-31 record and losing just one game on their journey to the finals. Even though in the regular season they were ranked as 25^{th} overall in defense and at one point during the season they were dead last in defensive rating, but they were able to make up for it with their amazing offense. On the other hand, the Los Angeles Lakers had the 10^{th} best defensive rating in the 2016-2017 season while having the worst offensive rating in the entire league. How can bad NBA teams be more successful without superstar players?

if supposedly bad NBA teams who have a low offensive rating and a high defensive rating struggle to win games, then they could adjust their offensive playing style emphasizing offense and getting better offensive players, because it is statistically proven that offense wins games

A very good example are the Toronto Raptors, who in the past four years have struggled in the playoffs, mostly because of their offensive playing style. In the 2017-2018 the raptors have had their best record in history at the midway point of the season, because they changed their offensive playing style to emphasize passing and shooting. This is all despite not having Legendary Superstars.

Methods:

Select an NBA Team that has not made the playoffs and has struggled (Below .500) for at least 2 years (Ex: Phoenix Suns) And/orCreate an NBA Roster with a maximum of 1 NBA All-Star (Excluding Lebron James, Kevin Durant or Stephen Curry) and the rest must be from an NBA team that has been struggling. Set Season Standards. 82 game seasons, best of 7 playoffs and 3 playoff rounds.

Set up Independent, Dependent and Controlled variables (Listed below) Run at least 100 simulations per session for accurate results. (1 session = Approx. 1 week). Record Findings in separate Journal. Independent variable will be the Roster of simulated NBA teams, the Dependent variable will be the record or playoff success of each team and the Controlled: variable will be the Roster of unused NBA Teams and season standards

Results:

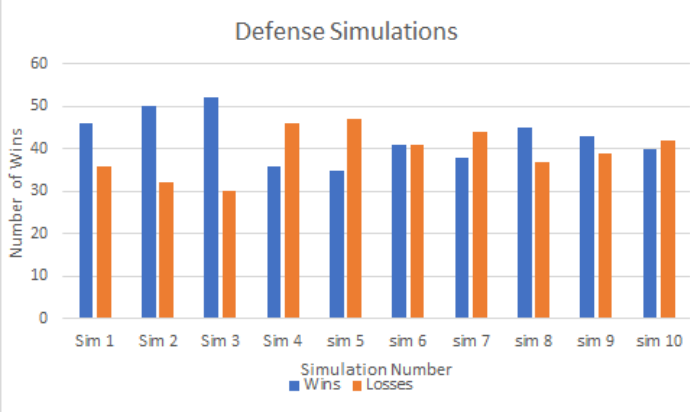

Figure 1 : The number of wins with teams with an offensive emphasis. 10 simulations. Blue represents the number of victories and Orange represents the number of losses. On average the Defensive teams won 42.6 games per season

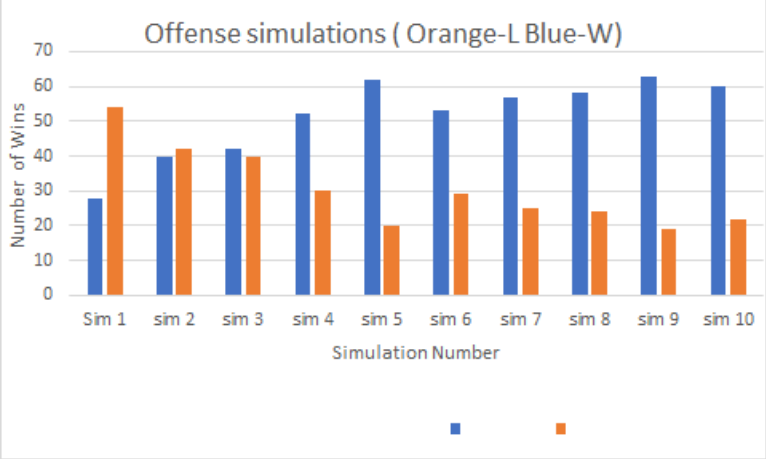

Figure 2: Teams with Higher Offensive emphasis. 10 simulations. Averaged about 52.5 wins pers season with the highest being 63 wins.

Discussion/Conclusion:

After approximately three weeks of these experiments of NBA Teams. The results suggest that Offensive Emphasis has a much bigger chance of future success. Most of the teams that were on the Offensive Emphasis consisted of players that are better shooters and offensive rebounders. This seems to be key as Offensive rebounds provide more opportunities for scoring. Another reason is the possibility of Offenses playing at a much faster pace. Even in the current NBA Season, there is a clear correlation between the pace(Possessions per game) and Wins Per game. The Rebounding teams often failed to even make the playoffs. A reason this may be is because rebounding teams require much more 'Big Men' (6'9 or Taller) for Rebounding shots. Due to the large amount of 'Big Men', they were playing much slower than most of the 'smaller' teams and were outscored.

This experiment did not completely satisfy the hypothesis that was suggested at the beginning of SCICAN!. The hypothesis was that teams that could gather more well rounded players would succeed. This did not work as there are not many well-rounded players in the NBA and is the reason the offensive teams did so well. The offensive teams still had some defensive ability and rebounding ability, but the defensive players had much weaker offensive game which lead to them losing often. The data shows that the teams with well-rounded players did mediocre as they averaged only a 60% win percentage. This may be because, although the players may be well-rounded offensively and defensively they did not have as much skill. In conclusion, superstar players are not necessary for a successful team, but can be the difference between contenders and champions.

Application:

The information found in this journal will be very helpful with basketball coaches. This information does not need to be NBA specific as it can be used for other teams such as high school or college basketball teams. Implementing this type of research in highschool or college will also help players have à better understanding for the game. NBA fans themselves can't do much other than spread the information out to coaches or managers of teams if possible.

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Correlation Between Book Genres and IQ-Measured Intelligence

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Abstract

The question this experiment is based around looks to investigate whether the book genre read by a person influences that person's intelligence. This is being tested because reading has been proven to affect a person's intellect, but no studies have been done to determine if the genre has a part in it. An IQ test is used to establish the intelligence of the subjects, along with a survey of preference of book genre. The results are that the more complex the genre, the higher the IQ of the subject. Various elements of a book are the reason for variations of intelligence. This information can be used by readers to figure out what books are best for intellectual stimulation.

Introduction

The purpose of this project is to find out how book genres correlate with intelligence. Reading is proven to have many benefits on the brain such as memory development and being able to focus easily (Reader's Digest). However, books are split up into genres and some studies have found that reading certain genres can improve the reader's empathy and emotional intelligence or EQ (Scientific American and APA PsycNet). This is important because since a person's EQ can be affected, it's possible a person's IQ can be as well, a valuable tool when assessing someone's intelligence.

The question is "How does preference of book genre correspond with intelligence?". The hypothesis is that if people read books that necessitate the use of imagination to visualize the story, then those people will have a higher intelligence, because the more a person visualizes and thinks about what is happening, the more that person's brain will be stimulated (Reader's Digest).

Methods

IQ is being used as a measure of intelligence because it accounts for some important parts of brain utilization and allows for quantitative comparison of results. Have the test subject take an IQ test with a time limit of twenty minutes. This IQ test should be of fifteen questions. Within the test, there must be questions that test spatial intelligence, short-term memory, processing speed, logical reasoning and mathematical ability. Record the score of each test. Ask what the subject's favourite genre is. Repeat these steps for each subject tested. All subjects must be of the same age and grade.

The independent variable is the test subject, which is changed to observe the results. The dependant variable is the IQ score. This is dependant on the test subject's preference of genre. The controlled variables are the IQ tests, the quiet working conditions, and the time given for the tests. The tests and time must be identical so it is a fair assessment for each subject. The working

conditions must stay quiet so subjects can attain the same level of concentration.

Results

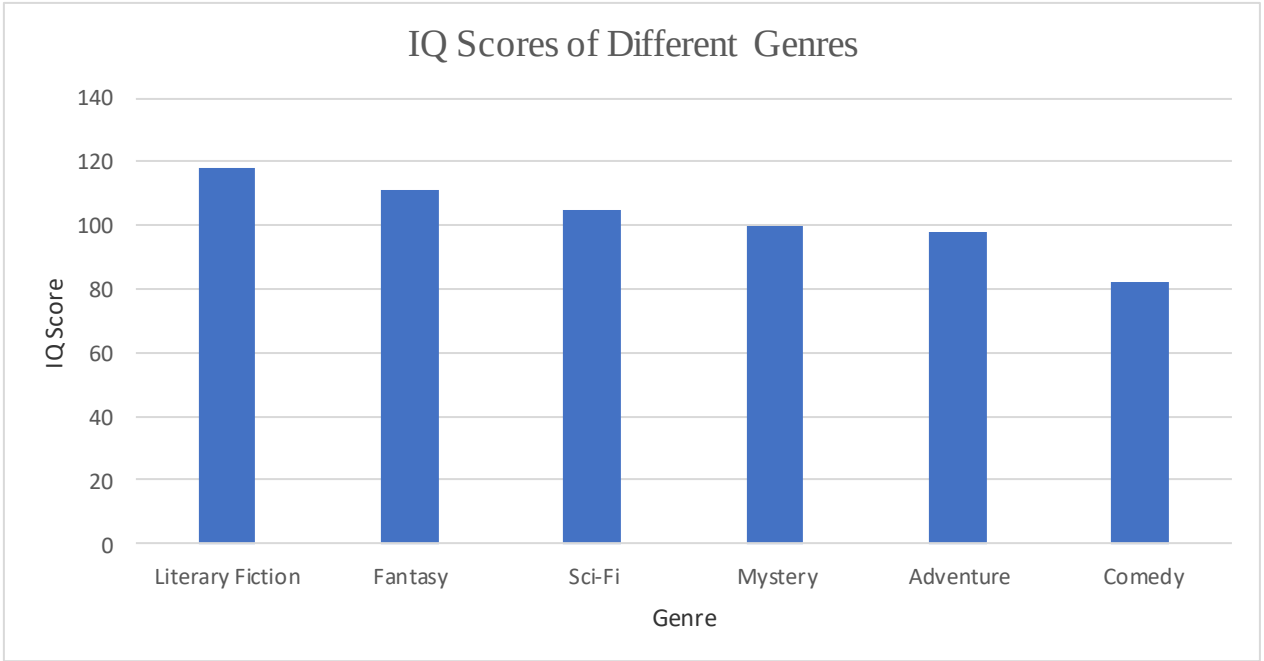
Table 1

Test subject	Genre	IQ score
1	Comedy	82
2	Adventure	98
3	Mystery	100
4	Sci-Fi	105
5	Fantasy	111
6	Literary Fiction	118

IQ Score and Genre

Table 1: IQ score and Genre separates all the data by test subject, genre and score.

Figure 1: IQ Scores of Different Genres compares the IQ scores of the book genres from highest to lowest



Discussion

The hypothesis is wrong since it predicts that genres that force a person to extensively use imagination would be the highest. Although Fantasy (111) and Sci-Fi (105) were the runners-up, both were bested by Literary Fiction (118). To answer the question, the data suggests that the more complex the genre, the more likely the reader will have higher IQ. For example, the highest IQ is from Literary fiction (118), which is very sophisticated because it analyzes the character's personality and motivations. On the other hand, the data proposes that Adventure has a lower score of 98 because it's often focused only action, and lacks the critical thinking (Literary Fiction, Mystery) or imagination (Fantasy, Sci-Fi) that other genres demand.

The genres become more intricate as the IQ scores go up, which could suggest a correlation. This relates to the original question that asked whether there was any correlation. Although the hypothesis was incorrect, the data does allude to some accuracy since the second-highest score was that of Fantasy, which does require visualization. No other investigations have experimented with this question but research consistently shows that reading develops the brain (Reader's Digest).

An issue with this investigation is that the sample size was very small. If the sample size is larger, the results would be much more reliable and would give a much better representation of the readers of each book genre

Application

Fields of study that deal with the brain, such as Neurology could benefit from this study. Information about which book genres stimulate the brain more could help with delaying cognitive decay and start more research on how to stimulate the brain. The public also could apply this information because the advancement of the brain is something of interest. The big picture here is that the brain is the most important part of the body, and these results provide an opportunity to improve its functions.

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Effect of Different Amounts of Social Media Usage on High School Aged Teenagers

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Abstract

This study aims to study how different amounts of social media usage affects metrics such as grades on high school aged teenagers, which is extremely important in the 21st century, as more and more time is being consumed on it. This is doubly true for high school aged teenagers, as they spend some of the highest amounts of time on social media. This study has been conducted by sending a survey to Vincent Massey Secondary School through the e-learning platform 'Edsby'. A Python program was written to analyze the data. This study has found that teenagers who were the happiest were those who went on social media the medium amount, and the teenagers with the best grades were the ones who went on social media the least amount. This data confirms the fact that social media is not necessarily unhealthy if used in a moderate amount but could be dangerous if used too much. This is possibly because social media starts to interfere with school work and other tasks as it is addictive.

I. Introduction

Teens are spending more and more time every day on social media, and 24% of teens self-identify as going online "almost constantly", and it is still not well known what the effects of that is. There has been a study (Wolpert 2016) done on social media by UCLA that shows teens are more likely to "like" a post if it has received many likes. This kind of behavior, along with the fact that face-to-face interactions are decreasing could have potentially drastic effects on teen behavior and social interactions (Ehmke N.d.). Fully understanding the effects of social media is necessary for understanding how teens behave, when they consume large amounts of social media. This study aims to survey the effects of social media on happiness and grades. If teenagers consume less social media, then they will be more likely to be happier and have better grades. If teenagers use more social media, they will have worse grades and less happy lives. This is because social media is addictive and presents an unrealistic window in to others' lives, and time spent on social media takes away from time studying, which will result in lower grades.

II. Method

First, a short survey that takes under 30 seconds to complete will be created to prevent potential survey

takers from leaving due to a long survey length. Questions that are asked include: Gender, Age, How often do you go on social media?, Which social media sites/apps do you primarily use?, How satisfied are you with your life, How well are you doing in school? (Grades). Then, questions that measure happiness, and mark averages in school will be collected. Non-identifying personal information such as age and gender will also be collected. The survey will be sent through Edsby School Talk to reach as many people as possible. A Python program will then be created to analyze data and return the average scores of each of Average Marks, Life Satisfaction for each of the social media usage amount categories. Finally, a graph will be created for each Average Marks, Life Satisfaction. Average scores will be analyzed and conclusion of effect of social media will be drawn. The independent variable is the number of hours of social media per day, this is because the purpose of this study is to measure and study the effects of different amounts of social media usage. The dependent variable is the rating of happiness and grades, this is because these variables are what the study will use to compare the effects of different amounts of social media usage. Finally, the fixed variables would be the place where the survey is taken, because if the survey was taken in different places, it can affect the data. For example, if the survey was given both offline and on Facebook, those who are on Facebook potentially spend more time on social media than those who took the survey offline. Age and gender will also be controlled for if a noticeable difference is found.

III. Results

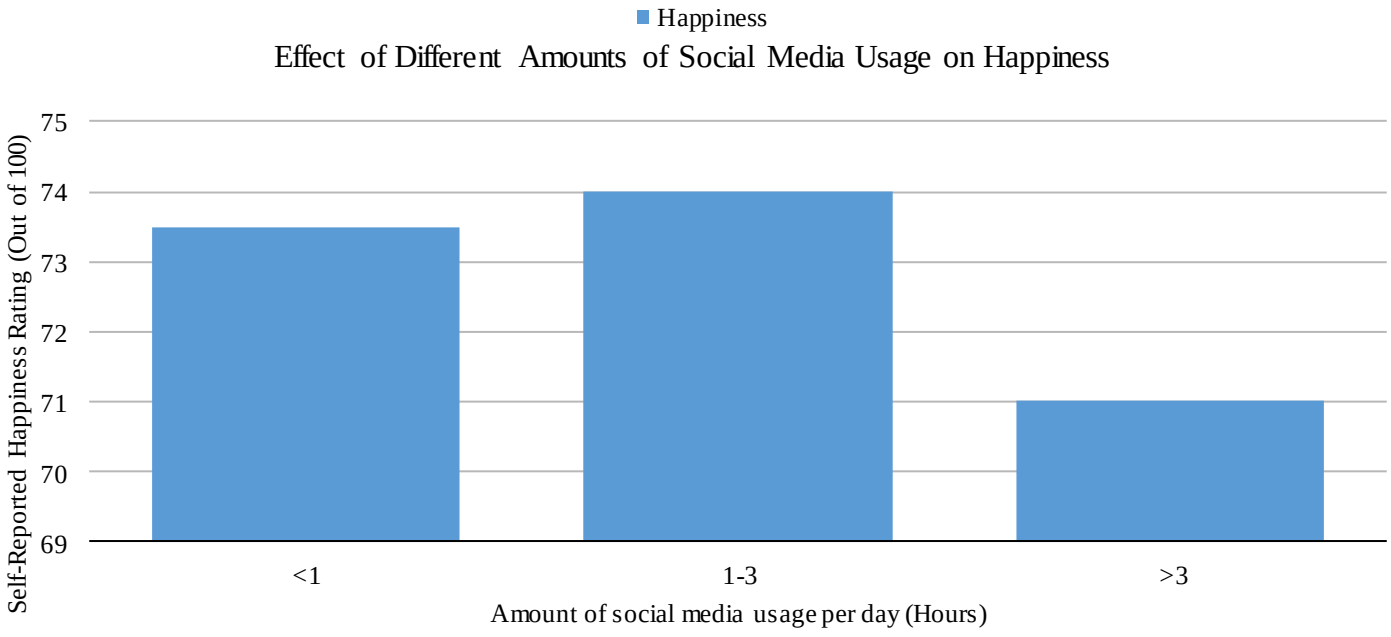

Figure 1: A bar chart showing the effects of different amounts of social media on self-reported happiness.

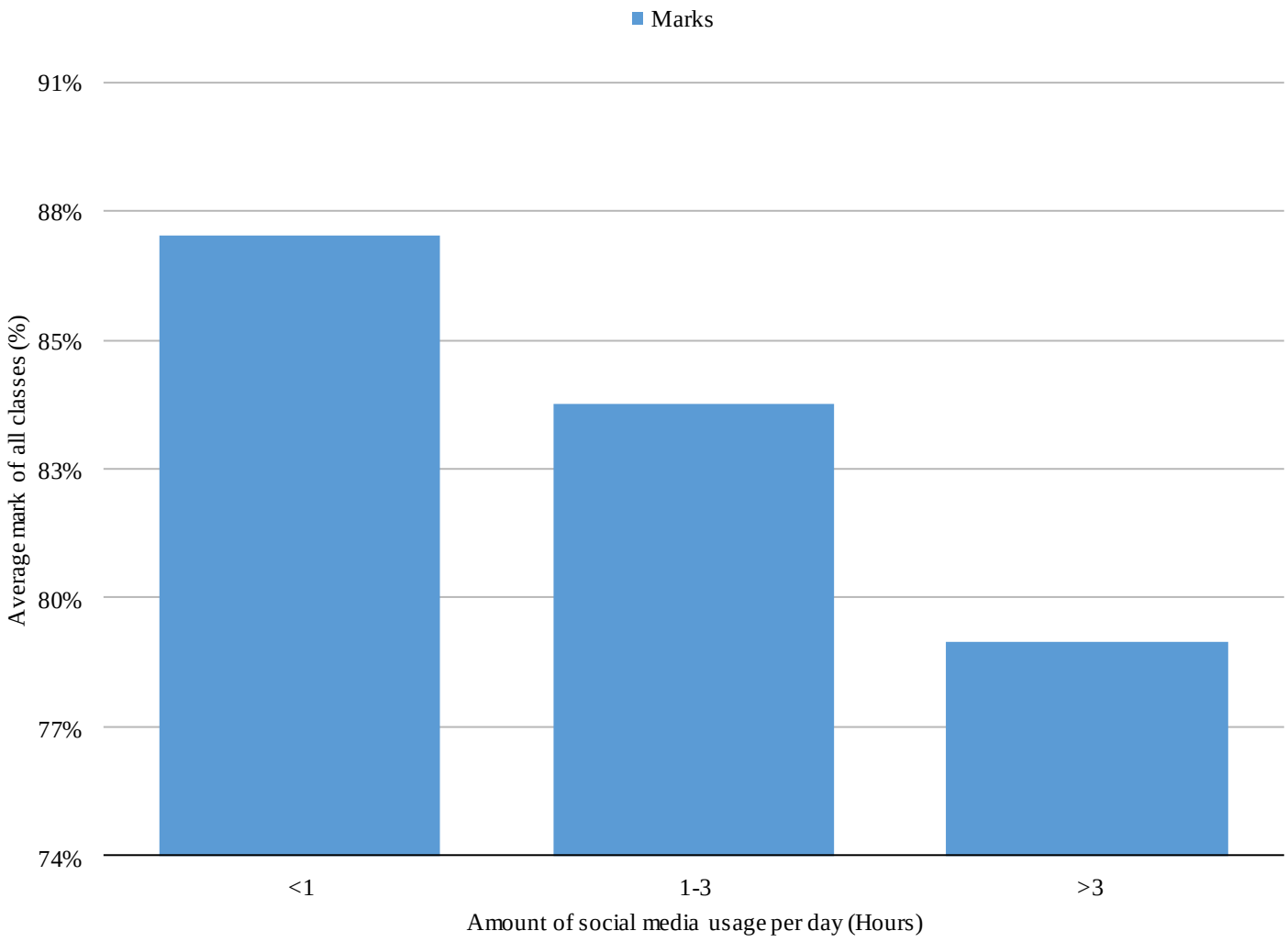

Figure 2: A bar chart showing the effects of different amounts of social media usage on the average of all class marks.

The results of this study shows that teenagers who go on social media for less than one hour per day had the best marks, those who went on social media for between one to three hours per day had the second highest marks, those who went on social media had the lowest marks. (Figure 1). The teenagers who went on social media for less than one hour had the second highest happiness rating, and the teenagers who went on social media for between one to three hours had the highest happiness rating, and those who went on social media for more than three hours had the lowest happiness rating (Figure 2).

IV. Discussion/Conclusion

The hypothesis was partially correct as it was said that those with less social media usage would have the most life satisfaction. This was proven to be false (Figure 2), as those with medium social media usage had the highest life satisfaction. An explanation for this is that those with little social media usage don't socialize enough, which is important for life satisfaction. Heavy social media usage was predicted to result in the lowest life satisfaction, and this was proven to be correct by the data. This can be explained by the fact that over usage of social media causes a person to feel bad about themselves due to comparing themselves with others. The prediction of marks based on social media usage was proven to be correct. This is logical as those who do not engage in extensive social media usage will have more time to study and/or with less distractions. The initial purpose was to determine the effects of extensive social media usage on teens. That has now been answered by comparing the average scores for 'Life Satisfaction' and 'Marks', the survey has indicated that extensive social media usage leads to low life satisfaction and poor grades, while a light to none social media usage leads to the best grades, but not as good life satisfaction compared to medium social media usage. A tradeoff will have to be decided between life satisfaction and marks, which is a personal decision and beyond the scope of this project. It can be seen from the data that those with light to none (<1 hour per day) social media usage had the highest marks out of the categories of '<1 hour per day', '1-3 hours per day', '>3 hours per day'. Medium (1-3 hours per day) social usage followed very closely with only a difference of 0.36/100. Heavy (>3 hours per day) social media usage had a comparatively heavy drop-off of 1.58/100. In terms of life satisfaction, medium social media usage had the highest reported life satisfaction score of 73.92/100, which was then closely followed by light to none social media usage with a score of 73.50/100. Again, heavy social media usage had a large drop-off down to 71.64/100. This study did not account for the fact that it was submitted through Edsby, a type of social media, which could have affected the balance of results. This is because frequent users of Edsby logically have a greater chance of caring more about their marks, while simultaneously spending more time on social media, thus affecting the results.

V. Application

The results of this study can be applied to fields of studies such as adolescent psychology. Knowing how teenager's grades and happiness react to different amounts of social media usage allows for deeper studies to target and research why those effects such as medium amounts of social media usage causes the highest happiness rating occurs. Not only is this research significant to other researchers, it is also of interest to the general community. Many parents of teenagers are concerned about their child's social media usage, as this research presents a new train of thought that contrary to popular belief, some social media usage

might be beneficial to happiness. The importance of social media to society at the present is undeniable, more and more of the world is now occurring in the digital sphere. Understanding the physical and mental effects of social media on teenagers is crucial, especially as more and more time is being spent on it, with 92% of teens reporting going on social media daily (Lenhart 2015), and as access to internet further increases around the world.

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Exploring the Uses and Ways of Potential and Kinetic Energy by Making a Fish Feeder

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ABSTRACT

Potential and kinetic energy are forms of energy that are more common and useful than most think, and can be used to create things like a fish feeder. Making the fish feeder was a complex process using various material skills such as: pipes, wood, elastics, an air dart, a plastic spoon, a marble, and tools. The materials are then put together in a way that the user starts the feeder making the air dart hit the marble in the spoon, which falls down the pipe and hits the box holding the fish food, dropping it into the fish bowl. Creating this fish feeder shows the ways and how energy can be used for numerous things in the world today.

INTRODUCTION

This project works with potential and kinetic energy and establishes its different ways and uses. This way of physics can cause one to notice the multiple ways it can be included into the life of any person by becoming a solution towards problems and reassuring the lives of future generations. Physics is also called “the fundamental science” because of its way of helping create theories and successful experiments related to the numerous other topics similar to potential and kinetic energy, many of which are beneficial to people and will causes small but extremely effective changes to one’s life. The purpose of this experiment is to learn how to use potential and kinetic energy to creatively make a fish feeder that is started by the user and goes through various steps before eventually dropping the fish food into the bowl, showing the possibilities and goals that can be achieved by using potential and kinetic energy. If height effects the amount of kinetic energy that is released (from potential energy

gained), then a certain height should allow the ball to fall and to gain and release enough energy to drop a decent amount of food into the bowl. This is because the height increases the amount of potential and kinetic energy with respect to the center of gravity which is where the total weight of the body may be thought to be concentrated. A “dropped” object converts its potential energy obtained from its height into kinetic energy as it accelerates. Therefore, the greater the height, the more kinetic energy will be released. (Sarah Friedl 2003-2018)

METHODS

Creating this fish feeder starts by cutting long pieces of wood, that are in the shape of rectangular prisms. Cut two 26cm long ones, one 36.5cm long one, one 17.5cm long one, two 93cm long ones, and one 84cm long one and put a hook on each of the pieces with lengths 26 and 93cm approximately 2 cm from top. First glue the two 26cm ones against the edge of a wooden base and the 93cm ones 28.5cm from the same end with both pairs 4 cm apart on either side of the center line of the base. Then glue the 17.5 cm one 21cm from the same end and 0.5cm from the center line, the 84cm one 45cm away from the end and 2cm away from the center line, and the 36.5cm one 8.5cm from the same end and also 2cm away from the center line. It is best to put all the pieces that are individual and do not have another piece the same length as them on the same side of the center line. Take the small wooden slabs/pieces and use pivot arrangements (one on each side) to connect one to each of the pairs of wood that are 26cm long and 93 cm long. Then use elastics to connect the fish food box to the platform on the 26cm piece and the spoon to the platform on the 93cm piece by putting it around the slab and spoon or box, along with using another elastic to put around the slab and bring around the hook. Bring the pipe to the top of the 84cm tall wooden stick and curve it a bit towards the spoon. Lead the pipe towards the fish food box and use clamps and duct tape (put along 17.5cm and 84cm long wood pieces) to secure it and keep it in its proper position. One place a clamp is needed is right underneath the slab with the fish food (on the 36.5cm tall piece) where the pipe will end. Some other possible places for the clamps and tape are close to the top of the 17.5cm tall piece of wood and along the 84cm long piece. Connect the funnel to the top of the pipe where the marble falls. It is important to make sure that both ends of the funnel are big enough for the marble to fall through. Stick the stand of your dart to the 17.5cm long wood piece and make sure to angle it towards the small wooden slab that holds the spoon. Put the marble in the spoon, push down on the pump of the air dart and watch the feeder do its job.

