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Shoes' Characteristics and their Effect on Juggling

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Abstract

Juggling is an important skill in soccer that all players should perfect. Juggling can be done in tight or large spaces and requires minimal equipment (a ball), this exercise is very efficient and beneficial to all players as it is one of the best ways to improve coordination. The experiment conducted consisted of 5 players juggling a size 5 soccer ball, with 5 different pair that all the players had in common to reveal the best shoes for juggling relating the results to the shoe's features. All subjects were chosen based on their gender, experience, skill level and exercise count to have a fair result. After the experiment, 5 out of 5 players scored their best juggling average with the outdoor cleats and 3 of them scored their best individual juggling score with the same pair of shoes. The juggling average for vans and converse were significantly lower than the rest of the shoes. This experiment helped players understand the features of their shoes and how important they are for performance. Knowing this, the players can choose shoes based of their own preferences and their opinion of which will aid them more.

I. INTRODUCTION

II.

All players have preferences in shoes when they play soccer and juggle. Juggling is a key part in soccer as it benefits the players skills and mentality. The footwear used in juggling is relevant and important to soccer players, because the type of shoes played in, leads to a better juggling performance which ultimately increases one's self-confidence (Abushahla, 2017). Second, juggling builds persistence and determination, with the right pair of kicks, consistency will improve (The Logical Trainer, 2018). Having the best shoes to get the perfect juggling rhythm, improves a player's touch and control which can lead to a better game performance overall (Carty, 2018).

Different shoes have different impacts on juggling based on their characteristics. To get the best juggling rhythm, the best footwear must be revealed thus, the players can have the greatest execution. This leads to the question being... Which type of shoe will enhance juggling performance on an outdoor pitch?

If different types of shoes such as indoor soccer gym shoes gym, outdoor soccer cleats, vans, converse and simple running shoes are compared then the outdoor cleats (spikes) will increase the number of juggles because it has minimal cushioning meaning its light weight increases ball control, optimizing for the player's feel and touch which can lead to a better game performance overall (Carty, 2018).

III. METHODS

Five players were chosen to participate in this experiment based on certain skills and traits. The subjects juggled a size 5 soccer ball on the same outdoor pitch, on the same day. Each one, juggled with the same 5 different pairs of shoes; vans, converse, outdoor soccer cleats, running shoes and indoor soccer shoes. With each pair of shoes, the subjects juggled 5 times until the ball dropped. The players juggled without any breaks and recorded their results, by counting how many times they could hit the ball before letting it drop to the ground. They were not given any practice time beforehand to warm-up and had to juggling with both feet, alternating foot each time. This rule ensured there would be no bias in a preferred foot, so that the results would be fair. The shoes are the independent variable in this experiment because they were the factor changed with the same controlled variables. The connection between the shoe and the number of juggles is what was being analyzed. The result of number of juggles was the dependent variable because it was influenced by all the other factors in the trials, specifically the footwear. Ultimately, this is what the experiment was testing for and wanted to be examined. There were numerous variables that had to be controlled when conducting this experiment. Such as floor surfaces, the experience the players had and the weather outside. The floor surface could have affected the shoes' impact on the number of juggles since different shoes are meant to be used on different surfaces. The test was limited to only an outdoor soccer field. The experience of the people juggling was also a controlled variable. Some may have had a better touch since they had been playing soccer longer and would have had more touches on the ball. Or simply may have had juggled with more pairs of shoes than another. This is why all the subjects were chosen based on the years of soccer they have, the exercise count they get per week and whether or not they have practiced juggling with the 5 pairs of shoes a similar amount of times. If one juggled more with vans rather than cleats, the results would have been inaccurate. Exercise count was also an issue, because the more fit one is, the easier it is to keep the ball in the air. The weather outside was also a factor. If it was sunny outside for one trial then rainy the next trial, the number of juggles would differ because juggling in the rain or any form of precipitation could be distracting.

IV. RESULTS

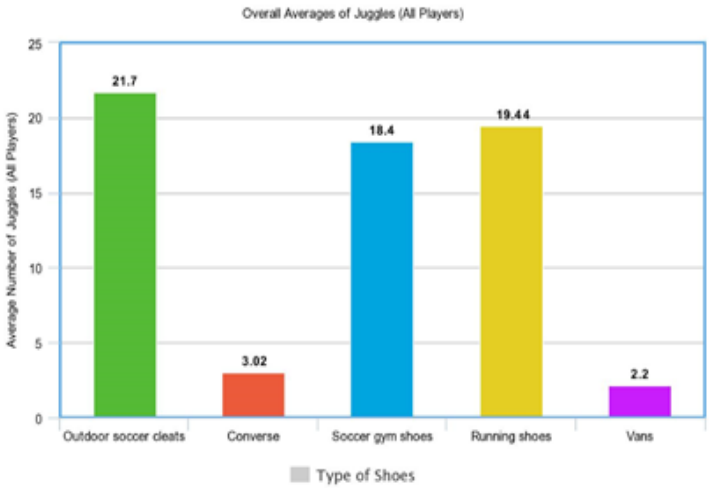

Figure 1: Overall averages of juggles from all players for outdoor soccer cleats, converse, soccer gym shoes, running shoes and vans

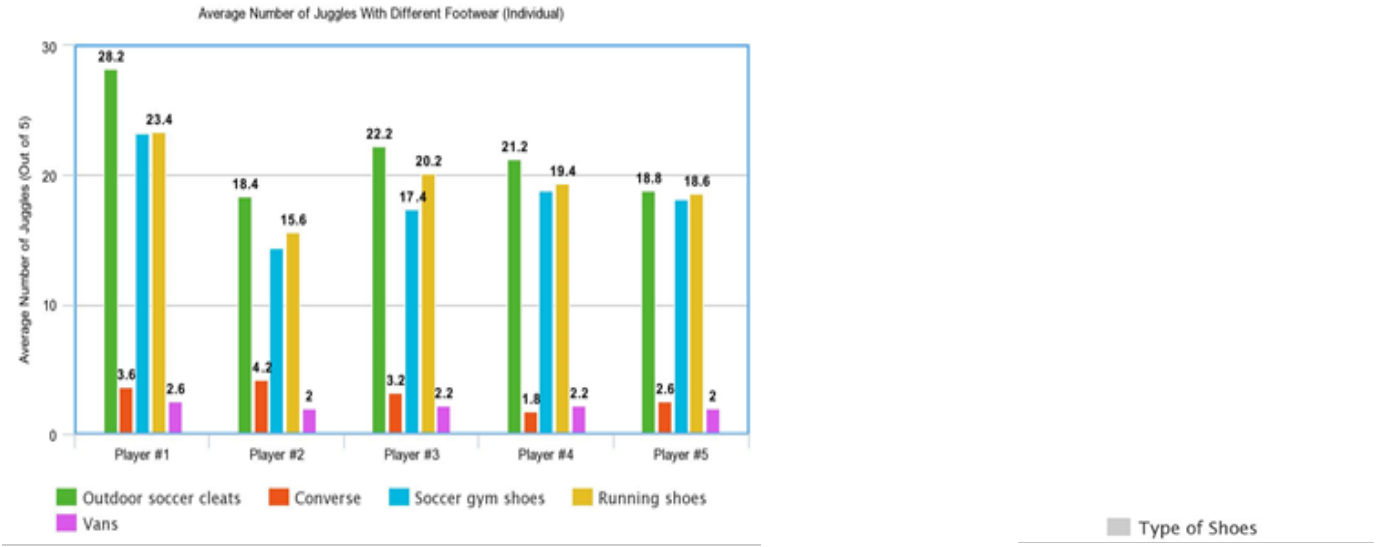

Figure 2: Averages of juggles from each player with outdoor cleats, converse, soccer gym shoes, running shoes and vans.

V. DISCUSSION AND CONCLUSION

The hypothesis was that the outdoor cleats would result in the greatest number of juggles and it was in fact, correct. In order to enhance juggling performance outdoor soccer cleats are preferred. Out of all the players, 5 out of 5 scored their highest average of juggles with the outdoor cleats. Furthermore, 3 out of 5 players had their best overall individual juggling result with that same pair of shoes, the highest coming from subject #1, with a

total of 38 touches on the ball. Unlike, (most of) the other shoes in this experiment, this footwear carries special features (lightweight, sock and skin-fit) to play soccer. Converse and vans scored significantly lower than the others with an average juggle of 3.08 (converse) and 2.2 (vans). Both shoes have similar characteristics, having rubber sole and being very flat.

The outdoor cleats are specifically designed for this sport, making it ideal that they better juggling performance. Companies such as Nike, design their shoes using technology (like Finite Element Analysis, a computer system) to predict how the footwear will test out on the pitch. Outdoor cleats have numerous characteristics that contribute to their function. Having a fit collar aids in handling the ball better, by being able to control ankle movement easier since the "sock" slows the motion. Being lightweight allows for better agility and speed. Finally, the most important part, being tightness, makes sure there is no excess air in the shoe, so it is as your foot is touching the ball, for the best control. Unnecessary air can cause the ball to bounce unpredictably. As for the converse and vans, they did not succeed because they are canvas footwear, meaning their flatness disallows the ball from spinning back towards the body and to instead.

V. APPLICATION

Further information on the technology behind soccer cleats could have been researched to understand the progression of technology and how they have help to form today's soccer cleat. This information could be applied to computer software's such as Finite Element Analysis to improve results coming out of the program. This research could also help soccer players understand the basic of the shoes and help them in finding the right fit. Knowing what helps them achieve better results on the field can ultimately improve their game.

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Effect of Shape on Visual Appeal of a Picture

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Abstract

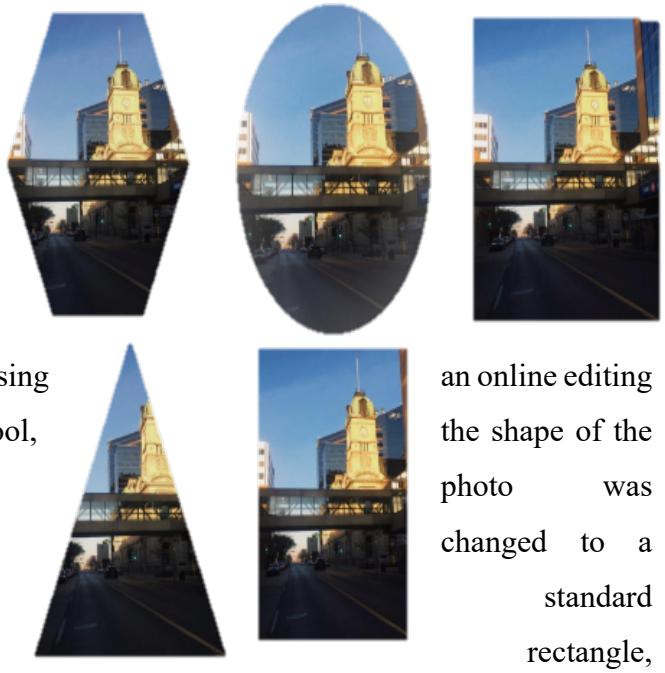
This project was about finding out which shape made a picture the most visually appealing. The question that was asked was how can the shape of a photo be used to influence visual appeal? Pictures are a primary source of communication and are taken on a daily basis by many people. Increasing the visual appeal will make more people want to look at the picture and make it more emotionally engaging. To test the question, an experiment was done where the shape of a picture was changed to a standard rectangle, golden ratio rectangle, triangle, hexagon, and circle. This was done with three different photos to make sure results were consistent. Participants were asked to vote for which picture they thought was the most appealing from each of the trials. The golden ratio rectangle won 2 of the 3 trials and was selected a total of 40% from all three trials. This made it the most visually appealing shape. These results can help many people make their pictures more visually appealing and it also proves that the golden ratio rectangle is a very visually appealing shape. This knowledge can be used in photography but also in areas such as interior design, art, and architecture.

I. INTRODUCTION

Shapes make up the world. They are one of the six classic design elements that are used in photography (Dunsford, 2019). Due to this, shapes play a large role in the visual appeal of a photo. This is important because many photographers rely on the visual appeal of their pictures in order to sell them or to create images that people will actually like. Visual appeal is crucial to attract the attention of viewers and without it, photos would be easily overlooked. Photos shouldn't be overlooked because they can be used to remind people of stories, individuals, and feelings that were felt in the past. Knowing what shape makes a photo the most appealing will make it easier for photographers to take better pictures and will also make sure that an image is more emotionally engaging so it won't be overlooked. This leads to following question: How can the shape of a photo be used to influence visual appeal? If the shape of a photo is changed to a standard rectangle, golden ratio rectangle, circle, triangle, and hexagon, then the photo that is a golden ratio rectangle will be preferred because it will make the photo more interesting and emotionally involved. According to a professor at Duke University, the golden ratio rectangle allows people to take in information more efficiently. When the proportions of a shape allow the information to be taken easily, it can be seen as a source of pleasure which is associated with appeal (Connor, 2011). It is also a very prevalent shape in nature (Micalizio, 2012). Repetition is seen as visually appealing because it can add consistency and organization.

II. METHODS

A picture of a flower was taken on a camera. Then, using an online editing tool, the shape of the photo was changed to a standard rectangle, golden ratio rectangle, triangle, hexagon, and circle so there were 5 separate photos produced. No other factors of the photos were changed. The pictures were shown to ten different participants from the ages of 10-20 and they were each asked which photo was the most visually appealing. Their answers were recorded in Table 1. After, a picture of a building was captured. The same steps were repeated, and the answers of the participants were recorded in Table 2. A picture of a boat was taken. The same steps were repeated, and the answers of the participants were recorded in Table 3. The independent variable in this project was the shape of photograph. The dependent variable was the visual appeal of the photo. This was measured by asking people to vote for photo that they thought was the most visually appealing. The controlled variables were lighting, colour, angle, distance, location of photo, and photo subject. These variables were selected as controlled because they



are important factors in photography and could've easily influenced the visual appeal of a photo. By keeping them controlled, it ensured that the photos were being judged purely on shape rather than other outside influences. The age group of the subjects was also controlled because people of different ages might have had more or less exposure to one of the shapes which could have influenced their perspective on the visual appeal of the photo.

III. RESULTS

Figure 1. Pictures used for trial one of the experiment

Figure 2. Pictures used for trial two of the experiment

Figure 3. Pictures used for trial three of the experiment

Table 1. Participant choices as to which shape was most visually appealing for picture 1 (flower)

	Standard Rectangle	Golden Ratio Rectangle	Triangle	Hexagon	Circle
Participant 1	x				
Participant 2		x			
Participant 3	x				
Participant 4					x
Participant 5					x
Participant 6					x
Participant 7		x			
Participant 8					x
Participant 9		x			
Participant 10					x

Table 2. Participant choices as to which shape was most visually appealing for picture 2 (building)

	Standard Rectangle	Golden Ratio Rectangle	Triangle	Hexagon	Circle
Participant 1		x			
Participant 2				x	
Participant 3	x				
Participant 4					x
Participant 5					x
Participant 6		x			
Participant 7		x			
Participant 8	x				
Participant 9		x			
Participant 10		x			

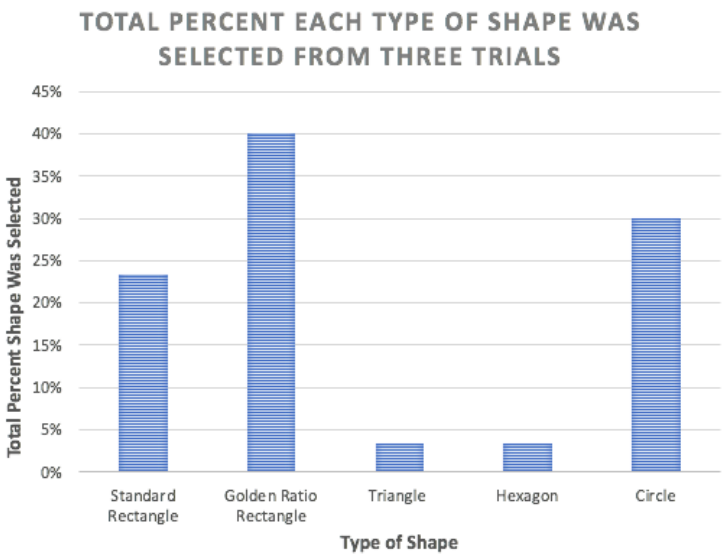


Figure 4. Graph represents averaged trial data to show total percent each shape was selected

Table 3. Participant choices as to which shape was most visually appealing for picture 3 (boat)

	Standard Rectangle	Golden Ratio Rectangle	Triangle	Hexagon	Circle
Participant 1		x			
Participant 2	x				
Participant 3	x				
Participant 4					x
Participant 5		x			
Participant 6					x
Participant 7		x			
Participant 8	x				
Participant 9			x		
Participant 10		x			

IV. DISCUSSION AND CONCLUSION

The hypothesis was correct. For two consecutive trials, the golden ratio rectangle was most preferred. In the second trial it got 5/10 of the votes while the second highest number of votes was tied with 2/10 for the circle and standard rectangle. In the third trial, it got 4/10 of the votes with the second highest number of votes going to the standard rectangle. However, in the first trial of this project the golden ratio photo was not most preferred and got 3/10 of the votes compared to the winning 5/10 votes for the circle. Despite this, since 2 out of 3 of the trials had golden ratio as the most preferred and the golden ratio rectangle had the highest total percentage with 40% of the votes. Due to this, the hypothesis was correct. To answer the initial question, if the shape of a photo is a shape that is common and is emotionally relatable then the appeal of it will increase. This was

demonstrated in the project because less common shapes such as the tringle and hexagon were voted one time each in all three trials while shapes that are seen commonly in daily life such as the golden ratio rectangle, circle, and standard rectangle each won at least one of the trials or was close to winning.

The reason the golden ratio rectangle won may be because of many factors. The rectangle is a very persistent shape that has been seen for decades. It became popular in the ninetieth century when people argued that the rectangle should be used more because of its aesthetic preference and it became the most widely used shape in media (Hovet, 2017). This explains why people may prefer a rectangle the most, because of repetition of it in the media. Specifically, the golden ratio rectangle is preferred because of the geometric proportion which makes the photo aesthetically pleasing. According to professor at Duke University, Adrian Bejan, humans can interpret a picture with the golden ratio faster than any other. This is because shape of the golden ratio makes it easy to scan the image due to the spiral that is formed in the shape when various points of it are connected. It is easy for animal eyes to follow the path that the spiral is creating. Animals feel better when being helped and the help in this case is being helped follow the image. There is feel pleasure in this assistance the pleasure is connected to appeal. Also, it is a very common shape, being seen in architecture like the Great Pyramids, art such as the Mona Lisa, and nature such as pine cones (McVeigh, 2009). Since the shape is commonly used and has had a close relationship to humans for many centuries, it was most preferred in the experiment done.

V. APPLICATION

The information learned in this project can be used in multiple different areas. It can be used in visual art when creating a drawing or painting because many people create art to make something that is visually appealing. It can also be used in modern architecture. People are more likely to enter an office or building that looks appealing from the outside and the use of the golden ratio rectangle proportions can make it look nice. This project can be expanded further in the future. This test could be done again but instead of changing the shapes of a photo to five completely different shapes, the picture can be changed to shapes of the same family such as all rectangles. By doing this, it could be observed which of the rectangles is most visually appealing instead of just testing the golden ratio rectangle. Also, other elements of the photo could be tested to see which is the most visually appealing. These elements can include colour, lighting, and angles.

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The Effects of First-Person Shooter Video Games on Reaction Time

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Abstract

The question that was investigated in this study was whether or not playing FPS (First-Person Shooter) video games had an effect on reaction time. This is extremely important because as people get older, they need to keep their brains in good shape and that includes reaction time. In order to test this question, each participant was asked to play an hour of FPS video games. Their reaction time was tested before and after each playing session. The study concluded that playing FPS video games leads to faster reaction times. It also concluded that those who played more hours of FPS games per week had faster reaction times in general than those who played less. This could be an easy and fun way to keep mental cognition in its best possible state.

I. INTRODUCTION

Knowing the effect video games has on reaction time is important because reaction time has many real-life applications where it could mean the difference between failure and success. For example, drivers usually only have half a second to react to avoid a potential collision (AAA, 2019). Another example is in sports such as Squash, boxing, and badminton where reaction times are extremely important in order to win games (Wood, 2010). If video games have a positive or negative effect on this, people should be revaluating how much time they spend playing video games since reaction time is so sensitive to altercations (CogniFit, 2017). That's why this study is trying to find the effect of FPS video games of reaction time. It is hypothesized that if someone plays First-Person shooter video games for one hour then their reaction time would be notably faster (at least 10 milliseconds) than someone who doesn't because video games train them in all three important factors of reaction time: perception, processing, and response (CogniFit, 2017). Since most screens are limited to only displaying sixty frames per second, information can appear very rapidly and players must perceive this information as fast as possible. After that, a player must quickly process the information and decide on the correct course of action before their opportunity disappears. Finally, a player must respond by pressing the appropriate button as fast as they can. This process repeats many times during video games and players will improve each time it happens.

II. METHODS

8 similarly aged (1-year difference) participants are taken to perform the experiment. 5 measures of their reaction time are taken in the afternoon using the website Human Benchmark (https://www.humanbenchmark.com/tests/reactiontime). The website starts with a red square. As soon as the square turns green, the participants are to click as fast as they can. They are asked to play one and a half hours of an FPS video game. After the playing session, 5 more measures of their reaction time are taken. The participants are asked the average number of hours they spend playing FPS video games per week. They are also asked if the test reaction time measurement felt easier and they felt more energetic after the playing session.

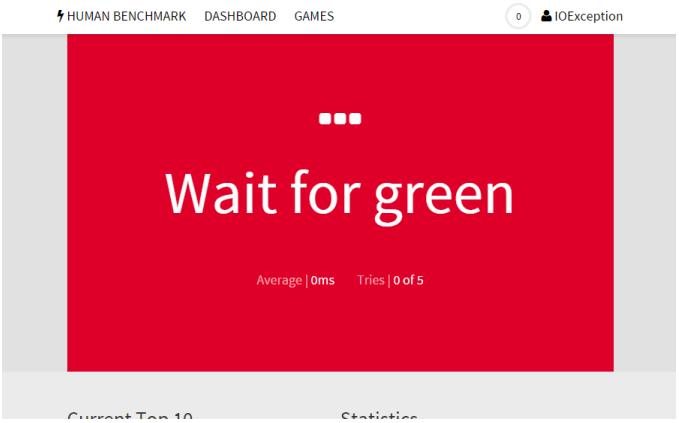

Figure 1: Initial view of Human Benchmark while participant waits for green

The dependent variable is how long it takes each individual to respond to the stimulus (reaction time). The dependant variable is how often each person plays FPS video games. The control

variables are the duration of the playing period, the time of day, the ages of the participants, and the type of game. The time of day must be kept the same because if the experiment is done during different times, some people would be more tired than others. The ages must be kept the same because peoples reaction time decreases as they get older and that would effect results. The type of video game must be kept the same because some video games might be less fast-paced or intensive than others and that would effect results.

III. RESULTS

The results concluded that playing an hour of FPS video games leads to a better reaction time. There also was a direct correlation between playing more hours of FPS games per week and having a faster reaction time.

Table 1: Experiment observations

Age	5 Test Results before gaming (ms)	5 Test Results after gaming (ms)	Average hours of FPS played per week	Did you feel like you could react faster? (1-5)	Did you feel more energetic after? (1-5)
15	247, 225, 236, 225, 213	228, 211, 201, 199, 204	10	5 – Strongly agree	4 – Strongly Agree
15	233, 232, 250, 233, 284	221, 204, 212, 199, 219	8	4 - Agree	3 - Neither agree nor disagree
15	191, 186, 202, 173, 164	174, 170, 172, 167, 177	12	5 – Strongly agree	4 - Agree
16	265, 248, 238, 219, 238	220, 218, 209, 224, 204	6	4 – Agree	4 – Strongly Agree
15	252, 252, 276, 248, 254	232, 228, 219, 220, 208	10	3 - Neither agree nor disagree	4 - Agree
16	292, 274, 336, 291, 303	260, 275, 255, 249, 266	4	3 - Neither agree nor disagree	3 - Neither agree nor disagree
16	246, 258, 263, 270, 256	235, 229, 241, 246, 237	6	4 - Agree	4 - Agree
15	275, 272, 285, 290, 293	265, 263, 269, 274, 262	3	2 - Disagree	3 - Neither agree nor disagree

When taking the average of the reaction times, each participant had an improvement of at least 10ms. Each participant also either felt more energetic/reactive or now difference at all, with one outlier reporting feeling less reactive.

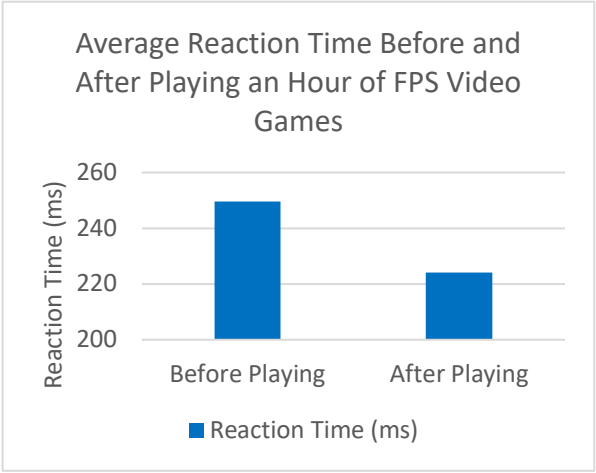

Figure 2: Table showing the average reaction times before and after playing FPS video games

In figure 2, an average improvement of 25ms can be seen. When looking at table 1 it can be seen that the lowest difference is 10ms and the largest difference is 40ms.

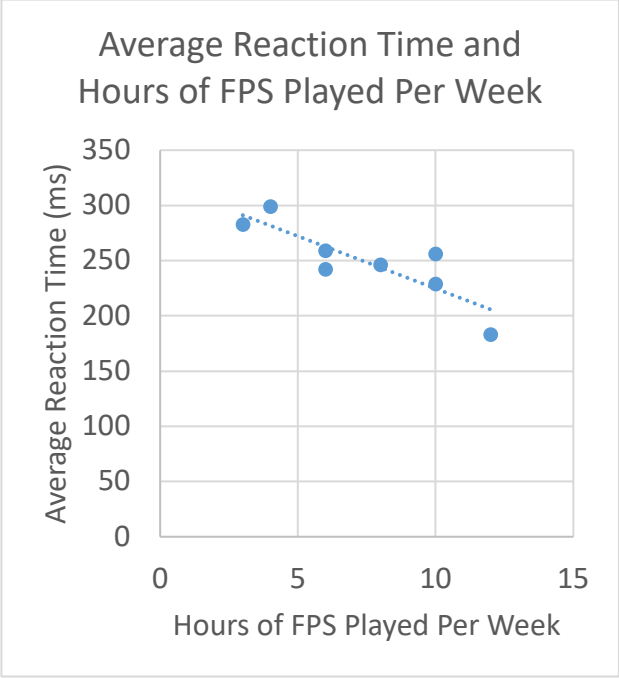

Figure 3: Graph comparing reaction time and average number of hours spent playing FPS per week

In figure 3, a correlation between the average number of hours spent playing FPS and reaction

time can be seen. Those who play more FPS games have a much better reaction then those who play less. The difference is almost 100ms.

IV. DISSCUSSION AND CONCLUSION

The hypothesis was correct, if someone plays First-Person Shooter (FPS) games for an hour then their reaction time would be notably faster. Video games have a positive effect on reaction times. For every single one of the participants, the average time it took them to react had decreased by a value greater than 10ms. For example, participants 2 and 5's average reaction time had decreased by about 35ms, and participant 2 and 7's average reaction time had decreased by about 20ms. Also for each of the participants, at least 4 out of 5 of the tests after playing FPS games didn't exceed the slowest test result from before playing the FPS. For example, participant 3's slowest reaction time from before playing was 191ms and none of their results from after playing were any slower.

The reason for the faster reaction time is due to the constant conditioning throughout FPS games. FPS games train in all three important factors of reaction time: perception, processing, and response. People need to quickly perceive all of the moving objects on screen and understand what to pay attention to. After that, they need to process and come up with the appropriate course of action (and that could include taking no action). Finally, they need to execute that course of action as quickly as possible by pressing the right buttons. After doing this over and over, they start to build up and strengthen the parts of their brain responsible for reaction, especially gray matter. Gray matter includes parts of the brain responsible for muscle control, perception, and memory. Many other researchers have reported similar results, especially with gray matter.

If this experiment was to be performed again, there should be many changes. Next time, there should be separate groups tested, each with different levels of exposure to FPS video games. The effect on reaction time would then be tested after a period of exposure, around a week. Simply taking people who already play FPS video games doesn't give the most accurate results.

V. APPLICATION

These results can be used for many applications but have great potential towards improving mental cognition. As we get older, especially with an aging population, people need to keep their metal state in its best shape. This research can help people work towards an easier way to achieve this. Video games are an easy and captivating medium to train peoples' brains. Scientists that study cognition could take these results and find more about this topic. For example, these results don't prove whether or not these improvement in reaction time are temporary or if you have to maintain it. This all leads into the concept of brain development, something that our knowledge is limited on. As we find out more about the brain and how it works, we can get more detailed insight about this topic.

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The Accuracy of Personality Tests

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Abstract

The relevance of the experiment lied on the fact that an abundance of people today take personality tests to be aware of their lifestyles, but without the knowledge that these simple tests are not reliable and that they could be potentially hindering their thoughts and lives. The question investigated in by doing this experiment was: Compared to a known accurate personality test and inaccurate personality test, how do the results influence the agreement for the person taking the test? To answer this question six participants completed two personality tests on separate days during the afternoon, one being known as accurate (MBTI test) and the other being known as inaccurate (Playbuzz test). The results depicted that when taking a known accurate personality test, people will agree to their results more, due to the illusory truth effect. Based on the results found it was concluded that the initial hypothesis was correct. The experiment showed the importance of not believing things so easily, especially the results of a personality test.

I. INTRODUCTION

Many people take personality tests for self-discovery, compatibility between friends/lovers, finding a career path, etc. However, the results to these personality tests are not accurate and could make people believe something about themselves that is not true. The accuracy of personality tests is inconsistent, with people finding them accurate and inaccurate. A popular personality test is the Myers-Briggs Type Indicator (MBTI) that divides people into 16 different personality types and often suggests career paths or romantic pairings. This test is very famous because it is known for being accurate. Everyday people find the test reliable and true to themselves. People even ask others what MBTI personality type they are when meeting someone new. However, organizational psychologist Grant (2013) said that the characteristics measured by the test have almost no predictive power on how happy someone will be in a situation, how someone will perform at a job, or how happy someone will be in their marriage.

Personality tests continue to be questioned for their accuracy, especially well-known ones. This brings about the question to be answered in this investigation: Compared to a known accurate personality test and inaccurate personality test, how do the results influence the agreement for the person taking the test?

If a personality test that is known to be accurate is taken, then people will agree to the results because people tend to believe information to be correct when exposed to it repeatedly. The illusory truth effect demonstrates that when the brain responds faster to repeated statements, they are seen to be more truthful (Resnick, 2017). A study conducted by Fazio, Brashier, Payne, and Marsh (2015) asked a group of students to read through a list of statements, some false, some true. Next, the students were given another set of statements,

however, this time they had to rank each statement on a scale of 1-6, 1 being definitely false, and 6 being definitely true. Lastly, the students answered multiple-choice questions related to the statements they had just read. The researchers found that repeated false statements

were more likely to be accepted as true. Repetition increased perceived truthfulness, even for contradictions of well-known facts. Reading a statement like, "A sari is the name of the short-pleated skirts worn by Scots" increased the students' later belief that it was true. Since participants already have previous knowledge of the personality test being accurate, they will believe that, so when taking the test, they will also find themselves agreeing to their result. Vice versa, a known inaccurate personality test will find themselves not agreeing to their result.

II. METHODS

Six people participated in this study. Participants were given website links to two personality tests: MBTI and Playbuzz.

1. Myers-Briggs Type Indicator (MBTI): https://www.16personalities.com/free-personality-test
2. Playbuzz Quiz: https://www.playbuzz.com/gregs/what-is-your-personality-type?utm_source=adwords.com&utm_medium=prom-t3-search&utm_campaign=otr&gclid=EAIaIQobChMI_Oab44eF4gIVIYdbCh1NLghGEAAYASAAEgJEpPD_BwE

Each participant had previous knowledge of the MBTI test being known as accurate and the Playbuzz test being known as inaccurate. Participants took each test on a separate day, during the same time of day; afternoon. After completing both personality tests, participants were asked to answer the following questions:

Q1: Do you agree with your results? If not, which test was inaccurate? Explain.
Q2: When do you think personality tests should be used?
Q3: Do you think personality test results actually depict someone's personality? Explain.
Q4: Do you often take personality tests? Why or why not?

In this experiment, the independent variable was the result of the personality test; accurate or inaccurate. The dependent variable was the participants' agreement to their results, which were measured by their answers to the questions. To ensure the experiment's reliability, several variables were controlled. Participants needed to have previous knowledge of MBTI and Playbuzz being known as accurate/inaccurate, so the illusory truth effect could take place. The format of the personality tests (multiple-choice) was controlled to ensure the data collected across each test was fair to be compared against. Each participant took the personality tests on separate days to ensure no bias impacted the results. Furthermore, participants took the tests during the afternoon to ensure no outside factors, such as tiredness, affected the results.

III. RESULTS

Table 1 depicts participant one's responses to the questions asked after taking both personality tests.

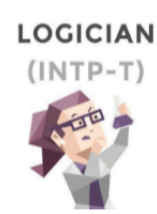
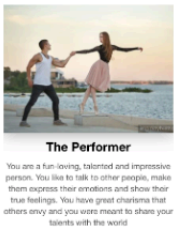
Result Type	Answers to Questions
Accurate (MBTI test) 	**Q1:** I agree with the first test (MBTI) because I do think a lot throughout the day. I am friendly and relaxed with people I know and I defend my opinions like the "Logician" result I got. I highly disagree with the second test (Playbuzz) because I don't like talking to most people and find that I don't have any unique talents like the "Performer" result I got. **Q2:** I think they should be used in work environments so people can determine their strengths/weaknesses and know what to work on. **Q3:** No, I don't think personality tests depicts a person's personality because most people lie on these tests, hoping to get results they want or the test is simply too vague and doesn't have the choices someone would pick for a certain question, which leads to an inaccurate result. **Q4:** Yes, I click any link for a test that comes my way. I am always curious to see my results even though I don't tend to believe them. I compare myself to the results and rate the accuracy.
Inaccurate (Playbuzz test) 	

Table 2 depicts participant two's responses to the questions asked after taking both personality tests.

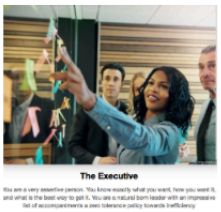
Result Type	Answers to Questions
Accurate (MBTI test) 	**Q1:** I do not agree with my results from the second test (Playbuzz). This is because I still do not know exactly what I want to be in the future, which is something that doesn't match the description of the result. The first test (MBTI) was kind of accurate because I am curious and enjoy creating. **Q2:** I think personality tests should be used when an employer is looking for employees, in order to search for a positive and enthusiastic person to work for the company. They can also be used when someone is finding their personality and wants a lead to help. **Q3:** I don't think personality tests actually depict someone's personality because tests cannot cover every aspect of personalities. A reaction in one situation does not guarantee the same in another. **Q4:** I do not often take personality tests because I think I know my personality well enough and that tests won't be needed to define myself.
Inaccurate (Playbuzz test) 	

Table 3 depicts participant three's responses to the questions asked after taking both personality tests.

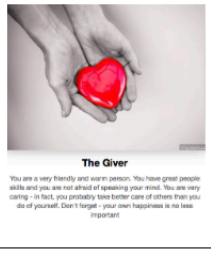
Result Type	Answers to Questions
Accurate (MBTI test) 	**Q1:** I agree with my first test (MBTI) results, but not my second (Playbuzz). I feel like my second result didn't give me an answer that accurately represents how I see myself, whereas the first was detailed and I agreed with it more because I am quiet, yet strongly thoughtful. **Q2:** I think personality tests should be used when you're feeling doubtful of yourself. The results are usually positive, which can give you a better understanding and new perspective on how you see yourself. **Q3:** Personality tests can't fully depict someone's personality because to do that, you need to know and understand a person. A series of questions can't do that. However, I think that there may be some details that can be right when taking a personality test. **Q4:** I don't often take personality tests because I don't really believe them. I'm sure of who I am as a person and don't feel the need to get this information for something that doesn't know me as a person.
Inaccurate (Playbuzz test) 	

Table 4 depicts participant four's responses to the questions asked after taking both personality tests.

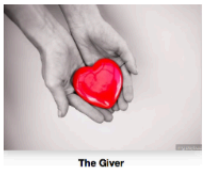
Result Type	Answers to Questions
Accurate (MBTI test) 	**Q1:** I do not agree with my results for both of the tests. I think both results represented an exaggerated version of my personality. The first test (MBTI) was a little more accurate than the second test (Playbuzz). I think I am confident and social, but I do not care about my social status and I am not popular. The second test (Playbuzz) was not accurate. I am a people's person, but I put myself before others. I am not that caring or a "mother figure." **Q2:** I think personality tests should be used when someone is feeling insecure and they need to know who they are. Most of these personality tests are positive and make the person taking it feel confident. I also think they should be used for jobs, when employers are looking for an employee who fits their motto and brand. **Q3:** No, I do not think personality tests actually depict someone's personality. This is because every person is very different and putting them into a set category is very general. However, I feel like there are some details that are correct. **Q4:** Yes, I often take personality tests because I am curious about myself. I do know myself, but these tests can make me realize more negative things about myself that I cannot admit. Taking them is fun and I always stumble upon them.
Inaccurate (Playbuzz test) 	

Table 5 depicts participant five's responses to the questions asked after taking both personality tests.

Result Type	Answers to Questions
Accurate (MBTI test) 	**Q1:** I agree with my results for both of the tests because they are both very similar. The first test (MBTI) goes deeper into it: I am honest/direct, always working hard, judgemental, and stubborn. The second test (Playbuzz) sums up my personality; I am always on the go, doing things and very hands-on. However, both tests are very general and I feel like they don't specifically apply to me. **Q2:** I think personality tests should never be used in any situation. They are not very useful and reliable in my opinion. **Q3:** No, I don't think personality tests actually depict someone's personality because it's not fair to completely judge someone based on their answers for a few questions, that quite frankly do nothing in the real world. **Q4:** Yes, I often take personality tests for fun, but I don't give my results a lot of deep thought. Also, most results are at the surface of my personality.
Inaccurate (Playbuzz test) 	

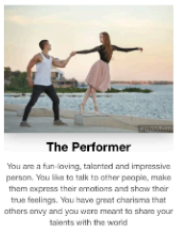
Result Type	Answers to Questions
Accurate (MBTI test) 	**Q1:** I agree with my results from the first test (MBTI), but not the second test (Playbuzz). I am very assertive, energetic, and I like to think of myself as a leader. I can be stubborn and impatient just like the "Commander" personality type. However, I am not "The Performer." I am outgoing, but I do not have any special/impressive talents. **Q2:** I think personality tests should be used when employers are looking for an employee who fits the personality of their company. People should use them sometimes, just for fun. **Q3:** No, I do not think personality tests actually depict someone's personality. I would like to think people's brains and personalities are deeper and more diverse than the results you get. **Q4:** No, I do not take personality tests often because I am confident in myself. I know my personality and the tests are not always accurate.
Inaccurate (Playbuzz test) 	

Table 6 depicts participant six's responses to the questions asked after taking both personality tests.