The independent variables in the experiment are: the structures and objects leading to the food being put in to the bowl – the objects do not change their state or use in any way. They constantly remain the same and are used that way as well. The dependant variables are: how one obstacle triggers the next or another, and how each of the obstacles works and uses the potential and kinetic energy based off of the obstacle that was before them. The controlled variables are the fish food, materials, and what obstacles are part of the overall experiment.

Where each of the wooden pieces are in the diagram:

Dart stand – 36.5cm

Pipe support – 17.5cm

Pipe start and beginning support – 84cm

Marble stand – 93cm

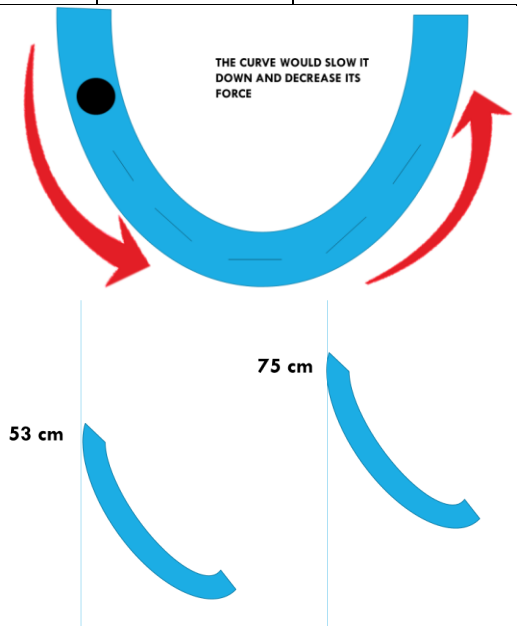
Fish food box stand – 26cm

RESULTS

Table 1: Observations of the Pipe that the Marble Falls Down

Trial #	Description	Outcome/Results
Trial 1	Pipe starts at a height of 53cm and has more of a shallow curve. Pipe goes all the way down and against the bottom wooden platform before curving back up towards the feed box	- Hits feed box with very little force - makes very little amount of food fall out. - Sometimes barely touches the feed box - Elastic around the feed box does not cause to much of a tightness - Pipe is sturdy and stays in place
Trial 2	Increased height at which the ball starts falling to 75cm. Pipe still goes down all the way and is against the wooden platform before curving. Curve sharpens very slightly because of the pipe being pulled up.	- Hits feed box and makes more food fall out than in Trial 1. - Box moves as if it was hit with more force – ball hits it harder. - Elastic around the feed box does not cause to much of a tightness - Pipe is sturdy and stays in place
Trial 3	Kept height where ball started at 75cm. Created a sharper curve for the ball by not making the pipe go all the way down to the wooden platform and raising it up by holding	- Hits feed with a good amount of energy - drops a good amount of food in the bowl (more than in Trial 2). - More force hits the box and - Elastic around the feed box does not cause to much of a tightness - Pipe is sturdy and stays in place

	so the ball has to travel less of a distance up after it falls from the top and reaches its lowest point.	



Observations of other parts of the experiment that didn't really include as much potential or kinetic energy:

Table 2: Adjusting the Stand Holding the Marble at the Top of the Slide

Trial #	Description	Outcome/Results
Trial 1	Wooden platform measuring 8.5 cm with a plastic spoon taped on top. The handle against the wooden surface and the part of the spoon that holds the food sticking out and adding 6cm. This part of the spoon will hold the marble and leads in to the pipe that the marble will fall down.	- When the end of the wooden platform (end with out the spoon) is hit with the dart, there is not enough force to allow the marble to fall out of the spoon and down the pipe. - It moves but remains in the spoon. - Does not bend forward enough to allow the marble to fall
Trial 2	Kept the structure of the wooden platform and spoon the same but added on popsicle sticks to the end. Taped four of them together along their long side and glued it to the wooden platform.	- When the dart hits the platform holding the marble, the marble is able to fall out of the spoon and down the pipe. - Rest of the steps continue smoothly

	Added about 8cm to the overall length of the structure holding the marble.	

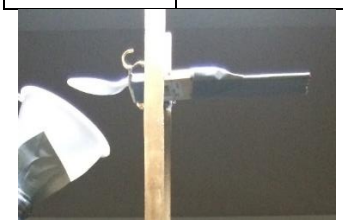
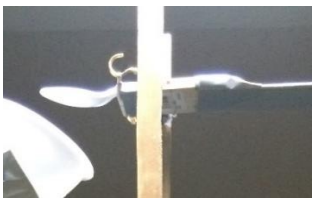


Table 3: Tightness of Elastics Affecting the Movement of the Fish Food Box

Trial #	Description	Outcome/Results
Trial 1	The elastic was twisted a few times before being put on to the hook to tighten the grip on it and hold it in place.	- The box was difficult to move - Required more force to hit it enough (so fish food would fall out) - Felt as though there was lots of tension and stiffness when it was moved
Trial 2	Decreased the number of twists in the elastic(s) before placing it on the hook	- The box was easier to move - Flowed a lot better when it moved - Required less of a push from the ball to get a decent amount of food out



There are also other basic things that require trials and experiments. The tightness of the elastic connecting the fish food box to the two poles holding it up – changing the tightness by twisting (to tighten) or untwisting (to loosen) the elastic. The tighter the elastics would be, the more force it would take from the ball to hit the box enough and make the food fall out.

DISCUSSION/CONCLUSION:

Building a fish feeder that is started by the user and goes through various steps to eventually drop fish food into the bowl, proves that the hypothesis of height affecting the amount of kinetic energy released and that there is a height measurement that allows the ball to drop a good amount of food in the fishbowl, was true and possible. The result of the collected data proves that when the height is increases, it releases more kinetic energy and therefore the ball hits the food box harder because the greater the height, the more food would fall in to the bowl. It also proves that having

the longer curve leading to the fish food decreases the amount of energy and force the marble releases by the time it reaches the food box. Whereas having a shorter curve allows the ball to keep its energy and hit the box with more force. Getting the correct measurements requires testing by increasing or decreasing the height at which the marble begins to fall at and finding which height allows the marble to gain enough force to drop a decent amount of food into the bowl. Increasing and decreasing the height is what proves that the potential and kinetic energy changes and that in the case of the fish feeder, the height that causes the most productive fall and drop of food is the height of 75cm.

These results show an accomplishment of the original purpose and proves that the use of potential and kinetic energy is possible. The experiment and results prove two major things. The first which connects back to the known fact of how the greater the height that the ball starts falling from, the more fish food falls from the box and into the bowl is that there is a height that allows the ball to hit the fish food box and drop a decent amount of food into the bowl with the design of this feeder – 75cm. The second major thing is that when the curve at the end of the tube that the ball goes through changes, it also affects the force of the ball. At first the curve is longer and continues all the way down, touching the base of the fish feeder and then resuming its way up until it reached the fish food. The other way it was set up was that the curve was quicker and shorter so that it also shortens the distance the marble has to go against its original path. It goes up to the box before touching the base and makes the point where the marble and fish food box meet a lot closer to the end of the curve (shortened the distance the ball had to go in an upward direction). With this change, the curve is much more effective, and more food falls into the bowl. This data and the experiment supports the hypothesis by proving that there is a specific height that allows the ball to gain enough force to hit the box and drop a good amount of food and also by proving, based off of previous research and results, that the height affects the force the ball gains and hits with. (Kidz World 2017)

APPLICATION

Potential and kinetic energy are only a few of the many different examples of energy that are common in everyday lives, and with a little creativity it is possible to take these ways of energy and turn them into things that the world can get the most of whether it's for plants, animals or people. Building this fish feeder shows just a teensy example of how far one can go when they have the knowledge they need. From expanding the use of renewable energy sources, to finding a possible substitute for gasoline, to preventing the destruction of natural resources. The number of ideas that these concepts can be used for are endless and with a lot of dedication and a hint of creativity, it can make a

difference. On can never forget that just like the energy, every person has potential!

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Comparing Python, Java and C++ under the Identical Command

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Abstract:

There are thousands of programming languages in the world each made to perform a specific task. It is very important to understand their differences in order to select the most appropriate language when inventing software. This experiment runs several programming languages under identical functions to compare each language's pros and cons. The result of the experiment shows Python is comparatively worse than Java and C++ in terms of the fluency of the program, which proves the hypothesis to be incorrect. The result of the finding also teaches a lesson of to not judge a program by the simplicity of its code structure.

Introduction:

The purpose of this experiment is to recognize that different types of programming languages are made for different purposes; some work best in creating simple programs use within the computer like Java and Python, others are meant to code robots such as C and C++. Programmers should be aware of the differences between the languages and choose the one that best fits their project.

Which programming language in the experiment causes the most harm to the computer?

If a language is generally used to program devices outside of a computer, then it will cause the most damage to the computer because these languages tend to be realistic. For example, C++ assign specific address to store each value. However, values such as integer 1 cannot be exactly represented in the memory but is instead stores in bits such as 0.99999999451. This complexity of the program may require more memory usage, therefore causing more harm to a computer.

Methods:

Experiment 1:

Set up a while loop for Python on Repl.it with a variable called x that has a value of 0, and for every loop it runs, it adds 1 to x and outputs x's current value. The computer use in this experiment should be an old, outdated one to maximize the difference between the results. Restart the computer, and login onto Repl.it to set up the code. Record the percentage of memory usage before the code is run. Run the code and start a timer counting down from 60 seconds simultaneously. Once the timer reaches 0, stop the program and record the x value as well

as the increase of the percentage of memory usage.

Comparisons Between Python, Java, and C++			
	Python	**Java**	**C++**
Loops ran in 60 seconds (Computer 1)	#1. 0 #2. 15648 #3. 0	#1. 1268419 #2. 1332829 #3. 1334199	#1. 1572330 #2. 1478048 #3. 1451508
Maximum memory increased in 60 seconds (Computer 1)	#1. 11% #2. 11% #3. 12%	#1. 12% #2. 14% #3. 16%	#1. %16 #2. %16 #3. %17
Did it crash (Computer 1)	#1. YES #2. YES #3. YES	#1. NO #2. NO #3. NO	#1. NO #2. NO #3. NO
Time (in seconds) takes to output 300000 lines (Computer 2)	#1. 147.29 #2. 177.69 #3. 185.71	#1. 30.96 #2. 38.17 #3. 30.64	#1. 19.40 #2. 16.83 #3. 18.35
Did it crash (Computer 2)	#1. YES #2. YES #3. YES	#1. YES #2. YES #3. YES	#1. YES #2. YES #3. YES

Repeat the above procedures two more times then switch to Java and C++ with the same amount of experiment.

Experiment 2:

The computer use in this experiment should be a new, recently released one to prove the solidity of the results, showing a pattern that occur in every computer. Restart the computer and set up the identical while loop as in Experiment 1 for Python on Repl.it. Run the code and start a timer counting from 0. Once the x value reaches 300000, stop the timer and record the time. Repeat the above procedures two more times then switch to Java and C++ with the same amount of experiment.

The independent variables in the experiment are Python, Java, and C++. Dependent variables are the amount of lines output in 60 seconds, the percentage of memory usage increase, and the time it takes to output 300000 lines. The control variables in the experiment are the computer and the codes for each programming language. The computer must be control because the fluency of each program will be different if they are test with different computers, therefore causing the result to be inaccurate. The codes also need to be control because if the languages are not performing the same function,

then the comparison between the results will be irrelevant to the purpose of this experiment.

Results: Table 1

Figure 1- This graph shows the number of loops ran in 60 seconds of Python, Java, and C++; numbers on the left represents the number of loops.

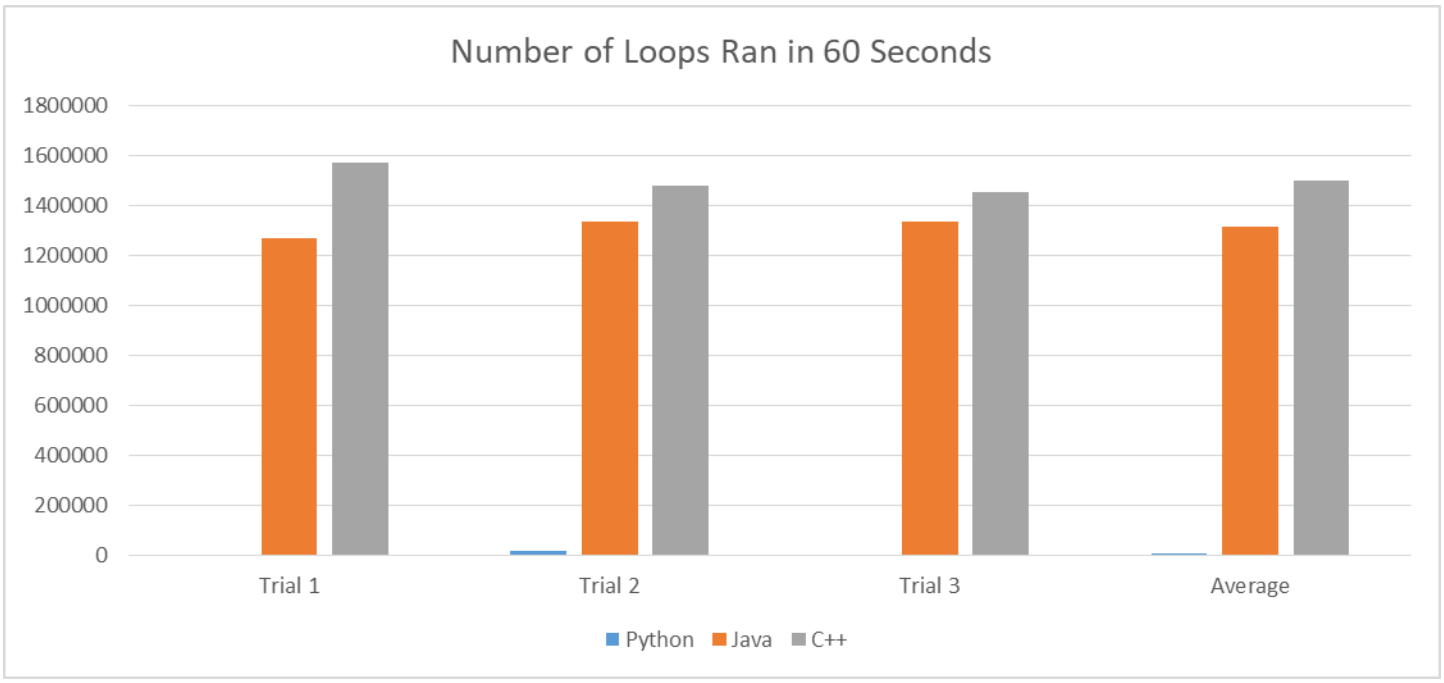


Figure 2 – This graph shows the maximum percentage of memory increase in 60 seconds of Python, Java, and C++; numbers on the left represents the number of memory increase in percent.

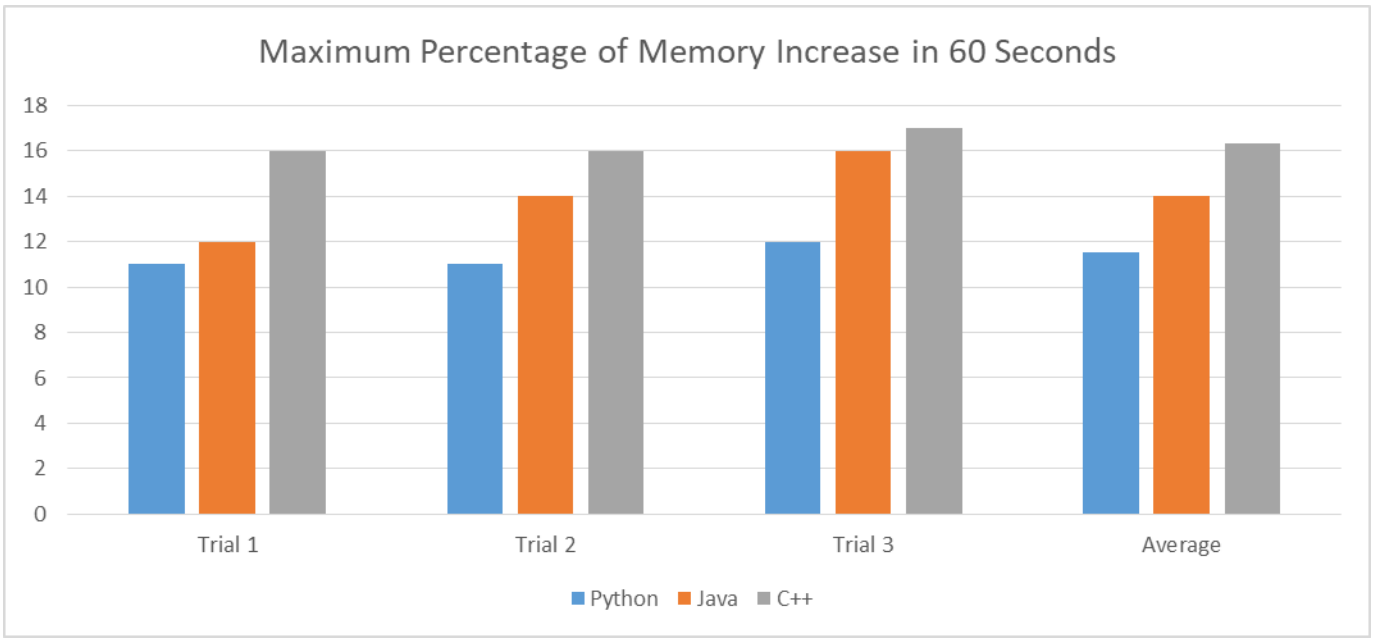
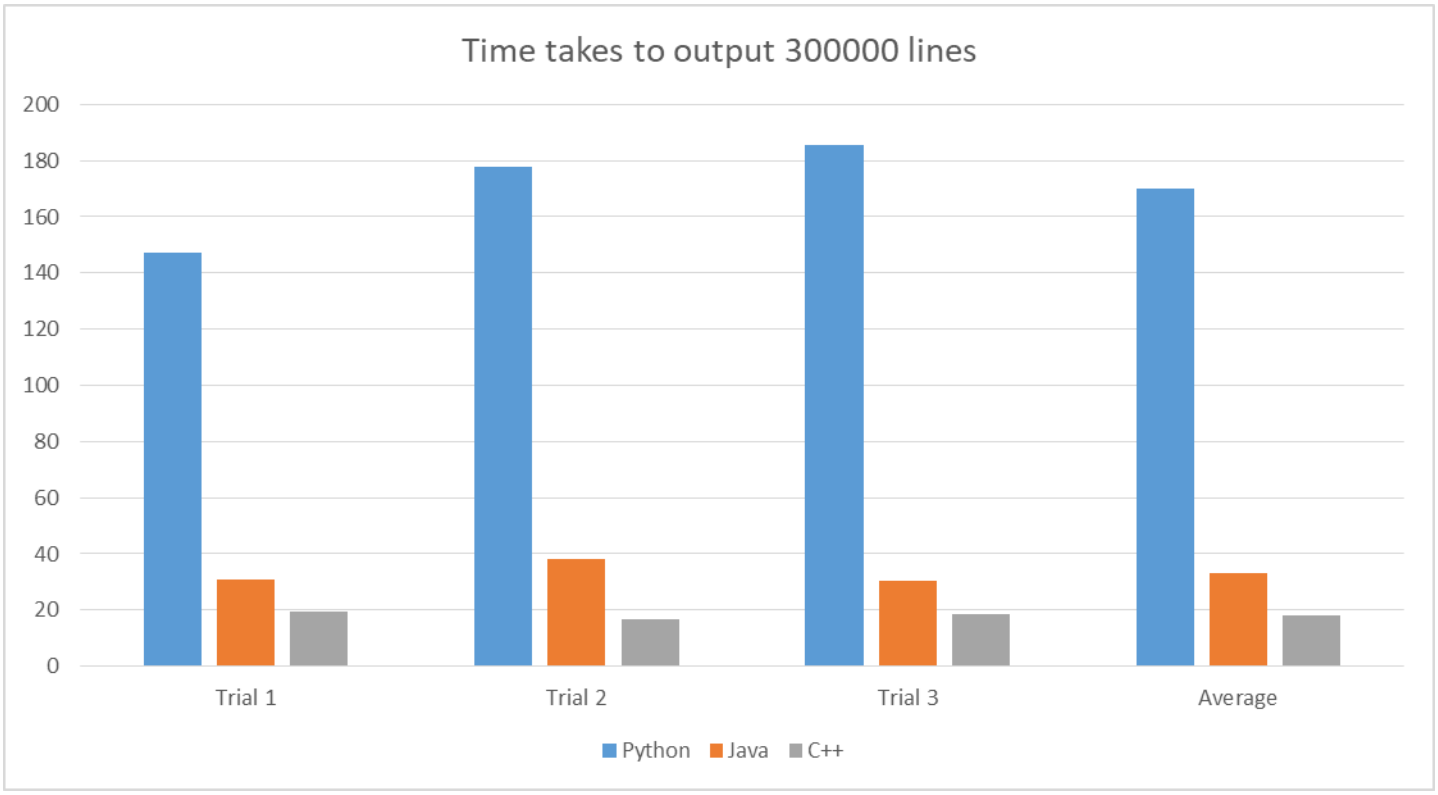


Figure 3 – This graph represents the amount of time takes to output 300000 lines of Python, Java, and C++; numbers on the left represents amount of time in seconds.



Discussion/Conclusion:

The hypothesis is incorrect because even though C++ is mainly use to program technologies outside of the computer, the results prove that C++ in fact causes the least harm to a computer (outputs ~1500000 lines in 60 seconds fluently), while Python on the other hand, is the one who does the worst in this experiment (crashes during the trials, takes the longest to output 300000 lines). Therefore, the experiment concludes that it doesn't matter whether if a language is targeted specifically toward computers or not. Every program is different, and the internal interaction inside the program has no relation to its apparent code structure.

By looking at the data gathered in laptop #2, Python took a significantly longer time (2 min 45 sec) to run (300000 lines) when comparing with Java (35 sec), who was also slower than C++ (18 sec) in general. With this in mind, it made sense for Python to crash in laptop #1 while the other two languages did not, since Python in the experiment let the already struggling laptop even slower to a point it could no longer be running properly. C++ had the most memory usage (16%) in laptop #1 not because it caused the most harm to the computer but instead it ran the most lines. Overall, although C++ used up the most memory, it causes the least harm to the computer; and with Java in the middle, Python is the program that causes the most harm to a computer.

Analysing the results gather in computer 2, Python took a significantly longer time (2 minutes and 50 seconds) comparing with Java (33 seconds) and C++ (18 seconds) when asking them to output the same amount of lines. The results gather in computer 1 makes it seem like Python uses the least memory when running (11.5%), but the fact that it crashes repeatedly makes the statement unlikely to be true, and instead, a more preferable possibility is that Python has the least percentage of memory increase in computer 1 because it does the least amount of work, on the other hand, C++ acquires the most memory usage (16%) not because it does the most harm to the computer, but instead it runs the most lines. Overall, the order of harmfulness from the greatest to the least is Python, Java, and C++, proving the hypothesis to be incorrect.

Some problems are occurring during this experiment to make errors, one is the timing of pressing the timer, which causes the results to be different in terms of few seconds, the other problem is the fact that the condition of each computer can never be the same throughout the entire experiment, because there are times when the computers just lag for no reason, or the Wi-Fi is interrupt while running the program. The above problems do change the results by a little bit, but because the purpose of this experiment is targeting a general pattern in each program, these errors are too little to be consider.

Application:

The information discovers in the finding is useful for computer scientists, because they can now compare the languages and pick the one that works best with their project. For example, a computer science lecturer may choose Python as a beginner language to teach his/her students, while a university student may choose C++ as the core language for his/her robotics assignment. If this experiment is continuing with more programming languages being compare, it can create a well-organized system for the entire community to view, so that every individual is able to select the most fitting language for their use of teaching, researching, or inventing, and is ultimately very beneficial.

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Effects of a Plant-Based Diet on the Human Body

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Abstract

The question investigated was how eating a plant based diet and omitting animal products can affect the health of the human body. The importance of this experiment is to improve a person's health and potentially decrease the chances of experiencing certain diseases such as heart disease, diabetes and other illnesses that can be related to eating habits. The experiment was conducted on three people of the same family throughout the course of three weeks. The amount of animal products consumed gradually decreased throughout the first two weeks and on the final week all foods consumed by the subjects were plant based. No significant changes were yielded and all subjects felt no difference in their health. Results could have been different and more precise if the experiment was prolonged and further measurements such as blood levels were tested.

INTRODUCTION

The purpose of this project is to determine if there is a way to improve health and limit the risk of experiencing serious illnesses by changing the way a person eats. Many people are experiencing serious and life-threatening diseases such as heart disease, diabetes and cancer and these may be linked to the types of foods consumed. Processed foods and many animal products that are incorporated in the diets of many people today are generally high in saturated and trans fats and include chemicals and harmful ingredients. (Golden, 2015). Very little foods consumed have nutritional value such as a wide variety of whole grains, nuts and seeds and fruits and vegetables. These foods are very nutrient dense and full of essential vitamins, minerals and fiber that are beneficial to the human body and contain antioxidants that may lower the risk of various health problems including high blood pressure, diabetes, heart disease and obesity (Tuso, Ismail, Ha, and Bartolotto, 2013). The question is how eating whole, plant based foods and omitting animal products can improve how a person feels and their overall health. The hypothesis is that if a person follows a diet consisting of whole, plant based foods, then their overall health will be improved because these foods are more nutrient dense, and contain many essential vitamins and minerals for a healthy body. Plant based foods are low in saturated and trans fats, and are also free of cholesterol, which are factors that contribute to chronic disease (Melina, Craig and Levin, 2016).

METHODS

The experiment was conducted for three weeks on three people of the same family. The weight and height of each subject were measured as well as their state of health. During the first week, one of three meals eaten was completely plant based, and any additional foods consumed contained no animal products. All foods consumed each day of the week were recorded. After the first week, the weight, height and how each subject felt physically and mentally were recorded as well as any new changes that had occurred during the first week. During the second week, two of three meals eaten were completely plant based and contained no animal products as well as any additional foods consumed. All foods consumed each day of the week were recorded. After the second week, the weight, height and how each subject felt physically and mentally were recorded as well as any new changes that had occurred during the second week. During the third and final week, all foods consumed by subjects were plant based, and no animal products were consumed at all. All foods consumed each day of the week were recorded. After the final week, the weight, height and how each subject felt physically and mentally were recorded as well as any new changes that had occurred. The independent variable was the diet, the dependent variable was the physical and mental changes in the subject's health and the constant variable was the person being tested and their overall lifestyle. These were controlled so that the results would be more precise and true. If one person's lifestyle were to suddenly change during the experiment, the effects of the experiment may be altered from before and would not be reliable.

RESULTS

Results show that no significant changes had occurred in any of the subjects. All subjects incorporated more whole foods, fruits and vegetables into their diets throughout the three weeks of the experiment.

Nov. 24	Breakfast	Lunch	Dinner	Snacks
A	-porridge (soybeans, whole grains, nuts, seeds, red dates) -whole wheat bread	-radish pastry -cucumber and tahini -roasted asparagus	-salmon -avocado and tomato salad -noodle soup	-nuts and fruits
B	-whole wheat bread with banana and peanut butter	-2 egg rolls with vegetables -cucumbers with hummus	-salmon -noodle soup	-vegan cheesecake -granola bar -pear
C	-same as A	-same as A	-same as A -lentil salad	-pear

Table 1 shows a sample of what each subject ate in one day throughout the first week.

Dec. 1	Breakfast	Lunch	Dinner	Snacks
A	-nuts and fruits	-vegetables and hummus	-ribs -roasted cauliflower -congee -fermented vegetables	-nuts
B	-cinnamon	-cucumber	-ribs	-granola

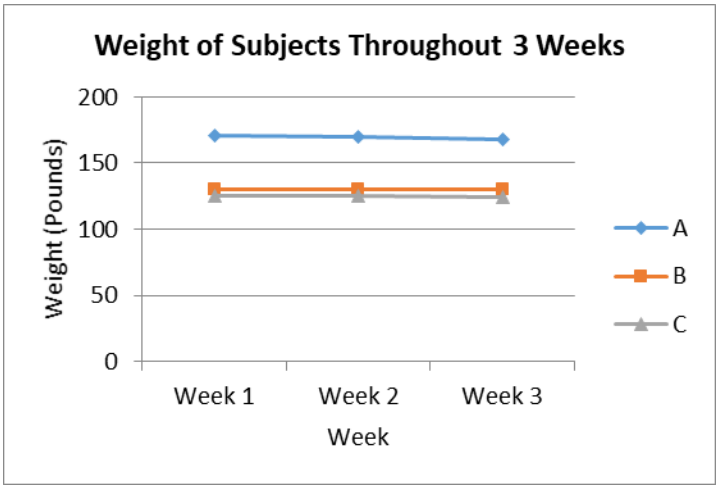
	apple morning rounds -almond milk -nuts	and hummus	-roasted cauliflower -congee	bar -seaweed -fruit jello -kiwi
C	-same as B	-rice and mixed vegetables	-same as A	-nuts and fruits

Table 2 shows a sample of what each subject ate in one day throughout the second week.

Dec. 3	Breakfast	Lunch	Dinner	Snacks
A	-sticky rice balls with nut/seed/date paste	-wrap with vegan soy meat -red pepper with hummus	-curry with carrots, potatoes, tofu, mushrooms, curry paste -roasted broccoli	-granola bar -BBQ quinoa chips -clementine -dry roasted nuts
B	-same as A -strawberry soymilk	*Same as A, cucumber with hummus*	-same as A	-vegan ice cream sandwich -BBQ quinoa chips -granola bar -clementine
C	-same as A	-congee with whole grains, beans, peanuts and red dates	-same as A	-sunflower seeds -apple -dry roasted nuts

Table 3 shows a sample of what each subject ate in in a day throughout the third and final week.

The heights of all subjects remained the same, and Subject A and C had a slight decrease in weight- Subject A had a decrease of 3 pounds and C had a decrease of 1 pound. The weight of Subject B remained the same.



Graph 1 shows the weight change of each subject throughout the experiment.

All subjects claimed to have felt no major difference in their physical or mental health throughout the course of the three weeks, but halfway through the experiment Subject A felt more fatigue than usual. On the third week Subject A had the same energy levels as before.

DISCUSSION/CONCLUSION

In conclusion, the hypothesis was incorrect-none of the subjects tested felt any better or any worse during the experiment. No significant physical or mental changes or improvements in their health were experienced either. Subject A may have experienced some fatigue and a slight change in weight due to the fact that they ate very little food in the morning for many days of the week. The results were not as expected; instead of yielding health improvements and benefits, no changes were

yielded at all and the reason may be because prior to the experiment, all subjects were already eating a well-balanced diet and limited the amount of heavily processed foods in their diets so the change in the way each subject was eating was not a big difference to before. Also, the amount of time tested may not have been long enough to yield any noticeable changes. Eating a plant-based diet cannot improve the health of a person right away and it may take weeks or months to experience the benefits. Improving the health of a person is not necessarily achieved by following a plant based diet but can also be from incorporating more whole, plant based foods and minimizing the amount of processed foods consumed. The experiment could be improved by prolonging the duration by a minimum of two weeks because more significant changes could have occurred during the extended period. Also, more subjects of different diets and states of health should have been tested to truly determine the effects of a plant based diet. A wider variety of tests should have been included such as blood tests and blood pressure prior, during and after the experiment. These adjustments would obtain more accurate results and changes.

APPLICATION

This information can be applied to fields of study in nutrition and dietetics, so that they can find more ways of improving the health of humans through diet and a variety of foods. The information can help them determine ideal foods to consume for optimum health. It is useful to those who are seeking ways to improve their overall health, but are not sure how to find the best way to achieve this goal. Families with children can also apply this information into their daily lives by knowing which foods they should incorporate more and balancing their meals so that the children can grow up eating healthy and feeling well.

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Healthy Alternatives in a Cookie Changes the Way It Tastes

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Abstract

The question investigated was how can different healthy alternatives could affect how a cookie tastes. Finding the answer to this question is important because healthy alternatives is a simple answer healthy eating without having to go on a strict diet and helps lower the amount of junk food that goes in the body. An experiment was conducted where subjects were given two different types of a cookie, a healthy and unhealthy version, to try. After finishing the cookies were asked to answer questions about the difference between the two types. The results showed that people found the healthy version of the cookie less appetizing than the non-healthy version and would not choose to have the healthy version again. In conclusion, even though healthy alternatives are better for the body than the original unhealthy versions, adding them to a cookie makes it taste less tempting and did not taste better than the unhealthy version.

Introduction

The purpose of the experiments was to substitute different ingredients of a cookie with healthier options to try and make it healthier, and see how the taste is affected. Healthy alternatives are very important because they can reduce the prevent chances of health issues. Eating foods that are unhealthy and that are bad for the body can cause obesity along with heart disease, diabetes, kidney failures, and strokes (5 Harmful Effects of Junk Food). Due to the number of calories found in junk foods, it can cause blood pressure and blood sugar levels to rise and the excessive amounts of fat and lead to the clogging of arteries (What Happens When You Eat Too Many Sweets & Fast Foods?).

Therefore, the question that was asked for the experiments was how can different healthy alternatives affect how a cookie tastes. The hypothesis conducted from the questions was, if healthy alternatives is used in baking the cookie then it will be distasteful because foods that have a lot of sugar taste a lot better than the dull foods that have no sugar. Foods that have a lot of sugar or that are sweet light up the pleasure parts of our brain, making us enjoy foods that taste sweet (Why Sugar Makes Us Feel So Good?).

Methods

The first step to conduct the experiment is to follow a chocolate chip recipe step by step making the first batch (The Best Chewy Chocolate Chip Cookies). Another batch needs to be made from the same recipe, however this batch will have some ingredients that will be substituted. Substitute the flour in the recipe for whole wheat flour, using the same amount used in the recipe. The butter and chocolate chips should be switched out for coconut oil and raisins, still using the same amounts from the recipe. Then bake the second batch as instructed in the recipe. Once both batches are done, have subjects try a cookie from the healthy alternatives batch first. Then have them try a cookie from the batch without the substitute. Have subjects answer the questions prepared for the experiment as referred to in Figure 1. Then record the answers as well as observation so they can be analyzed later.

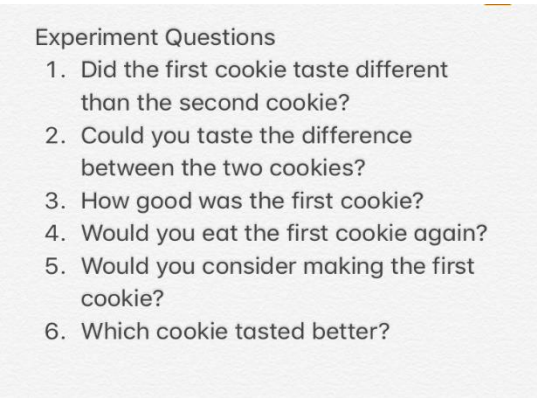
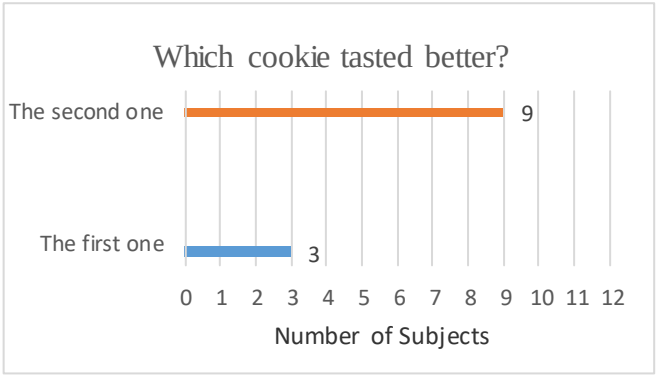


Figure 1- Questions that were asked during the experiment

The independent variable throughout the experiment was the two different recipes. Even though, the same recipe was used, there was ingredients that were switched out, essentially making it two different recipes. Therefore, one recipe would be made without any alterations. The second recipe would also be from the same recipe, but it would include the substitutes of flour, butter, and chocolate chips to whole wheat flour, coconut oil, and raisins.



The dependent variable includes how the original cookie tastes compared to the one with substitutes. Each subject has their own acquired tastes that could be different from the other subjects. They also different preferred flavours that light up their pleasure centers of the brain. This variable can be used for the results at the end of the experiment.

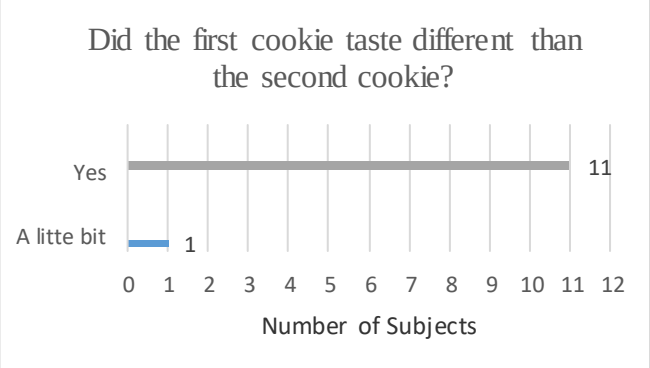
The controlled variables were the baking times and temperature, the recipes, and the oven the cookies were baked in. This makes sure that the baking process does not get changed and the cookies are made the same way These controlled variables make sure the results are accurate and that

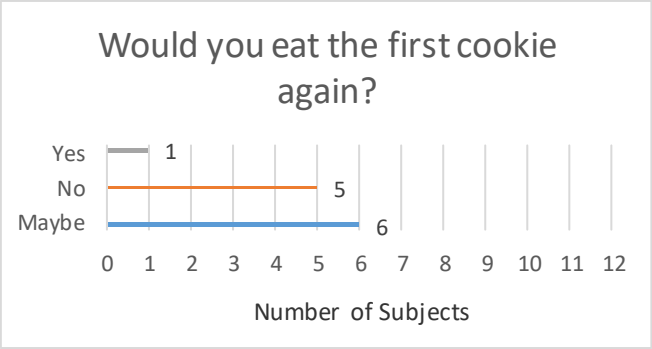
nothing becomes altered. If these were not controlled, it could affect how the cookies tastes and it could change the overall results.

Results

All subjects were able to identify that was a difference in the two cookies. As shown in Figure 3 and
4.

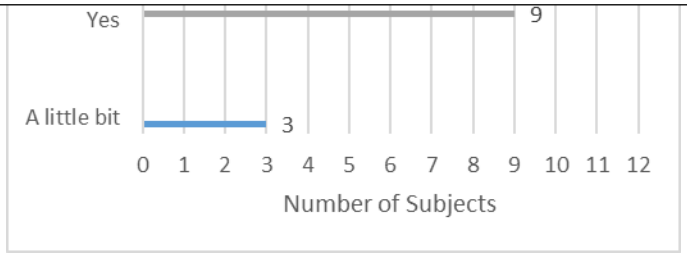
Figure 3- Shows how many subjects could taste the difference between the two different types of cookies





After conducting the experiment, the conclusion that was drawn was that 75% preferred the taste of the unhealthy cookie over the cookie with the healthy alternatives. As shown in Figure 2.

Figure 2- Shows the number of subjects that preferred the first one (healthy alternatives version) and the second one (the unhealthy version)



When asked if participants would eat the first cookie (healthy alternatives version) again only 8% said yes while the rest of the participants either said no or maybe (Figure 5).

They were also asked if they would consider making the healthy alternative cookie and about 60% said no, the rest of them either said yes or maybe (Figure
6).

Figure 4- Shows the number of subjects that could taste a difference between the first cookie (healthy alternatives version) and the second cookie (unhealthy version)

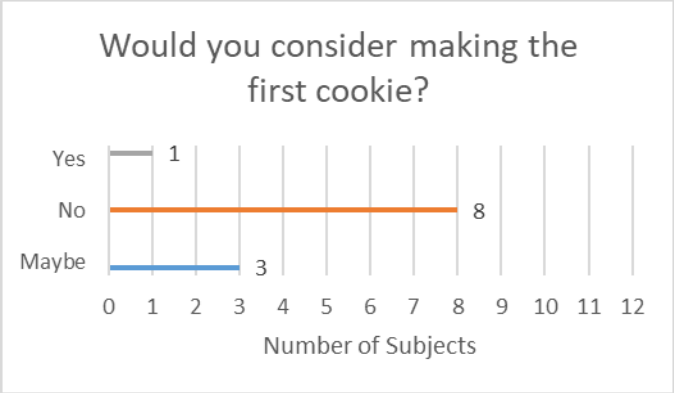


Figure 4- Shows the number of subjects that would consider making the first cookie (healthy alternatives version) again

When asked how good was the first cookie (healthy alternatives version), 58% of subjects said it was ok, about 33% found it not very good and only 8% thought it was amazing (Figure 7). The people who did not find it amazing were asked why it was not good or ok. Subject's 2,5,10, and 12 found the cookie to be very bitter and subject's 4,7,8,9, and 11 all thought the cookie was lacked a lot of sugar and just didn't taste as good as the unhealthy version.

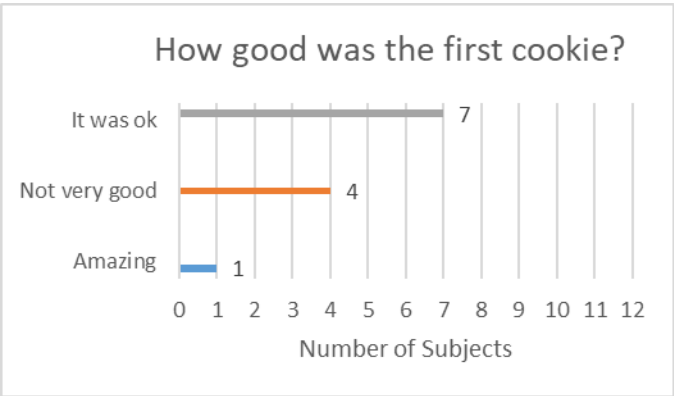


Figure 5- Shows how subjects felt about the taste of the first cookie (healthy alternatives version)

Discussion/Conclusion

The overall results confirmed the hypothesis, that was conducted in the beginning of the experiment, was correct. From the experiment, the initial question that was asked was, how can different healthy alternatives affect how a cookie tastes. The results showed that many people could differentiate between the unhealthy version and the version with the healthy alternatives. The healthy alternatives that were used was whole wheat flour for the flour, coconut oil for the butter, and raisins for the chocolate chips; added a bitter flavour to the cookie since all the substitutes used were plant based and they are known to taste bitter. Therefore, most people found the healthy alternative version of the cookie unpleasant because of how adding the substitutes changed the overall taste and it was not at all sweet and savory like the unhealthy version.

Even though, they hypothesis was correct the results did not make a big impact. The healthy alternative version did not taste better than the healthy version because it didn't have the same amount of sugar. Another reason people found it distasteful was because people were not use to the taste of the healthier version like they are with the unhealthy version. People have been eating the unhealthier version longer than the healthier version, and their brains recognize that sweet taste and that lights up their pleasure centers. Therefore, if people were to slowly increase their intake of healthy alternatives, it would make their brain recognize and be used to the taste, making their pleasure centers light up from the healthy alternatives.

Application

Making sure to include healthy alternatives in food ensures people to improve their diet without being on a strict diet. If healthy alternatives were used more in food and people enjoyed them, health issues would go down and would benefit everyone. It would also benefit food industries if they could include more healthy alternatives that make a difference and is good for the body, because people would buy them over the original versions. In the

end, healthy alternatives could be very beneficial for everyone if people spend more time getting use to healthy alternatives and enjoying them.

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Features of Baleen Whales Can Be Mimicked To Enhance Water Filtration Systems

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ABSTRACT

This study investigated how can humans sterilize dirty water more efficiently by mimicking baleen whales to improve the water crisis. Research states that baleen whales can filter feed, thus the project was examining on how features of a baleen whale influence a filtration system. People who live in undeveloped countries suffer and die each year from waterborne illnesses such as diarrhea due to the inadequate water. To investigate the question, a filtration bottle named the Whattle is made using basic materials such as paintbrush bristles, a pump, activated carbon and more. The function of each material would mimic the filtration system of a baleen whale. According to the results, water is filtered cleaner using features of a baleen whale and could remove contaminants found in dirty water. In conclusion, the results may help people get sanitary water to drink. Furthermore, the experiment proved that biomimicry is an integral step to solve human problems.

INTRODUCTION

Water is an essential component every human being needs to survive. In 2004, the Asian Tsunami hit the Southeast of Asia and forced people to drink contaminated water or eventually face death. The devastating news brought upon the purpose of this project, which is to find a solution to the water crisis by improving water filtration systems. In many undeveloped countries, obtaining clean water is impossible. Valerie Webber (2015) declares without clean water, humans can experience extreme diarrhea, nausea, vomiting and stomach cramps because the water contains viruses and other microbes, which kills cells and disrupts the cell's function. According to the Water Project, half of the world's hospitals are filled with patients suffering from waterborne illnesses (2016). By treating and sterilizing the filthy water, people can get cleaner water. Research indicates that baleen whales contain unique features such as baleen plates and tongues that allows them to filter feed. Thus, inspiration to create a filtration device mimicking a baleen whale sprung up. This project may be the solution to the water crisis and decrease the amount of people suffering from waterborne illnesses. After gaining an abundance of knowledge, the question how can humans sterilize dirty water more efficiently by mimicking baleen whales to improve the water crisis was investigated.

If water filtration devices mimic features of a baleen whale, then water could be cleaner, because baleen whales has features that makes them able to filter their own food. According to Biologist Alexander Wreth (2013), baleen whales efficiently filters out debris from their food. Furthermore, scientists have conducted flow tank experiments, which tested how baleen whales control water flow through their mouth. The scientists figured that they use small lift forces of their tongues to pass water lateral between their plates for easier swallowing (Goldbogen, J., Cade, D., Calambokidis, J., Friedlaender, A., Potvin, J., Serge, P., and Werth, A) .

METHODS

The following procedures were followed to produce the filtration bottle, the Whattle.

To begin with, a lid was taken off from the top of the plastic bottle and the center of the lid was located. The pump from the coffee press was taken and a drill bit that has the same diameter as the metal rod on the coffee press was found. Then, a hole was drilled on the center of the lid so that the metal rod of the coffee press can fit through it. The metal rod was inserted through the drilled hole on the lid.

Next, two dots were drawn equidistant apart at the middle of the plastic bottle. The bottle was turned to the opposite side and the same steps were repeated as before. The two dots were aligned with the other two dots from the other side of the plastic bottle. Then, the four dots were drilled using a drill bit the same diameter as a copper wire. Two pieces of copper wire were inserted through each pair and are parallel to each other. To ensure safety, the plier was used and it bended the copper wire around the circumference of the plastic bottle so that no copper wire is poking outwards. Hot glue was used to seal the four holes to ensure no water is leaking. Figure 1 shows how the copper wire is supposed to be constructed in the bottle.

Figure 1 illustrates how the copper wires were inserted through the middle of the bottle.

To make the filtration system, a gauze pad was taken and sewed into a circular pouch. The circular pouch was filled with activated carbon filter and the opening was sewed closed to make sure nothing falls out (Figure 2).

Figure 2 portrays the appearance of the circular pouch sewed with activated carbon.

In addition, two circles were cut out with the same diameter as the plastic bottle from a plastic plate using scissors. Tiny holes were poked with needles on one of the circle and larger holes were drilled in the other. A sponge was used, and a circle was cut with a larger diameter than the plastic circles cut out from before. From the circular sponge, a circle of the same diameter as the plastic circle was cut. The sponge was hot glued to the circumference of plastic circle with drilled holes (Figure 3).

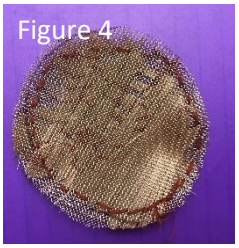


Figure 3 and 4 depicts the filtration features created.

Moreover, two circles with the same diameter as the plastic bottle was cut out from a barbecue net. The bristles on the paintbrush were then cut off and a cut out from the barbecue net circle. The other circle cut out from the barbecue net was placed on top of the bristles and this assembly was sewed altogether using a needle and thread (Figure 4). The bristles sticking out the metal circle was trimmed.

The plastic circle with drilled holes and sponge was inserted into the plastic bottle so that it lays just above the copper wire. The activated carbon pouch was put on top of the plastic circle with drilled holes. A thick elastic band from a thermos container lid was hot glued to the circumference of the plastic circle with needle-made holes. This circle was inserted on top of the pouch. Lastly, the barbecue net and paintbrush bristle assembly were put on top of the plastic circle with needle-made holes. The lid and coffee press were put back onto the top of the bottle. The finished product looks like Figure 5.

Figure 5

Figure 5 portrays the innovation's appearance after following the procedure.

To test how efficient the Whattle would filter, dirty water mixed with mud and leaves was poured into the filter. The dirty water was pumped and observations were noted. Paintbrush bristles were then taken out of the filter and dirty water was put in the bottle once again. O noted once mo

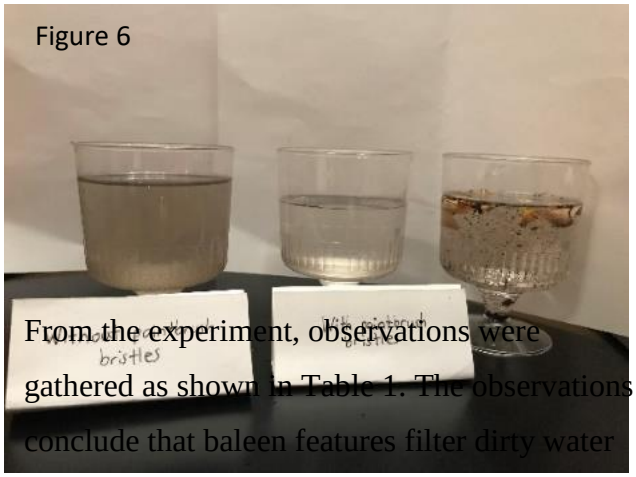
The independent variable is the paintbrush bristles. The dependent variable was the cleanliness of the water. The controlled variable in this experiment was the Whattle and type of water used to filter. These variables were controlled to ensure that the experiment gave accurate results and it was not biased in any way.

RESULTS

After constructing the Whattle (Figure 5), experiments were conducted to study whether baleen features influenced filtration systems.

The experiment was repeated several times to verify that the results were accurate. After several attempts, the Whattle proved that it could filter water much cleaner using features of a baleen whale. The main baleen mimicked function is the paintbrush bristles in the Whattle. Figure 7 shows the comparison of how the dirty water looks like before and how it filtered with and without the paintbrush bristles.

Figure 6 shows the difference in water quality using baleen feature, the paintbrush bristles, and without.



From the experiment, observations were gathered as shown in Table 1. The observations conclude that baleen features filter dirty water much cleaner than without baleen features.

Figure 7 shows how the paintbrush bristles were taken away from the filter.

When the paintbrush bristles were taken away, an obvious observation of the speed of filtration was noticed. As seen on Table 1, the filtration process is slower when paintbrush bristles were added to the Whattle.

Furthermore, the results shown from Figure 6 depicts the original water seemed to look even dirtier when it was filtered without paintbrush bristles. On the other hand, the original water was filtered crystal clear using the paintbrush bristles.

Table 1

Filtering with paintbrush bristles	Filtering without paintbrush bristles
-Clean water is produced	-A muddy colored water is produced
-Filtering process is a	-Filtering process is a

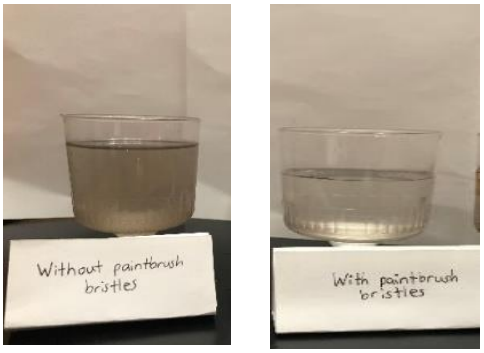
little slower	little faster

Figure 8

-Large sediments were filtered right away in the very beginning of the filtering process	-Large sediments were filtered, however smaller sediments easily flowed through the filtering process
-The coffee press pump mave the filtering process a little faster	-The coffee press pump made the filtering process go faster as well

.

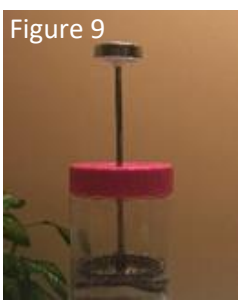
Table 1 shows the observations recorded during the experiment.



DISCUSSION/CONCLUSION

The hypothesis is correct. In the hypothesis, it states that the addition of a substance mimicking the baleen whale would filter water much more efficiently. Scientists set forth that the smaller the holes in the filter, the better they would filter out dirty sediments, bacteria and viruses (2016). However, the small holes would make the filtering tongues to make filtering process faster by applying pressure. Using this feature, a pump was added to the top of the filter (Figure 9).