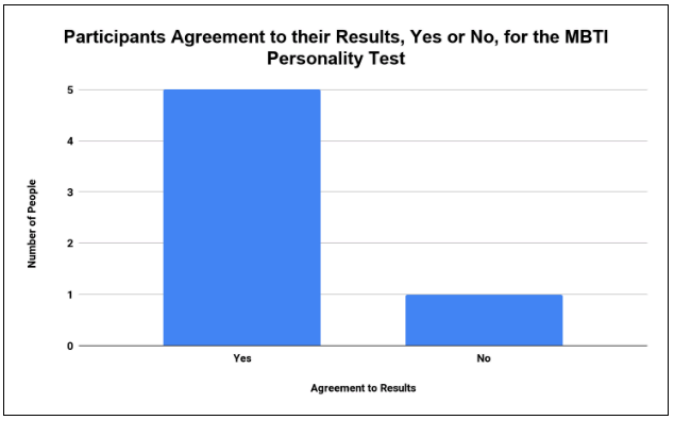


Figure 1 displays participants' agreement to their results for the MBTI personality test. The taller bar represents the participants who agreed to their results and the smaller bar represents the participants who disagreed to their results.

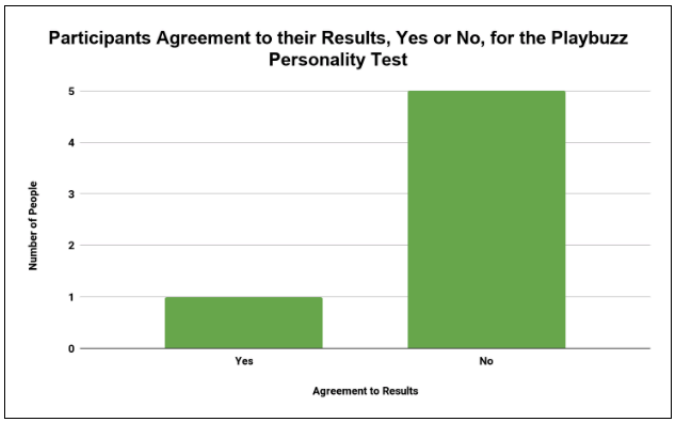


Figure 2 displays participants' agreement to their results for the Playbuzz personality test. The taller bar represents the participants who disagreed to their results and the smaller bar represents the participants who agreed to their results.

IV. DISCUSSION & CONCLUSION

In completing the experiment, the data suggested that the hypothesis was correct. The hypothesis stated that if a personality test that is known to be accurate is taken, then people will agree to the results. The data of the experiment clearly showed this as from the total of 6 participants, 5 participants agreed to their results after taking the accurate MBTI personality test, which outweighs the 1 participant that agreed to their result after taking the inaccurate Playbuzz personality test. Since participants had previous knowledge of these tests being accurate/inaccurate, the data showed that people tend to believe information to be correct when exposed to it repeatedly. Participants believed the information about the accuracy of the personality tests, so when taking them, they also had the same reaction for accuracy. Therefore, in answering the initial question, the data evoked that when taking a known accurate personality test, people will agree to their results more.

The experiment's results can be justified using past scientific studies conducted on this topic. The illusory truth effect demonstrates that when the brain responds faster to repeated statements, they are seen to be more truthful (Resnick, 2017). A study conducted by Fazio, Brashier, Payne, and Marsh (2015) repeatedly gave a group of students a set of statements, some true, some false. The researchers found that repeated statements were more likely to be accepted as true, even if false. Repetition

increased perceived truthfulness. The results from their experiment are almost identical to the findings of this personality test experiment because the participants had previous repeated knowledge of the personality tests being accurate/inaccurate, so when taking the test, the illusory truth effect took place. They believed the statements of the accuracy of the personality tests, so once they got their results, the statements also had a part of determining the accuracy of their results.

V. APPLICATION

Results from this experiment can be applied to other fields of study such as Psychology. The findings in this experiment could lead to the investigation of how the results of personality tests affect the mental health of the person taking the test. Questions like, do results showing negative qualities make the person want to improve themselves? The information this study provides could also be of use to the general public, by informing them to do their research before believing something. In being exposed to these findings, the public may not give attention to personality tests anymore. The results of these experimental efforts could also spark improvement in personality tests; personality tests that are more scientifically backed and accurate.

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Effects of Plasma electrolytic Oxidation on Magnesium with relation to coating thickness

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Abstract

During recent years magnesium and its alloys have demonstrated great potential as biodegradable orthopedic implants due to their excellent biocompatibility and mechanical properties such as high strength and being light weight. However, magnesium is subjected to an overly rapid and uncontrolled degradation, caused by its low corrosion resistance. The objective of this project was to determine if plasma electrolytic oxidation would improve the corrosion resistance with correlation to coating thickness. After conducting research, the hypothesis made was that plasma electrolytic oxidation would improve the corrosion resistance of magnesium in the human body with a positive correlation to coating thickness. In this project, plasma electrolytic oxidation treatments were applied to Mg samples differing times, resulting in varying coating thicknesses. Potentiodynamic polarization tests were performed in simulated body fluid to establish corrosion properties. The hypothesis was proven to be correct. The results have shown that as coating thickness increases so does corrosion resistance. This proves magnesium's poor corrosion resistance can be solved and it does indeed have a future in the biomedical field.

I. INTRODUCTION

Magnesium demonstrates great potential to be a novel material for orthopedic implants because of its biodegradability and biocompatibility with the human body. However, because of limiting factors such as its low corrosion resistance, extensive applications are still inhibited (Chen, Xu, Smith, Sankar, 2014). Nevertheless, because of biocompatible coating techniques such as plasma electrolytic oxidation (PEO), corrosion rates can be decreased and controlled. PEO is a relatively novel technique that produces highly dense and extremely hard coatings. However, still much is not known about PEO because of the complex electrochemical reactions involved. Nevertheless, its usefulness has been shown regarding preventing degradation of materials (Dehnavi, 2014). Researching the effects of coating thickness will be beneficial for a deeper understanding of PEO coatings on magnesium. The question asked is: What effects do plasma electrolytic oxidation treatments have on the corrosion resistance of magnesium in the human body with relation to coating thickness? The hypothesis formed is if coating thickness is increased, then the corrosion resistance of magnesium will increase as well because plasma electrolytic oxidation has demonstrated great effectiveness in protecting lightweight metals such as magnesium (Li, Liang, Wang, 2013).

II. METHODS

Five magnesium samples were obtained and sanded with grit paper to ensure similar surface roughness. Two litres of distilled water was poured into the electrolyte tank and 0.8g/L of potassium hydroxide was added as an electrolyte. One magnesium sample was immersed in the water and connected to power

supply. The power was turned on and coating process was initiated. The sample was coated for 4 minutes and a coating thickness gauge was used to measure its coating thickness. The same coating procedure was done for 3 other samples however with coating times of 8, 12, and 16 minutes. One sample was left uncoated as the substrate. Simulated body fluid was obtained and poured into potentiodynamic polarization testing equipment. The substrate was placed, and the test was initiated on Ec-Lab software. The corrosion properties were calculated using Ec-Lab and recorded. Potentiodynamic polarization testing procedures were carried out for the rest of the samples.

The independent and dependent variables were coating thickness and corrosion resistance respectively. One control was the fluid the corrosion testing is performed in. This is because body fluid is simulated, and we are not testing for what kind of fluid is the most corrosive. If the fluid is changed then it would compromise the results on coating thickness. The shape and size of the magnesium samples were also controlled. If these were changed the coating would not be the same on each of them therefore compromising the results. Everything about the samples were kept the same except for their coating thickness to achieve the most accurate results. They were even sanded with abrasive paper to ensure similar surface smoothness.

III. RESULTS

The results were portrayed by tables and graphs with Table 1 and 2 containing the raw data while Figure 1 contains averaged data. Degradation rate was calculated using the equation $D = 2.285 \times 10^{-3} \times d \times A \times i_{corr}$ where d is the density of the Mg samples (1.74 g/cm3) and A is the tested surface area (0.196 cm2).

Table 1: This table shows the corrosion potential and the calculated degradation rate of each coating thickness for trial 1

Sample	**Coating Thickness (μ m)**	**i_{corr} (μ /cm^2)**	**Degradation Rate (mg/year)**
S1	0	1.10	0.85
S2	15.1	0.63	0.49
S3	21.3	0.48	0.37
S4	27.2	0.36	0.28
S5	33.1	0.29	0.22

Sample	**Coating Thickness (μ m)**	**i_{corr} (μ /cm^2)**	**Degradation Rate (mg/year)**
S1	0	1.12	0.87

S2	16.1	0.56	0.44
S3	21.7	0.44	0.34
S4	27.5	0.34	0.26
S5	33.3	0.27	0.21

Table 2: This table shows the corrosion potential and the calculated degradation rate of each coating thickness for trial 2

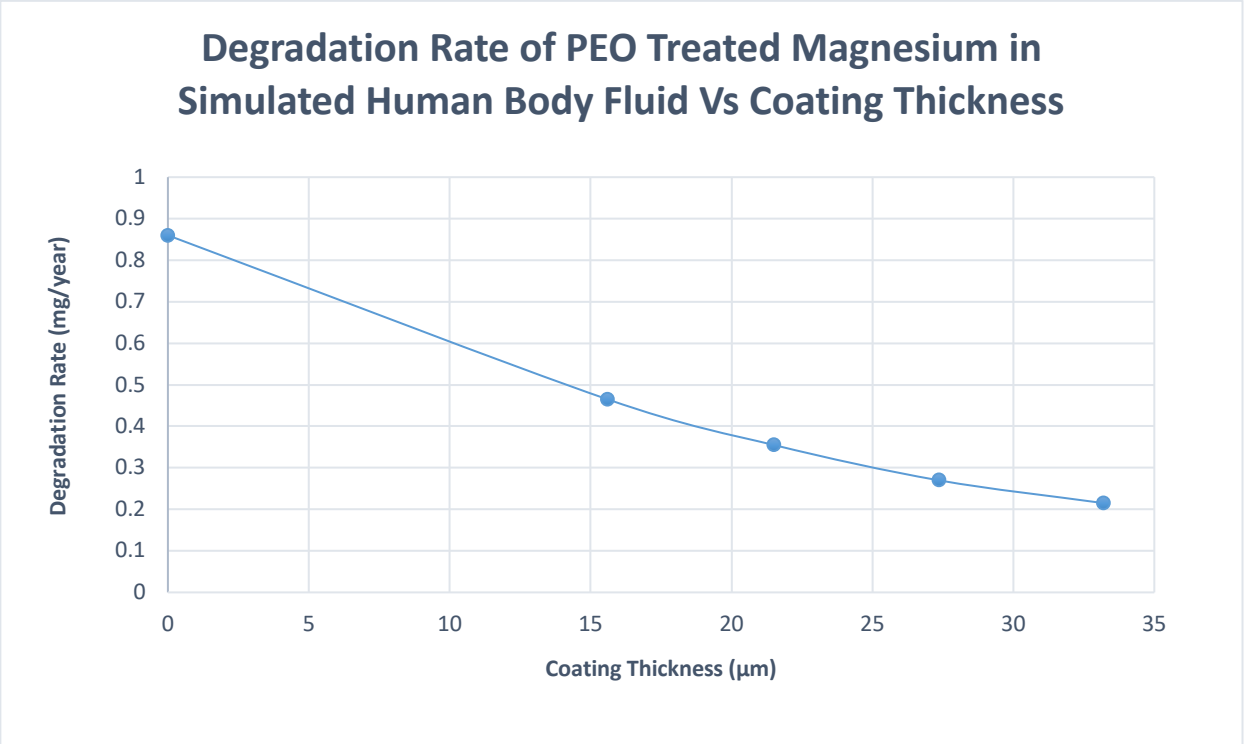

Figure 1: This line graph shows the averages of the degradation rates for both trials compared against the averages of coating thickness for both trials

IV. DISCUSSION & CONCLUSION

The hypothesis was proven to be correct by the results of the experiment. Table 1 and 2 contain the findings for degradation rate. Fig.1 shows a relatively linear decrease in degradation rate as coating thickness increases. This negative correlation confirms that the effects of increasing PEO coating thickness on magnesium increases corrosion resistance. The increase in corrosion resistance is because of the decrease in degradation rates. The degradation rate roughly decreases by intervals of 10 mg/year with S5 depicting a rate four times slower than that of the substrate. Trial 1 and 2 showed little difference, however, because trial 2 had slightly thicker coatings, under 1 μm in difference, it exhibited a degradation rate about 0.02mg/year slower. Because plasma electrolytic oxidation produces extremely hard and dense coatings that adhere well to lightweight metals like magnesium, it helped increase corrosion resistance and lower degradation rates as seen in the results. PEO coatings should still be effective in human body fluid and the findings confirm that assumption. Furthermore, the results have shown that the coating thickness relates linearly to corrosion resistance and degradation rate allowing estimation and deduction of how long a coating of certain thickness will last. The purpose was to research the effects of PEO on magnesium so it may potentially be used in biomedical fields later. Although much more testing is required, the relationship between coating thickness and corrosion resistance has been found through this experiment.

V. APPLICATION

This project is only a beginning for the idea of magnesium as a biomedical implant. Future directions may include alloying as alloying magnesium with certain metals such as Zinc increases its strength without sacrificing biodegradability and biocompatibility. Another direction is changing the coating parameters for PEO such as electrolyte composition and current type. That will also influence the coating. Different coatings other than PEO can also be utilized to treat magnesium. A more advanced approach can be testing magnesium implants in animals but that may still be a long way off. The results of this project are not limited to the biomedical field as PEO's relationship to Mg can be applied to anything that requires it.

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Different Intensity Exercises and Pain Experienced across Age Groups

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Abstract

The question of this SCICAN! Project was: How do different level intensity exercises affect muscle, joint, and breathlessness pain experienced in elderly people relative to other age groups? This question is relevant, due to the developed world's increasing elderly population, which needs a painless and less damaging way to exercise, to increase overall health. The experiment used two 70-year-olds, two 50-year-olds, and two 30-year-olds. Each age group did as many push-ups, sit ups, squats, steps, wall push-ups, and crunches as they could, the first three being high intensity, and the last three being low intensity exercises. They recorded the number of each exercise they did, and pain experienced on a scale of 1-10. When the results for pain experienced were graphed, the younger age groups experienced far less pain with the high intensity exercises compared to the elderly participants, but the older age groups preformed very similarly to the younger age groups for the low intensity exercises. So, the conclusion was reached that the 70-year-olds experience less pain with low intensity exercises relative to the younger age groups (30-year-olds and 50-year-olds). The results are important, because it shows a way for the elderly to properly exercise, and reap the health benefits, without doing too much damage to their bodies.

I. INTRODUCTION

The purpose of this project is to find the effects different intensity exercises have on muscle, joint, and breathless pain experienced in the elderly relative to other age groups. This project is important, because of the increasing elderly population in the developed world (United Nations). The benefits exercise brings to your health is well known; however, many exercises are too painful or damaging for the elderly to perform. The problem of this SCICAN! is: How do different level intensity exercises affect muscle, joint, and breathlessness pain experienced in elderly people relative to other age groups? The hypothesis for this project is: If low intensity exercises are practiced, then less pain will be experienced amongst elderly participants, because high intensity exercises need more muscle mass, bone density, and a higher VO2 max, which elderly people do not have (Minson, C).

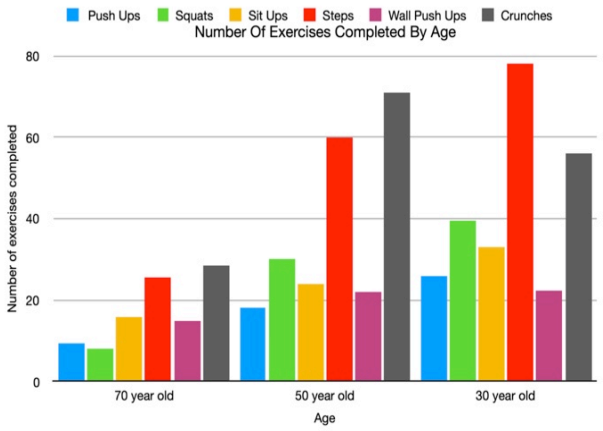
II. METHODS

An experiment was used for this project. Two 70-year-old participants were to do as many pushups, sit ups, squats, steps, crunches, and wall push-ups as they could. When they finished, they recorded the amount of each exercise they could do, and the amount of breathlessness, muscle, or joint pain experienced on a scale of 1-10. This was repeated, but with two 50-year-old participants, and 2 30-year-old participants. The dependent variable in the experiment was the average of the pain rating from each age group, as this was what the experiment was trying to measure. The independent variable was age.

The control variables were: Earlier physical activity, time of day, and previous injuries. These variables were controlled, because they could have had a large impact on the results of the experiment. Any earlier physical activity could have made the participants tired, or put them in more pain during the experiment. Time of day was controlled, because it could have made the participants feel tired, or fatigued, and therefore not preform to their true potential. Any previous injuries might have made the participants experience more pain than they normally would, without the injury.

III. RESULTS

Figure 1: Graph of the amount of different exercises completed by age



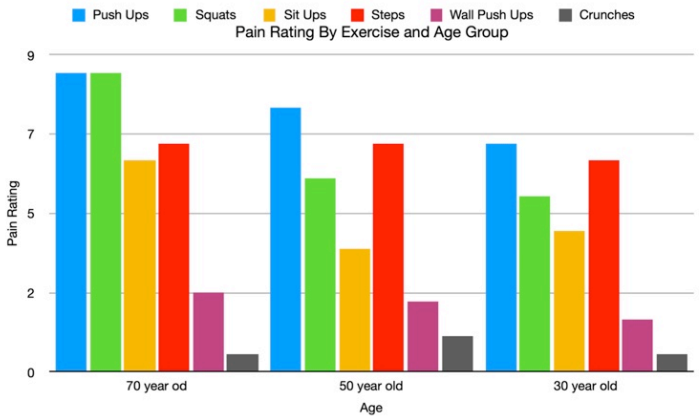


Figure 2: Graph of pain ratings on a scale of 1-10 for each different exercise by age

IV. DISCUSSION AND CONCLUSION

The hypothesis was correct. the initial purpose/ problem was: Do lower intensity sports cause less breathlessness, joint pain, and muscle pain as you age? The findings suggest that the hypothesis was right. If you look at the second chart (Pain Rating By Exercise and Age Group), you will see that, with the high intensity exercises(blue, green, and yellow), the difference between age groups is massive (The 70-year-old's participants recorded an 8.5 for squats, whereas the 30-year-old's recorded around a 5) However, if you look at the low intensity exercises, the difference is far less. As a matter of fact, sometimes, the results are almost identical. The results are very understandable if you look at the scientific background information. The exercises that do not require as much air (wall push-ups, for example) are better for the elderly, because the elderly generally have a lower V02 max. Exercises that do not put too much emphasis on joints (crunches, for example) are better for the elderly, because their joints are generally more damaged.

Exercises that do not require too much muscle (steps, for example) are better, because the elderly generally have less muscle mass, and a worse maximal heart rate, meaning they cannot get oxygen to their muscles as efficiently.

V. APPLICATION

This information could be especially useful to the field of kinesiology, or geriatrics. This information could be used to further research, or to help clients of professionals in this field be more healthy, or feel better. The general public could use this information by spreading this information to the elderly, so they could lead a more active, and therefore healthy, lifestyle. The scientific community could use this information as a basis for further research, such as: Why do elderly people have lower VO2 max, more joint problems, less muscle mass, etc., or how to stop/counter elderly people from having a lower VO2 max, worse joints, less muscle mass, etc.

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Screen Time and Its Effects on People

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Abstract

The correlation of screen time and its effects on humans was investigated for this project. The question which was asked was, does the amount of screen time have an effect on humans? This topic was relevant due to its popularity in the present era, and the amount of usage everyone has with screen devices. To put this to test, an experiment was conducted in which ten test subjects sacrificed three hours of screen time, afterwards, they ranked their level of difficulty on a scale of 1-10, with 10 being the most difficult. Finally, the subjects were asked if they felt more productive without screen time. Two majors` results were found from the experiment. The first being that the average level of difficulty was a solid six, which meant that they were inclining towards really difficult. The second being that, majority of the test subjects found themselves to be more productive without the use of screens. Finally, with these results it is clear that screen time does have an effect on people, as they felt the urge to constantly use devices within the three hour time frame, and by reducing the amount of screen time people felt more engaged with the world and education as they felt more productive.

I. Introduction

Answering the effects of screen time is relevant since, almost everyone has their own portable devices now a days. According to Rogers Behavioral Health, teens are facing more depression, anxiety and other mental health struggles than the previous generations. Although there are other factors which contribute to the result, screen time is a major one.