Figure 9 shows the pump used to speed up the filtration process.



This not only speeds up the process of filtering, but also, made sure that the Whattle filters pure water.

Furthermore, the addition of paintbrush bristles would mimic the feature of baleen plates. Baleen plates produces a mesh-like strainer for the whale to catch its prey while it filters out water. Paintbrush

bristles are similar to baleen plates. To make the paintbrush bristles work more like baleen plates, it was overlapped in layers to create the mesh-like strainer so that it functions just like baleen plates. This experiment validates that mimicking baleen whales could help us to improve water filters.

When the paintbrush bristles were taken out of the filter, the water was not filtered as clean as when the paintbrush bristles were used. Since baleen plates are tightly packed together, the paintbrush bristles were mimicked to have smaller pore holes. The paintbrush bristles kept the small sediments out of the water as it filtered. When the paintbrush bristles were taken away, the pore holes were enlarged (Figure 10). This would've made the water seem much dirtier than the original dirty water. The paintbrush bristles created a large difference and filtered the water much cleaner when it was added to the filter.

Figure 10

Figure 10 gives a visual representation of the pore holes being enlarged as the baleen feature, paintbrush bristles, were taken out from the Whattle.

The most significant result is when the dirty water was filtering with the baleen feature of paintbrush bristles, it was able to filter small and large sediments found in the contaminated water right away. On the contrary, when the paintbrush was not used, smaller sediments easily flowed through the filtering process because the pore holes were enlarged without the baleen features. This result proves that baleen features can efficiently filter out dirty water. Furthermore, the pump was observed to filter the dirty water much faster by applying pressure. The experiment shows that the Whattle can be trusted and distributed to areas lacking clean water sources. People could use it to get sanitary water to drink from.

Despite, the results proved the hypothesis to be correct, some possible errors might have occurred and affected the results. From Figure 6, the dirty water that was filtered without baleen features was much dirtier than the original dirty water. The dirty pollutants could have slipped pass the filtration system as it was not as secure. This might have been the reason why the water looked dirtier than the original water. If this experiment was repeated, hot glue would fill in any cracks in the bottle.

Furthermore, since the dirty water is mixed with dirty sediments such as mud and leaves with debris, the pump might have crushed the mud into smaller sediments which allowed it to pass through the filter. If the pump was excluded from the experiment without using paintbrush bristles, then the results might have been more accurate.

Application

This project proves the importance of biomimicry. People should discover nature's beauty and capture its creativity to turn it into something amazing that may better the world. Biomimicry is everywhere so not only the baleen whales can be mimicked, but other animals also include unique features that can be mimicked from. This valuable project may be the solution to the water crisis in undeveloped countries and help those in need. This information could be applied to the field of biology and water treatment faculties for them to improve with this idea and save those suffering from waterborne illnesses.

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The effects of diet versus mental state

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Abstract

The purpose of this study is to compare the effects of state of mind and diet on health to see which one has a greater effect. This is important because it can change the way sick people are treated. It could mean that a cure to chronic diseases and one of the best ways to prevent heart attack can be just by changing how happy someone is. To test the effects of the diet versus the mental state an experiment was conducted. The participants would take a survey and go on a one-week diet and then they would retake the survey to see how it changed. The participants expressed through the second diet that physical health got better but mental health got worse and stress levels stayed the same. Using the information from the study, the result for the previously posed question is that diet has a greater effect on physical health. Although the experiment showed that diet had a greater effect on physical health the fact that mental health was rated lower indicated that the perception of being healthy is the true determinant of health.

Introduction

This project tries to test the ideology behind the saying ‘mind over medicine’; food, depending on what we eat can be used as medicine; for example, honey to soothe a sore throat or chia seeds for high cholesterol. But what if there was a better way to treat the human body and still get to eat the stuff that actually tastes good. According to the Mayo clinic a positive mental state comes with an increased life span, lower rates of depression, lower levels of distress, greater resistance to the common cold, better cardiovascular health and reduced risk of death from cardiovascular disease. With all those benefits mental state has shown to be very powerful so does state of mind have a greater effect on health than diet. For the purpose of the experiment the hypothesis was that if state of mind has a greater effect on health than diet, then the state of health should stay the same after a new diet.

Methods

To test the hypothesis an experiment was conducted, the experiment required a minimum of four participants preferably with diverse age ranges and mixed genders. Also, a Survey and a Writing utensil, the SCICAN

Instruction sheet provided and two tables to record the results. To begin conducting the experiment start by creating two tables, on a sheet of paper, one named 'before diet results' and one named 'after diet results', the rows will represent the question number and the columns will represent each candidates' answers. This table will be used to tally the survey results collected. Then each candidate will take the survey provided before starting the experiment, once the surveys are collected record the results of each question in the 'before diet results' table. Next each candidate will be given the diet instructions and one week to complete the diet, candidates will then re-take the survey provided one day after the last day of their diet, once the second survey is collected, record new results in the 'after diet results' table.

The independent variable during this experiment is the diet, the dependent variable is how the candidates rate their physical and mental health and the control variable is the survey. The survey had to be controlled because it was a record of each of the participants' results and by not changing any of the questions it showed if there were any significant changes after the diet.

Figure 1.

Results

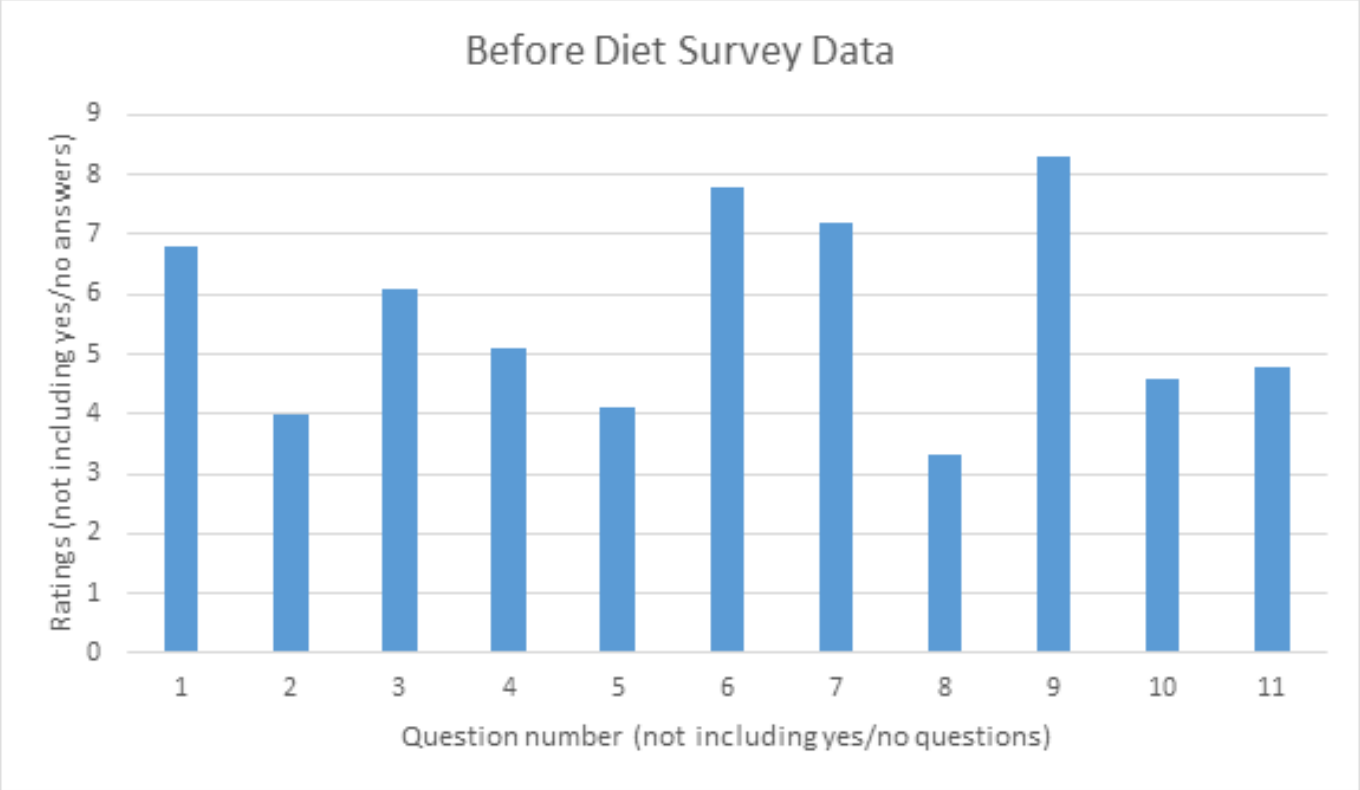
numbers inside the table is a tally of how many people answered what

Table 1.

BEFORE DIET RESULTS:

Question #	Answer/ Rating												
	1	2	3	4	5	6	7	8	9	10	Yes	No	Average
1						2	3	1					6.8
2	1		1		3	1							4
3				1		2	3						6.1
4			2	1	3	1							5.1
5	1		2		1	1	1						4.1
6					1		1	2	1	1			7.8
7			1				2	2		1			7.2
8		1	2	3									3.3
9							2	2		2			8.3
10											6		yes
11			1	1	3	1							4.6
12			1	1	3	1							4.8

Figure 2



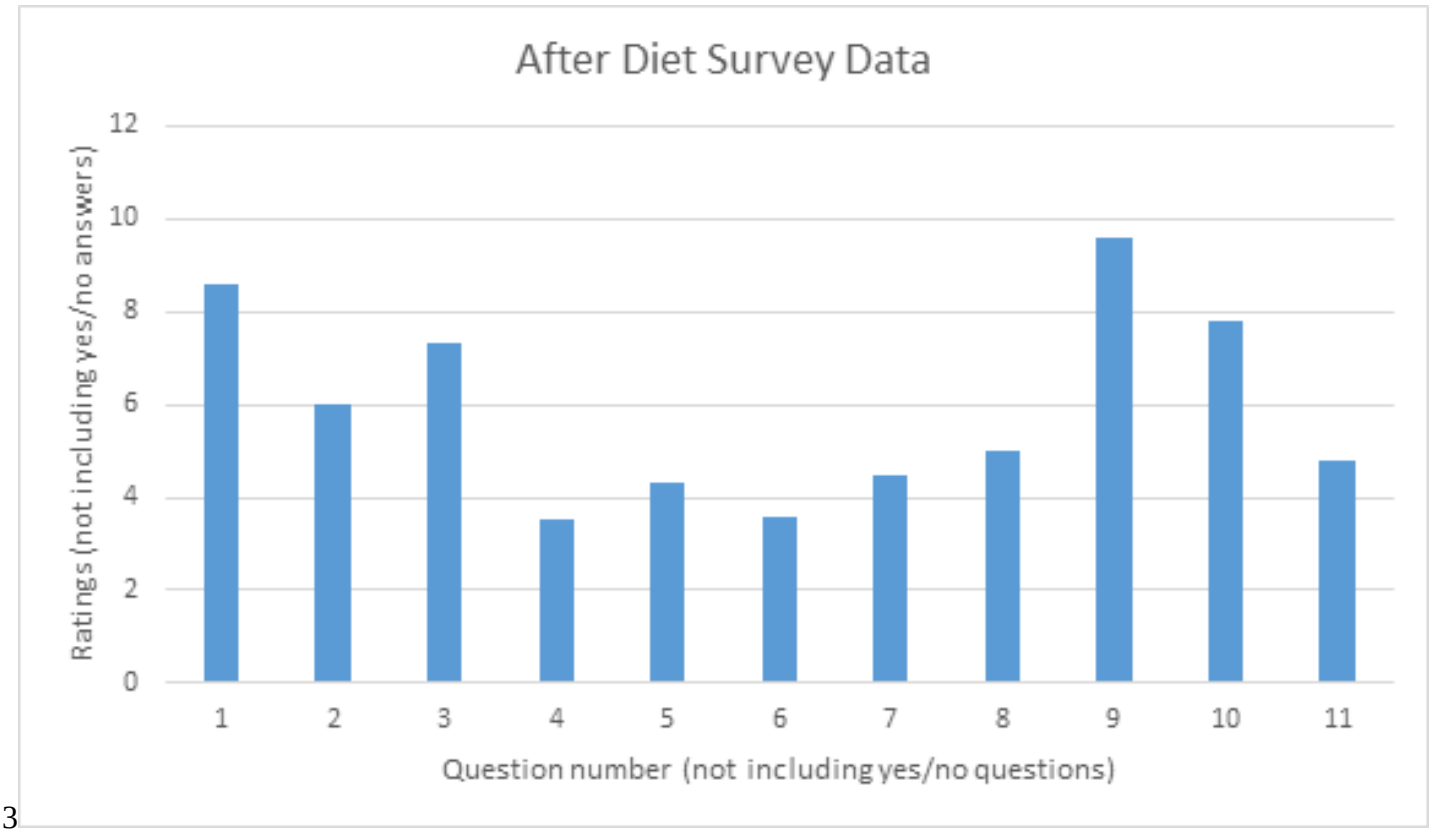
AFTER DIET RESULTS:

Table 2.

Question # Answer/Rating

	1	2	3	4	5	6	7	8	9	10	Yes	No	average
1					1		3	2		1			8.6
2				3	1	3							6
3				1			2	2		1			7.3
4	1		2	1	1	1							3.5
5	1	1		1	1		2						4.3
6	1		2	1	1	1							3.6
7					1	3	1		1				4.5
8		3		2	1								5
9											6		Yes
10									2	4			9.6
11					1	1	1		1	2			7.8
12			1	1	2	2							4.8

Figure



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Conclusion

In conclusion, the hypothesis was incorrect; the experiment indicates that diet has a greater effect on physical health than a person's mental state. This is evident because after the diet the average rating for physical health increased by 1.8 out of 10 and the average stress rating stayed the same.

During the analysis of the data it was also evident that the average rating for mental health got worse after the diet. It went from approximately 8.2 out of 10 to approximately 7.6 out of 10. Also, the average rate for physical health got better, the average rose from approximately 6.8 out of ten to 8.6 out of ten; the average rating for a candidate's diet got better from 6.1 out of ten to 7.3 out of ten and stress levels stayed the same with both surveys having an average of 7.2. During the first survey, the individual ratings for most candidates' stress levels differed by 1 from their physical health, even the average only differed by 0.4, this suggested that the quality of a person's physical health can be closely determined by how much they are stressed. But after the second survey the individual ratings for physical health increased and the average stress

ratings stayed the same which suggests that a person's diet has a greater effect on their physical health. This is because people associate physical health with a good diet so even though some people hate the taste of healthy food people ate it in hopes of becoming healthier; it's more about the perception of the action and that it why people seemed to rate mental health lower after the diet. The use of the stress ratings is important because it, along with some other rates give a good idea of the people's mental state when contributing to this experiment.

Application

This information could be valuable in medicine because it could change the way people with chronic illnesses are treated. For example, along with the medicine maybe there would be a therapy session to go with it. A lot of times people who develop chronic conditions will develop depression as well and that could actually make them worse; according to Dr. Lissa Rankin people can actually heal themselves just by being positive. This experiment could also open up many doors in the field of neuroscience. The power of the human brain is beyond the capacity of humans to understand and this experiment is just one more example of that. In neuroscience an experiment could be held to see if it's possible to make someone like the things that are good and eliminate the problem with unhealthy eating.

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(Figure 1)

http://www.picturequotes.com/be-positive-quotes

One's past experiences impact Ones present decisions

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Abstract

Do humans have free will and the ability to make decisions without being influenced by their surroundings? To answer this question, something that would dramatically affect someone's life had to be chosen, and the chosen experience was divorce, there also had to be something that would challenge and test someone's ability to make a decision based on morals. One could set up a bill with high value and have test subjects with divorced parents walk past it, and afterwards have an actor follow them to see if they would return the bill. Most test subjects with divorced parents decided not to return the bill and admit they had seen a bill on the ground at all. Most of the test subjects without divorced parents returned the bill, this in return proves that ones past experiences affect ones present decisions. With this information, we can only acknowledge the fact that ones mistakes does not define that person, but is a reflection on their past. This information should in result have humans more understanding of each other.

Introduction

The purpose of this research is to determine if people have free will and if one is able to control one's thoughts. One may hypothesize that people do not have the ability to freely make decisions out of pure understanding of the world, instead our feelings and past experiences greatly affect the outcome of our decisions. Answering this problem is crucial because if we find the roots of people's decisions and what causes one to behave in certain ways rather than just referring back to the ancient human believe that if one does something wrong it is straight up ones fault and that person should be punished, we may be able to understand and physiologically alter our beliefs and ones bad decisions as they are happening or maybe even before they happen. This in result would

Introduction Continued

create a more peaceful world because if our society can understand the human mind and what causes people to behave the way they do we could prevent murder and find better ways to deal with the emotions and thoughts that causes people to act that way. This would also create a more understanding world, if not world maybe a more understanding and more justice full court system and school system.

If we do not have free will and all our actions are based on previous actions, thought and feelings that pop into us because of our surroundings, then one could find more effective means of punishments and ways to prevent people from repeating their actions and creating a moral fear rather than a fear of jail to stop us from doing bad.

Introduction Continued

This is because if we know what causes affects us and influence us into doing bad, then we could use psychological means of dealing with these thoughts and feelings, and having one more aware of his thoughts and actions. If one was to ask anyone "do you want a good life or bad life" the answer will certainly always be good If one ask someone if they think living in jail is a good life or bad life the answer will certainly be bad life. Then why do people still go to jail, I mean no one wants to go to jail, therefore we are not completely free in our decisions. Our feelings and thoughts influence our behaviour and these feelings and thoughts come from pervious experiences.

Methods

Research either in a school or neighborhood or any other social place where one can run this experiment, the research should be to find children between ten and fifteen years of age who had their parents divorced. One can find out whose parents have been divorced by asking people around friends or family if they know anyone in the neighbourhood or the

place you are conducting this experiment if any of

the children around has had their parents divorced. Afterwards, research the times that the children with

divorced parents leave their home (I.e. to walk to their friend's house) and the path they take. Set up a bill with a high value preferably a one-hundred-dollar bill in the path they take. Stabilize the bill with a rock or stone keeping the bill clearly visible but

Methods Continued

making sure it will not fly away by the wind. Hide behind a bush or green electric box and wait for the test subject to pass by the bill, if the test subject doesn't even pick up the bill but clearly acknowledges it mark it down as I they didn't steal the bill, if the test subject takes the bill walk behind the test subject as if you were just casually walking in the area and ask if he or she has seen a bill, if the test subject replies with *no*, mark it down as if they stole. If the test subject returns the bill mark It down as if they didn't steal. The independent variable is the bill placed on the ground, the dependant variable was wither the test subjects stole the bill or not. Finally, the controlled variable was the test subjects, this variable had to be controlled because the experiment needs people with divorced and non-divorced parents.

Results

The results were as expected, in this case all test subjects with divorced parents stole the bill, though not all test subjects were expected to steal.

Only one of the test subjects without divorced parents stole the bill. Test subjects with divorced parents were expected to steal and test subjects without divorced parents were not expected to steal which was proven true with this experiment.

(figure 1) This proves the original hypothesis to be true, that past experiences and feelings greatly affect present choices. The information gathered shows no correlation between when the test subjects parents

Results Continued

were divorced and wither or not they stole the bill. Though the kids with parents divorced earlier were

theoretically expected to steal the bill less often, because there is a higher chance that they would have forgot or at least it would have meant less to them, and would not have been as significate as having one parents getting divorced not too long ago.

Though the information shows no correlation between the age of the parents' divorce, there is a slight connection between wither the test subject was a male or female, the one female that stole the bill looked around before taking the bill and the males not as often also the results show that males stole the bill more often and that no male did not steal the bill.

Figure 1- This table shows the age of the test subject wither or not their parents are divorced, if they stole the bill or not the age when their parents got divorced and finally their gender.

Age	Parents Divorced or not	Stole the bill or not	Age of child when parents got divorced.	Gender
15	divorced	Yes	6	Male
15	divorced	yes	12	Female
15	Not divorced	Yes	--	Male
16	Divorced	yes	7	Male
15	Not divorced	No	--	Female
15	Not divorced	No	--	Female

Discussion/Conclusion

Yes, the hypothesis was correct, that our

surroundings affect our actions and behaviours, and that every previous incident or event that has happened in our lives affect our decisions and our thoughts/feelings. To answer the initial question asking if we have free will and wither or not we control our thoughts, no we do not make decisions out of the blue based on if we are good or bad people

but that previous experiences heavily affect our choices, this was proven because the people with the divorced parents stole the bill much more often than the people that did not have their parents divorced.

The results show that people with divorced parents have a higher chance of stealing the bill than people with non-separated parents. All ages were the same except for the error of having a 16-year-old mixed with the other 15 year olds. Males also seemed to have stolen the bill more frequently as well, though this could have just been a lack of data, because there was not enough data to justify that males steal more

than females.

These results relate to the original question by proving that the age and gender do not have as big as an impact to committing crimes as ones past does. Research has been done in previous years where a test subject would read an article that states that cheating on an exam is not necessarily a bad thing and it encouraged the idea of cheating, there was

Discussion/Conclusion Continued

another group of test subjects that read an article stating that cheating was a very bad thing and it exaggerated the fact that cheating was wrong, these test subjects were

called In weeks after to write an exam where the answers were simple to obtain but the instructor told them clearly to not look at the answers. Evidentially the group that read the article stating cheating was wrong looked at the answers much more often than the group that read the article stating cheating was wrong.

This information shoes that your actions can be altered by experiences and information given to you not necessarily long ago. This information also proves that peoples decisions and moral structure may be altered by something as small as an article, so what if it was a friend you look up to, that would indeed make a much larger impact on your decisions and morals. This fact has been acknowledged in schools and families, the fact that you should select good friends that will guide and show you the right way.

Application

This information could be very affective if everyone was to accept it which is near impossible, this is

Application Continued

because we have lived our lives with the idea that all our decisions and mistakes are our free decision, which is

because we have lived our lives with the idea that all our decisions and mistakes are our free decision, which is correct to a certain point. That is where the struggle to have most people understand begins, but in an ideal world this information would be useful

correct to a certain point. That is where the struggle to have most people understand begins, but in an idle world this information would be useful

because in school systems instead of punishing a student, we should punish a student and find the

reason that caused the outcomes of his actions and have other students understand that these experiences/ feeling lead to this type of behaviour

and just by acknowledging this information we may be able to understand our selves more and control our actions more.

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The Effects of Running on the Mental Health and Study Habits

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Abstract

In this study, the purpose of this experiment was to inquire the benefits of consistently running compared to any other physical exercise. The question investigated was 'how does running affect the mental health and study skills?'. Stress is a world-wide prevalent issue among all ages, and finding the solution to this is very critical. An experiment was formed to inquire how consistently running impacted one's stress level and study skills. The data was gathered from 15 different people through a stress tracker journal that was filled out daily at two different occasions. They did it daily before running, playing a sport or not doing any physical exercise and after doing the exercise. The stress level written for each category, was then averaged and data was compared to subjects participating in other sports (physical activity) and subjects that didn't participate in any physical exercise. The results for assessing the participants' study skills were gathered through a survey which was filled out before and after the 2-week study to ensure accurate results. The outcome of the experiment answered the initial question, running has a great advantage on the mental health, and a moderate benefit on one's study habits by alieving stress and improving many academic skills needed in the everyday life.

Introduction

The purpose of this experiment was to inquire the benefits of consistently running compared to any other physical exercise.

It is vital to inquire on this topic, as stress is increasing globally among all ages and finding a solution to it is required to lead a productive life (Running competitor).

To move forward in this fast-paced world, running will play a pivoting role in reducing mental stress, and enhancing mental abilities during the education years.

The question researched was how does running consistently affect a person's mental health and study skills.

The hypothesis for this investigation is, if people run more often, their mental health

and study habits will increase because running produces an endorphin rush, which in return reduces pain, combats stress, relaxes the mind, and even increases the neurons in hippocampus in the brain which is the control centre of memory and knowledge (Rodalewellness). Not only does running decrease a person's stress, but also improves and sharpens the brain. Some benefits on the brain directly impacted by running are, quick recall, improved focus, decision making, planning, organizing, and juggling mental tasks are all easier to accomplish (Team Airia).

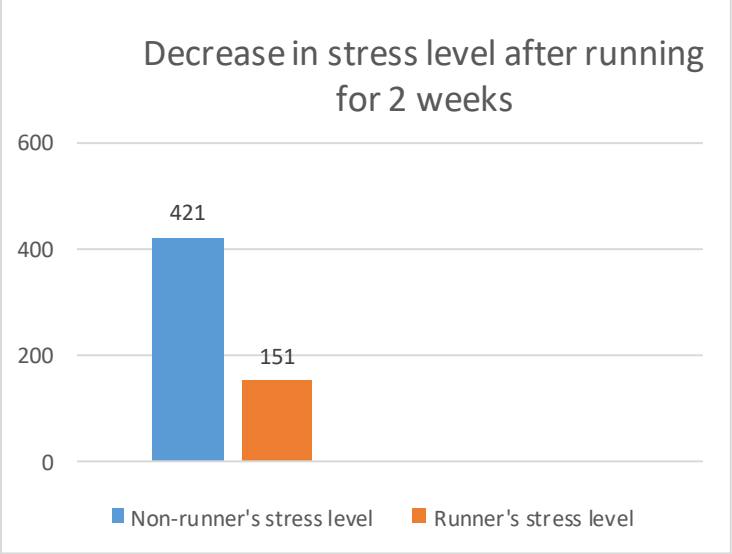
(Figure 1) on the left shows a girl running on a bridge. Image retrieved from google images. (Figure 2) on the right shows a high-school runner racing at provincial championships (OFSAA) at Petawawa, Ontario.

Methods

The experiment was done under a two-week study for participants who were either consistently running, playing different sports, or not exercising at all. This study was done by a stress tracking journal to accumulate accurate results. To collect data for this study, 15 participants were chosen, five subjects who consistently ran, five subjects who played different sports other than running and five subjects who did not participate in any physical exercise. All participants were asked to rate their stress from 0-10 (0 being no stress, 10 being the most stress) daily for 2 weeks before and after the participating in exercise. To collect data for study habits, the same participants were asked to fill out a study habits questionnaire. The subjects answered questions based on academic skills such as testing/reading, time management/ procrastination, concentration/memory, test anxiety, information processing and motivation/attitude. For constant runners, stress level was written down twice daily, on a scale of 1-10 (no stress is 0, highest stress is 10) and stress triggers (homework, exams, competitions, etc.) for that day in 'Stress Reduction Journal'. This was done prior to running and filled out again after running. 'Stress Journal Questionnaire' was filled out after the 2 weeks of marking down stress levels and stress triggers in 'Stress Reduction Journal'. The level of stress reduction in 'Stress Reduction Journal' was observed and how it was changed before and after running. The different options regarding the study habits were chosen in 'Study Habits Questionnaire' to find out how they were affected. Finally, all types of journals and questionnaires were compared to find out how running affected the mental health and study habits among the participants who played different sports or none at all. Subjects were asked to repeat steps 1-7 if they played other sports and substituted running for the sport they play. If no sports were played, stress level was marked down after getting home from school/ work and just before sleeping.

In this study, three types of variables were kept into consideration. The dependent variable for this study is the amount of stress decreased after a run/other sports and the decrease or increase in study habits such as concentration, memory, and efficiency. These are

dependant variables because they change depending on the participants physical activity. The independent variables were identified as the different type of participants. The participants in the study were changed so the results gathered for this experiment would be precise and more accurate, rather than gathering limited results. The constant variable throughout this study is the survey, the number of participants, and length of experiment. These factors were kept constant to keep a complete record of their stress level and study habits during the period of experiment. Another reason they were kept as controlled variables, was to ensure the accuracy and reliability of this procedure.



(Figure 3) shows the stress level of participant consistently running for 2 weeks (421) compared to participant who did not exercise (151)

Results

At the end of the study, the data was collected and analyzed. After the stress levels and study skills were accumulated, the data suggests that after running for two weeks consistently, a person's mental health increased, study habits improved and stress decreased dramatically. Participants reported different stress levels in this two weeks study according to the scale, minimum stress level was 0, and maximum stress level was 1400 in total. As an added average, the five runners' stress level was 421 before running, and it declined markedly to 151 after two weeks of running. The participants engaging in other sports had a moderate reduction in stress from 354 to 253. As excepted, the stress level in the 'no physical activities group' remained almost unchanged, declining only marginally from 357 to 335. Results gathered in the study skills, were similar to the data in the stress reduction questionnaire (highest skills- 32, least skills - 0). The participants 'consistently running' achieved an average of 26-29, participants in other sports group scored an average of 24-27, and the 'none physical activity group' reached a score of 21-24.

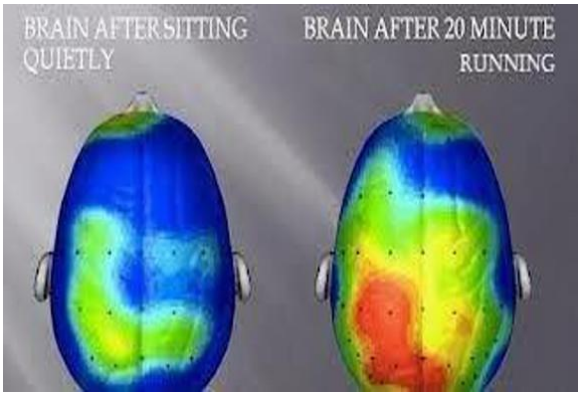
Discussion/Conclusion

After analyzing the data collected, the hypothesis was proven correct. The initial purpose was to determine the impact of running on a person's academic abilities and mental health. Two problems were encountered through this process. Although this questionnaire was done appropriately, some participants responded to the questionnaire to the best of their recall abilities, in case they filled out the questionnaire at a different time (later). Another problem was the different workloads of assignments on different days. Participants having smaller homework to finish on certain days, noticeably

felt less stressed as compared to the heavier homework days, regardless of their physical sports participation. Comparing the three groups (runners, other sports, no physical activity), academic skills seemed to be improved more in runners followed by other sports activities and stayed the same in the no physical activity group. The more marked improvement was observed in concentration/memory, motivation/attitude, test anxiety, and information processing. Whereas academic skills like writing and testing/reading improved only moderately. The time management/ procrastination skills were the most varied result collected. For future applications, this experiment could be done differently by expanding the time understudy, from two weeks to a few months to improve reliability, and increasing the number of participants. To gather data more accurately, for future this experiment could be done differently by gathering data from participants who had roughly the same amount of stress triggers such as homework, assignments, or projects to begin with, so the results will be accurate for all participants.

Application

Running can play a beneficial role in different aspects of life. It can be incorporated in many different areas such as stress reduction, physical health improvement, increased academic skills such as increased focus and concentration, and prevention of chronic medical diseases. Running will specifically help those who are prone to stress. It will also help a group of patients suffering with mental illnesses such as generalized anxiety disorder, depression, impulse control, addiction disorder, and substance use and abuse. Alleviating stress can minimize and prevent these mental illnesses besides impacting the physical health in a positive manner. In order to increase the students' academic grades, running can be used to improve study habits and eventually the overall school performance.



(After sitting still) (After running for 20 minutes)

(Figure 4) shows more brain activity on the right when the participant ran for 20 minutes, compared to when participant sat still for 30 minutes. Image retrieved from (http://newsroom.gehealthcare.com/week-3-getfit-update-campaign-gains-momentum/)

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Missing Consecutive Basketball Shots in Relation to Shooting Slumps

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Abstract

The question that was asked was whether missing a few consecutive shots in basketball can cause a shooting slump. The study was conducted by watching NBA players play and investigating the pattern of their shots made/missed. From the results gathered, it can be derived that if a player misses 3 or 4 consecutive shots, it causes a difference in their playing ability and they continue to miss for a while. Therefore, from these results and the analysis, it can be confirmed that missing a few consecutive shots in basketball can indeed caused a shooting slump.

Introduction

This project is about missing basketball shots and how they can cause shooting slumps. Researching and experimenting with this problem is important because it can help players who miss their shots often. It can help the player by letting them know how they can change their playstyle or mindset if missing their first shot negatively impacts their game. An example of why this is important is when Stephen Curry, one of the greatest shooters of all time, had a string of games last season where he shot very poorly and, so he needed to improve upon his shooting (Silverman, S (2017, September 11th) Does Your Body Angle Affect Your Basketball Shooting?).

The question that is asked is whether missing a few consecutive shots in basketball can cause a shooting slump for the rest of that game. A "shooting slump" is defined as a period of time in which a player misses every single shot that they take. The amount of shots missed for it to be classified as a shooting slump is 4 or more because that makes it a larger and more reliable sample size. Also, if a player misses a shot while playing basketball, then their performance in that time frame will be negatively affected as well. This is because if you shoot poorly, then your muscle memory of making shots and the memories of having the ball fall through the net will not be there. This is backed up by the fact that muscle memory makes it so that an action that you do very often is imprinted in your mind. However, if you don't make shots for a while, then your muscle memory will be messed up.

Methods

The procedure for this experiment is conducted through a manner of steps. First, a list of NBA players that want to be studied must be made. Then, a game in which that player is playing in must be watched to determine their shooting patterns. Afterwards, every time the chosen player makes or misses a shot, it must be recorded. At the end, the shooting patterns of the players can be looked at and compared.

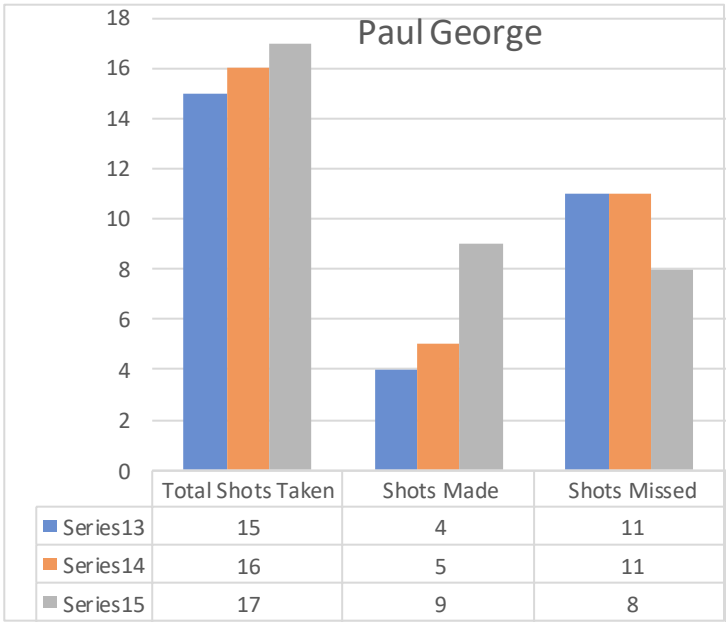
The independent variable that will be used in this experiment is the chosen player. This is because every player has a different average for points per game, rebounds per game, assists per game, etc. Also, every player has a unique playstyle. Some players can be very aggressive defenders, great shooters or all-around formidable athletes. Finally, some players can hit a lot of shots depending on their height compared to their defensive matchup, their own skill or their team's ability to get them good, open shots.

The dependent variable in this experiment will be the shooting percentages of the player, the amount of shots per game they take, the ability of the team of they're playing on, the quality of the shots they are taking and the ability of the opposing team on defense. The controlled variables will be the basketball (all the same size), the size of the court (all NBA courts are the same size) and the nets (all the same height).

	A	B	C	D	E	F	G	H	I	J
1	Player Name	Team	Opponent	Total Shots Taken	Shots Made	Shots Missed	Pattern of Missed and Made Shots (Made Shots=X,Missed Shots=O)			
2	James Harden	Houston Rockets	Utah Jazz	25	19	6	XXXXXXXXXXOOXXOXXXXXXOOO			
3	James Harden	Houston Rockets	Memphis Grizzlies	25	11	14	OXOOXOOXXXOOXXOOOXXOXOOXO			
4	James Harden	Houston Rockets	Cleveland Cavaliers	21	8	13	XOXOXOOXXXOXOOXOOOOOO			
5										
6	LeBron James	Cleveland Cavaliers	Houston Rockets	24	15	9	XXXOOXXXXXXOXOOXOXXOXO			
7	LeBron James	Cleveland Cavaliers	Washington Wizards	34	23	11	XXXXXOXXOOXXOOXXXOXXXXXXXOOOXXXOOX			
8	LeBron James	Cleveland Cavaliers	Atlanta Hawks	17	10	7	OOOXXOOXXOOXXXXXX			
9										
10	Bradley Beal	Washington Wizards	Portland Trail Blazers	37	21	16	XOXXOXXOXXOOOXOXXXOOOXXXXXOXXOOXOOXOX			
11	Bradley Beal	Washington Wizards	Utah Jazz	15	4	11	OXOOXOOOOOXOOOX			
12	Bradley Beal	Washington Wizards	Detroit Pistons	11	4	7	OXOOOXXXOOO			
13										
14	Paul George	Oklahoma City Thunder	Chicago Bulls	15	4	11	OXOXOOOOOOOOOXX			
15	Paul George	Oklahoma City Thunder	San Antonio Spurs	16	5	11	OXOXOOOOOOXXOXOO			
16	Paul George	Oklahoma City Thunder	New Orleans Pelicans	17	9	8	XXXOXOXOOXOXOOXXO			
17										
18	Kyrie Irving	Boston Celtics	Brooklyn Nets	20	8	12	OOXOOXOOXXOOOOXXXXOO			
19	Kyrie Irving	Boston Celtics	Golden State Warriors	16	4	12	XOOOOXOOOOOOXXOO			
20	Kyrie Irving	Boston Celtics	Atlanta Hawks	12	10	2	XXOXOXXXXXXX			
21										
22	Andrew Wiggins	Minnesota Timberwolves	Dallas Mavericks	15	7	8	XOXOOOOOXOXXOXX			
23	Andrew Wiggins	Minnesota Timberwolves	Detroit Pistons	18	11	7	XOXOOXXXXOOXXXOXXO			
24	Andrew Wiggins	Minnesota Timberwolves	Charlotte Hornets	14	5	9	XXOXOXOXOOOOOO			
25										
26	Donovan Mitchell	Utah Jazz	Brooklyn Nets	15	5	10	OXXOOXOXOOOXOOO			
27	Donovan Mitchell	Utah Jazz	Orlando Magic	9	4	5	XOXOXOOOX			
28	Donovan Mitchell	Utah Jazz	Philadelphia 76ers	19	6	13	OXOOOOOOXXXXOOXOOOO			
29										
30	Kyle Kuzma	Los Angeles Lakers	Phoenix Suns	23	11	12	OOOOOOXXXXOXOXXOXXOXOOX			
31	Kyle Kuzma	Los Angeles Lakers	Denver Nuggets	11	7	4	XOXOOXXXXXO			
32	Kyle Kuzma	Los Angeles Lakers	Chicago Bulls	15	7	8	XXXXOXOXOOXOOOO			
33										
34	CJ McCollum	Portland Trail Blazers	Memphis Grizzlies	17	8	9	OXXOXXOOOXOOOXOXX			
35	CJ McCollum	Portland Trail Blazers	Philadelphia 76ers	14	1	13	OOOOOOOOXOOOOO			

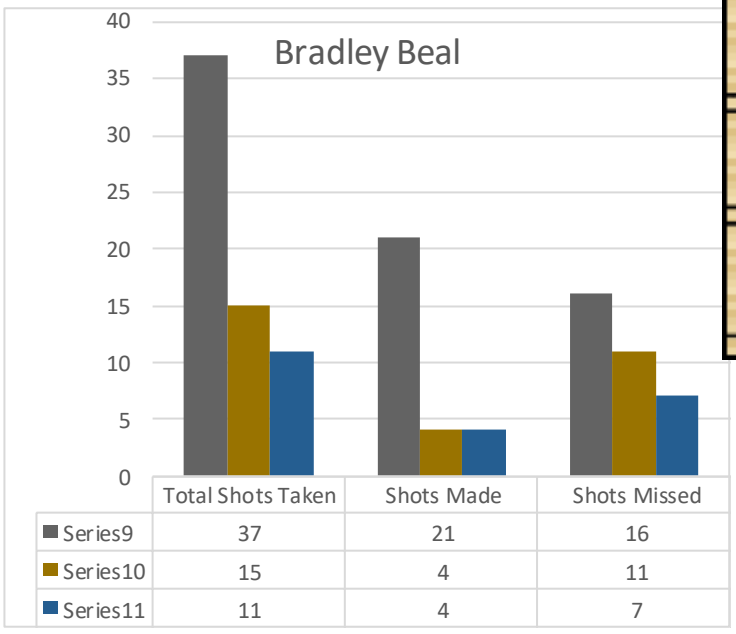
Table 1. A table which shows the data collected from NBA players and their shooting stats as well as their pattern of misses/makes.

Results



	Total Shots Taken	Shots Made	Shots Missed
Series13	15	4	11
Series14	16	5	11
Series15	17	9	8

Figure 1. The numbers of misses per attempts of the NBA player Paul George



	Total Shots Taken	Shots Made	Shots Missed
Series9	37	21	16
Series10	15	4	11
Series11	11	4	7

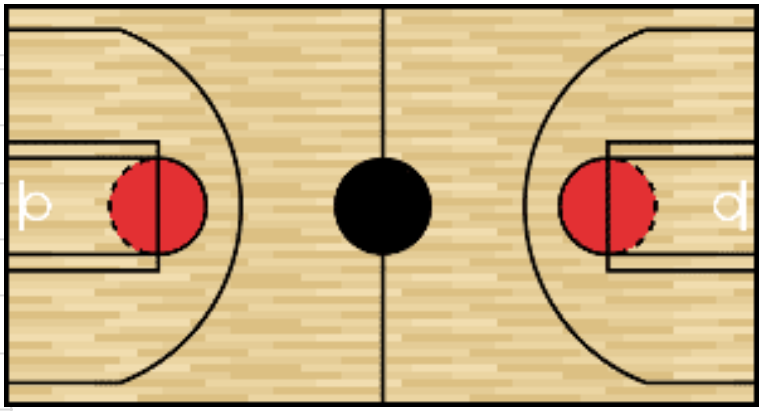


Figure 2. The numbers of misses per attempts of the NBA player Bradley Beal

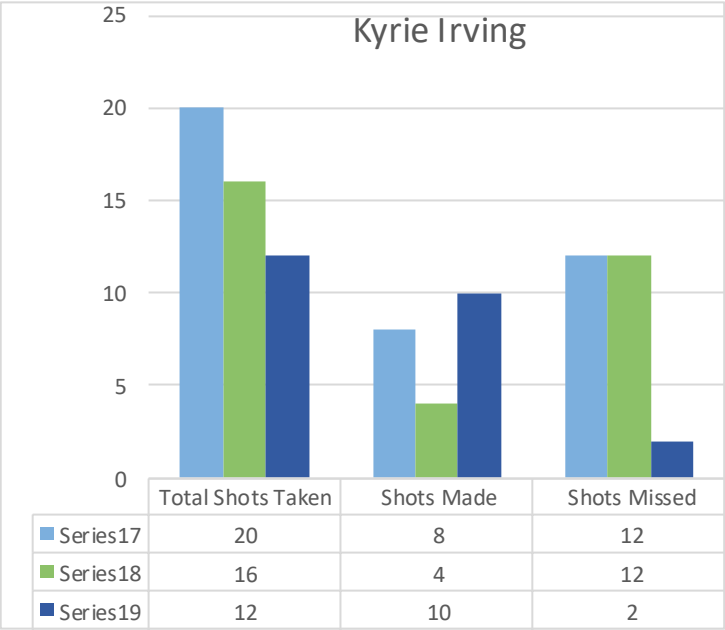


Figure 3. The numbers of misses per attempts of the NBA player Kyrie Irving

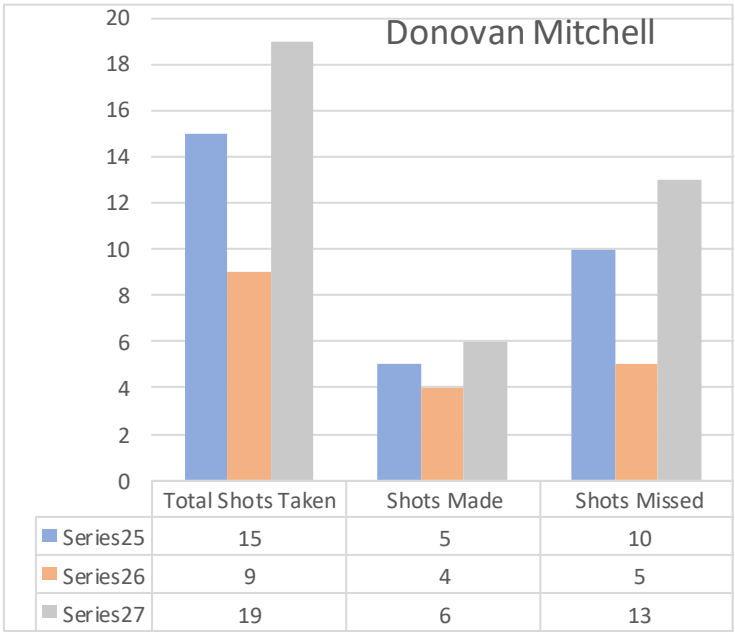


Figure 4. The numbers of misses per attempts of the NBA player Donovan Mitchell

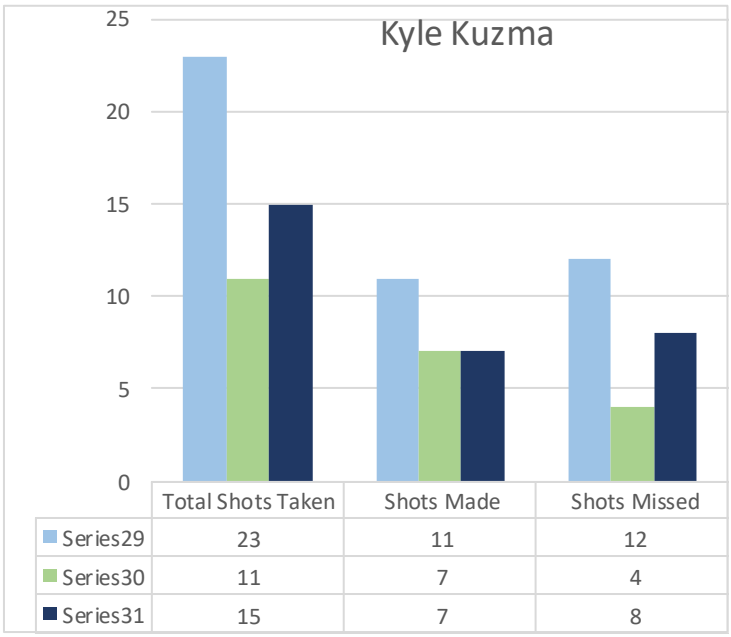


Figure 5. The numbers of misses per attempts of the NBA player Kyle Kuzma

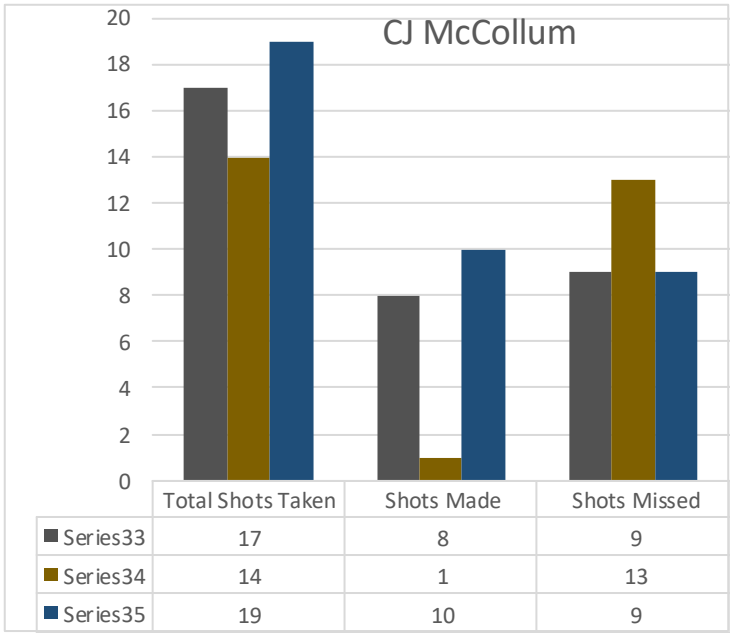


Figure 6. The numbers of misses per attempts of the NBA player CJ McCollum

Player Name	Team	Opponent	Total Shots Taken	Shots Made	Shots Missed	Pattern of Missed and Made Shots (Made Shots=X, Missed Shots=O)
James Harden	Houston Rockets	Utah Jazz	25	19	6	XXXXXXXXXOOXXOXXXXXXOOO
James Harden	Houston Rockets	Memphis Grizzlies	25	11	14	OXOOXOOXXXOOXXOOOXXOXOOXO
James Harden	Houston Rockets	Cleveland Cavaliers	21	8	13	XOXOXOOXXXOXOOXOOOOOO
LeBron James	Cleveland Cavaliers	Houston Rockets	24	15	9	XXXOOXXXXXXOXOOXOXXXOXO
LeBron James	Cleveland Cavaliers	Washington Wizards	34	23	11	XXXXXOXXOOXXOOXXXOXXXXXXXOOOXXXOOX
LeBron James	Cleveland Cavaliers	Atlanta Hawks	17	10	7	OOOXXOOXXOOXXXXXX
Bradley Beal	Washington Wizards	Portland Trail Blazers	37	21	16	XOXXOXXOXXOOOXOXXXOOOXXXXXOXXOOXOOXOX
Bradley Beal	Washington Wizards	Utah Jazz	15	4	11	OXOOXOOOOOXOOOX
Bradley Beal	Washington Wizards	Detroit Pistons	11	4	7	OXOOOXXXOOO
Paul George	Oklahoma City Thunder	Chicago Bulls	15	4	11	OXOXOOOOOOOOOXX
Paul George	Oklahoma City Thunder	San Antonio Spurs	16	5	11	OXOXOOOOOOXXOXOO
Paul George	Oklahoma City Thunder	New Orleans Pelicans	17	9	8	XXXOXOXOOXOXOOXXO
Kyrie Irving	Boston Celtics	Brooklyn Nets	20	8	12	OOXOOXOOXXOOOOXXXXOO
Kyrie Irving	Boston Celtics	Golden State Warriors	16	4	12	XOOOOXOOOOOOXXOO
Kyrie Irving	Boston Celtics	Atlanta Hawks	12	10	2	XXOXOXXXXXXX
Andrew Wiggins	Minnesota Timberwolves	Dallas Mavericks	15	7	8	XOXOOOOOXOXXOXX
Andrew Wiggins	Minnesota Timberwolves	Detroit Pistons	18	11	7	XOXOOXXXXOOXXXOXXO
Andrew Wiggins	Minnesota Timberwolves	Charlotte Hornets	14	5	9	XXOXOXOXOOOOOO
Donovan Mitchell	Utah Jazz	Brooklyn Nets	15	5	10	OXXOOXOXOOOXOOO
Donovan Mitchell	Utah Jazz	Orlando Magic	9	4	5	XOXOXOOOX
Donovan Mitchell	Utah Jazz	Philadelphia 76ers	19	6	13	OXOOOOOOXXXXOOXOOOO
Kyle Kuzma	Los Angeles Lakers	Phoenix Suns	23	11	12	OOOOOOXXXXOXOXXOXXOXOOX
Kyle Kuzma	Los Angeles Lakers	Denver Nuggets	11	7	4	XOXOOXXXXXO
Kyle Kuzma	Los Angeles Lakers	Chicago Bulls	15	7	8	XXXXOXOXOOXOOOO
CJ McCollum	Portland Trail Blazers	Memphis Grizzlies	17	8	9	OXXOXXOOOXOOOXOXX
CJ McCollum	Portland Trail Blazers	Philadelphia 76ers	14	1	13	OOOOOOOOXOOOOO
CJ McCollum	Portland Trail Blazers	Brooklyn Nets	19	10	9	OOOXXOOOXXXXXOXXOOX

Table 2. The highlighted rows indicate the most evident examples of shooting slumps

Discussion/Conclusion

In the end, the hypothesis of the question of whether missing a few consecutive shots in basketball can cause a shooting slump was proven to be correct. This is proven in the data which is highlighted in Figure 2. James Harden proves the hypothesis when he missed a few shots in a row against the Cleveland Cavaliers and ended up finishing the game with 6 consecutive misses. It is also evident in Paul George's performances against the Chicago Bulls and the San Antonio Spurs. In the first game, he missed a few shots and ended up missing a grand total of 9 consecutive shots and in the second game, a similar situation occurred, and he missed 6 consecutive shots. However, the game in which I found this most evident in is in CJ McCollum's game against the 76ers, in which he missed 7 consecutive shots, made one shot and missed another 5 shots. This relates to the question because it provides an answer to the question of whether missing a few consecutive shots can cause a shooting slump. It relates to the hypothesis because it proves that it is correct and that missing a few consecutive shots indeed causes a shooting slump. However, it also shows that this doesn't occur often to players that are at an elevated level such as James Harden and LeBron James. They can be considered as outliers.

Application

This information could be useful for fields of study such as neurology to explore the mental aspect behind this problem. Also, it could be used in the fields of study of biology to study whether the problem has something to do with the muscle movements of the player. This information could also be used by the general public or the scientific community to show that shot selection really is crucial and if you miss one shot, it could turn out to a disaster. These results ultimately fit into the big picture of the NBA because these players could use the information gathered on them to improve their game and not get into as many shooting slumps.

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How does practicing affect your natural handwriting?