The question is, how does screen time effect people? According to several sites, such as psychologytoday.com, it states that it is due to a release of dopamine, a chemical compound in the brain which is released when satisfied or content. The hypothesis was that if screen time is reduced by three hours, test subjects will feel more productive. This is because, when abstaining from screen devices for some time the mind will slowly become relaxed and focused on something atypical, such as schoolwork or sports for distraction.

II. Methods

For the experiments, first a survey was conducted which asked, how many hours on average do students spend in front of a screen device per day. Afterwards, the average for the number of hours

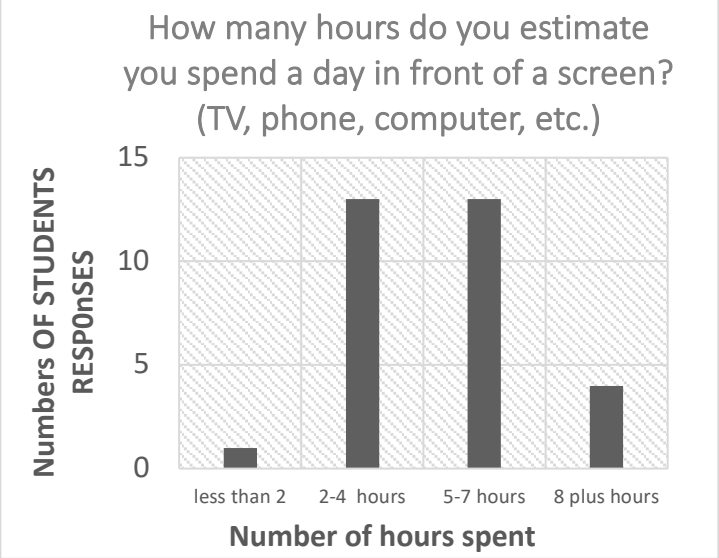
spent was calculated, which came to be about four hours.

For the second experiment 10 volunteers were used as test subjects. Subjects had to give up all sorts of contact with a screen device for three hours, once a little over moderate difficulty.

The final part of the experiment was the aftermath of the second experiment. This experiment was a survey in which, the student's productivity was questioned. Subjects were asked if they felt more productive without any screen time. All of them answered yes except one subject. This proved the hypothesis, that if screen time is minimized, subjects will feel more productive, as there are no distractions.

The variables used in the experiments were consisted of three; independent, dependent, and controlled. The independent variable was determined by the duration of time for screens to be given up for the experiment. The dependent variables were identified by the students, since their productivity was measured as well as their difficulty for the experiment. Lastly, the controlled variables were two, the questions being asked, since they needed to be according to the post and aftermath results for the experiment. The second were the students being experimented on, because they had to be students of various screen time

the experiment had been accomplished by each volunteer, the subjects rated the difficulty of the experiment, with 10 being the most difficult. The average resulted as 6 out of 10 for the difficulty. This means that, the average student at Massey slightly incline towards really difficult, but



users, to get a general outlook on students average for the experiment at Massey.

III. Results

This experiment was a general analysis of where Massey students stand, in terms of the number of hours spent on a screen device, according to 31 students.

For both 2 to 4 hours and 5 to 7 hours, 13 people stated that they use screen during these two-hour intervals each, and four students stated that they spend 8 or more hours. The total average for all responses was 3.88 hours.

After the controlled experiment was conducted, in which test subjects had to give up screen time for three hours. The average level of difficulty was a solid 6, meaning that it was a little over moderate difficulty, yet inclining towards really difficult.

The final experiment, in which the follow up question was asked to the test subjects if they were more productive. Everyone except one replied yes, which proves that students are more productive with a reduced amount of screen time, due to lack of distraction, and an increase of focus.

IV. Discussion & Conclusion

At the start of this experiment, it was hypothesized that, reducing the amount of screen time will have a positive effect on the students. After approximately a week and a half of conducting these experiments, the results suggest that the hypothesis was proven correct. It was discovered that, by limiting the number of hours on a screen device, lead to a high amount of productivity, as most subjects stated that they got more work done. This proves that it has a positive impact on the students, and it also proves that it reduces stress and anxiety. By finishing most of your work in those three hours, students were able to diminish most of the stress, and anxiety which were caused by schoolwork, this also means that, screen devices serve as a distraction at times.

For the first experiment a basic understanding of the average amount of hours spent on screen devices was needed. To do this, a survey was conducted on a handful of people. The average was 3.88 hours a day on a screen device. With this result, 10 students were prohibited from using any devices for three consecutive hours. Most students encountered an urge to use a screen device, but since they couldn't they found themselves to be more productive. The urge was due to dopamine, which is a chemical that is released in times of joy and amusement, in today's day and age, people find the use of screen time really amusing, whether it be playing a videogame or watching a tv show. During these actions, dopamine is released making one feel good, and long for the act, in this case, the use of screen devices. Therefore, by giving screen devices a break, people had an urge to continue, but over time were able to overcome their desires, and became more productive.

Did you find yourself more productive, without screen time?	
Yes	No
IIIIIII	**I**

V. Application

This information is useful in ways for finding out the long-term effects of screen time reduction, in

the future, and its impact on the human body by reducing it. Some further research which may be beneficial to answer if reduction of screen-time increases most peoples productivity, would be to test volunteers, by reducing their screen time by a few hours every week. By doing so, a long term data will be collected, which will confirm or deny the sample experiment. This information may also be significant for psychologist as well as the medical field, as screen time correlates to the brain functions, as well as the human body. The general public and scientists can utilize this information, as awareness for society and the amount of time which is spent on screen devices.

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Best Ways to Raise More Money for a Fundraiser

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Abstract:

The purpose of this project was to find what the best ways to sell a product for a fundraiser were, and how much they impacted the sales. This is important because of the many students who are involved in many fundraisers at Massey and the desire to lower costs of the expenses these fundraisers would help with. During this project, chocolate bars were sold using different selling strategies. The strategies were selling a variety of flavours, putting labels on the outside of the box the bars were in and talking to people about what was being sold and for what purpose. The study found that the different strategies boosted sales from almost two and a half times to almost three times and that talking to potential buyers was the most effective. This means that using these sales boosting tactics was more effective than initially predicted.

I. INTRODUCTION

The purpose of the project is to test which way of selling for a fundraiser is most effective. This is important because of the large number of students and fundraisers at Massey as this will help these students. This leads to the question; what is the best way to increase product sales? If various sale boosting strategies, such as offering new products or a larger variety of products, are applied, then sales will increase because when a larger variety a product is sold it makes the product more interesting and exciting for the customer, making them want to purchase more or more often.

II. METHODS

Sold the product, chocolate bars, normally, with no additional effort, for a few days. Next, introduced a wider variety of the product, flavours such as mint and dark chocolate, for the same number of days as with no method, but didn't do any more advertising than what was done in the first week. Added labels to the box the product was in to show what's in the box, and what flavours were available, for the same number of days again. Went up to potential buyers and tried to sell the product as often as possible. The independent variable was the selling strategy that was used in that particular set of days and the dependent variable was the number of sales that were made. The controlled variables were the time and location that the bars were sold. Didn't include sales figures for any sales made outside of locations travelled to every day for all four weeks.

III. RESULTS

Table 1) shows the average number of bars sold per day with each selling strategy.

	Bars Sold
Normal	6.6
New Flavours	15.0
Labels	16.7
Announcements	18.0

The number of bars sold using each selling strategy was well over double compared to when no strategy was used.

Figure 1) graph of table 1 showing the average sales per day for each strategy.

IV. DISCUSSION & CONCLUSION

The hypothesis was correct because the hypothesis stated that when a greater variety of a product was available sales would increase and the data definitely showed this. The sales increased by over two times, from 6.6 sales per day to 15 bars per day. The data showed that the best way to sell more chocolate bars is to verbally tell people about the bars; what the cause was, what flavours were available, and how much they cost. Although in the data this was the best way to sell the bars, putting labels of what the bars look like on the boxes and having a larger variety of flavours were also very beneficial, selling 16.7 and 15 bars per day average respectively. This was especially true compared to when no extra work was done, as all of these strategies sold over double what having no strategies sold.

This shows that no matter what strategy is used, the sales will increase dramatically. These results are further proven by countless other investigators that all want to help increase the sales of individuals fundraisers. One source of error in the results could have been the fact that each strategy wasn't used for the same days of the week. This may have affected my results because no matter what selling strategy was used, the sales increased as the week went on, especially on Fridays. This is likely because people are more likely to be looking forward to something, such as the weekend, on Fridays and want that thing they're looking forward to being sweetened - with chocolate.

V. APPLICATION

This information is useful to anyone who is trying to do something that could benefit others but needs money to do so. This could be one of the many fundraisers that are always happening around schools like Massey, or a group outside of schools such as a sports team, or even the amazing people doing work for various charities. All of them will be able to raise more money for a cause they want to support, as well as spreading the word to encourage others to help out for their cause, or even a new one that their supporter wants to support.

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Many test subjects were influenced by the fake horoscope traits they were told.

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Abstract

This study explored how likely people were to be influenced by false information. This was relevant because, there was more and more information available on the internet, and with that people should have checked if the information was true. Believing false information could have harmed the people that were consuming the information and the people the information was about. The experiment gathered people of different horoscopes and told them real or fake traits. Then they were asked to fill out a questionnaire. Each horoscope had 4 corresponding questions. The questions were used to see whether they were influenced or not. The results found that the test subjects were more likely to believe the traits they were told, which means the test subjects were influenced by the information. The experiment proved that the general public was influenced by false information, which raised awareness about checking the reliability of sources.

I. INTRODUCTION

How likely are people to believe traits of horoscopes that are not their own?

While some people are die-hard believers of horoscopes and others read them just for fun, it is hard to deny that they affect the general public, and have created a huge market. For the people that believe in them, horoscopes will help predict the future, the compatibility of a partner and more. In 2010 the GGS found that 34% of the test group thought that astrology was "sort of scientific" or "very scientific" (National Science Board. n.d). On the other hand, a study carried out by Geoffrey Dean and Ivan Kelly found that there is no relation between your character and your zodiac sign (Dean, 2016).

If people are told they have traits of a horoscope that is not their own, then they will believe it because, according to a study by Michel Gauquelin there are no links between someone's personality and their horoscope. In the study he asked astrologers to foretell the personality of someone based on their horoscopes and overall, they failed (Kelly, 2001).

II. METHODS

First, a teenager was asked to be a test subject. After, the test subject was asked their horoscope. Then the test subjects were read the fake or real horoscope analysis from the script, refer to Figure 1. Next, the subjects were asked to complete a google form at 4 pm the same day. The data was inserted in an excel sheet. Lastly, steps 1-6 was repeated with other test subjects.

Script

Since you are a (their horoscope), these are your traits.

Fake/Sagittarius

You are a natural born leader, you are generous, honest and idealistic. (Their horoscope)s keep an open mind and you always remain optimistic. (Their horoscope)s also dislike clingy people and details.

Aries

Since you are a (their horoscope), these are your traits. You are a natural born leader, you are generous, honest and impulsive.

Leo

Since you are a (their horoscope), these are your traits. You are generous and creative, but you can be stubborn and lazy sometimes.

Virgo

Since you are a (their horoscope), these are your traits. You are loyal, hardworking, shy and you worry often.

Libra

Since you are a (their horoscope), these are your traits. You are cooperative and gracious, but you can carry a grudge and be indecisive.

Scorpio

Since you are a (their horoscope), these are your traits. You are courageous and resourceful, but you can be a little stubborn and you tend to get jealous.

Capricorn

Since you are a (their horoscope), these are your traits. You are loyal, responsible, disciplined but you can carry a grudge.

Aquarius

Since you are a (their horoscope), these are your traits. You are independent and progressive. You enjoy freedom but you can be aloof sometimes.

Pisces

Since you are a (their horoscope), these are your traits. You are creative, compassionate and wise but you tend to worry too much.

Taurus

Since you are a (their horoscope), these are your traits. You are loyal, responsible and practical but you can be a little stubborn.

Gemini

Since you are a (their horoscope), these are your traits. You are curious but you can be indecisive, you worry too much, and you are impulsive.

Cancer

Since you are a (their horoscope), these are your traits. You are loyal, sympathetic and emotional but you can be pessimistic sometimes

Figure 1 was the script that was read to the test subjects. The first part of the script is the same for every subject. However, what horoscope traits the subject was read determined whether they were told real of fake traits.

Questionnaire

https://bit.ly/2EZwupr

Variables

Independent variable – the horoscope

Dependent variable – if they identified with the traits of a horoscope that was not their own

Controlled variable – script, horoscope of the test subject, time between when subjects were told the traits and when they filled out the questionnaire, all test subjects were teenagers

The first part of the script is kept the same for every test subject, so they all believed that the traits listed were their own. That means every subject was treated the same. The second part depended on whether they were told real or fake horoscope traits. The questionnaire asked questions about all the traits of all the horoscopes. This way every test subject got the same questions and the same number of them. The horoscope of the test subject was a controlled variable. Their horoscope could not change, this way everyone was influenced the same. The time they filled out the questionnaire was also a controlled variable. Because, a difference in time could have resulted in test subjects remembering more clearly or less clearly when filling out the questionnaire. They were all teenagers because they would think more alike than people from different ages. All these variables made sure there was not any unwanted irregularities.

III. RESULTS

Table 1 showed the answer to the 31 questions from the 25 test subjects. 1 means the subject answered yes, and 0 means the subject answered no. The actual column was the subject's actual horoscope, and the told column was which horoscope they were told. The top 2 rows were which horoscopes the questions belonged to.

Table 1	Questions based on horoscope		scorpio	aries	sag	sag	sag	sag	scorpio	taurus	pisces	taurus	empty	empty	pisces	empty	empty	empty	capricorn	scorpio	scorpio	capricorn	capricorn	aquarius	aquarius	aquarius	aquarius	pisces	pisces	taurus	cancer	cancer	cancer
			aries		aries	aries	leo		leo	leo	leo	virgo	virgo	virgo	virgo	libra	libra	libra	libra	empty	empty	taurus											
Subject	Actual	Told	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30	Q31
1	leo	sag	1	0	1	1	0	1	1	0	1	0	0	0	1	1	0	1	0	0	0	0	1	1	1	0	1	0	0	1	0	0	0
2	leo	sag	1	1	1	1	1	1	1	0	1	1	1	0	0	1	1	1	0	0	1	1	1	1	0	1	1	1	1	1	1	0	0
3	libra	sag	1	1	1	1	1	1	1	0	0	1	0	0	1	0	1	0	1	1	0	0	0	1	0	1	0	0	0	1	0	0	0
4	scorpio	sag	0	0	1	1	1	1	1	0	0	1	0	0	0	0	1	0	0	0	1	1	0	0	1	1	1	1	0	1	1	0	0
5	gemini	sag	1	1	1	0	1	1	0	1	1	0	0	1	1	0	0	1	1	0	0	0	1	0	1	1	1	1	0	1	1	1	1
6	capricorn	sag	1	0	1	1	1	1	0	0	0	1	0	1	0	1	0	0	0	1	0	0	1	1	0	0	0	1	0	0	0	0	1
7	aquarius	sag	0	1	0	1	1	0	0	1	1	1	0	1	1	1	1	1	0	1	1	0	0	1	1	1	1	0	0	0	1	1	1
8	virgo	sag	1	0	0	1	1	1	1	1	0	1	1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	0	1	0	1	0	0
9	cancer	sag	0	0	0	1	1	1	0	1	1	1	1	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1
10	virgo	virgo	0	0	0	1	1	1	1	1	0	1	0	1	1	1	0	1	0	0	0	0	0	1	1	1	1	1	0	1	0	0	1
11	libra	sag	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	0	1	1	1	0	1	1	1	1	1	1	0	1	1	0
12	taurus	sag	1	0	1	1	1	1	0	0	1	1	1	0	0	1	1	0	0	0	1	1	0	1	1	1	1	1	1	1	0	0	0
13	pisces	pisces	0	1	0	0	1	0	0	1	1	1	1	0	0	0	0	1	0	0	1	0	1	1	0	1	1	1	0	1	0	0	0
14	pisces	sag	0	1	1	1	1	1	1	0	1	0	1	1	0	0	0	1	1	0	1	0	0	1	1	1	1	0	0	0	0	1	1
15	leo	sag	1	0	1	1	0	1	1	1	0	0	1	1	1	0	1	0	1	0	1	1	1	1	0	1	1	0	1	1	1	1	1
16	leo	sag	0	0	1	1	1	1	1	0	1	1	1	0	1	0	0	0	1	0	1	1	1	1	1	0	0	1	1	1	1	1	1
17	capricorn	sag	0	0	0	1	0	1	1	0	0	0	0	1	0	1	1	1	1	1	1	0	0	1	0	1	0	1	1	0	0	1	0
18	virgo	sag	0	1	0	1	1	1	0	1	1	1	1	0	0	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0
19	capricorn	capricorn	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	0	1	1	1	1	0	1	0
20	aries	aries	1	1	1	0	1	1	1	1	0	1	0	0	0	0	1	1	1	1	1	0	0	1	0	1	1	0	0	1	1	0	0
21	aquarius	aquarius	0	0	1	0	1	1	1	1	1	1	0	0	0	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	0	0
22	aquarius	aquarius	1	0	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0
23	gemini	gemini	0	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	0	1	1	1	1	1	0	0	1	1	1	1	1	0
24	leo	leo	0	0	0	1	1	1	0	0	0	0	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1	0	1	1	1	1
25	aquarius	aquarius	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	0	0	1	0	1	0	1	1	1	0	0	1	1	0

Table 2 showed which questions the subjects should have answered yes to, according to their actual horoscope. For example, for question one, people that were the horoscope Aries or Scorpio should have answered yes.

Table 2 Questions that subjects who should answer YES based on their real traits

Subject	Actual	Told	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30	Q31
1	leo	sag	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	leo	sag	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	libra	sag	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	scorpio	sag	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
5	gemini	sag	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	capricorn	sag	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0
7	aquarius	sag	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0
8	virgo	sag	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	cancer	sag	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
10	virgo	virgo	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	libra	sag	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	taurus	sag	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0
13	pisces	pisces	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
14	pisces	sag	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
15	leo	sag	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	leo	sag	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	capricorn	sag	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0
18	virgo	sag	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	capricorn	capricorn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0
20	aries	aries	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	aquarius	aquarius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0
22	aquarius	aquarius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0
23	gemini	gemini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	leo	leo	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	aquarius	aquarius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0

Table 3 showed the sum of questions that subjects who should have answered yes based on their real traits. From the test subjects, one of them was an Aries and one was a Scorpio. So, in total 2 people should have answered yes to question 1.

Table 3. Sum of questions that subjects who should answer YES based on their real traits

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30	Q31	
Subjects who were told real traits	1	1	1	1	1	0	1	1	2	1	1	1	2	0	0	0	1	0	0	1	1	3	3	3	3	1	1	0	0	0	0	31
Subjects who were told fake traits	1	0	0	0	4	0	5	5	5	3	2	2	3	2	2	2	4	1	1	3	2	1	1	1	1	1	1	1	1	1	1	57
Total	2	1	1	1	5	0	6	6	7	4	3	3	5	2	2	2	5	1	1	4	3	4	4	4	4	2	2	1	1	1	1	88

Table 4 showed the subjects who answered yes to their real traits. Table 4 showed the responses to the 31 questions. If the test subject answered yes to the questions that corresponded to their actual horoscope, it was recorded.

Table 4. Subjects who answered YES to their real trait

Subject	Actual	Told	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30	Q31
1	leo	sag	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	leo	sag	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	libra	sag	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	scorpio	sag	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
5	gemini	sag	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	capricorn	sag	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
7	aquarius	sag	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0
8	virgo	sag	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	cancer	sag	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
10	virgo	virgo	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	libra	sag	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	taurus	sag	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0
13	pisces	pisces	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
14	pisces	sag	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	leo	sag	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	leo	sag	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	capricorn	sag	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	virgo	sag	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	capricorn	capricorn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
20	aries	aries	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	aquarius	aquarius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0
22	aquarius	aquarius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0
23	gemini	gemini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	leo	leo	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	aquarius	aquarius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0

Table 5 showed the sum of subjects who answered yes to their real traits. The percentage of real showed, of the number of people who were supposed to answer yes, how many people did. The percentage of fake showed the same for the fake traits.