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Abstract

The question that started this whole experiment was to find the answer to if practicing will make any significant differences to our natural handwriting. If people are not satisfied with how their writing looks, then this would provide them with a chance. To see if there was an affect, in a set period of time participants were asked to practice their handwriting in pen and pencil. The handwriting would then be compared and analysed to see if there were any differences. The results showed no significant or major changes in the participants handwriting. according to the results it can be concluded that practicing your handwriting makes no significant difference.

Introduction

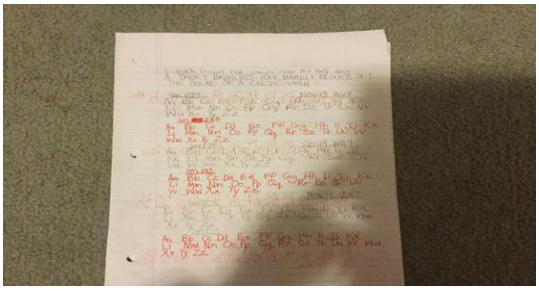
Handwriting is a huge part of our daily routine and sometimes people aren't satisfied with it. If people are willing to change how they write, then this experiment will allow them to see if it's possible. There was a study that was done that indicated that personality is linked to handwriting. If people change the way they write it can be possible that it can affect your personality in a good way. Another study showed that people are quick to judge and that includes how they perceive other's handwriting. If people want to be perceived in some way, then changing their handwriting can help.

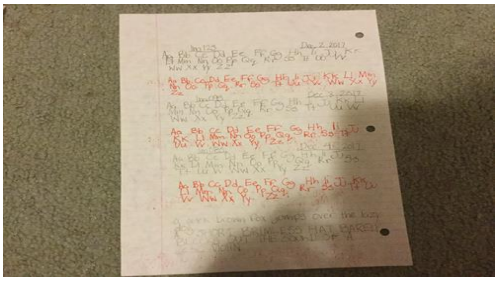
The big question is how practicing will affect natural handwriting. If people practice their handwriting then there will be a significant change because if they have the will and determination to do it, the brain will most likely accept these changes. It has been proven that the reason that people's handwriting can change no matter the age is because they have the will to do it. If we reverse this process, then in theory you can change your handwriting. When you write something down the brain sends electrical impulses to the hand muscles. When people do things frequently then the brain will remember them, and it will slowly morph into everyday habits. Hard practice and practice go a long way when doing something. There are lots of situations where practice show improvement.

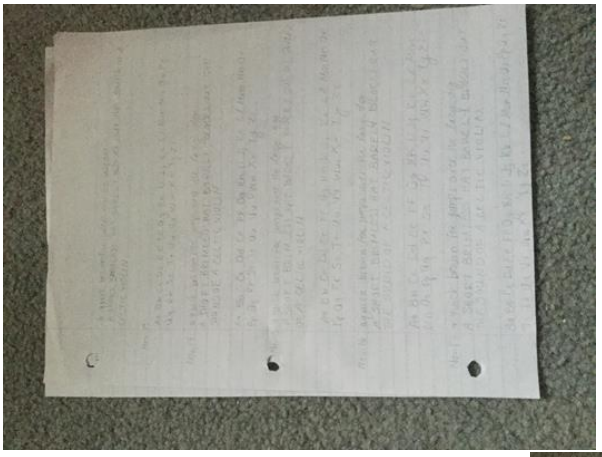
Methods

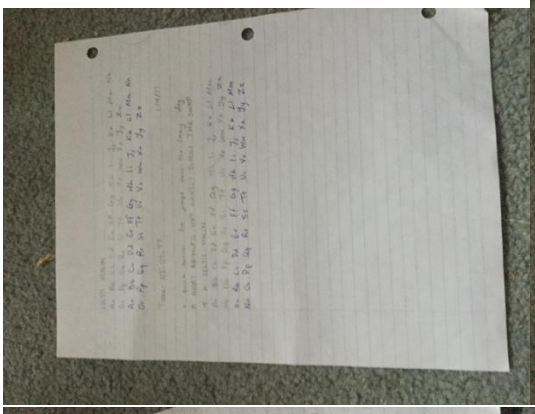
The experiment was conducted in a period of 21 days. Participants were asked to write down an initial sentence to give a base line of what their handwriting looked like naturally. Then they were asked to write down the alphabet two times once a day in both pen and pencil to see if different utensils made a difference. The participants were also asked to time themselves to see if time had any factor in how participants would write. Participants were also asked not to erase anything since the raw data was preferred. On the last day of the experiment participants were asked to rewrite the base sentence again to be compared to the first time the sentence was written down. The participants are asked to keep all the papers safe and then hand them in on the designated day. The handwriting was then analysed and compared. The participants were then asked to answer a few questions to find out how they felt about the experiment. The dependent variable is the handwriting that each participant produced. It was what needed to be measured to answer the big question to see if practicing affects how the person's handwriting turned out. The independent variable of this experiment is the utensil that the participants used and the time it took to write things down. Those were changed to see how it would affect the outcome of the participants' handwriting. The controlled variable was the practice and the initial sentence because it was to give all participants an equal footing to do the experiment, so there were no advantages or disadvantages

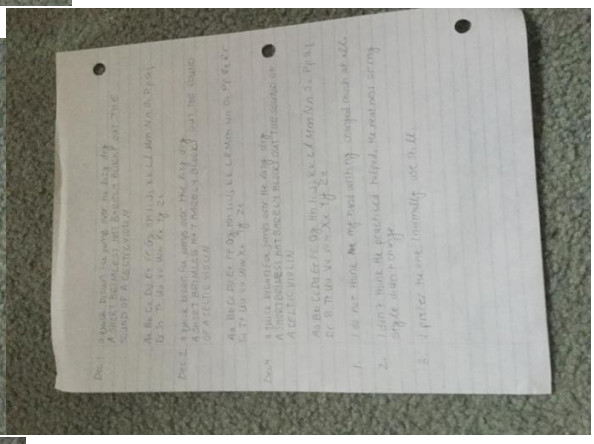
Results

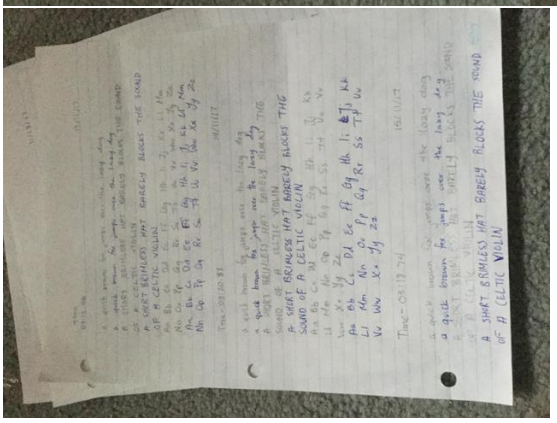












Question	Answer	Answer	Answer
1. Do you think your handwriting changed in anyway? If so how?	Style didn't change, but got neater	Did not think handwriting changed much	Handwriting got neater
2. Did the practice help?	It might've	Didn't think it helped	Found it helpful

3. Did you find writing with a different utensil help you and make anything easier or do you prefer the one you regularly use?	**Prefer pencil and didn't help, but it depends on what surface is being written on and what is being written**	**Didn't think it was helpful and prefer the utensil normally used**	**Didn't think writing with different utensil helpful and prefer the normal one**

The pictures on the left is the handwriting that participants started out with and the pictures on the right is the handwriting once they were done the writing practices. There were side by side comparisons to see if there was any difference between the two. The table contains the answers of the questions that were asked.

Discussions/Conclusion

My hypothesis was not correct if people practice their handwriting then there will not be a meaningful change. According to the data collected people did not think that practicing handwriting changed anything. According to experts It is completely up to the person who is writing and how they are growing and developing or if they have physical or mental changes, so there are other factors that can affect how handwriting is changed and not just will. There was a lot of demanding work and practice that went with this experiment and it didn't really help. This might not morph into people's daily handwriting since nothing significant happened. There wasn't a wide range in age, so it is not clear if the same results would happen in different age groups. The answer to the question "how will practice your handwriting affect your daily handwriting" according to my data is that it doesn't do a lot to affect your daily handwriting.

The analysis if the handwriting is quite subjective, so this analysis is according to personal views. Analyzing the practice that was done not much change was noticed from the beginning of the test and the ending. All results show that the most this test did was make the handwriting neater and according to data collected participants did not think that this test helped. Although according to experts it usually takes 30 days to show any significant difference in handwriting. Also, it is mentioned that to change your handwriting people must be willing to change it, and the participants might not have had the will to change

anything. Also, other factors were not taken into consideration like mood and others. This experiment went on for only three weeks, so maybe if it was extended there would be a more significant difference such as slating, change in size etc. The timing of the practices also went down as time, as weeks progressed, but it was not in a steady consistent flow downwards sometimes the time would rise back up from time to time by one or two seconds, but that is to be expected. The use of pen did not help or change anything in the daily handwriting of people according to data.

Application

This information can be used by people who want to change their handwriting and want to know if practicing can help in anyway. Handwriting is directly linked to the brain, so the data that was collected may help in the psychology of handwriting. It might also spread awareness to the importance of handwriting since it's been dying with the more technological advances in our society. Also, it could show how practicing things repeatedly may not always have the affect that you think it does.

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What is the best way to get faster

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ABSTRACT

The purpose of this experiment was to find the best way to gain speed. This project is important because athletes will be able to utilize this information to help them and people alike. To do this, there was a comparison between two workouts to determine which one was better. One of them was custom made, and the other was professionally made. Subjects would test these workouts, by using them and then switching them later to see which one had improved more. The results that were determined were that the custom-made workout had better results than the professional workout. 4/6 of the subjects had better results than the 2/6 that improved more in the other workout. The custom workout was better than the professional workout.

INTRODUCTION

Many student athletes, professional athletes, and people alike try to achieve a goal when they exercise. The biggest question on their mind is "how to improve or get better". This is important to these people because for student athletes; they need to get better to help win team games or independent sports. For professional athletes they would want to be the best and achieve new human heights. For athletic people, they could use this to help them, do better if they participate in marathons. When you exercise your muscle fibers get damaged and so your body tries to repair it with a cellular process. The muscle fibers are formed with new muscle proteins and, so that increases muscle mass and strength.

For those who are more focused on the running aspect of fitness, they try to get faster and increase their endurance. Then the real question is ("What is the best way to get faster?") In the shortest and most efficient way possible. That's where this project comes in. So, to find what is the best way to get faster, this project compares a professional workout to a custom workout.

If changing the method of training by rearranging and adding more exercises such as core exercises, arm exercises, calve exercises, and back exercises, than this should increase speed for running because these exercises focus more on the movements of body while running. With more exercises the results should be better due to the increase of intensity.

(METHOD)

To start this experiment initially there are supposed to be a minimum of 6 or more subjects, with even numbers. The total amount of subjects are then separated into two groups, one that focuses on the professional workout first then the other group focuses on the custom-made workout. Record the subjects start times after placed into groups. Group one, follows the custom-made workout according to (Figure 1). Group two, then follows the professional workout according to (Figure 2). Once both groups finished their start workouts, group 1 then follows (Figure 3) track workout, and group 2 starts their track workout (Figure 4). Once a all workouts are finished, continue the next day and record the data again. Continue this project for at least a minimum of 2 weeks or more, for both workouts. The independent variables are the two workouts. The dependent variable is the end speed of the subjects. The controlled variables are the weather, clothes, location, and equipment (timer).

(Figure 4)

1. Lunges – 50m
2. Sigon squats -1 min
3. Reaching toes – 30 secs

Track training session I

Conditioning Run and Endurance Run

2 x 800m. After each run, walk back to the start. Rest 10 minutes. Target time for each 800: 3 mins or under.

Track training session II

Race Modeling Run

250m

150m x 2

100m

Rest 3 mins in-between reps and 8 minutes between sets.

(FIGURE 2)

1. Squats – *15 reps*
2. Barbell Squats – 4 sets of 10 reps
3. Leg Press – 3 sets of 6 reps
4. Calf Lifter – 4 sets of 10 reps
5. Wall Squats – 1 min with a weight of 50-80 max of carry
6. Dead Lift – 5 sets of 6 reps
7. High knees – 1 min

(*FIGURE 1)*

1. Do Power Cleans - *5 sets of 5 reps*
2. Do Barbell Squats - *3 sets of 6 reps*
3. Do Bench Press - *3 sets of 6 reps*
4. Do Plate and Bodyweight Complex Finisher - *3 supersets of the following:*
5. Do Chin-ups - *10* reps
6. Do Jump Squats w/plate - *12 reps*
7. Do Hanging Knee raise - *20* reps
8. Do Reverse Lunge w/knee drive - *8 reps on each leg*
9. Do Dips - *10 reps*
10. Do Sled Drag (40 ft.)

(Figure 3)

1. Skips - *50m*
2. Backward Skips - *50m*
3. High Knees - *50m*
4. Butt Kicks - *50m*
5. Backward runs - *50m*
6. Leg swings (front and back) - *10 reps*

Track training session I

Conditioning Run

8 x 200m. After each sprint, walk back to the start. Rest 2 minutes. Target time for each 200: 30 seconds or under.

Track training session II

Race Modeling Run

250m

150m x 2

Rest 90 seconds in-between reps and 8 minutes between sets.

RESULT

Table 1 "Experiment 2" Professional (Part 1)

Distances

Subjects	Number of Weeks	400m	200m	100m	Percentage of improvement
Baqer	0	1:56:41 mins	38.23 seconds	15.68 seconds	11.1% Increase in speed in 400m
	1	1:48:29 mins	37.56 seconds	15.23 seconds	3.7% Increase in speed in 200m
	2	1:43:47 mins	36.78 seconds	14.24 seconds	9.1% Increase in speed in 100m
Mitch	0	1:09:08 mins	33.76 seconds	14.87 seconds	11.7% Increase in speed in 400m
	1	1:04:87 mins	34.56 seconds	14.24 seconds	2.6% Increase in speed in 200m
	2	1:00:98 mins	32.87 seconds	14.04 seconds	5.5% Increase in speed in 100m
Aria	0	1:37:24 mins	42.67 seconds	16.98 seconds	11.2% Increase in speed in 400m
	1	1:29:28 mins	40.23 seconds	16.36 seconds	6.5% Increase in speed in 200m
	2	1:26:26 mins	39.89 seconds	15.97 seconds	5.9% Increase in speed in 100m

m=meters

Table 1 shows, all three subjects that tested the professional workout achieved around 11% increase in speed in 400m. In 200m, subjects have achieved an increase of 3.7%, 2.6%, and 6.5% in speed. In 100m, the three subjects have achieved increases of 9.1%, 5.5%, and 5.9%.

Table 2 "Experiment 2" Professional (Part 2)

Distances

Names	Number of Weeks	400m	200m	100m	Percentage of improvement
Roger	0	1:01:25 mins	30:78 seconds	13.97 seconds	8.1% Increase in speed in 400m
	1	59:45 seconds	29:89 seconds	13.47 seconds	7.6% Increase in speed in 200m
	2	56:98 seconds	28:43 seconds	13.49 seconds	3.4% Increase in speed in 100m
Felix	0	1:00:24 mins	35:24 seconds	16.11 seconds	5% Increase in speed in 400m
	1	1:00:89 mins	32:56 seconds	15.65 seconds	11.9% Increase in speed in 200m
	2	57:18 seconds	31:03 seconds	14.98 seconds	7% Increase in speed in 100m
Majd	0	2:06:72 mins	47:78 seconds	18.67 seconds	5.1% Increase in speed in 400m
	1	2:05:98 mins	45:43 seconds	18.42 seconds	11% Increase in speed in 200m
	2	2:00:23 mins	42:48 seconds	18.03 seconds	3.4% Increase in speed in 100m

Table 2 shows, the next three subjects that tested the professional workout have achieved 8.1%, 5%, and 5.1% increase in speed in 400m. In 200m, subjects have achieved 7.6%, 11.9%, and 3.4% increase in speed. In 100m, subjects have achieved 3.4%,7%, and 3.4% increase in speed.

Table 3 "Experiment 1" Custom (part 1)

		Distances			
Names	Number of Weeks	400m	200m	100m	Percentage of improvement
Roger	0	1:13:51 mins	35.43 seconds	15.54 seconds	10% Increase in speed in 400m
	1	1:10:56 mins	32.65 seconds	15.03 seconds	8.5% Increase in speed in 200m
	2	1:05:36 mins	31:98 seconds	14.29 seconds	8% Increase in speed in 100m
Felix	0	1:23:93 mins	45:34 seconds	17.43 seconds	22% Increase in speed in 400m
	1	1:15:27 mins	40:21 seconds	17.02 seconds	15.9% Increase in speed in 200m
	2	1:05:29 mins	38:12 seconds	16.57 seconds	4.9% Increase in speed in 100m
Majd	0	2:27:23 mins	50:87 seconds	23.3 seconds	10% Increase in speed in 400m
	1	2:19:53 mins	52:24 seconds	19.79 seconds	4% Increase in speed in 200m
	2	2:12:24 mins	48:24 seconds	19.31 seconds	17% Increase in speed in 100m

Table 3 shows, all three subjects that tested the custom workout achieved 10%, 22%, and 10% increase in speed in 400m. In 200m, subjects have achieved an increase of 8.5%, 15.9%, and 4.9% in speed. In 100m, the three subjects have achieved increases of 8%, 4.9%, and 17%.

Table 4 "Experiment 1" Custom (part 2)

		Distances			
Names	Number of Weeks	400m	200m	100m	Percentage of improvement
Baqer	0	1:38:78 mins	35.89 seconds	14.20 seconds	11.2% Increase in speed in 400m
	1	1:32:65 mins	35.12 seconds	14.03 seconds	5.5% Increase in speed in 200m
	2	1:27:47 mins	34.23 seconds	13.77 seconds	3% Increase in speed in 100m
Mitch	0	58:78 seconds	32.08 seconds	13.78 seconds	6.7% Increase in speed in 400m
	1	57:45 seconds	30.69 seconds	13.67 seconds	9.3% Increase in speed in 200m
	2	54:89 seconds	28.98 seconds	13.39 seconds	2.8% Increase in speed in 100m
Aria	0	1:23:21 mins	38.34 seconds	15.45 seconds	7.2% Increase in speed in 400m
	1	1:19:45 mins	37.98 seconds	15.49 seconds	1.5% Increase in speed in 200m
	2	1:17:24 mins	37.76 seconds	15.05 seconds	2.5% Increase in speed in 100m

Table 4 shows, the next three subjects that tested the custom workout have achieved 11.2%, 6.7%, and 7.2% increase in speed in 400m. In 200m, subjects have achieved 5.5%, 9.3%, and 1.5% increase in speed. In 100m, subjects have achieved 3%, 2.8%, and 2.5% increase in speed.

DISCUSSION/CONCLUSION

The hypothesis was correct with the results that if changing the method of training by rearranging and adding more exercises such as core exercises, arm exercises, calve exercises, and back exercises, than this should increase speed for running because these exercises focus more on the movements of body while running. With more exercises the results should be better due to the increase of intensity.

The best way to get faster is to use the custom workout, because the custom workout focuses more on the movements of the body and during the experiment, it showed better results that 4/6 of the subjects improved more. The custom workout also showed the highest amount of improvement with 22% in 400m.

These results relate to the original question because they indicate and show an increase in speed which showed improvement. The custom workout results had better progress than the professional workout results.

The data does support my hypothesis, due to the better increased speed results from most subjects, by adding more essential exercises the better balanced the body is.

My results are consistent with other investigators because other investigators have similar procedures and have the similar idea of balancing the exercises and doing more full body.

For problems and errors that may have affected the experiment, were the weather conditions, the subject's efforts and the subject's diets. The weather conditions would affect the results because the temperatures would tire out the subjects more quickly or tighten the muscles up more. In hot summer temperatures, the subjects would sweat more and get dehydrated. In cold winter temperatures, the subject's muscles would freeze and tighten up and slowing down the circulation in the body, making them run slower. For the subject's diets, having a bad diet could lead to bad energy requirements, poor performance, low hydration levels, and bad macronutrient needs. The amount of effort is also important because it affects the accuracy of the end results, by not going to the full potential. If these problems or errors had not happen, then in the experiment results would have been received faster and the potential increase in speed should have been greater.

APPLICATION

How would this information be applied to other fields of study?

This information would be applied to other fields of study such as other sports, myology and kinesiology. In other sports they could see where and how to use speed to their better advantage. In football for example, they could use this study to help their players run faster and get into their positions quicker. In myology and kinesiology, this information can be used to see, how to train the muscle the most efficient way possible and see how efficient the muscle is used.

How would the general public or scientific community use this information?

The use of this information would help the general public by helping parents help their kids train for their special sport. In the scientific community they could see the most efficient way to train.

How do your results fit into the big picture?

These results can help any future athlete globally trying to achieve athletic goals. This is a very universal workout experiment where any sport can use it to train and get better.

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The Holistic Qualities of Music and Their Influence on the Appreciation of Music

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Abstract

The purpose of this experiment was to find out the most influential qualities of music, in order to determine what causes people to like the songs they like, and why. The plan for completing this experiment was to conduct a survey that would present songs and question the subjects on the qualities of the songs. The subjects would answer questions related to how influential the qualities of music were in the liking of the song, as well as how influential each quality was in relation to all the others. The results proved to be thorough, showing that "melody" was the most influential quality in the process of forming an opinion for a song, being chosen exactly 40% of the time over the other 5 options by the subjects. "Rhythm" was the second most influential quality, being chosen about 20.667% of the time by the subjects as the quality that influenced the subject's opinion on the song the most. "Beat and meter" was a close third, at being chosen about 18.667% of the time. "Tempo" was the most influential at 8% of the time, where as "harmony" was the most influential at 6.667%, and "pitch" was the most influential only 6% of the time. These results show that a listener's opinions on a song are influenced the most by the melody, which is proven by trends in the current industry of music, as melody-driven pop songs are popular. These results imply the most important factor in the forming of an opinion of a song is the melody, the rhythm, and the beat – in that order.

Introduction

The purpose of this experiment was to get a better understanding for the appreciation of music, and to attempt to make sense of 'good' music, which is inherently subjective, in a way that results in answers that can be quanitified and are objective. In early April of 2017, a scientific article was published that discussed various properties of sound and music, and their effects on creating an aesthetic musical experience for the listener (Brattico et al., 2017). This experiment is an attempt to expand upon the effects of the qualities of music on the experience that is created for the listener.

The question that was formed from this study was the following: What qualities of songs impact the appreciation of the songs by the listener the most? If the way to find the most impactful qualities of songs

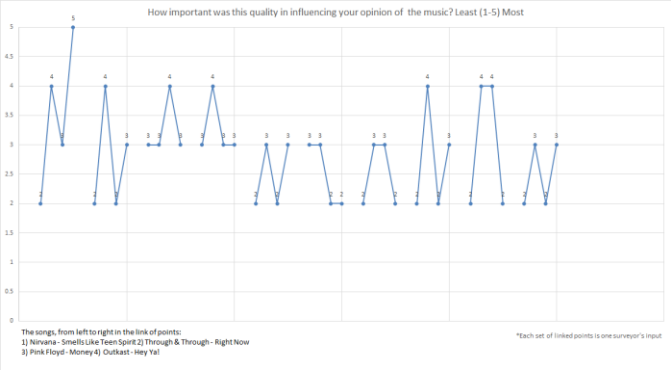
was to get feedback from many listeners on songs, then creating a survey that provides concise, accurate results on the influence of specific qualities of music, as well as the whether the song is liked or disliked thanks to the most important quality, should be possible. This should be possible because providing questions for specific criteria to collect specific data should be easy to do with surveys, as the surveys can make very specific questions easy to answer by putting them into the format of multiple choice, or numerical scale.

Methods

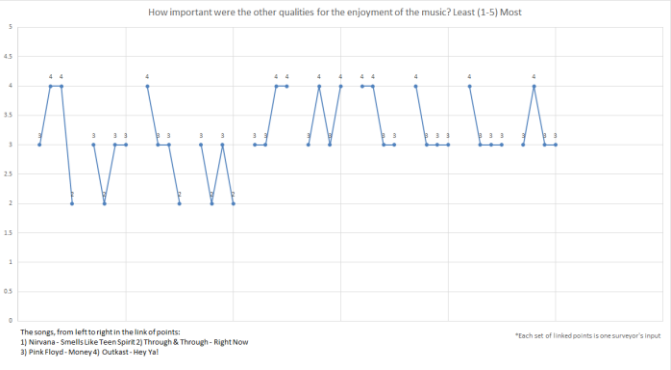
In order to conduct this experiment, holding a survey would be the most ideal way to collect results effectively. Before holding the survey, multiple subjects who agree to complete the survey need to be obtained (preferably at least 10 or more subjects). Each song quality must have its own section, wherein there must be at least two songs that demonstrate the opposite ends of each quality (i.e. for the quality 'tempo', one song with the primary quality of tempo would have a fast tempo, and one song would have a slow tempo). The survey must allow for the subjects to describe which songs they liked, why they liked them, and what quality of the song impact their opinion the song the most. Once the survey is organised into sections by quality, get the subjects to complete the survey. Once all subjects are done surveying, collect the data and organise it in a readable format (i.e. excel sheets). Once the data is organised, cross-reference the data from all songs to find out what qualities are the most influential from all songs. Additionally, it should be noted which songs are liked or disliked the most, in order to determine exactly how the most influential quality of the song affected the song: whether a quality causes dislike or appreciation more. The primary quality that the song is associated with (see the example of the quality 'tempo' from the other column) should also have it's influence on the song recorded – this should determine whether a quality that is very prevalent in a song is necessarily the most impactful factor of that song or not. A simple number scale is fine for these questions , as they allow for the results to be quanitified easier. A number scale for these questions could just be from 1 to 5, where 1 meant that the quality was the least impactful / the song was greatly disliked by the subject, and 5 could mean that the quality was the most impactful / the subject greatly liked the song. Just a multiple choice for choosing the most influential non-primary quality should suffice, and should make analysing data easier. These are all the steps needed to make and collect the results. The independent variable in this experiment is the song that is changed: many songs will be chosen, but only one variable changes – the song that is played. The dependent variable is what the subjects rate the songs they hear. The control variable is the fact that all subjects are listening to and rating the same songs (i.e. if there are 20 subjects, they will all listen to the same selection of songs).

Results

The results proved to be thorough, showing that "melody" was the most influential quality in the appreciation of a song, being chosen exactly 40% of the time over the other 5 options by the subjects. "Rhythm" was the second most influential quality, being chosen 20.667% of the time. "Beat and meter" comes third, being chosen about 18.667% of the time. "Tempo" was the 4th most influential, being chosen 8% of the time. "Harmony" was the 5th most influential, at 6.667%, and "pitch" was the least influential at being chosen only 6% of the time. These percentages were calculated by taking all of the times that specific quality was chosen as the songs most influential quality, divided by the number of times the subjects were asked about which quality was the most influential. This shows the percentage that that specific quality was chosen as the most influential, on average. The results showing how much the main associated quality affected the subject's appreciation of the song on a scale of 1 to 5 are shown below, along with the results for how much all of the qualities that are not the main associated quality affected the appreciation of the song (on a scale of 1 to 5 as well).