Table 5. Sum of subjects who answered YES to their real trait

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30	Q31	Total
Subjects who were told real traits	1	1	1	0	1	0	0	0	1	1	0	1	1	0	0	0	0	0	0	1	1	3	2	3	3	1	0	0	0	0	0	22
Subjects who were told fake traits	0	0	0	0	2	0	5	2	3	3	2	1	1	0	1	1	2	0	1	1	1	1	1	1	1	0	0	1	0	1	1	33
Total	1	1	1	0	3	0	5	2	4	4	2	2	2	0	1	1	2	0	1	2	2	4	3	4	4	1	0	1	0	1	1	55
% of Real	100%	100%	100%	0%	100%	0%	0%	0%	50%	100%	0%	100%	50%	0%	0%	0%	0%	0%	0%	100%	100%	100%	67%	100%	100%	100%	0%	0%	0%	0%	0%	71%
% of Fake	0%	0%	0%	0%	50%	0%	100%	40%	60%	100%	100%	50%	33%	0%	50%	50%	50%	0%	100%	33%	50%	100%	100%	100%	100%	0%	0%	100%	0%	100%	100%	58%
%of Total	50%	100%	100%	0%	60%	0%	83%	33%	57%	100%	67%	67%	40%	0%	50%	50%	40%	0%	100%	50%	67%	100%	75%	100%	100%	50%	0%	100%	0%	100%	100%	63%

Table 6 showed, if the subjects were told fake traits, which questions they were supposed to answer yes to. It was based on the horoscope that corresponds with the fake traits they were told., which was the horoscope Sagittarius.

Table 6. Questions that subjects who should answer YES based on their told traits

Subject	Actual	Told	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30	Q31
1	leo	sag	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	leo	sag	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	libra	sag	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	scorpio	sag	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	gemini	sag	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	capricorn	sag	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	aquarius	sag	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	virgo	sag	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	cancer	sag	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	virgo	virgo	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	libra	sag	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	taurus	sag	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	pisces	pisces	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
14	pisces	sag	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	leo	sag	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	leo	sag	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	capricorn	sag	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	virgo	sag	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	capricorn	capricorn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0
20	aries	aries	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	aquarius	aquarius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0
22	aquarius	aquarius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0
23	gemini	gemini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	leo	leo	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	aquarius	aquarius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0

Table 7 showed the sum of the subjects who were supposed to answer yes to questions about their told horoscope traits. This made it easier to calculate the percentages later on.

Table 7. Sum of questions that subjects who should answer YES based on their Told traits

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30	Q31	Total
Subjects who were told real traits	1	1	1	1	1	0	1	1	2	1	1	1	2	0	0	0	1	0	0	1	1	3	3	3	3	1	1	0	0	0	0	31
Subjects who were told fake traits	0	0	16	16	16	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	64
Total	1	1	17	17	17	16	1	1	2	1	1	1	2	0	0	0	1	0	0	1	1	3	3	3	3	1	1	0	0	0	0	95

Table 8 showed whether the test subjects answered yes to the traits they were told. And also showed the responses of the test subjects and whether the test subjects were influenced.

Table 8. Subjects who answered YES to their Told trait

Subject	Actual	Told	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30	Q31
1	leo	sag	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	leo	sag	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	libra	sag	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	scorpio	sag	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	gemini	sag	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	capricorn	sag	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	aquarius	sag	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	virgo	sag	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	cancer	sag	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	virgo	virgo	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	libra	sag	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	taurus	sag	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	pisces	pisces	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
14	pisces	sag	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	leo	sag	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	leo	sag	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	capricorn	sag	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	virgo	sag	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	capricorn	capricorn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
20	aries	aries	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	aquarius	aquarius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0
22	aquarius	aquarius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0
23	gemini	gemini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	leo	leo	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	aquarius	aquarius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0

Table 9 showed the sum of subjects who answered yes to their told traits. The percentage of fake showed, out of the number of people who were supposed to answer yes to their told traits, how many people did. It is the same for the real traits.

Table 9. Sum of subjects who answered YES to their Told trait	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30	Q31	Total
Subjects who were told real traits	1	1	1	0	1	0	0	0	1	1	0	1	1	0	0	0	0	0	0	1	1	3	2	3	3	1	0	0	0	0	0	22
Subjects who were told fake traits	0	0	11	15	13	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	54
Total	1	1	12	15	14	15	0	0	1	1	0	1	1	0	0	0	0	0	0	1	1	3	2	3	3	1	0	0	0	0	0	76
% of Real	100%	100%	100%	0%	100%	0%	0%	0%	50%	100%	0%	100%	50%	0%	0%	0%	0%	0%	0%	100%	100%	100%	67%	100%	100%	100%	0%	0%	0%	0%	0%	71%
% of Fake	0%	0%	69%	94%	81%	94%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	84%
%of Total	100%	100%	71%	88%	82%	94%	0%	0%	50%	100%	0%	100%	50%	0%	0%	0%	0%	0%	0%	100%	100%	100%	67%	100%	100%	100%	0%	0%	0%	0%	0%	80%

Table 10 showed the percentage of test subjects that agreed with their actual horoscope traits. Out of the questions that belonged to all the subject's real traits, how many questions were answered with yes.

Table 10 :Comparison of subjects that agreed with their actual horoscope traits

Subjects who were told real traits	71%
Subjects who were told fake traits	58%
Total	55
% of told Real	71%
% of told Fake	58%
%of Total	63%

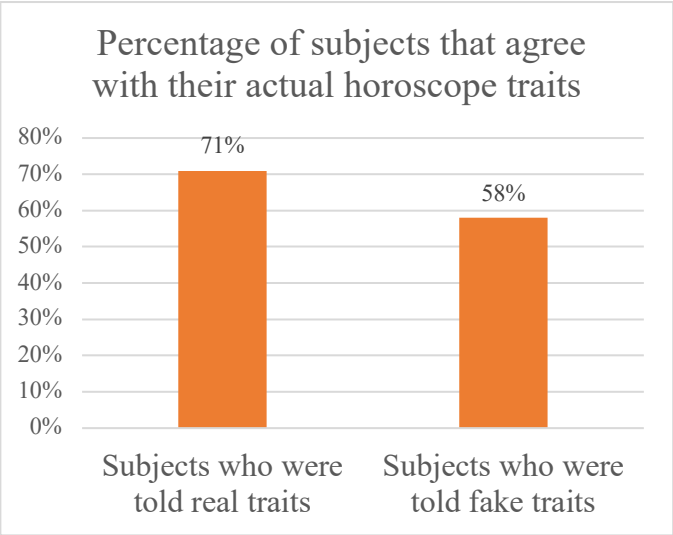

Figure 2 showed the difference of agreement with real traits, between the subjects who were told real traits and those who were told fake traits. Comparing the test subjects that were told their real horoscope traits, it demonstrated whether the test subjects were influenced by the traits they were told.

Table 11 showed the percentage of test subjects that agreed with their told horoscope traits. Out of the questions that belonged to all the subject's told traits, how many questions were answered with yes.

Table 11 Comparison of subjects that agreed with their told horoscope traits

Subjects who were told real traits	71%
Subjects who were told fake traits	84%
Total	76
% of told Real	71%
% of told Fake	84%
%of Total	80%

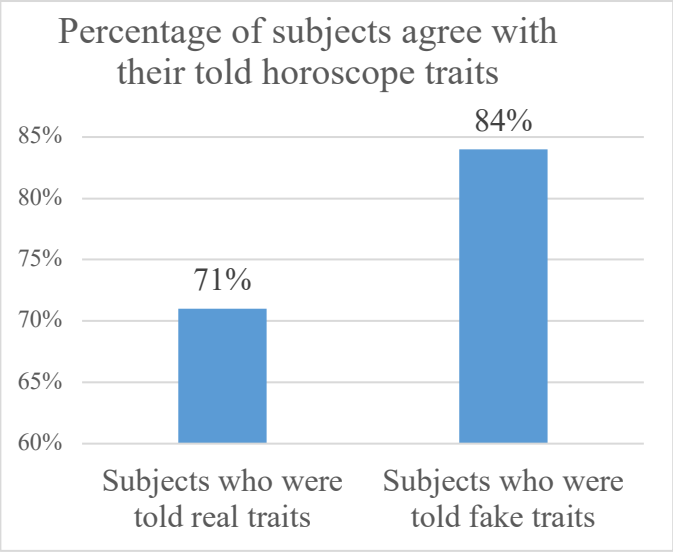

Figure 3 showed the difference of agreement with told traits, between the subjects who were told real traits and those who were told fake traits. The percentage of people who were told real traits is the same as Figure 2, since their told traits were their real traits. However, this was a control that showed whether the test subjects were influenced by the traits they were told.

IV. DISCUSSION & CONCLUSION

This experiment had a controlled group of subjects who were told their actual horoscope traits. This group agreed with 71% of their real traits. The rest of the subjects were told fake traits, which were traits from another horoscope. To simplify the analysis, this experiment uses the traits from Sagittarius for all the fake traits. For example, a subject with the horoscope Virgo who should be told , “Since you are a Virgo, these are your traits. You are loyal, hardworking, shy and you worry often”. Instead, they were told , “You are a natural born leader, you are generous, honest and idealistic. Virgos keep an open mind and you always remain optimistic. Virgos also dislike clingy people and details”, which belongs to

Sagittarius. This group agreed with 84% of the fake traits, but only 58% of the traits described by their actual horoscope.

This showed that people are very likely to believe traits of horoscopes that are not their own since they agreed to more of the fake traits than their real traits. The experiment proved that the hypothesis was correct. The subject's beliefs were easily affected.

Furthermore, it proves that there is not necessarily a link between someone's personality and their horoscopes, as the study by Michel Gauquelin proved (Kelly, 2001). Since there was only 71% of real traits were agreed with, even though the subjects were told the real traits. Additionally, there was a higher percentage of agreement to the fake traits than the actual traits, so it shows that the "actual" traits may not be very accurate to the subjects' actual personality. It also proves that there is no relation between the test subject's personality and their zodiac sign (Dean, 2016).

V. APPLICATION

This study raises awareness for the general public. It should tell the general public to not believe everything on the internet. They should learn to check their resources and not blindly believe information. Further research could be done with what factors people are most influenced by. For example, whether they are more influenced by verbal or physical communication. This information can be applied to the psychological field of study to see how people are psychologically influenced. It can also be applied to the social sciences, to discover how to influence someone into a business deal, or how to influence consumers.

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The Overestimation of Mathematical Ability When Perceiving Overall Intelligence

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Abstract

This experiment was conducted to see whether the general overestimation of mathematics when perceiving overall intelligence is actually true in reality and why we perceive this to be larger than it is. This is important because there is lots of stereotyping pertaining to this topic and understanding this can help us remove our underlying bias when evaluating overall intelligence. The procedure for this experiment included ten subjects from various levels of mathematics who participated in a standardized math and a series of four more cognitive tests. The scores out of 100 were recorded in a table for each subject. After analyzing the results from the tests and plotting them in a bar graph a clear correlation emerged between the math test scores and the cognitive test scores. From my results, it can be seen that there is a relation between math ability and overall cognitive ability which seems to indicate that it is true and the overestimation of math is justified as it relates to many cognitive areas.

I. INTRODUCTION

It is important to answer this question because it will give some insight to which skills learned from math can be applied to other areas of life and how to hone and use those skills to be more successful in the future. There have been studies conducted linking taking more math courses and the annual incomes of people while other activities such as reading classic books had a negative or no correlation to annual income ("How to Get Smart", 2009). This implies that there are some skills learned from studying math that cannot be learned elsewhere and that these skills at least partially contribute to success in life and that learning what exactly about math effects influences other areas of life can be important to success. So, the question asked for this study is, why people perceive math to be a very large part of intelligence. If math ability and cognitive ability are compared, then the results will be very similar because there are transferable skills learned from math that can be applied in many other areas of life as well. One person who believed this to be true was Abraham Lincoln, who made it a goal to master Euclid's many works on geometry in order to strengthen linguistic and logical abilities as well as overall mental capabilities (Suri, 2018). This shows that amongst other skills, logical and linguistic skills are developed through math as you must be able to think in a different way to solve many problems and this shift in perspective can help you solve a real life problem as well. Math also involves communicating solutions in a way that

is understandable and simple, so anyone can follow it, which is another useful in many aspects of life such as science, business, or writing.

II. METHODS

This experiment was conducted by having ten grade ten students from varying levels of math (enriched, academic, and applied) take a thorough online standardized grade ten math test with ten questions from aplusclick.org and scored out of 100, then having the same ten students participate in a series of four cognitive tests from Testmybrain.org in the areas of cognitive speed, short term memory, emotion sensitivity, and continuous concentration with each score out of 100 being recorded for each student. The scores of each student of each test will then be compared to other students and graphs to see if there is a correlation. For this study, the independent variable is the levels of math of the students before the test. The dependent variables include, the scores on the math, cognitive speed, short term memory, continuous concentration, and emotion sensitivity tests. The control variables included the length of the tests to make sure each student got a fair chance to display ability and for accurate results. The time to complete the tests, also for fairness and accurate results. The time of day the students will write the tests at, to try to equalize the mental state of students and conditions the write in to get the most accurate

Table 1. Scores and Reactions of 10 Subjects on Math and Cognitive Tests

Students	Math Test Score (/100)	Reaction after Math Test (/100)	Continuous Concentration Score (/100)	Cognitive Speed Score (/100)	Short Term Memory Score (/100)	Emotion Sensitivity Score (/100)
Student 1	100	Surprised	88	81	82	85
Student 2	40	Upset/Angry	72	65	74	56
Student 3	60	Unhappy	74	77	80	68
Student 4	100	Relaxed	83	90	90	76
Student 5	70	Indifferent	77	71	71	72
Student 6	70	Mad	80	74	76	67
Student 7	90	Mildly unhappy	81	82	84	94
Student 8	60	Indifferent	68	71	59	65
Student 9	70	Surprised	72	69	68	57
Student 10	80	Happy	86	81	77	86

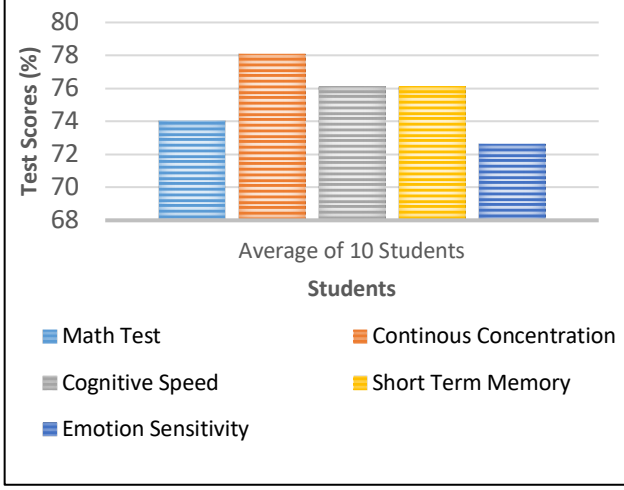
results. The age of students, because age has an effect on math ability which could mess up the results.

III. RESULTS

After the experiment was conducted the scores of the math test and cognitive tests were recorded out of 100. For the math test, the reaction to the students score after the test were recorded for a qualitative measurement and all the results were inputted into a table as shown in Table 1.

The scores of all tests were then averaged and graphed, shown in Figure 1.

FIGURE 1. MATH TEST SCORES COMPARED TO THE AVERAGE OF OTHER COGNITIVE TEST SCORES



The scores were then ranked from one (first) to ten (last) based on score for each test and if the scores were equal, the student who used less time (which was also tracked but not recorded) was ranked higher as shown in Table 2.

IV. DISCUSSION & CONCLUSION

Yes, the hypothesis was correct after looking at the results of the study. There was a clear correlation between the math test scores and essentially all of the cognitive tests. To answer the initial question, math has a positive effect on areas of cognitive ability, mainly continuous concentration, cognitive speed, and short-term memory. This is shown in the ranking of the scores as student 1 for example is within 2 spots on all of his tests with a 100 on the math tests and is consistently between 80 and 90 on all other tests. This is true for most of the other students as

Table 2. Rank of 10 Subjects on Math and Cognitive Tests					
Students	**Math Test Rank (Time taken if same score)**	**Continuous Concentration Rank**	**Cognitive Speed Rank**	**Short Term Memory Rank**	**Emotion Sensitivity Rank**
Student 1	**2**	**1**	**3**	**3**	**3**
Student 2	**10**	**9**	**10**	**7**	**10**
Student 3	**8**	**7**	**5**	**4**	**6**
Student 4	**1**	**3**	**1**	**1**	**4**
Student 5	**6**	**6**	**8**	**8**	**5**
Student 6	**5**	**5**	**6**	**6**	**7**
Student 7	**3**	**4**	**2**	**2**	**1**
Student 8	**9**	**10**	**7**	**10**	**8**
Student 9	**7**	**8**	**9**	**9**	**9**
Student 10	**4**	**2**	**4**	**5**	**2**

most are within 2 or 3 sports on the ranking for all tests. One of the articles that were researched prior to the experiment had to do with students' mentality and how it influenced how well students performed at math, as was observed in Table 1 (Duncan, 2018). After observing students on the math test, some of the students had a reaction that was indifferent or unemotional and generally these students performed below or at average level in both the math and all other cognitive tests. This could be a result of attitude since they didn't care as much about the testing as they didn't react at all to their score. While there were other students who performed worse who still had a strong reaction this could be attributed to other factors like personality, how they were feeling that day, or maybe just lack of aptitude towards the subject. Overall though, students who had a stronger reaction towards their score tended to perform better, as the students who were indifferent ranked sixth and ninth on the math test with similar scores throughout all other tests as well. One source of error on my experiment was the small sample size. There was only one take of each test and the math test only contained ten questions even though the questions had multiple steps it would produce a more accurate result if there were slightly more questions.

V. APPLICATION

After conducting this experiment and gathering and analysing the results the conclusion was reached that math ability does relate to overall cognitive ability. These findings could be useful because from this

information we can ask many more questions, such as why does this occur? What about math makes it similar to overall cognition? To what extent does this correlation exist? Many more studies could be conducted from this experiment and lots more can be learned about humans and human psychology and neurology. By knowing this information, a member of the general public could be more inclined to study math as it has shown to relate to overall intelligence so if one studies math they will naturally improve in many other cognitive areas as well and become a more intelligent person.

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The Effect Different Hand Positions Has on Baseball Distance

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Abstract

Two different hand positions on a bat were compared. This is relevant because the proper hand position increased baseball distance and speed. Person A goes to home plate, person A grabs the bat with their top hand 14cm away from the knob, pitcher stands on the pitching mound, and the pitcher throws as many baseballs to person A until person A hits 5. Measure how far each baseball travelled after it was hit and collect the data. Person A repeats this procedure but with their top hand 20cm away from the knob. Repeat entire procedure with person B and C. The results prove that the holding the bat 20cm away from the knob increases the distance the baseball travelled. Therefore, holding the bat at 20cm away from the knob is the best hand position for a baseball player like me.

I. INTRODUCTION

This question is relevant because the proper bat grip increases baseball speed and distance after it is hit. The player will be able to make quick adjustments based on where the ball is thrown to be in the optimum position for hitting the baseball **(Doug Bernier 2014)**. The optimum position for the baseball to hit the bat is 17-21 inches from the players top hand, and right on the front face of the bat **(Rick Dawn)**.

How do different hand positions on a bat affect how far the baseball will travel after it is hit? If holding the bat with the top hand 20cm away from the knob, then holding the bat 14cm away from the knob will increase the baseball distance because the players hands are held as far away from the load as possible. In a third class lever the way to increase mechanical advantage is to move the effort closer to the fulcrum, which in this case is the knob **(link here)**. [and move the load (baseball) closer to the blank]

II.METHODS

First, person A goes to home plate. Next, person A grabs the bat with their top hand 14cm away from the knob. Then the pitcher stands on the pitching mound, about 12m away from person A. Pitcher throws as many baseballs to person A until person A hits 5. Measure how far each baseball travelled after it was hit. Collect the data. Person A repeats this procedure but with their top hand 20cm away from the knob. Repeat the entire procedure with person B and C.