Results for the influence of 'beat and meter' on songs where 'beat and meter' is the primary quality



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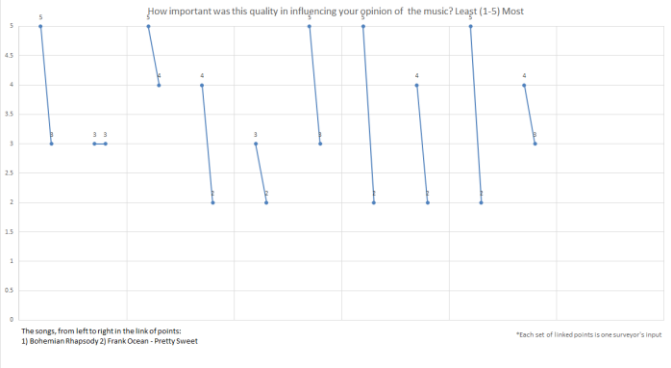

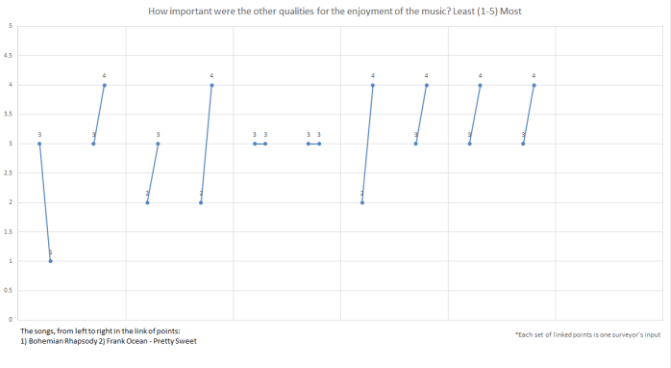

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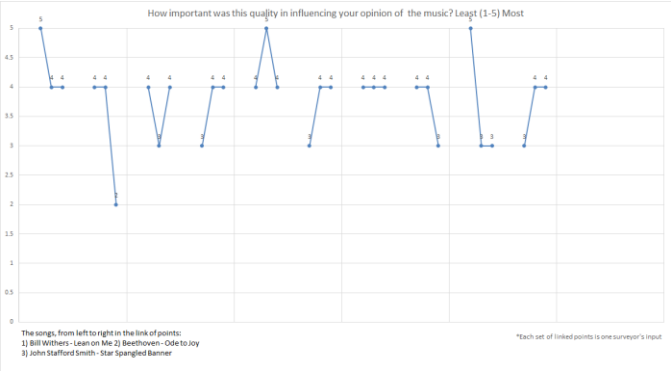
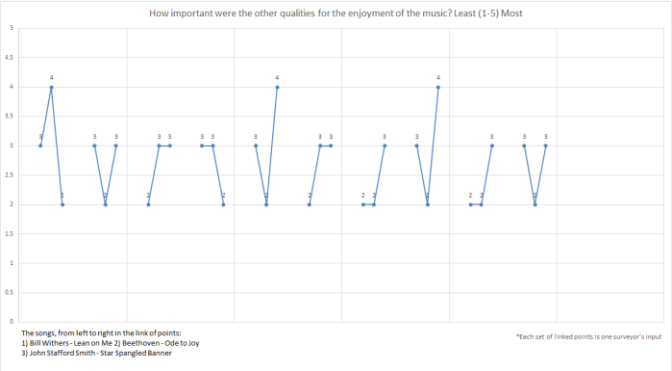
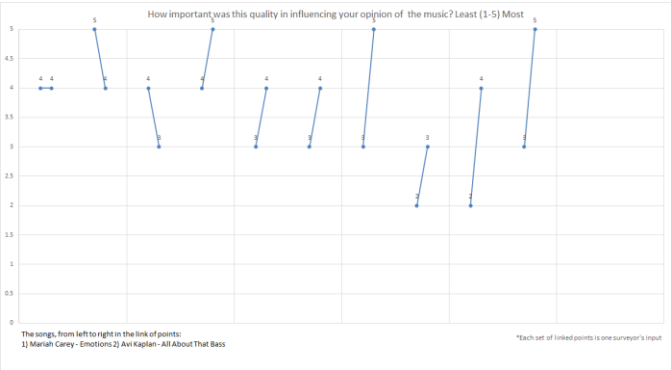


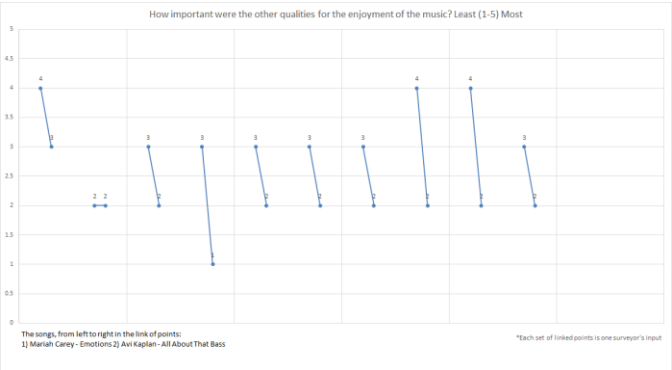
Results for the influence of other qualities on songs where ‘harmony’ is the primary quality



Results for the influence of ‘melody’ on songs where ‘melody’ is the primary quality

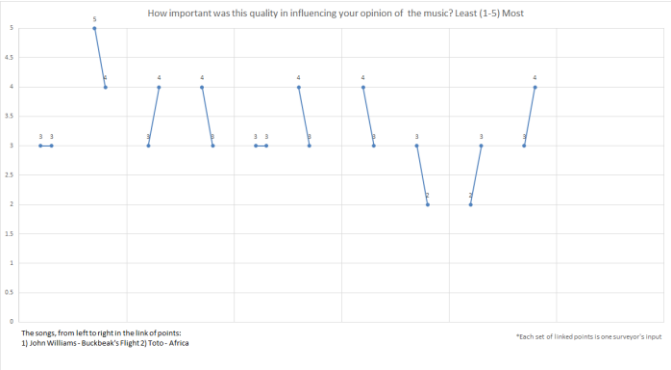
Results for the influence of other qualities on songs where ‘melody’ is the primary quality

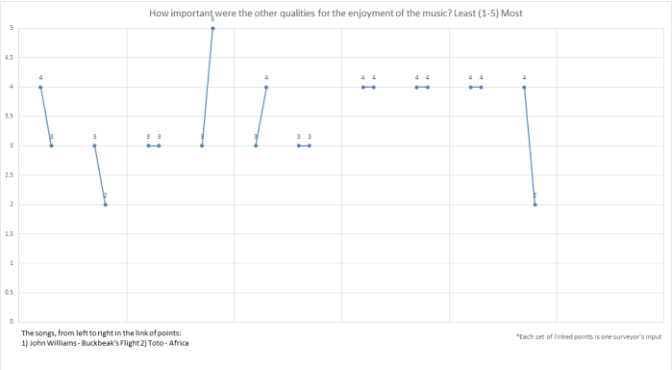




Results for the influence of ‘pitch’ on songs where ‘pitch’ is the primary quality

Results for the influence of other qualities on songs where ‘pitch’ is the primary quality

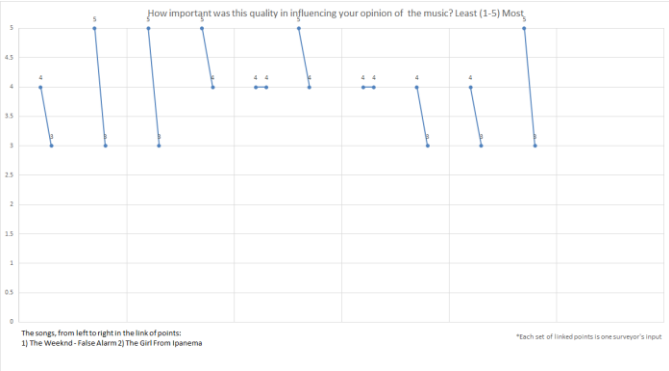




Results for the influence of ‘rhythm’ on songs

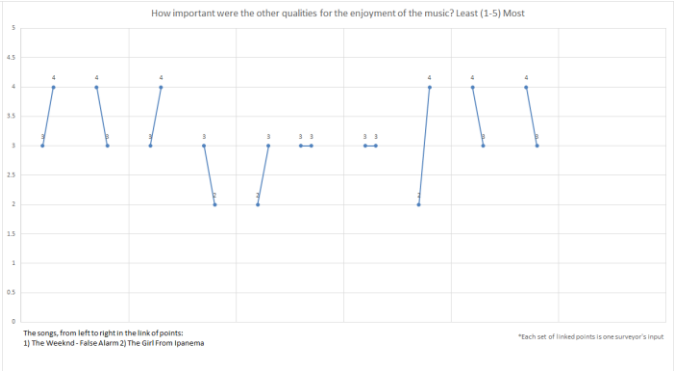
Results for the influence of other qualities on

where ‘rhythm’ is the primary quality



Results for the influence of ‘tempo’ on songs where ‘tempo’ is the primary quality

songs where ‘rhythm’ is the primary quality



Results for the influence of other qualities on songs where ‘tempo’ is the primary quality

Discussion/Conclusion

The hypothesis that was initially stated was proven to be correct: a survey was created that was able to determine the most influential qualities of music, while also showing which qualities of a song are the most important, and how much the song was liked. The results were clear, and showed how important each quality was in comparison to each other. For example, the quality ‘melody’ was the most influential quality 40% of the time – this knowledge was contrived from the survey results, and helped to illustrate which qualities were the most important, and when held in comparison with the influence of other qualities (in terms of percentage), can show the importance of the other qualities in relation to one specific quality. The most significant results were the top 3 most influential qualities of a song: ‘melody’, ‘rhythm’, and ‘beat and meter’, in that order. While melody was significantly the most influential, rhythm and beat and meter were almost equally important in terms of helping a subject form an opinion on a song. These results help to answer the original question exactly, by showing which qualities of music are the most important, through displaying the most influential qualities for the appreciation of a song by a subject. The scientific article mentioned in the introduction suggested that properties such as tempo had a fairly significant influence on the preference and liking of music, where slow tempo would be associated with sadness, and fast tempo would be associated with happiness – and would also be rated more positively than songs with slow tempo (Brattico et al., 2017). However, this suggestion was not mirrored in these results, as the quality ‘tempo’ was noted to be the most influential about 8% of the time. Another notable difference between the expectations for ‘tempo’ was that only the song with fast tempo were noticed to be disliked by subjects– the song with slow tempo was consistently liked, and never disliked. There were some problems and sources of error in this experiment. More songs could have been used for each section quality. More songs would’ve helped to remove the risk of

subjects already having opinions on the songs used, that might be based off of things unrelated to the actual qualities of the song. Having more clear examples of songs for less obvious qualities (like the difference between 'rhythm' and 'beat and meter') may have helped to prevent any confusion from the subject in regards to what quality they were actually rating on the survey, so that they wouldn't accidentally judge a quality thinking it represented a different quality of the song. If these problems did affect the results, then being more thorough in the music choice would result in more accurate results. Another possible source of error would be localised taste: since the subjects are all Canadian-based, the responses to the qualities of music might be different than the responses of someone living in a foreign country who has a musical taste of songs that sound very different from the West. The clear solution is to survey many people, world-wide.

Application

This information can be used in other fields of study, such as psychology. A in-depth analysis of how the brain physically reacts during listening to a song, as well as how a brain actually 'enjoys' a song, can use these results from this experiment as reference, because the results provide information about what qualities are most important, and they influence a person's opinion on a song. This information (or at least the methods used) could help to prove why or how a certain quality of a song affects your brain physically, and what changes music can cause to the brain, since the results also describe how a quality influences how someone appreciates a song. In the broad scope, these results cannot be relied upon outside of the western world, as music influences world wide are different than the music styles in the West. This experiment resulted in answers from subjects who had only been immersed in westernised music. To get an accurate representation of the rest of the world, a wider range of subjects must be used. If this is done, then the results would be globally accurate, and could be reliably used in research. These results can still be used in the western world, specifically for people who intend to create music that panders to people's preferences based off of the qualities of music that this experiment's data deems the most influential. People who make music could look at the collected data and make their songs around the most influential qualities, resulting in (hopefully) songs that are hits. If more subjects take the survey, and there is a wider range of subjects in terms of their experience with music, then the data collected and analyzed from this experiment will become more accurate, and could be used for more things reliably.

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Music: The Physical and Mental Effects on Teenagers

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ABSTRACT

Throughout this project, the question that is being researched is on different genres of music and how it can affect teenagers physically and mentally. This is important to be researched because this can show the importance of music by emotions and movements as well as the benefits. To display the results of the question being asked, a survey is given in which students listen to four different samples of popular songs. Afterwards, the participants were asked to describe how they feel and what they would be doing (actions). There were six options under emotions and five options for actions and the participant would fill out which answer best suits them. According to the results which were displayed in circle graphs and separated by song, action, and emotion, some of the participants results did correspond with that specific genre of the song (people chose to happy and would be singing or dancing while listening to upbeat melody), but other results did not correspond with the song. These results showed up this way from the brain, mainly affected by the nucleus amygdala and accumbens (NA) and the neurotransmitter dopamine. These parts help choose the kind of emotion while listening to music, but since everyone's brain functions differently, this can change since people don't always have the same opinions.

INTRODUCTION

This project is based on music. Music has influenced peoples' emotions many times; from crying while listening to a depressing song or dancing to an upbeat melody. The purpose of this is to show how music can help a person express themselves more and show their personality. A person's emotions and movements are very powerful and by listening to a song, it can affect both things. Music can also be beneficial to people, by helping to reduce stress levels or just being positive. This is because of the power of listening to music.

The question for this project is how does music affect teenagers physically and mentally. Many teenagers have been affected by music many times, especially with today's technology like YouTube and Spotify. Since teenagers' brains have matured a lot from a child and functions better then elder and

adults, teenagers are the perfect audience to listen to music to.

The hypothesis that is being stated for the question being asked is if the rhythm is corresponding with the type of genre of music, then the emotion and movement will relate to the genre. An example of this is listening to song about happiness and the person feels happy and wants to dance. Studies show that this can be caused by the brain. The brain helps distinguish the emotion a person feels which can also relate to the body by giving signals and responding to it.

METHODS:

The method used to answer this question is by conducting a survey. In this survey, there will be 4 songs with different genres. The genres that are chosen are pop, ballad, rock, and classical. The songs are *Despacito, Too Good for Goodbyes, Welcome to the Jungle,* and *Symphony No.9.* There will be 2 tables that will be drawn or typed out. The 1st table should have 5 emotions listed which are happy, sad, angry, surprised, confused, and another option called *Other* in the first column and in the second column in the first row, write *Tallies* as the title so the results can be recorded. Do the same with the second table but have 4 different actions which are dancing, singing, studying, and doing nothing and an option called *Other.* The 2 tables should look something like this:

Example of the 1st table

Emotion	Tallies
Happy	
Sad	
Angry	
Surprised	
Confused	
Other	

Example of the 2nd table

Action	Tallies
Dancing	
Singing	
Studying	
Doing Nothing	
Other	

After making the charts, start asking 12 people who are the ages of 13-18. Let each person listen to the 4 songs. Ask the participant how they feel about each song and what kind of action they feel like doing while listening to the song. Tally each option the participant chose for both tables. If the participant chose *Other*, then tally it and write down in brackets their emotion and/or action.

The independent variable for this survey are the participants responses. Not all of responses will be the same so it is changed on purpose. The dependent variable is also the response for each person. Since every participant's responses are

different, this will determine the hypothesis to the original question by seeing any trends. The controlled variables are the 4 song choices, the 2 tables and the options on the tables, the questions being asked for each participant, and age group. These lists of variables do not change because the survey results should be fair to each person, so they should have the same charts, songs, and questions being asked.

The age group will always be teenagers since the question is being asked the age group, therefore it wouldn't change.

Table 1 (below): These are the participants results (emotions and action) for the upbeat song, *Despacito* (black coated rows) and the sad song, *Too Good for Goodbye* (yellow coated rows)

RESULTS:

Emotion	**Tallies**	**Emotion**	**Tallies**
Happy	|||||	Happy	|||
Sad		Sad	||||
Angry	||||	Angry	
Surprised	|	Surprised	
Confused	|	Confused	
Other		Other	|(tired),|(thoughtful),|(bored),|(calm, tired),|(funny)
Action	**Tallies**	**Actions**	**Tallies**
Dancing	|||	Dancing	
Singing	|	Singing	||
Studying	|	Studying	||
Doing Nothing	|||	Doing Nothing	|||||
Other	| (throwing pillows), ||(tapping),|(shopping)	Other	|(sleeping), |(eating), |(crying)

Table 2 (below): These are the participants results for the rock song *Welcome to the Jungle* and the classical piece *Symphony No.9*

Emotion	**Tallies**	**Emotion**	**Tallies**
Happy		Happy	|||||
Sad		Sad	
Angry	||||	Angry	|
Surprised		Surprised	|
Confused	|||||	Confused	|
Other	|(disgusted),|(weird)	Other	|(annoyed), |(calm),|(dramatic),|(excited)
Action	**Tallies**	**Action**	**Tallies**
Dancing		Dancing	
Singing		Singing	|||
Studying		Studying	||||
Doing Nothing	|||||	Doing Nothing	||||
Other	|(scream), ||||| (ignore)	Other	| (covering my ears)

Figure 1
Percentage of people feelings: Despacito

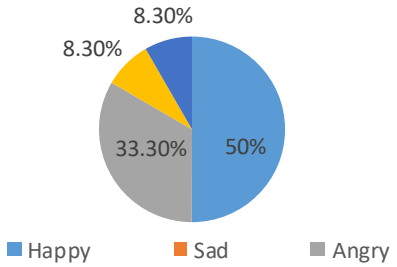

Figure 2
Percentage of people's action while listening to the song: Despacito

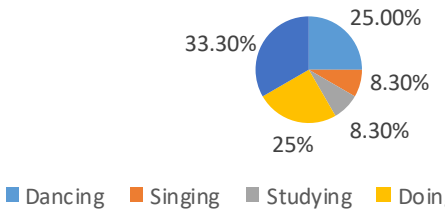

Figure 1 and 2 (above) shows the participants results for *Despacito* (left: emotions, right: movements) in percentage

Figure 3
Percentage of People Feelings: Too Good For Goodbyes

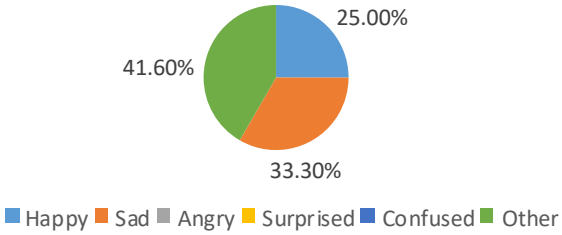

Figure 4
Percentage of people's action while listening to the song: Too Good For Goodbyes

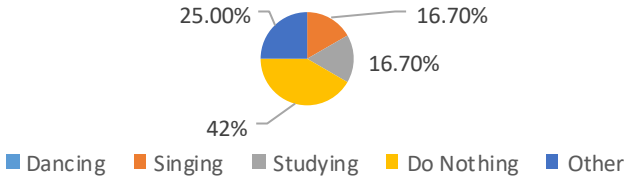

Figure 3 and 4 (above) shows the participants results for *Too Good for Goodbyes* in percentage

Figure 5
Percentage of People Feelings: Welcome to the Jungle

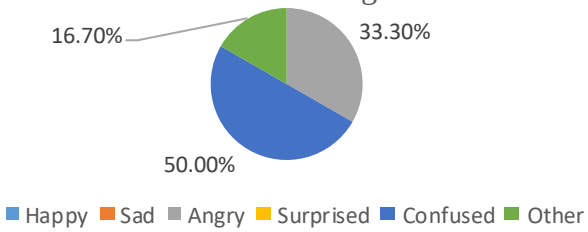

Figure 6
Percentage of people's action while listening to the song: Welcome to the Jungle

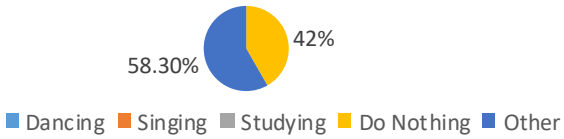

Table 5 and 6 (above) shows the participants results for *Welcome to the Jungle* in percentage

Table 7
Percentage of People Feelings: Symphony No.5

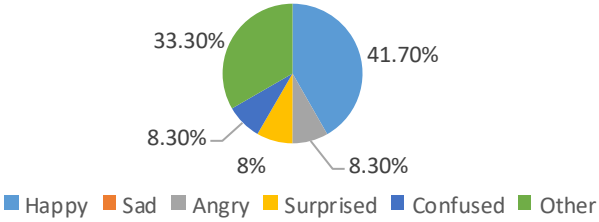

Table 8
Percentage of people's action while listening to the song: Symphony No.5

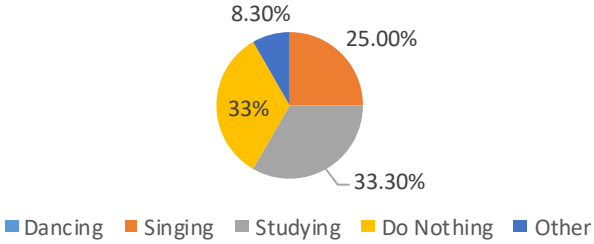

Table 7 and 8 (above) shows the participants results for *Symphony No.9* in percentage

DISUSSIONS/CONCLUSION:

Some of the parts of the hypothesis are correct. By looking at the charts and results, some peoples' emotions corresponded to the genre of music. But the actions and emotions didn't really correspond with other songs. The results that stood up most of the participants that made my hypothesis correct were that half of the participants (50%) were happy while listening to an upbeat melody, half of the participants felt confused (50%) while listening to the rock song, and people would be studying or doing nothing (both options were 33.3%) while listening to classical music.

The most shocking results that contradicted the hypothesis was how most people didn't feel sad while listening to the ballad song and the highest percentage of action while listening to the upbeat song is the option *Other.* These results came out like this because what's affecting a person's emotions and movements is caused by the brain. Two parts of the brain that effect this is the called the nucleus amygdala and accumbens (NA) and the neurotransmitter dopamine (resources from How Music Affects the Brain for the Better, As a person is listening to music the nucleus amygdala and the nucleus accumbens helps decide what emotion suits to the type of music. The neurotransmitter dopamine releases and increases and will give signals to the body. An example of this happening is getting goose bumps when listening to a song in the person's opinion. The nervous and endocrine system will help respond to the body which gives of body movements. Scientists have said that the beat and melody of the music also identifies the emotions. Songs with fast tempo, high pitched voices that a major sounding melody are attributed to happy music which releases happy emotions and actions. Sad songs are the opposite of happy which and give out sad emotions. There will be a higher percentage that the genre of music does correspond with a person's emotions and body movements.

Some of the results before did not come out the way it did. This is also because of a person's own way of functioning in their brains. People have different opinions and different tastes in music. Not everyone's brains all function the same way, so a person won't give out the exact emotions to what another person is feeling. This is how peoples' taste in music is different. For example, a metal rock song could be a relaxing and pleasant to someone but another person might think it's a song to release out their anger.

The errors from the project that affected my results are mostly because of the song choices. The songs have not been the best choices of music because some of the songs are overrated. Songs like *Despacito* is a song that has been playing on the radio for quite some time that people might no longer like; even though they should be feeling happy. Some of the songs might have not been good for a person to correspond with others of people results that didn't relate to the genre of music.

APPLICATION:

Using music to help a person release their emotions is using music every day, everywhere at any time a person feels like it. Studying to classical music, working out to dubstep, and relaxing while having an acoustic playlist are examples to make a person happy. An occupation which helps people problems by listening to music is being in music therapy (Reference from About Music Therapy. (n.d.).)

. Studies shows that music can make anyone happy in their own way and help increase their memory (from a part of the brain called the hippocampus). People who work in music therapy help relax others with disorders, health, emotional and mental problems so they can feel happy and interactive by using music.

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Effect of Water Temperature on Speed and Exhaustion Levels in the Pool

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Abstract

The question investigated was: how does water temperature affect speed and exhaustion levels in the pool? This topic is relevant because athletes – specifically swimmers in this case – want to maximize workouts and train to the best of their ability. The experiment done was to compare swimming 50 meters 8 consecutive times in a 29°C (warm pool) and in a 25°C (cold pool). Then, to observe the time taken (seconds), as well as exhaustion levels (level 1-10). The times recorded ultimately increased. The more exercise and physical movement the body is put through, the more tired and slower the body movements will be

.

Introduction

The purpose of this project is to differentiate the effects of sprinting in a warm pool vs a cold pool. This project is significant because athletes – specifically swimmers are always looking for ways to improve and maximize workouts. Many swimmers think that hotter pools slow them down, believing that it doesn't remove the sweat they generate, causing the feeling of overheating and exhaustion (Cornerstones). There are different temperature mandates for different aquatic activities such as diving, water polo, and recreational swimming. If there are different rules/regulations for pool temperatures for different sports/activities, then there must be different effects on the body from different pool temperatures (Livestrong.com).

The question asked is, "How does pool temperature affect speed and exhaustion levels in swimming?" If there are different rules/regulations for pool temperatures for different sports/activities, then temperature *does* affect speed and strokes of swimming, because the FINA regulations must be established not only for the most efficient workouts, but for the health and safety of swimmers.

Methods

The swimmer wears a silicone cap, goggles, and FINA approved swimwear.

The swimmer starts in a 29°C, 25 metre pool. The swimmer warms up with a 100 metre relaxed swim, that doesn't need to be recorded. The swimmer pushes off the wall in streamline position and sprints 50 metres Freestyle (Front Crawl), with the choice of performing a flip turn, but must do the same procedure when repeated, to ensure fair results. Another person times the swimmer using a

stopwatch. The swimmer records the time taken in seconds, and their exhaustion level on a scale of 1-10 in a table in the *"Warm Pool"* sections *(Table 1).* The swimmer rests for 1 minute and hydrates during this time. Procedure is repeated 8 times.

Each 50 m Swam	Time (seconds) Taken in a "Cold" Pool	Exhaustion Level (1-10)	Time (seconds) Taken in a "Warm" Pool	Exhaustion Level (1-10)
1				
2				
3				
4				
5				
6				
7				
8				

Repeat the above instructions in a 25°C, 25 metre pool, and record the results in the *"Cold Pool"* sections *(Table 1)*

Conduct entire experiment at least one more time, for more stable results. The independent variable is the temperature of the pool. It is being changed through this experiment. The dependent variables are the recorded times, and the exhaustion levels of the swimmer. These are being measured and observed. There are many controlled variables. As mentioned earlier, the silicone cap, goggles, and swimsuit are a few. Another controlled variable is the swimmer, because if the swimmer is changed throughout the experiment, then the results will not be accurate as not all swimmers have the same speed or endurance. The swimmer must swim the same stroke throughout the experiment, as different strokes cause the swimmer to travel through the water at different speeds. The swimmer must have the same rest time and swim the same distance every time, because if the swimmer gets more/less of these, it will affect their exhaustion levels and speed in the next swim. The swimmer must hydrate every time so that there is not interfering with possible outcomes.