The independent variable is the position in which the bat is held. The dependent variable is how far the baseball will travel after it is hit. The controlled variables are the person who will be hitting the baseballs, the type of bat that is used, and the type of baseballs that are used. I decided to control these things so that the only difference in each procedure is how the participant holds the bat. This will make it much easier to identify if the change in the data was caused by the difference in the hand position.

III. RESULTS

Figure 1:

Pitch Number	Ball Distance (m)	Distance from knob (cm)
1	35.84	20
2	33.11	20
3	15.02	20
4	9.38	20
5	18.17	20
6	27.03	14
7	18.09	14
8	16.28	14
9	17.98	14
10	8.43	14

Figure 1 shows all the data collected from the experiment performed by person A

Figure 2:

Pitch Number	Ball Distance (m)	Distance from knob (cm)
1	30.64	20
2	11.15	20
3	13.32	20
4	18.12	20
5	26.72	20
6	12.22	14
7	11.21	14
8	22.43	14
9	12.75	14
10	14.65	14

Figure 2 shows all the data collected from the experiment performed by person A

Figure 3:

Pitch Number	Ball Distance(m)	Distance from knob (cm)

1	19.93	20
2	4.91	20
3	7.53	20
4	3.12	20
5	5.28	20
6	20.01	14
7	19.84	14
8	2.34	14
9	16.32	14
10	3.53	14

Figure 3 shows all the data collected from the experiment performed by person C

Figure 4:

Top Distance from Knob at 14cm:	
PARTICIPANT	Ball Distance Avg. (m)
A	17.562
B	14.6525
C	12.408

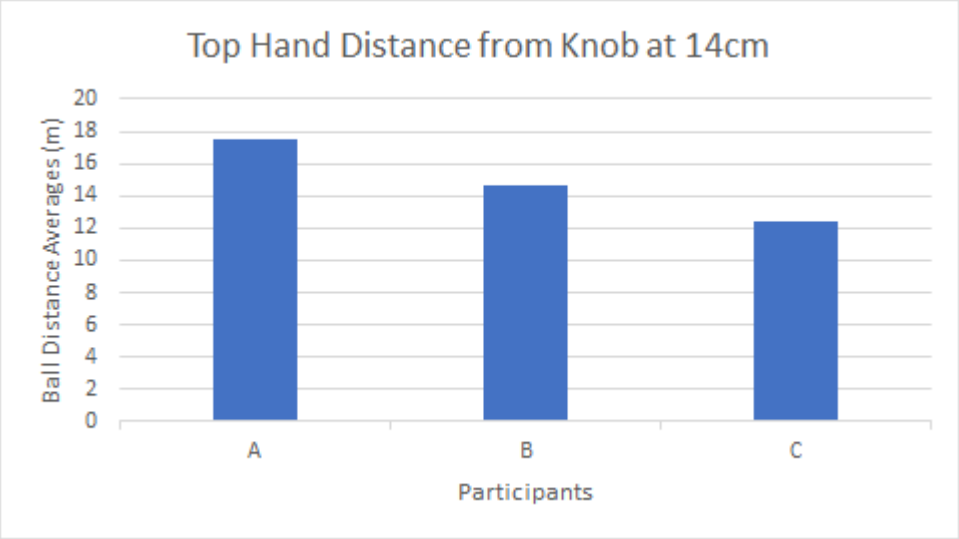

Figure 4 shows the average distance the ball travelled when the bat was held 14cm away from the knob, for person A, B, and C. The graph below it is a visual representation of table 4.

Figure 5:

Top Distance from Knob at 20cm:	
PARTICIPANT	Ball Distance Avg. (m)
A	22.304
B	19.99
C	8.154

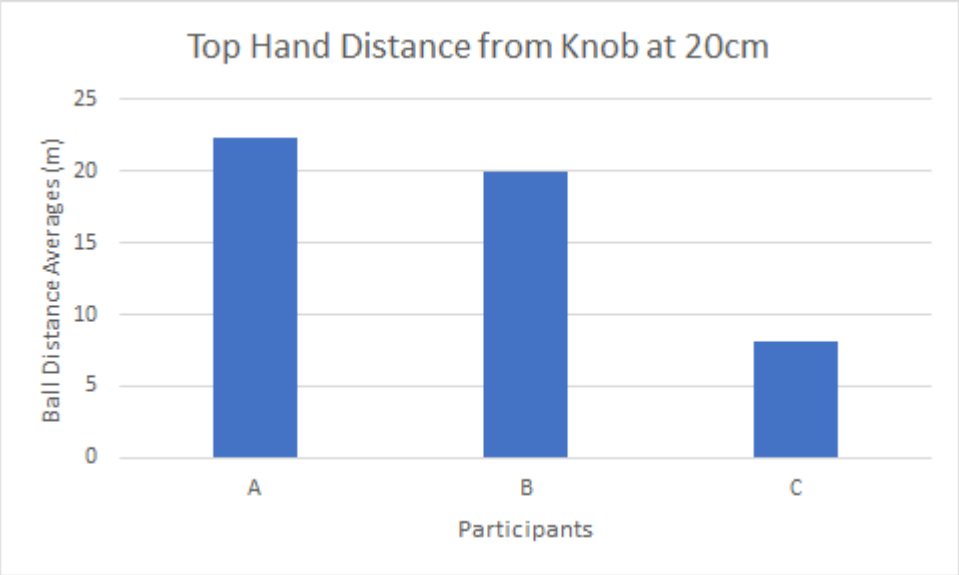

Figure 5 shows the average distance the ball travelled when the bat was held 20cm away from the knob, for person A, B, and C. The graph below it is a visual representation of table 5.

IV. DISCUSSION & CONCLUSION

The hypothesis was incorrect. According to the data, the best way to hold a baseball bat to increase the distance the baseball will travel after hit is to hold the bat with the top hand 20cm away from the knob. The average distance the baseball travelled when hit with the top hand 14cm away from the knob was 14.874m. The average distance the baseball travelled when hit with the top hand 20cm away from the knob was 16.816m.

Holding the bat 20cm away from the knob allows for the player to make quick adjustments so the player will be in the optimum position to hit the baseball as far as possible (Doud Bernier 2014). Holding the bat 20cm away from the knob makes the bat feel less heavy than holding the bat 14cm away from the knob, allowing players to use more energy to swing. When the bat is held 14cm away from the knob it is heavier therefore more energy is used to hold the bat and less is used to swing. Something that could have altered my results is that a human pitcher was used instead of a pitching machine. A pitching machine would give more consistent pitches meanwhile a human can make errors.

V. APPLICATION

Questions raised by the results were why holding the bat 20cm away from the knob is better for hitting father for a teenage female, yet for professional grown men baseball players, holding the bat 14cm away from the knob is better or hitting baseballs farther?

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The Journey to Disproving “Superfoods” By Comparing Results from 2 Subjects Each Following the Same Diet

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Abstract

The purpose of this SCICAN project was to disprove the myth that there are “superfoods” or diets that will work for everybody to lose weight, or improve their body in some way. This is extremely relevant because about 1 in 4 teens will struggle with body image (male or female) according to Dosomething.org (2018), so it’s important to inform them about the fact that there’s no such thing as a super food to prevent teens from falling into gimmicky traps found online leading them to think the problem is within themselves when it's not . The experiment used to disprove this myth involved having 2 subjects around the same age follow the Mediterranean diet and Vegan diet (2 of the most glorified diets) and comparing their weights from before and after each diet. As a result, both subjects ended the experiment with different weights than each other. Subject A’s weight had not changed no less than a pound, whereas subject B had gained 3 pounds through the same diet. Hence, proving the hypothesis of that there is no such thing as a one size fits all kind of diet. In the end, it was concluded that it all came down to how the individual’s own body reacts, therefore it is up to them to discover what will work and keep them happy.

I. INTRODUCTION

It is relevant to research this topic about finding the perfect diet because there are so many ways a teen can be influenced, especially through social media; and currently they are exposed to many advertisements about “perfect” foods/diets for a “perfect” body, which can be detrimental to a teen’s self-esteem. In fact, based on an article from the Huffington Post, based on surveys they have conducted they discovered that younger consumers are more health conscious than previous generations (Huffington Post 2017). When looking online for opinions on what people think is the healthiest diet an article by a registered dietitian named Shawna Curry said that there isn't a diet that would fit everyone in the world since our bodily systems are uniquely structured to each individual. It was also learned in the article that the reaction of the body to the food does not depend sonly on the food, but the body itself.

A common resolution of many people is to lose weight, and there’s many ways to do it other than with a sketchy 'super' pill advertised to do so online. The purpose of this SCICAN! project is to answer the question, "Are companies that are advertising superfoods right when they say it'll work for everybody?"It is hypothesized that if each subject follows the Mediterranean diet and the Vegan diet, then their weights will result differently than each

other because everybody is structured differently, therefore leading to different results/reactions.

II. METHODS

To prove that there is no such thing as a superfood/diet 2 subjects around the same age and height were used for testing. The reason why weight was chosen to be the measurement of success was because it is one of the most common goals people strive to change, whether it be to gain or lose it. Each of the subjects' weights were measured before the experiment to ensure accuracy. The 2 subjects followed the Mediterranean diet first over the course of a week. This meant that they could only eat organic based foods and have fish at least once as their protein during the week. Once the week ended, their weights were measured once again. After a 2 - day intermission the subjects resumed to testing and had to follow the Vegan diet next for the following week. The subjects could not eat any meat or anything that derived from animals such as butter and milk over this time period. Then, once the week ended the subjects' weights were measured again.

The independent variables of this experiment were the 2 diets themselves. The dependent variable was the weight of the subjects. Finally, the controlled variable was the age of the participants. The reason why the age was chosen as a controlled variable was because the rate of metabolism decreases naturally through age which would therefore be an added factor that would not have been considered. Therefore in order to have the most accurate results it was important to have the subjects be in their prime youth (teenagers) where metabolism is at its highest in an individual's lifetime.

III. RESULTS

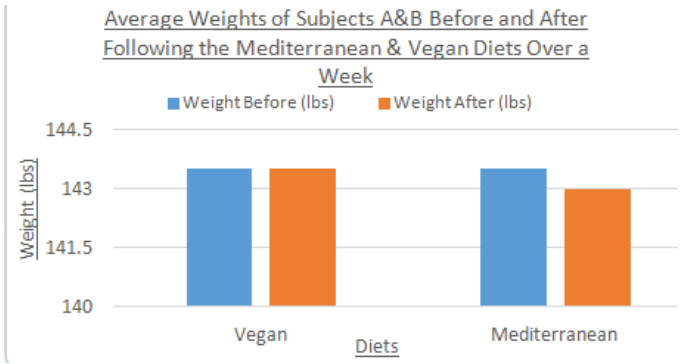

Figure 1: In the after bar it shows that there was a slight overall decrease as the average lowered from 143.5lbs to 143lbs for the results after the Mediterranean. Although, the average remained the same after the Vegan diet.

Table 1 In the table presented below, it is shown that Subject A had lost 1lb after a week of following the Mediterranean diet but Subject B's weight had neither increased or decreased.

Subjects' Weights Before & After Mediterranean Diet In A Week		
Subject	**Weight Before (lbs)**	**Weight After (lbs)**
A	160	159
B	127	127

Table 2. As shown in Table 2 Subject A had lost 3lbs,whereas interestingly, subject B had gained 3lbs. This shows the contrasting results of the 2 subjects that could not have been shown in Figure 1 through averages.

Subjects' Weights Before & After Vegan Diet In A Week		
Subject	**Weight Before (lbs)**	**Weight After (lbs)**
A	160	157
B	127	130

IV. DISCUSSION & CONCLUSION

Yes, this experiment has proved the hypothesis correct that there was no such thing as a one size fits all kind of diet. In the experiment 2 subjects close of age and health were selected to follow the Vegan diet and Mediterranean diet for a week each. Their weights were used to compare the difference each diet would have on the subjects, and as hypothesized, they were different. For example, in the first week after the Mediterranean diet subject A had went down a pound to 159lbs while subject B showed no change; thus already proving the hypothesis correct. To provide further confirmation, in the experiment subject A had also lost 3lbs yet subject B had gained 3lbs after following the Vegan diet for a week. Therefore in conclusion, proved the hypothesis correct that if the subjects followed the same rules for each diet, they're weights would still differ.

As mentioned before the results of the experiment proves that the whole buzz around the term "superfoods" is just a myth that the media uses to advertise. This was proven when subject A and B's weights were measured after the diets to have a difference of a pound for the Mediterranean diet and 6 pounds after the Vegan diet. Dzidek Sabat, a scientist, mentions in a paper that metabolism differs from person to person which supports the idea of 'personalized nutrition'. In a study he performed, 800 people consumed the same meals for a week and were later tested to see how their glucose levels had been affected. After the experiment just like me, he discovered that the individuals had vastly different responses to the same food. It was highlighted that recommendations on dietary intake for some patients can be detrimental to others (Sabat 2016). Despite having similar results to Mr. Sabat there are some sources of error that could have occurred during the experiment. One factor that could be controlled for next time could be giving each subject a limited time to perform certain physical activites. This is because one possible factor that wasn't considered in the results was the amount of activity each subject had done throughout the day, as the rate of metabolism naturally increases after the body is subject to movement. Another possible source of error would be if one of the subjects (or both) had broken some

of the rules of the diet such as eating a chocolate bar when unsupervised. This could be prevented for next time by providing the subjects with snacks that don't go against the restrictions so that they do not feel tempted to break the rules.

V. APPLICATION

Due to limited time, only 2 diets could be compared in a week for each individually. The results would have most likely changed more drastically if the time for each diet was extended, which would especially test the integrity of the subjects, therefore in which case a shorter time period would provide an advantage that there is more of a chance the subjects followed the restrictions of each diet. Information about nutrition can relate to the psychological and social fields of study. This is because whether we realize it or not, we make food choices based on what we are feeling or thinking, as it is reported that youth aged 19-32 who spend most of their time on social media, are more than twice as likely to report eating concerns (Journal of Academy 2016) since they're subject more influence by the media. Through this project the fact that superfoods are myths was proven which can help the general public realize how influential the media can be to our food choices, especially with gimmicky words like "super" before them.

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Optical Illusions In Relation To Critical Thinking

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Abstract

Does One's ability to solve optical illusions depend on their critical thinking and problem solving skills? This is important because the most important skill academically and in jobs is currently seen as critical thinking (Dr. Math, 2001). So if one's ability to solve optical illusions does depend on their critical thinking skills, then grade schools can use optical illusions to enhance students' critical thinking in the long term. Five test subjects were timed and marked on math tests that tested their critical thinking and problem solving skills. They were then shown a number of optical illusions and given thirty seconds to solve each. The results showed the test subject who took longer to complete their tests and scored lower solved less optical illusions and required more time to do so. The opposite is true for those who scored higher on their tests. These results show that one's ability to solve optical illusions does depend on their critical thinking and problem solving skills. From this we can conclude through the solving of optical illusions critical thinking and problem solving skills can be enhanced in the long run.

I. INTRODUCTION

The purpose of this experiment is to test whether one's ability to solve optical illusions depends on their critical thinking and problem solving skills. If optical illusions do, in fact, depend on our critical thinking and problem solving skills then they can be used to enhance said skills. Critical thinking is seen as one of the most important skills academically and in the work force today. The solving optical illusions every day can be used as an effective way to improve Teaching methods and allow students to overcome their academic weaknesses.

Does one's ability to solve optical illusions depend on their critical thinking and problem solving skills?

If one's ability to solve optical illusions depends on one's critical thinking and problem solving skills, then test subjects who score higher on the optical illusion analysis will score higher, and take a shorter amount of time, on the test, because one's ability to solve math problems depends on one's critical thinking and problem solving skills.

II. METHODS

Each of five test subjects of the same age and grade level were timed as they completed identical math tests. The next day each test subject was shown eleven optical illusions and given thirty seconds to one minute to solve each, depending on the difficulty of the illusion. Their tests were marked and compared with their scores on the illusion analysis.

The dependent variables include the test scores, the optical illusion analysis scores, the time taken to complete the tests, and the total time taken on the analysis for each test subject.

The independent variable was the test subjects' different levels in their critical thinking and problem solving skills.

The controlled variables include the environment the test and analysis were taken in that all test subjects were given identical math tests and shown the same optical illusions, and that the test subjects where of the same age group and grade level. All the test subjects are put in the same environment are being affected by the same external factors. That the math tests and optical illusions are the same for all test subjects ensures that their critical thinking and problem solving skills are being tested at the same level. The test subjects must be in the same age group and grade level to ensure that they are all equally developed and have the same academic knowledge.

III. RESULTS

Table 1 – Test subjects' scores on each optical illusion in analysis

Test Subjects	Illusion # 1	Illusion # 2	Illusion # 3	Illusion # 4	Illusion # 5	Illusion # 6	Illusion # 7	Illusion # 8	Illusion # 9	Illusion # 10	Illusion # 11	Total time (sec.)	Answered correctly
Subject 1	-	4 / 9	-	-	7 sec	5 sec	15 sec	-	25 sec	16 sec	12 sec	170	10
Subject 2	1 / 3	5 / 9	30 sec	30 sec	10 sec	20 sec	5 sec	-	15 sec	-	12 sec	182	13
Subject 3	2 / 3	5 / 9	30 sec	-	5 sec	15 sec	30 sec	10 sec	17 sec	30 sec	3 sec	176	17
Subject 4	-	4 / 9	-	-	5 sec	12 sec	16 sec	30 sec	26 sec	-	5 sec	183	10
Subject 5	-	3 / 9	27 sec	16 sec	-	17 sec	17 sec	-	14 sec	-	5 sec	186	9

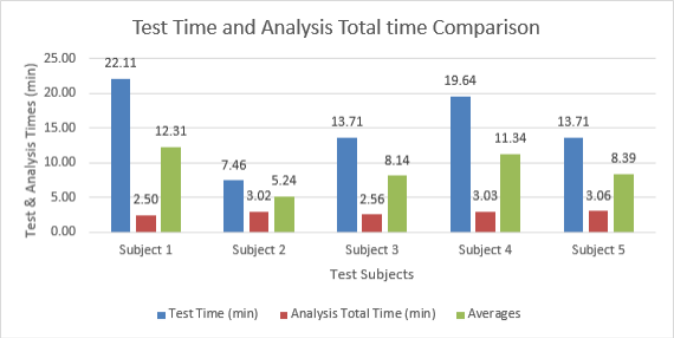
Table 2 – Scores on test and optical illusion analysis (%)

Test Subjects	Test Score	Analysis Score	Averages
Subject 1	56%	48%	52%
Subject 2	56%	62%	59%
Subject 3	100%	81%	91%
Subject 4	29%	48%	39%
Subject 5	72%	43%	58%

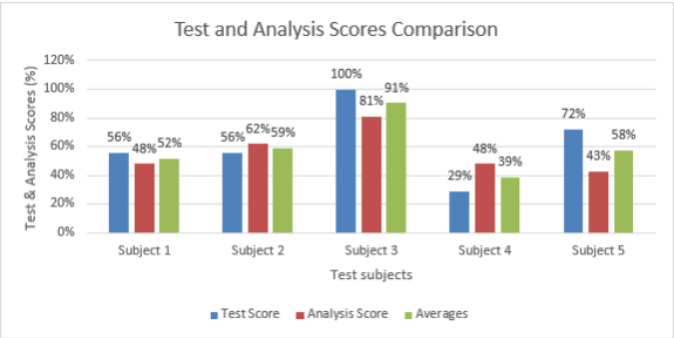
Table 3 – Time taken to complete tests and analysis comparison

Test Subjects	Test Time (min)	Analysis Total Time (min)	Averages
Subject 1	22.11	2.50	12.31
Subject 2	7.46	3.02	5.24
Subject 3	13.71	2.56	8.14
Subject 4	19.64	3.03	11.34
Subject 5	13.71	3.06	8.39

Equation 1 – Comparison between test and analysis times



Equation 2 – Comparison between test and analysis scores



IV. DISCUSSION & CONCLUSION

In conclusion the hypothesis was correct. The test subjects who scored higher and took less time to complete the math test also scored higher on the optical illusion analysis. This answers the question if one's ability to solve optical illusions depends on their critical thinking and problem-solving skills. The results show that the higher the test subjects scored on their tests the higher they scored on the optical illusions. The overall average shows that test subject three, who scored highest on the math test and on the analysis ended with the highest average of 91%, while test subject four, who scored lowest on the math test and on the analysis ended with the lowest average of 39%.