Table 1

Results

Data Comparison #1:

Results of the First-Time Experiment Performed

Each 50 m Swam	Time (s) Taken in a "Cold" Pool	Exhaustion Level (1-10)	Time (s) Taken in a "Warm" Pool	Exhaustion Level (1-10)
1	34.78	1	35.71	3
2	35.20	1	35.96	3.5
3	35.09	2	36.05	4
4	35.73	3	36.83	4
5	36.18	3	36.51	5
6	36.25	3.5	36.79	7
7	36.82	4	37.84	7
8	37.31	5	38.12	8

Table 2

Data Comparison #2:

Results of the Second-Time Experiment Performed

Each 50 m Swam	Time (s) Taken in a "Cold" Pool	Exhaustion Level (1-10)	Time (s) Taken in a "Warm" Pool	Exhaustion Level (1-10)

1	34.29	1	35.39	2
2	35.64	1	35.31	2.5
3	35.16	2	35.89	3
4	35.98	2	36.67	4
5	36.30	3	36.86	5
6	36.79	4	37.03	6.5
7	37.06	5	37.57	7
8	37.15	6	37.64	8

Table 3

Data from Table 2 interpreted into Fig. 1.

Comparing time taken to swim 50 m in a 29°C pool vs a 25°C pool.

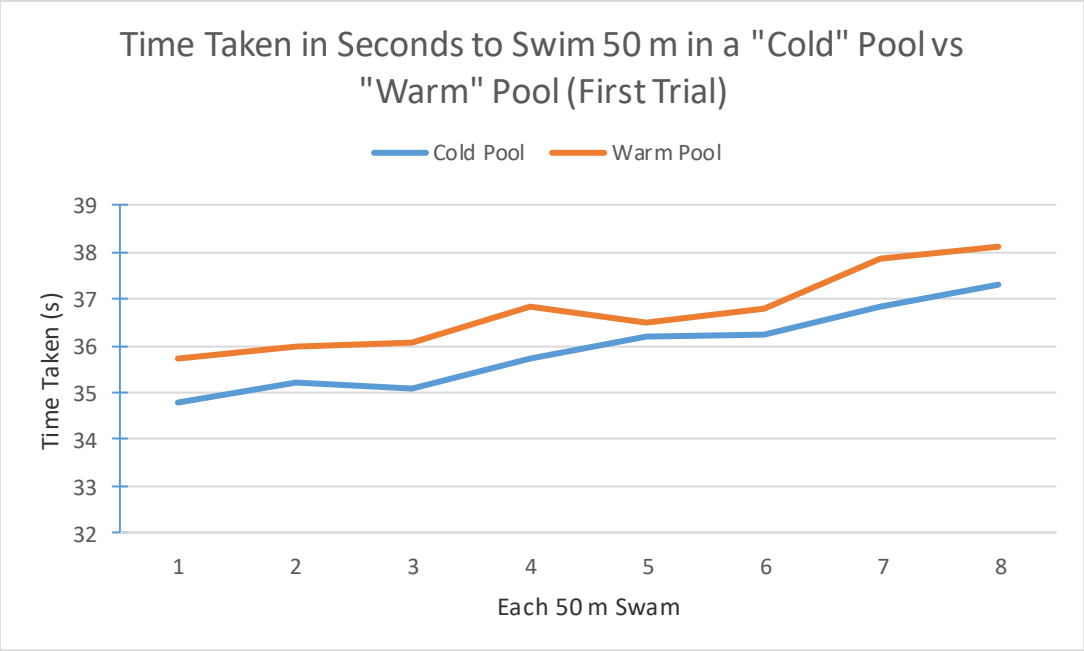


Figure 6

Data from Table 2 interpreted into Fig. 2

Comparing exhaustion levels in a 29°C pool vs a 25°C pool.

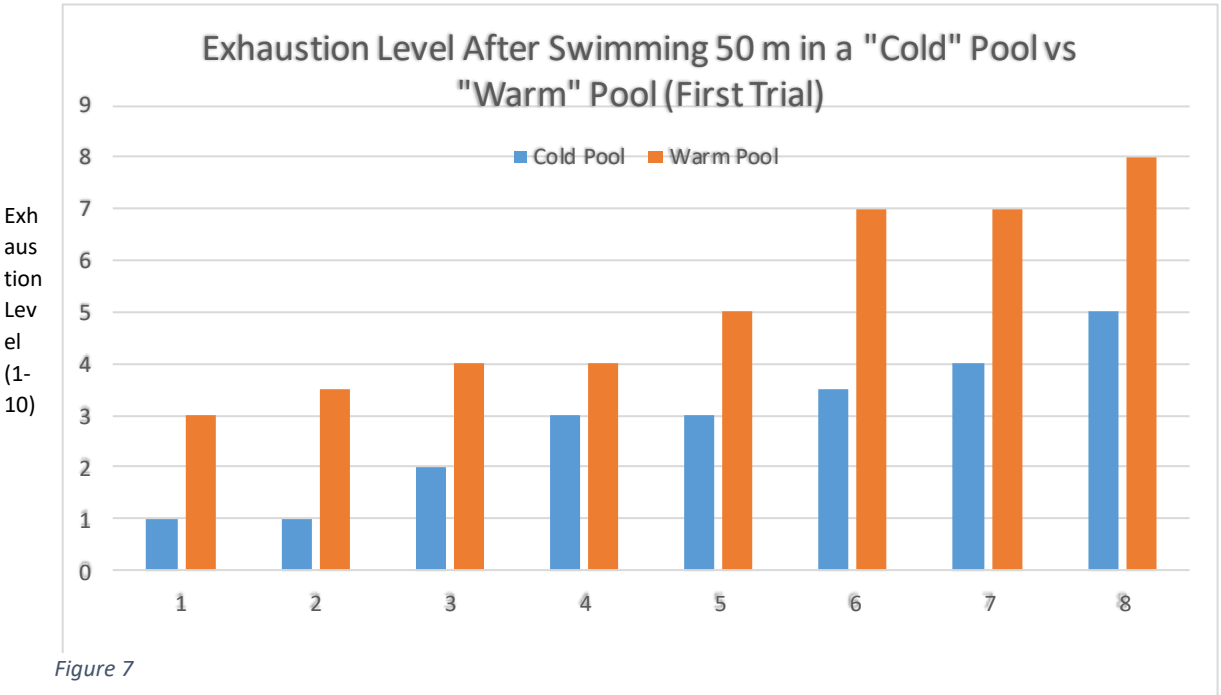


Figure 7

Data from Table 3 interpreted into Fig. 3.

Comparing time taken to swim 50 m in a 29°C pool vs a 25°C pool.

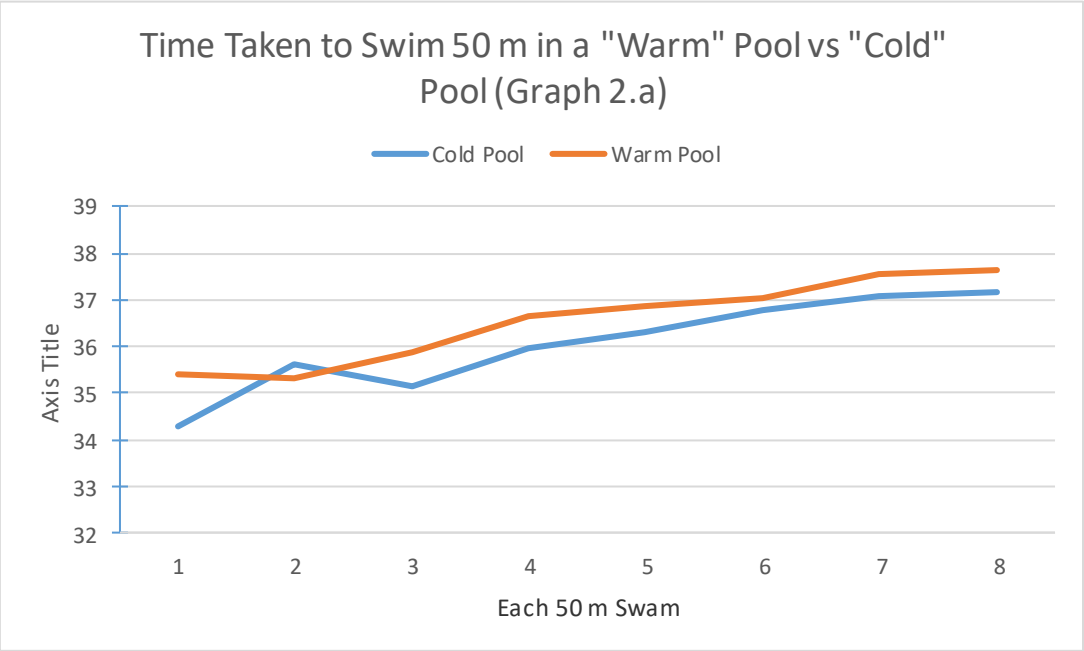
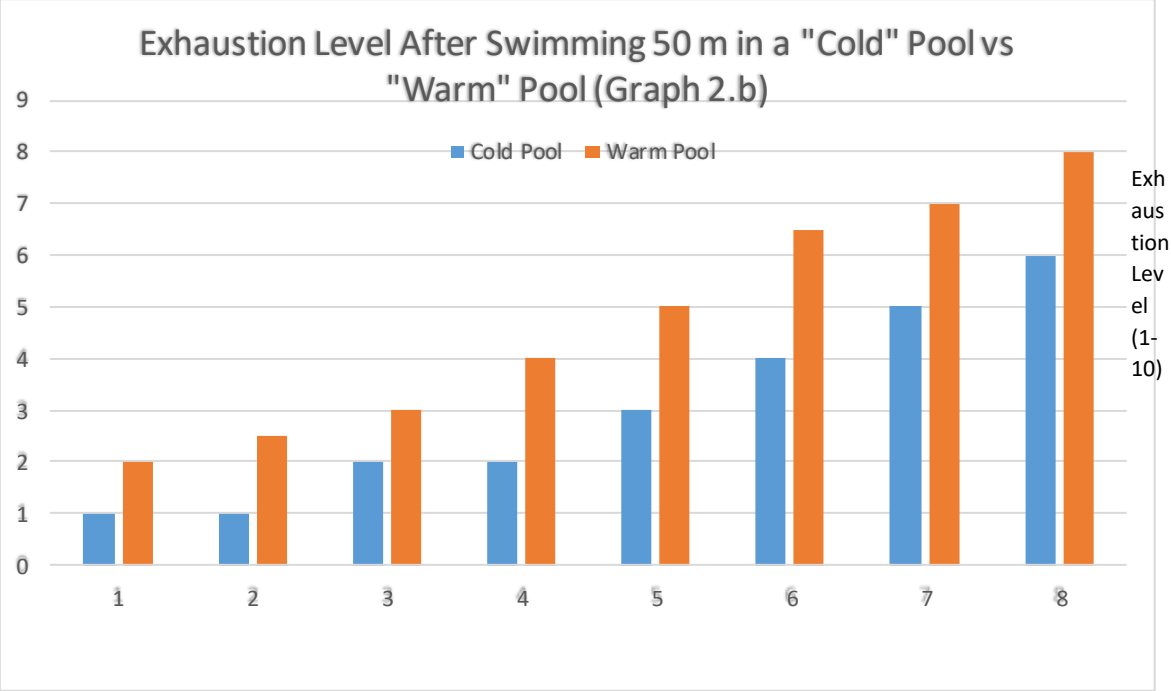


Figure 8

Data from Table 2 interpreted into Fig. 2

Comparing exhaustion levels in a 29°C pool vs a 25°C pool.



Discussion/Conclusion

Hypothesis was correct. In general, not only does "cold" water allow swimmers to swim faster, swimmers also don't get as tired as quickly as they do in "warm" pools. In both "cold" and "warm" pool experiments, the times taken to swim 50 metres ultimately increased. This is consistent with what other scientists have reported and this was expected, as it is known that the more exercise and physical movement the body is put through, the more tired and slower the body movements will be.

However, there were a few outliers in the experiments where the succeeding 50 metres swam was faster. There are many factors that could've caused this, such as starting the stopwatch too soon/stopping the stopwatch too late; pushing off the wall with less force than before; or having an exterior factor (pool equipment or person in the way) while trying to perform the experiment. These are all *controlled* variables.

The data collected supports the hypothesis. The "warm" pool experiment exhaustion levels after each 50 metres swam were always at least 1.5 times higher than the "cold" pool exhaustion levels after each 50 metres swam. The most significant result was how high the exhaustion levels were already within the first few repeats of the experiment, specifically in the "warm" pool.

Given the conclusions, competitive swimmers should always train and compete in "cold" or 25°C pool. It will especially benefit long distance swimmers, because not only will they swim faster, but their exhaustion levels will not rise as quickly as they would in a "warm" or 29°C pool. This allows them to swim for longer distances.

If warranted, the next step in this study should be finding out what stroke (Freestyle, Backstroke, Butterfly, and Breaststroke) is best for swimming long distances. This could be experimented by having a swimmer swim each stroke for as long as they can in a 25°C, 25 metre pool; stopping when they are too tired.

There could've been sources of errors when timing the swims. A way to solve this could be to have two people timing, each with stopwatches. When recording, the average time between both stopwatches can be used. This could help with collecting more precise data and is also convenient if one timer is faulty.

Application

This information can be applied to other cases of study in sports. In track or cross country, it is possible that if the temperature outside is cooler, then the runner will run faster and be less exhausted than if they were in warmer temperatures. This information can also be applied to those who do triathlons or lifesaving sport. In competitive swimming, coaches will use this information when choosing what pools to train at, to maximize swimmers' workouts. These results are overall

beneficial to swimmers who wish to swim faster, longer, and conserve their energy.

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Difference in the Perception of Time after Constantly Playing a Video Game for a Set Amount of Time

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Abstract:

The experiment was about the difference in time perception after constantly playing a video game for a set amount of time. The experiment has six volunteers come and preform a single task requiring complete focus for sixty minutes while the others would play for thirty. Once the two groups of three volunteers compared it was found that they both volunteers always preserved that twenty of the sixty minutes hadn't gone by, with two exceptions. This implies that five times out of six you will see a significant speed up in time if you remain focused on a single task for any given amount of time.

Introduction:

This experiment is to find out if someone will have a changed perception of time if they are focused on something else, and remain focused on that thing entirely. This project is important because it helps us realize how dangerous it is to play for a very long time, and just how much time we really waste compared to how much time we say we do. Is it possible that playing a game for a long period of time much of a certain video game can trick the brain into believing more time passed than the amount of time that passed in reality? If six people were made to play the same fast paced video game for different amounts of time, then the person who played for longer would believe that a large amount of time, because the players perception of time will be faster matching the game they had just played.

Method:

Setup the game and leave it on and ready for the volunteers. Tell the first volunteer to relax explain the following; They are going to play the EFPG for a while, and are not allowed to leave or check the time. The person conducting the experiment will arrive once you're done to ask you a series of questions. Tell them that they must reply with 100% honesty. Tell them they can start. Start the stopwatch the second the volunteer begins playing. Moniter them playing for the first 10 minutes. Afterward leave the room and allow them to play alone. This allows the volunteer to become immersed in the game, providing better and more exact results. Once 30 minutes have passed, return to the room and have the volunteer stop. Once done, turn everything off and sit across from the volunteer the pencil and paper to record results. (this process should only take a

maximum of 3 minutes). Begin with asking the volunteer to tell you how much time has passed and record their answer. Repeat the previous steps once more with two more volunteers. Once complete, repeat steps 1 through 12 again with 3 more volunteers, but this time allow the volunteers to play for 60 minutes instead. The Control variables in this experiment are the lack of clocks or time (so the volunteers can't know how much time passes), an arm chair 3 cookies f the same type, 500ml of clear water (So the volunteer is comfortable and not distracted), headphones, game controller, solitude (To keep them from being distracted by external forces).

Results:

Table 1

Volunteer	Amount of Real Passed	Amount of Time the Volunteer Perceived Passed
1	30 minutes	50 minutes
2	60 minutes	45 minutes
3	30 minutes	10 minutes
4	60 minutes	40 minutes
5	30 minutes	10 minutes
6	60 minutes	38 minutes

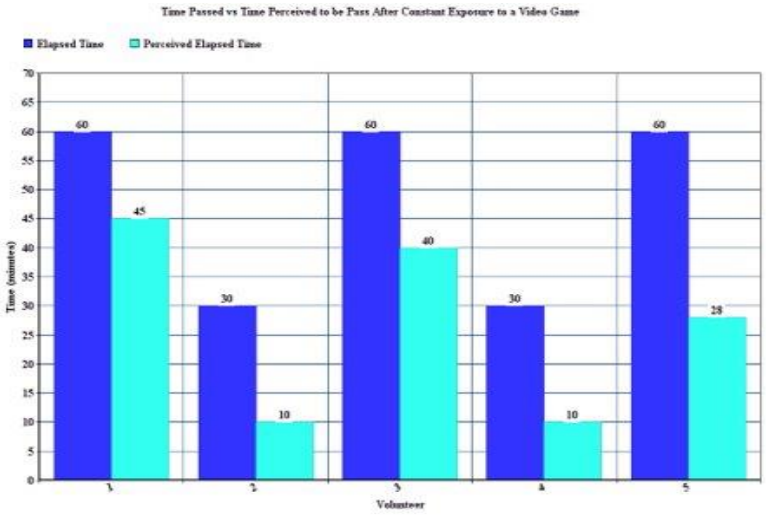

Figure 1

The information found in Table 1 is translated into Figure 1 with the exception of my first volunteer, who played for thirty minutes and perceived that the elapsed time was fifty minutes. This was a problem because the volunteer spent a lot of time fidgeting and moving around, and admitted to being distracted throughout the experiment, so their data was considered to be an "outlier" and was not included into either Table 1 or Figure 1.

Conclusion:

Based off of the data, it seems that this experiment did indeed answer my hypothesis which was "If six people were made to play the same fast paced video game for different amounts of time, then the person who played for longer would believe that a large amount of time, because the players perception of time will be faster matching the game they had just played." Even giving me more information than wanted, showing me that the subject indeed went through time, an acceleration of around twenty minutes each time. For example, the third volunteer which played for thirty minutes ended up perceiving that ten minutes had passed. Another case subject six which played for sixty minutes which ended up perceiving that thirty-eight minutes had passed. The experiment should have had more tests, or had more volunteers to help provide better results to make finding correlations easier. For example, The experiment could have had two more volunteers play for ninety minutes to see if the time always dilates twenty minutes again, or if it increases with play time.

Application:

This information would be very helpful in other fields of study because it helps to prove how powerful the brain is, showing that it's strong enough to make you believe that time itself can change, speed up and slow down whenever they want to. I think this could be used in Neuroscience which is the study of the human brain, and it could be used to prove that the human brain could be tricked into believing something, making that thing seem real to the subject.

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Food Preparation with a Vacuum Chamber

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Abstract

This project was done to test the effects of low pressure cooking on food, compared to normal cooking methods. To do this, popcorn was popped normally, and then under vacuum. The vacuum popcorn turned out to be bigger and fluffier. Additionally water was put into the vacuum chamber to observe how the changes in pressure affect boiling point and temperature. The water boiled under vacuum and lost heat, and almost got cold enough to freeze. In the end it was concluded that vacuum cooking wouldn't allow the food to heat up enough to properly cook, but lower temperature requiring foods could be expanded and made to look better.

I. Introduction

There are many methods interesting methods of cooking that either cook food fast, or cook it to absolute perfection, for example, Sous Vide and pressure cooking meet those criteria. These methods increase the pressure inside the container to cook the food at higher temperatures (3), but what would happen if the food was cooked instead, in a low pressure environment.

This experiment is important, as it is a different way of cooking food, and could potentially increase a foods size and perhaps quality. This will create visually larger food with less material, which is good for marketing and display. For example, vacuum popcorn would be bigger and would fill a bag with less kernels used.

Would vacuum chamber cooking increase the foods quality and/or size, also how would it be different than using a pressure cooker?

A pressure cooker traps steam inside an enclosed space, raising the pressure and the boiling points of the substances, this allows the food to reach higher temperatures (1,5 and 7). But what happens if the pressure is lowered instead? If a vacuum chamber is used to cook food, then the food should be bigger in size. This is because there would be less pressure pushing on a food externally than the pressure pushing out from inside the of the food, causing the food to expand.

II. Methods

Experiment 1 - Freezing water by boiling

A 100mL glass of tap water was placed inside the vacuum chamber, the glass was insulated, and a thermometer was placed inside the glass. The chamber was sealed and the pump was turned on

Experiment 2 - Vacuum Popcorn

25g of kernels and canola oil was placed into the vacuum chamber. The vacuum chamber was placed over a heat source and the heat was turned to medium power. The popcorn was cooked for five minutes, the popcorn was removed from the chamber and cleaned.

Another 25g of kernels of canola oil was placed into the vacuum chamber. The chamber was sealed again and the ultimate vacuum of the pump was allowed to be achieved. The vacuum chamber was placed over a heat source and the heat was turned to medium power, and the popcorn was cooked for another five minutes. The popcorn was removed.

25 popcorns was counted out from each batch, and placed into identical containers (Figure 6), the difference in volume was observed.

The independent variables is the environment the popcorn is cooked in (atmospheric pressure and under vacuum). The dependent variables are the size of the popped corn, and the amount of unpopped kernels. Controlled variables are the amount of time the popcorn is given to pop, the amount of kernels and oil used, and the heat of the fire.

Figure 1 - Vacuum pump lid, with inlet and outlet valves

Figure 2 - Vacuum chamber hooked up to vacuum pump with external heating set up

III. Results

Experiment 1 - Freezing water by boiling

Hypothesis: As lowering the pressure in an environment causes the vapour pressure to drop, then, if the pressure is low enough, the water should start boiling and eventually freeze.

Info

Mass of container: 74g

Amount of water used: 50g (50mL)

Observations

Table 1

	Attempt 1	Attempt 2	Attempt 3
Time	- stopped pump at 7:24 min	- stopped pump at 15:47 min	- Stopped pump at 12:30
Temperature	- very close to freezing (about 3°C)	- much warmer (10°C)	- still a bit warm (about 11°C)
Pressure	- no vacuum gauge	- no vacuum gauge	- no vacuum gauge

The experiment was conducted three times, although the results weren't exactly the same, they all followed the same trend. First, the water starts boiling at room temperature, then the boiling gradually dies down, the water surface becoming still over the course of a few more minutes. While all this is happening, the temperature of the water drops, as shown by table 1.

Experiment 2 - Vacuum Popcorn

Hypothesis: In a low pressure environment, gas would be allowed to expand more, as there are less particles, and the gas would try to reach equilibrium. So if popcorn was popped under vacuum, the water inside the kernels should expand more, creating bigger corn.

Info

Amount of oil used: 25 mL

Amount of corn used: 25 g

Amount time cooking for: 5 minutes

Heat level: Medium throughout

Observations

The first experiment that was conducted was to cook popcorn at atmospheric pressure. The popcorn was a bit burned, but popped normally. The second experiment was identical to the first, however, the popcorn was cooked in a vacuum. The vacuum popcorn popped more rapidly and violently than the normal popcorn, also, it was bigger and fluffier, as shown by Table 2 and Figure 2. It also appears that more popcorn kernels popped under vacuum, as shown by Figure 4.

Table 2

	Normal Popcorn	Vacuum Popcorn
Shape/texture	- a little hard - burnt by stove (possibly due to cooking error) - oily - kinda irregular shape	- fluffy and whitish - seems a bit bigger than normal popcorn - kinda squished
Popping	- popped in short bursts throughout - about 20 kernels were unpopped	- popped slowly at beginning, but then very rapidly near end of 5-minute limit - only 7 kernels were unpopped - the oil bubbled a lot more
Taste	- tastes normal, but hard	- tastes weird, almost like vinegar
Smell	- Burnt, but still delicious	- Doesn’t smell much like anything, kinda like butter

Figure 3 - attempting to freeze water by boiling it

Figure 4 - Comparison between normal popcorn (left) and vacuum popcorn (right)

Figure 5 - Insulated water with cup and towel

Figure 6 - 25 pieces of each type of popcorn counted out and compared

IV. Discussion/Conclusion

The original hypothesis for this experiment was that if food was cooked under a vacuum, the result would be larger in size, as there is less pressure pushing on the outside of the food than from the inside. The hypothesis is proven to be correct, as shown by the popcorn in experiment 2. It was evident that the average size (not mass!) of vacuum corn was larger than the normally popped

corn when the same amount of each type of corn was placed in a glass and compared. The quality of the vacuum popcorn also appears to be better, as they were softer and whiter. This result is achieved because there are less particles in the chamber, allowing for a larger "potential difference", in other words, bigger expansion. The purpose of the experiment was also to determine the difference of vacuum chamber cooking and pressure cooking. Vacuum chamber cooking increases the visual appeal of food (as in size), but not the overall quality of cooking. As shown by experiment 1, the boiling point is lowered, reducing the maximum heat something could get before it turns into gas, which causes it to be not well cooked. However, with pressure cooking, the boiling point is raised which increases the amount of heat the food retains while cooking, resulting in a better cooked food.

Experiment 1 - Freezing water by boiling

At about 2 minutes, the water started boiling violently, but no heat was added. Therefore, the temperature of the water wasn't heated to its boiling point, the vacuum lowered water's boiling point to the temperature of the water. This is shown by the glass of water boiling, but cooling dramatically. However, the vacuum pump used overheated before the water could get a chance to freeze solid. The water, however did get to as low as $3^\circ C$.

Experiment 2 - Vacuum Popcorn

It was very evident that the vacuum popcorn had a larger average size. This is most likely due to the lower amount of matter inside the chamber, and the expanding water vapour inside the popcorn have more room to spread out more, and faster, (as they want to achieve equilibrium inside the chamber), which causes the popcorn to have a larger volume.

Possible Errors

Possible errors in the experiment are that when air is let back into the chamber, the pressure change may have crushed the vacuum popcorn, causing it to be smaller

than what it should have been. Also, the seal most likely had a leak in later experiments, as shown by the water not getting below $10^\circ C$, although the pump was left running longer than earlier experiments, as shown by Table 1.

V. Application

As shown by experiment 2, the size of food increases along with the quality, which could be useful for filling popcorn bags with less kernels, effectively saving money. Otherwise, this method could be used to quickly remove moisture from something or reduce the temperature, as long as there is water present inside the substance. As shown by experiment 1, water boils away too quickly to gain any heat, so the temperature decreases.

The biggest problem with vacuum cooking is the low amount of heat that can be retain from the food (17), if it required water to cook. For example, if noodles were being cooked with a pan of water and external heat, the noodles wouldn't cook, as the water cannot retain heat under vacuum, however, if a slice of pizza was placed under vacuum, with external heating, the pizza would cook fine, and will benefit from being cooked under vacuum (as in larger size and higher quality).

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