Perception is the balance of raw data entering though our senses and the interior predictions of our brain (Denworth L., 2014). Critical thinking is the intellectual process of analyzing information that has been perceived and it is based on clarity, precision, and sound evidence (The Foundation for Critical Thinking). Often times as our senses receive data our brain uses its expectation and knowledge to come to biased conclusions. This is what prevents us from easily solving a math problem as well as easily seeing through an optical illusion. Since the test subjects who received a higher mark on the math test also received a higher on the optical illusions, then it can only make sense that the solving optical illusions is dependent on critical thinking and problem solving.

The original experiment was supposed to test was weather optical illusions can improve critical thinking and problem solving skills. However, since the solving of optical illusions does not show immediate short term effects on said skills, the experiment was then changed to test if optical illusions depended on those skills, so that the answer to the original question could be derived from the results of the second question. This was a

mistake that could have been corrected if the test subjects were to solve optical illusions every day for a full week after taking the math test, and were then given a similar math test after the week in order to compare the two tests. This would have shown if the solving of optical illusion had any long term affects. The solution to this problem was only recognized after the experiment was done. That being said, using the results from this experiment, which show optical illusions do depend on critical thinking, and that the test subjects seemed to find it easier to solve the illusions the more they solved, it can be concluded that optical illusions can, in fact, be used to improve critical thinking and problem solving skills.

I. APPLICATIONS

A question that is raised by these results is how different types of optical illusions affect our critical thinking and problem solving skills. Another question that is raised is what other skills optical illusions depend on and if they can improve those skills as well.

This experiment can be used to improve students' critical thinking and problem solving skills by getting them to solve optical illusions every day. Since critical thinking is currently seen as one of the most important skills academically as well as in the work force, this would greatly improve students' future prospects.

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The Impact of Positive Reinforcement on a Teenager's Stress Levels, Attitude and Success

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Abstract

Numerous teachers, parents, and students all have different ideas on how to encourage students to succeed in the most effective way. In an era in which stress and expectations are continually being raised for students, finding a sustainable way to reinforce student behaviour while maintaining success is essential. Although the debate that contemporary strategies of motivating students are inefficient is a prevalent argument amongst more traditional people, the use of using positive reinforcement to incline teenagers to achieve higher success levels while maintaining stress levels and a positive attitude has proved to be significantly more effective than using no reinforcement. When students were asked to complete an artistic, an academic, and a physical activity while being encouraged using positive reinforcement methods, it resulted in a higher level of success, a sense of personal satisfaction and mood improvement among those students as opposed to when they completed these activities without positive reinforcement. However, it did take these students longer to complete the activities after being reinforced. Ultimately, positively reinforcing students helped improve stress levels, attitude, and increase success.

I. INTRODUCTION

Teenagers are placed under an enormous amount of pressure in modern day classrooms as well as in every day life. As the structure of classrooms change with society, it must be assessed what ways of teaching and approaching teenagers will not only maximize success, but also not be detrimental to mental health. The measuring of a student's ability to manage work is directly correlated to the reinforcement of a teacher or mentor (Rumfola, 2017). It is imperative to know if there is a way of reinforcing all teenagers in way that that optimizes success, attitude, stress levels, and mood and to what degree of effectiveness would this strategy have.

How much does positive reinforcement affect a teenager's mood, attitude, stress levels, and academic success as opposed to no encouragement?

It is hypothesized that if positive reinforcement is used to motivate teenagers, then they will have reduced stress levels, positive attitudes, and a higher academic success rate because they will feel more motivated and self-assured. When comparing students who are continuously positively reinforced and students who are not, the students who have been positively enforced were 68% more likely to do what is being asked of them (Rumfola, 2017). The act of being verbally encouraged by another will encourage teenagers to feel more confident in decisions and therefore motivate hard-working behaviour. This will ultimately instill less pressure and fear of failure in a teenager and evoke an overall sense of pride and satisfaction. Teenagers are more likely to respond to someone teaching in a positive encouraging manner which will ultimately engage more students. This will additionally increase participation with students who struggle with

communication by making them feel more involved (Larriba-Quest, 2017).

II. METHODS

To test the effects of positive reinforcement, four students were tested on three different levels of intelligence: artistic, academic, and physical. Each student was asked to perform an activity correlating to each type of intelligence and completed each of the three tasks once without any form of reinforcement, and once using a three-step positive reinforcement method administered by a peer. Before the second attempt of each activity, the participants were encouraged using a positive reinforcement technique (Rumfola, 2017) in which they had what they were doing described by a peer, had the peer mention the emotion that comes to mind when they see the individual complete that task, and then had that summarized in one positive word. This was done to positively motivate the participant. The first activity tested artistic intelligence and had the participants draw a horse in one minute. After drawing the horse for the first time without any encouragement, the students were assessed on their feelings about the success of the drawing, and how they felt while drawing it. After drawing another horse a second time after being positively reinforced, they were assessed on the same questions (Table 1). To test the effects of positive reinforcement on an academic activity, the students then completed a series of 48 simple math problems (Education.com, 2019) in which they were recorded on the time of completion, correct answers, and how they felt after each of the two identical tests were completed (Table 2). Lastly, to test these effects on a physical activity, the participants used a crumpled 8 ½ by 11 sheet of paper and stood 20 ft away from a garbage bin and took 15 attempts to make a shot. The students were assessed based on time until completion of 15 shots, how many shots were successful, and how they felt about the activity after each identical activity was completed each time (Table 3).

III. RESULTS

The experiments displayed an increase of numeric success value in the academic and physical activities and a verbal confirmation of improvement in the artistic activity after being positively reinforced and asked to do each activity again. Participants also expressed an improvement in mood, attitude and stress levels after being positively reinforced. Overall, Table 1, Table 2, and Table 3 display how participant's mood became more self-assured and confident after being positively reinforced. This is further evident in Figure 1 and Figure 2. The improvement in confidence and completion is clear in the drawing after positive reinforcement is used. Figures 3-6 show the increase in numeric performance after positive reinforcement is used, but also that time taken to complete the activity increases with positive reinforcement.

Table 1: Participant's thoughts and emotions on the artistic activity

Participant #	Success of drawing (No reinforcement)	Success of drawing (With reinforcement)	Feelings/ attitude about first drawing	Feelings/ attitude about second drawing
#1	Horse drawing was incomplete after 1 minute. Participant #1 felt only half of the drawing was well done.	Horse drawing was completed and improved. The participant feels this drawing was better than the previous.	Participant felt agitated about having to make the drawing good, but eventually grew bored and unfocused.	The participant felt more motivated to complete the horse.
#2	Horse drawing was incomplete. Participant #2 achieved an outline described as "decent".	Horse drawing was nearly complete. More details were added to the horse.	Participant feels as though the drawing could have been better and more complete.	The participant expressed a more positive mood and felt as though the experience of drawing felt more encouraging
#3	Horse drawing began out well but as the time ran out it became rushed. ¾ of the horse was completed with some detail.	Participant #3 felt as though the drawing was not necessarily more complete, but the quality of the horse is better than the first.	Participant took their time at first but began to rush as the time ran out and was overall not very impressed with the horse.	The participant felt less rushed and felt more compelled to pay attention to detail. Expressed that the drawing was "not great but better than the first".
#4	Horse drawing was completed but done with little care. Most lines and details were done very quickly.	Horse drawing was less completed than the first but was more detailed and neater than the first.	The participant felt unmotivated and bored doing the exercise and only wanted to complete the horse quickly despite how messy it looked.	The participant cared more about the quality of the horse rather than the completion of it and expressed more contentment about drawing it.

This shows each participant's thoughts on the first (artistic) activity after completing the activity twice, once without reinforcement and once with positive reinforcement.

Table 2: Participant results and thoughts about the academic activity

Participant #	Score of quiz (No reinforcement)	Score of quiz (With reinforcement)	Feelings/attitude towards first quiz	Feelings/attitude towards second quiz
#1	2:17 minutes 45/48	2:23 minutes 48/48	Participant #1 feels "stupid" for incorrectly answering three questions, was anxious during test	Participant feels "smarter" and satisfied with the results
#2	2:08 minutes 45/48	2:14 minutes 48/48	Participant felt rushed and accidentally missed three questions.	Participant felt calmer and content with the score improvement.
#3	2:11 minutes 47/48	2:18 minutes 48/48	Participant felt "stressed" while completing the test and expressed annoyance when incorrectly answering one question.	Participant felt less pressure to get perfect, but felt more satisfied with the improved score
#4	1:58 minutes 44/48	2:04 minutes 47/48	Participant was focused on completing the quiz fast but felt disappointed after incorrectly answering two questions.	Participant took more time to focus on the questions themselves and felt less oriented to finish the quiz fast. Participant was still dissatisfied with incorrectly answering one question but felt calmer about it.

This shows the time and score results of the math quiz (academic) activity as well as participant thoughts and feelings before and after being positively reinforced.

Table 3: Participant results and thoughts on the physical activity.

Participant #	Successful shots (No reinforcement)	Successful shots (With reinforcement)	Feelings/attitude towards the first attempt	Feelings/attitude towards second attempt
#1	1:29 minutes 2/15 shots made	1:37 minutes 8/15 shots made	Participant states that they "hate this". Felt as though they could have done	Feels much calmer, feels confident about the improvement in score.

			better and feels disappointed.	
#2	1:26 minutes 9/15 shots made	1:31 minutes 9/15 shots made	Feels they could have done better; main motivation was fuelled by competition to achieve a better score than other participant(s)	Feels much calmer and less stressed, less competitions driven.
#3	1:28 minutes 12/15 shots made	1:36 minutes 13/15 shots made	Feels like they did pretty good but did not care about the score that much either way.	Felt more energetic and spirited about the game, was happy about the score improvement.
#4	1:32 minutes 7/15 shots made	1:27 11/15 shots made	Participant expressed frustration with the game and was disappointed with the score.	Felt much more motivated to improve the score. More relaxed and focused. Happy with score improvement.

This shows participant thoughts, feelings and results on the physical activity before and after being positively reinforced

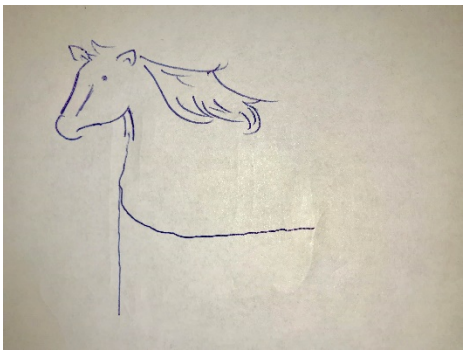

Figure 1: Horse drawing completed by participant before positive reinforcement is used

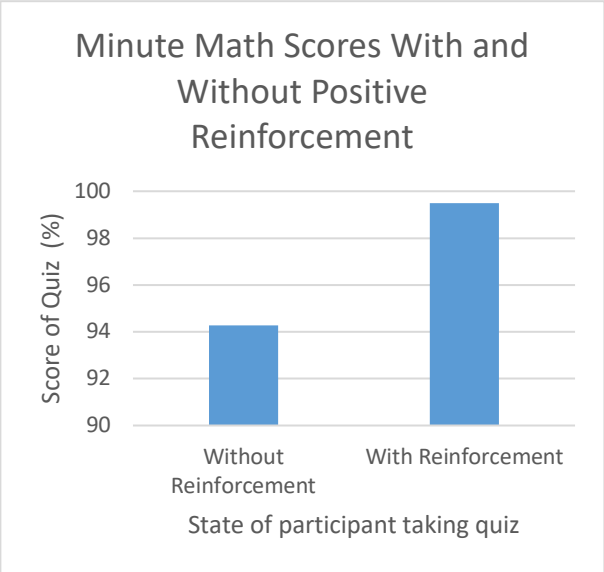

Figure 2: Horse drawing completed by same participant after positive reinforcement is used

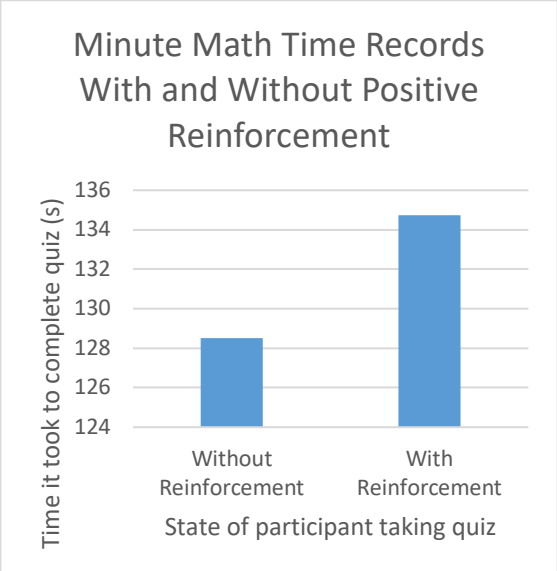

Figure 3: Shows the results of the math quiz taken twice by participants. Compares the scores of the quiz takes without reinforcement and the one taken with positive reinforcement

Figure 4: Shows the time results of the math quiz taken twice by participants and compares the time it took to complete the quiz with and without positive reinforcement

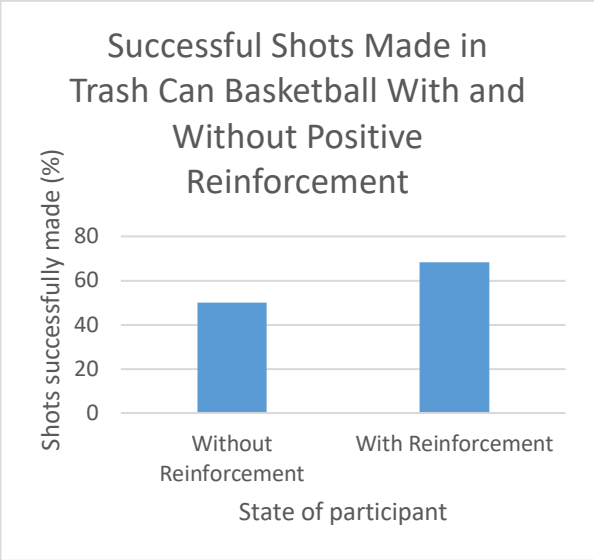

Figure 5: Compares the results of the physical activity before and after positive reinforcement

IV.

DISCUSSION AND CONCLUSION

The hypothesis was correct. Positive reinforcement has a significant and visible effect on teenager's mood, attitude, stress levels, and success rate. The research conducted in this experiment proves that in a physical activity, students perform with an 18.3% higher accuracy rate on average when encouraged with verbal, positive reinforcement. It also proves that in an analytical activity, students on average achieve scores 5.21% higher when encouraged with positive reinforcement, as opposed to receiving no reinforcement. As for mood, attitude, and stress levels, when students were faced with the creative activity of drawing a horse in a minute, many participants felt rushed to draw the horse and consequently, drew a horse they were not satisfied with. When encouraged with verbal, positive reinforcement however, participants felt less compelled to be rushed or frustrated by the activity and felt more content with the outcome and success of their drawing. The same results were proven in the academic and physical activity as well. Positive reinforcement allowed participants to feel

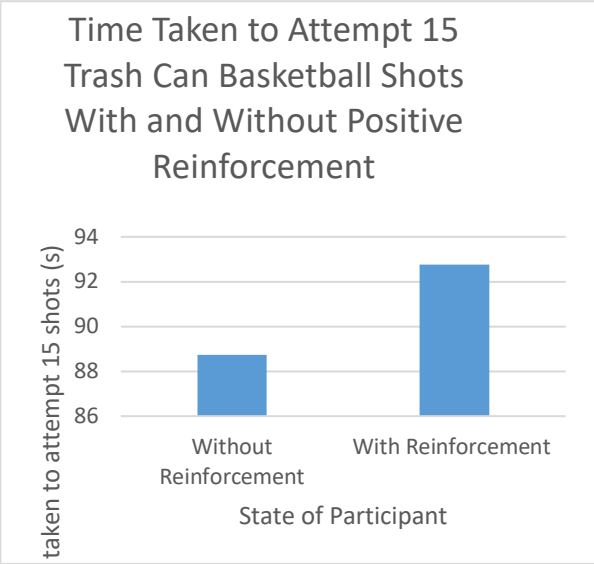

Figure 6: Compares the time taken to complete the physical activity before and after positive reinforcement

calmer and more confident in their abilities and as a result, performed better. Additionally, it was discovered that on average, students take more time to complete an activity when being positively reinforced. During the math quiz, students took 6.25 seconds longer on average to complete the math quiz. In the physical activity, students took an average of 4 seconds longer to complete attempting 15 shots of trashcan basketball. This not only proves that students perform better and feel better mentally when positively reinforced, but also take more time to complete activities.

The measuring of a student's ability to manage work is directly correlated to the reinforcement of a teacher or mentor (Rumfola, 2017). Because of this, the use of positive or no reinforcement by someone who is teaching or coaching another person has a significant impact on how they handle their work. As seen in the experiment results, when a student is positively reinforced by the person coaching the activity, they manage their work in a more calm and confident manner. This way of coping with stress allows students to focus more on the activity rather than their frustration. The use of praise in a learning or teaching environment allows the student to respect the teacher or coach more as well, leading to a lack of frustration, and a more goal-oriented mindset.

V. APPLICATION

Although it may seem like common knowledge, utilizing positive reinforcement methods in the classroom would be an innovative way to ensure student success, while being conscious of students' mental health and stress levels. If teachers and parents start applying these practices in a simpler form daily, the effects of this encouragement would become evident in noticeable ways. Just as the participants in these experiments did, students will begin to experience a sense of confidence and pride within their work. The focus on the numeric grade would become less rewarding than the experience of improving and being proud of the work they have created. Positive methods of reinforcing students breaks the toxic habit of solely focusing on numeric grades. Once this stress-inducing habit is broken, students are able to focus on the quality of their work which theoretically will raise grades as a result of this. Additionally, positive reinforcement methods induce a sense of internal motivation within students. This improves mental health and stress levels by building a resilience against small failures. This could be further researched by positive reinforcement on students being applied and tested on larger classrooms of students to observe what other external factors of a classroom would impact this technique of positive feedback. If this were to be as successful in a larger classroom, positive psychology could become a larger and more recognized field of scientific study and these methods could be integrated into an average, modern day classroom. This is a simple yet effective method of encouragement that could be used by any teacher, parent, or peer to allow students to further prosper in various aspects of their academic and social life.

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Colour Synaesthesia

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Abstract

Why does colour affect the way people feel? The importance of this question was very significant as it provided aid to children with lack of attention span, as well as all people in general. Subjects were given 4 different coloured pens as well as 4 different writing prompts, each with a specific tone, such as happiness or sadness. They were then told to choose a colour to represent each scenario as well as a backup reasoning as to why they chose this colour. After the completion of the experiment, the predicted outcome was almost entirely correct, blue to represent sadness, green for disgust, yellow for happiness and red for anger. Even if they all didn't correspond with the hypothesis, the trend that was discovered was the use of symbolism. Each subject chose a symbol in relation to the colour they chose to represent each prompt. This experiment proved that colour does indeed play a vital role in many lives and can be used in various aspects to aid the human kind.

I. INTRODUCTION

The purpose of this project is to discover why colour affects the way people feel. Reactions and interactions with surroundings often rely on colour. One's preference of colour usually plays a role in defining their thoughts and personality and are also influential of their actions and emotions. Colours are key in understanding how one feels, mentally, physically and emotionally. They are also very important in the fashion industry, especially regarding target consumers. Emotions are a major impact on how one feels mentally. It is proven through the colour therapy theory that the human body gains many beneficial physiological effects from the colours (Kendra Cherry, 2019). So, the question is, why does colour affect the way people feel? If 4 differently toned writing prompts, consisting of happiness, sadness, anger and disgust are read, then the colour chosen to represent each colour will be yellow, blue, red and green in that order because colours on the blue side of the colour spectrum often evoke feelings such as calmness or on the contrary sadness and colours on the red side of the spectrum often bring out warm feelings or taken in another form, anger (Kendra Cherry, 2019). This is tested by providing all 4 writing prompts to each subject then instructing them to answer the open response question, "Why was the *x* coloured pen chosen to represent scenario *y*?" where each colour could only be chosen once.

II. METHODS

Four differently toned writing prompts were provided to each subject, each accentuating a different emotion. The first being anger, followed by happiness, then sadness and finally disgust. Every subject read through each prompt, then chose one of the four coloured pens provided, blue, red, green or yellow, to represent each prompt. After deciding upon a colour, they responded to the reflection question. "Why was the *x* coloured pen chosen to represent scenario *y*?" This was an open response question and the procedure also included to be specific with the reasoning behind each colour chosen, as well as to be thorough. Subjects were each given their own separate sheet of paper to write out their responses and this ensured that there were no bias, just personal opinions. Each colour could only be chosen once.

The independent variable in this experiment was the tone of the writing prompts and the dependent variable was the feeling derived from the subject of the experiment, as well as the colour that was being used. As for the controlled variables, they consisted of the 4 writing prompts, reflection question, amount of time given to complete the experiment, the age of the subject, the range of coloured pens (blue, red, green, yellow) and lastly the necessity for the subject to be in the enriched program.

It was essential to keep each writing prompt the same throughout the experiment, for each subject, because if there were different prompts, they could've evoked different emotions. These prompts were specifically targeting certain emotions and in order to get the rawest results, it was mandatory for me to keep these prompts constant. As for the coloured pens, my hypothesis explained my predictions of which blue would represent sadness, green for disgust, yellow for happiness and red for anger, therefore these would have to be the colours used. The reflection question is what would provide me with the results so that was a definite controlled variable. The time limit given to complete the experiment was to make sure that subjects didn't overthink and change what emotion they were feeling. The purpose of the experiment was to get their initial emotion evoked after reading the prompts. Lastly, to narrow down the perfect subjects for this experiment, the qualifications included being 15-16 (typical grade 10 student), as well as in the enriched program. These qualifications make the results as accurate as possible since all the subjects would be like minded in one way or another.

III. RESULTS

As per the hypothesized result, all students chose the colour red to represent scenario 1. As for scenario 2, 70% chose the hypothesized yellow, while 20% chose blue, and 10% chose green. Scenario 3 consisted of the hypothesized result of the colour blue as 80%, with 20% remaining for yellow. Lastly, 90% of students chose the hypothesized result green, while 10% chose yellow.

Table 1: Colour chosen by each subject to represent each writing prompt

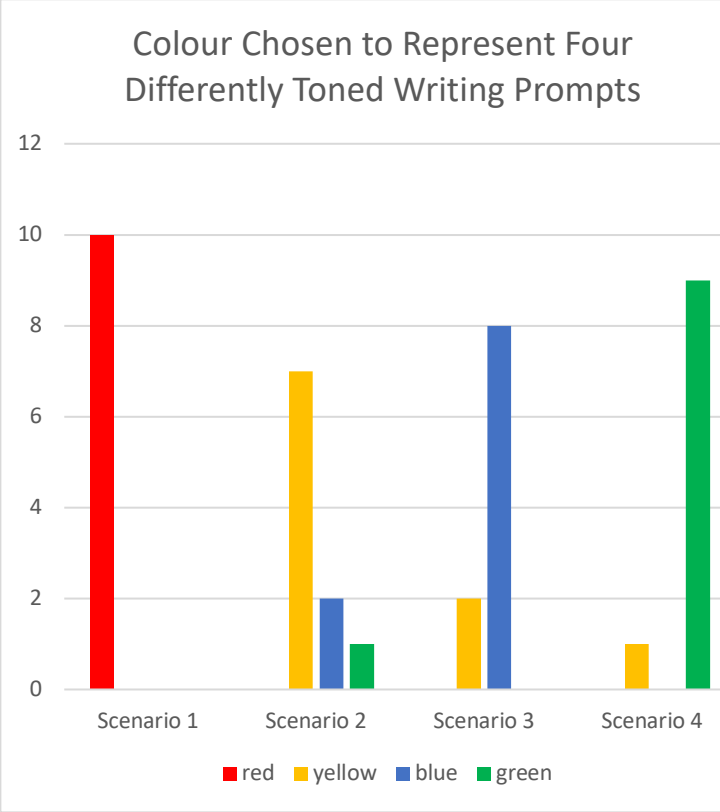
Student	Scenario 1	Scenario 2	Scenario 3	Scenario 4
1	Red	Yellow	Blue	Green
2	Red	Yellow	Blue	Green
3	Red	Yellow	Blue	Green

4	Red	Yellow	Blue	Green
5	Red	Yellow	Blue	Green
6	Red	Yellow	Blue	Green
7	Red	Yellow	Blue	Green
8	Red	Blue	Yellow	Green
9	Red	Green	Blue	Yellow
10	Red	Blue	Yellow	Green

Table 2: Reasoning behind choosing each colour

Student	Scenario 1	Scenario 2	Scenario 3	Scenario 4
1	Many keywords pertaining to anger, fear, and aggression are included in the description of this scenario. Red always corresponded to passion, hate, anger, love, all that stuff. As such, red would be the first colour that comes to mind when reading this	The entire situation just seemed bright and full of hope and happiness. Joy is often related to bright things, the sun, glitter, lamps, fairy lights, and just in general, brightness, thus, yellow	Blue is one of the colours for an ambulance and represents freedom and hope. The fact that this takes place in a hospital alone offers a lot to hope for	The odour that suddenly filled the room brought a feel of disgust, and although green is a natural colour, it also represents evil and disgust, which is definitely what comes to mind with the client
2	Red because anger is represented in this scenario	Yellow because the situation appears to feel bright and happy	Blue because blue represents a sick feeling as they lose their friend	Green because the situation appears as disgust
3	Red because this colour represents the angry emotion of the man. Also, the colour red is usually seen on someone's face when they are angry	Yellow because brightness and sunshine is usually interpreted by the colour yellow	Blue because the colour of air and the sky is usually seen as blue	I choose green because it represents the colour of the toenails which is green and disgusting
4	Red because anger	Yellow because it makes me happy	Blue because sad	Green because DIGUSTANG
5	Red because it represents his anger	Yellow because the sun is yellow, and a bright sunny day brings happiness	Blue because the situation is depressing	Green because I associate that with gross stinky odours
6	I chose red because there is a lot of anger and aggression	I chose yellow because I can picture the yellow sunny day, it makes me happy.	I chose blue because this scenario is sad	I chose green because this scenario is gross
7	I chose red bc in the description, there is a lot of the and red really brings out that feeling to me	I chose yellow bc yellow is a very chill and relaxing colour and that's the vibe I get from the description	I chose blue bc when you're losing air, your body slowly turns cold and blue reminds me of that	I chose green because we often associate green with vomit, and I think in. this case, vomiting is a very appropriate response since the toenails are gross
8	I chose red because it reminds me of anger and violence (blood and fire)	I chose blue because it seems calm like the ocean or sky	I chose yellow because it feels sick and sad, like the scenario	I chose green because it reminds me of disgusting odours and the nasty things
9	I chose red because the man was angry and red reminded me of that	I chose green because that sounds nice and good and green is good	I chose blue because it was the last colour	I chose yellow because no one likes ugly feet and no one

				likes yellow
10	I chose red cuz it reminds me of fire which is red and violent. Also, people's faces turn red when they're mad	I chose blue because everything is calm and the sea is blue	I chose yellow because hospitals are bright and hurting eyes	I chose green because it reminds me of mold and her toes were green and disgustin g



IV. DISCUSSION & CONCLUSION

No, the hypothesis was not entirely correct, however, it was fairly accurate. So how does colour affect the way people feel? Based on the data, it is seen that the colour chosen to represent a response to the scenario always depended on the emotion that had been evoked after reading it through. The question is, why that specific colour? The conclusion that is drawn after deeply analyzing the data is that humans often tend to relate their emotions to colours through the perception of different symbols. For example, student #8 expressed how the correlation between the angry man in scenario 1 and the colour red came from the symbolization of fire. Fire is commonly known to be violent, dangerous, harsh, strong, all characteristics of the angry man portrayed in scenario 1. By relating symbols to colours, it allows the human brain to associate our emotions alongside them as well. The previous research that has been done prior to the experiment further supports the outcome. Focusing on the colour yellow, Kendra Cherry had written about how this colour tends to make people feel energetic, cheerful and possibly aggressive. The brightness of the colour grabs the attention of humans and really gets them to focus, either to a point of content or aggression. From the data, both of these emotions are seen. Student #6 expresses how the bright sun in scenario 2 had evoked the feeling of happiness while student #10 described the yellow to be painful. This is due to the fact that there are two humans on opposing sides of the spectrum. Where one lands on the spectrum depicts what sort of emotion gets evoked. The only fault that could've played a role here, is the human brain itself. One cannot control the way something makes them feel, it is just an occurrence that happens naturally.

V. APPLICATION

This information can be useful in many different fields, research assignments and the general scientific community. One main field this could aid in is the medical field. Many kids suffer with lack of attention span due to a variety of different things which include ADD, autism, or just simply having trouble focusing. By

using colour synaesthesia in relation to say, the child's favourite toy, this can significantly help this child. For example, if a child has an obsession with garbage trucks, then the colour green would be a colour of interest. By using this knowledge, parents, teachers, therapists, anyone, can use thing such as flashcards or different learning activities to further help this child. By doing so, this child is positively affected and has an easier time learning and also has fun with it as well.

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Abstract

Laughter can drastically enhance the mood of people, but it seemed to have the potential to substantially impact a human's cardiac health in multiple ways. If found true, the medical field would be able to make great advancements in how certain cardiac illnesses are treated and even prevented. The heart rate of each of the subjects was measured before, directly after, and twenty minutes after a five-minute humorous video was displayed for them. The same process was repeated over a ten-day period, to show the effects of laughter overtime. As the days progressed, each of subjects had a decrease in their resting heart rate. When the initial heart rate data was compared to the final heart rate data, a difference of around three beats per minute on average was found, with data that showed that the heart rates were declining over the ten-day period. This was significant in the aspect that the heart rates had a considerable decrease within a short period of time. Lower heart rates are connected to better circulation, strengthened heart muscles, and a lower risk of cardiac illnesses.

I.
INTRODUCTION

Answering this question is extremely important due to the presence of research that states that laughing is capable of healing (Robinson, Smith, & Segal, 2018). With these capabilities, laughter could be used as a ground-breaking method to cure multiple diseases that may be known to be incurable. A study was recently conducted and proved that laughing may have been responsible for raising a patient's immune system by 40% (Rainey, 2013). Although that hasn't been completely proved yet, laughter in general has many benefits to the human body and should be researched more as a potential cure for diseases.

How does laughter impact the cardiac health of humans? If people laugh, then then their cardiac health improves, because laughter has multiple mental and physical benefits for the human body. An experiment was conducted by Lee Berk, where the doctor took blood samples of subjects who hadn't watched a humorous video and some of subjects that did. The samples proved that the people that were exposed to the humorous video had significantly less stress and had an improved immunity when compared to the people who hadn't watched the video, and as blood is pumped through the heart, there should be a direct correlation with cardiac health ("The Laughing Cure", 2000). Additionally, another study showed that just by making the subjects laugh for between 15-20 minutes, their overall health improved significantly in the long run, and a person was able to overcome mild bronchiectasis through this (Rainey, 2013).

II. METHODS

Three subjects were gathered in the same quiet room. The subjects were all seated separately. I-Pads that contained the same five-minute humorous video were distributed to each of the subjects. The volume and brightness on each I-Pad was made to be the same level. The heart rate of each of the subjects was recorded using a heart rate monitor. The data was then recorded in the "before viewing" column. The video was played on each of the subject's I-Pads. The heart rates of each of the subjects was measured again directly after the clip ended. The data was then recorded in the "after viewing" column. The subjects were then made to sit still without being exposed to anything for twenty minutes. The heart rates of the subjects were once again measured. The data was recorded in the "after twenty minutes" column. The process was then repeated for ten consecutive days.

In this case the independent variable would be the amount of laughter, while the dependent variable would be the heart rate of the subjects. As for the control variables, there were a numerous amount of them. Firstly, the time the experiment was conducted had to be made the same for all subjects and was in the morning as a way to prevent any external stresses or factors from affecting the results. That also allowed all the subjects to be in the same condition at the time of the experiment. Secondly, the amount of noise in the environment had to be controlled in

order to ensure no distractions were around, as that would cause the subjects to lose focus on the video and potentially laugh for a shorter period of time. Thirdly, the video displayed had to be the same for all subjects, as viewing different clips may cause different amounts of laughter in each of the subjects which would then result in varying results. Lastly, the levels of volume and brightness on each I-Pad had to be the same before the video was played. This ensured that each of the subjects saw and heard the same content. That allowed for more accurate and comparable data.

III. RESULTS

Table 1: Data from Subject #1.

Day	Minutes of Video Watched	Initial Heart Rate	Heart Rate at End of Video	Final Heart Rate (after 20 min)
1	0	75	-	74
2	5	78	83	75
3	5	76	82	76
4	5	83	89	82
5	5	75	79	73
6	5	74	81	73
7	5	75	82	72
8	5	74	79	71
9	5	73	77	72
10	5	71	75	71

This table shows the results of the experiment from subject 1. It displays the three different heart rate measurements on each day for subject 1.

Table 2: Data from subject #2.

Day	Minutes of Video Watched	Initial Heart Rate	Heart Rate at End of Video	Final Heart Rate (after 20 min)
1	0	82	-	83
2	5	83	91	82
3	5	83	88	83
4	5	84	87	82
5	5	82	89	82
6	5	86	93	84
7	5	81	83	80
8	5	80	84	80
9	5	79	82	78
10	5	79	81	78

This table shows the results of the experiment from subject #2. It displays the three different heart rate measurements on each day for subject #2.

Table 3: Data from subject #3.

Day	Minutes of Video Watched	Initial Heart Rate	HeartRate at End of Video	Final Heart Rate

				(after 20 min)
1	0	69	-	70
2	5	71	75	68
3	5	72	78	72
4	5	70	77	69
5	5	69	75	68
6	5	67	74	66
7	5	68	75	69
8	5	69	75	70
9	5	67	73	65
10	5	66	70	67

This table shows the results of the experiment from subject #3. It displays the three different heart rate measurements on each day for subject #3.

Table 4: Averaged results from all subjects.

Day	Minutes of Video Watched	Average Initial Heart Rate	Average Heart Rate at End of Video	Average Final Heart Rate (after 20 min)
1	0	75	-	75
2	5	77	83	75
3	5	77	82	77
4	5	79	84	77
5	5	75	81	74
6	5	75	82	74
7	5	74	80	73
8	5	74	79	73
9	5	73	77	71
10	5	72	75	72

This table shows the averaged results of the experiment for all three subjects. It displays the three different heart rate measurements on each day for the subjects.

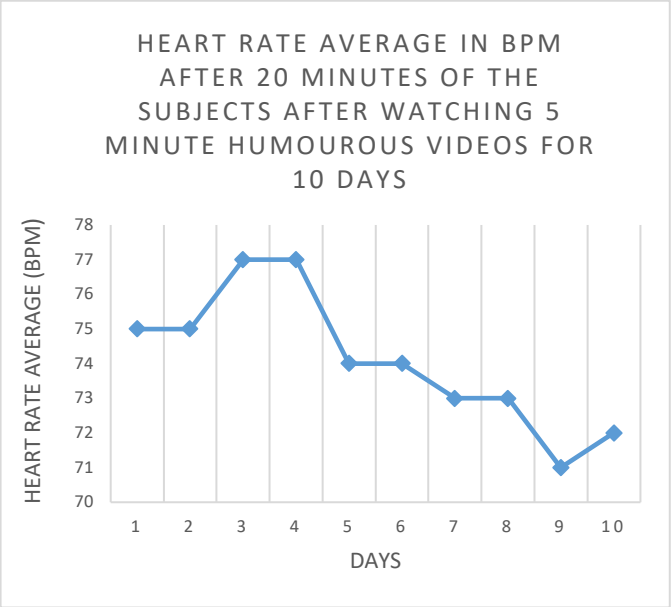

Figure 1: Average resting heart rate of all subjects over a period of 10 days.

This graph displays the decline of the average heart rates of all the subjects over the course of the ten days the experiment was held.

IV. DISCUSSION & CONCLUSION

The hypothesis was correct, as the data collected shows that the heart rate of the subjects decreased over the ten-day period of exposure to the humorous videos. The resting heart rate of the subjects decreased an average of 3-4 beats per minute, proving that laughter therapy can improve cardiac health. A decreasing heart rate signifies that the heart's condition is improving, and that it requires less exertion of effort to maintain a steady beat.

Moreover, it lowers the risk of having damaged arteries, restricted blood flow, and lowers the risk of encountering heart illnesses.

With very similar effects of working out, laughter engages the abdominal muscles. Due to the muscles expanding and contracting quickly, the body requires access to extra energy. Due to cellular respiration, the body requires oxygen in order to break down the energy stored. As oxygen is supplied through the circulatory system, the heart rate ends up going up to keep up with the amount of oxygen required. After occurring for an extended period of time, the heart adjusts to pumping out more blood with each beat rather than beating faster. This strengthens the heart muscle and improves the overall blood flow, while decreasing the resting heart rate.

This exact same experiment hasn't been done before, but researchers at the University of Texas have done a similar experiment. Although the researchers used the same independent variable as this experiment, blood flow was measured instead, and according to their results, there were instantaneous improvements (Skerrett, 2010). This proves that the circulation system is indeed impacted positively by laughter.

While efforts were made to exclude external factors from affecting this experiment, many were still involved and may have caused the data to be inaccurate. Even though the experiment was conducted in the morning to avoid the involvement of stress hormones or other variables such as caffeine consumption which raises the heart rate, the subjects may have been exposed to it beforehand as no warning or restriction was provided. Furthermore, the heart rate monitors encountered multiple technical difficulties as a phone with a sensor was used. As the device can't be considered a medical device, the results may have been imprecise. Those issues probably had the most impact on the results and may have caused errors.

V. APPLICATION

Although the data collected only proves a fragment of the research required to officially use laughter as a method of therapy in medical settings, it still plays a major role in the innovation of medicine. Further research needs to be conducted in order to discover other potential impacts laughter has on the human health and perhaps even side effects could exist. As of today, laughter has mostly been used in the medical field but has the potential to expand in the future if further uses are found. The scientific and public communities can benefit from this as it is a low-cost yet effective method for people to avoid cardiac illnesses and improve cardiac health. If advanced properly, laughter therapy can replace harmful medications and promote a positive way of life.

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How Cold Weather Conditions Affect Our Lungs

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Abstract

The purpose of my Scican was to find out if weather conditions affect our lungs. The experiment that was conducts was a lung model made by using plastic water, balloons, and some water to calculate how many "breathes" the balloons could intake for a minute (slowly increased the time to make sure results were consistent). The results from the experiment were the balloon that was filled with water took in less air then the one with nothing in it. Also had found that fluid from blood vessels come out and go into the lungs. The alveoli are then filled with the fluid with little room for gas exchange. When the oxygen can't get to the blood vessels, red blood cells do not have enough oxygen to take around the body.

I. INTRODUCTION

Breathe through our nose or mouth. The air then enters into the trachea (also known as the windpipe) which divides into the left and right bronchi. The left bronchus is in the left lung and the right bronchus is in the right lung. The bronchi divide into small branches called the bronchioles which have alveoli at the end. The alveoli is the area in the lungs where gas exchange occurs. Lastly, a muscle called the diaphragm contracts when you inhale and relaxes when you exhale. The question was how cold weather conditions affect our lungs. It is hypothesized that if you are in a cold area then it will increase the likelihood of having trouble breathing, then the lungs become inflamed and start to create a fluid that clogs our alveoli because the fluid is clogging our alveoli the oxygen takes a longer time pass through. This resulted to struggling of breathing.

II. METHODS

Cut the bottom of the water bottle and made an opening. Then took one of the balloons and cut the top off. Stretched the balloons over the bottom opening of the water bottle and Put a rubber band around this balloon. Continued to place a straw through the opening of the other balloon and secured it tightly with an elastic band but made sure the straw was not crushed. Repeated step 4 for the second balloon but poured in a cup of water and removed the cap of the water bottle; put the balloons into the water bottle so they are hanging inside the bottle. Secured everything by using Play dough around where the straw and bottle meet.

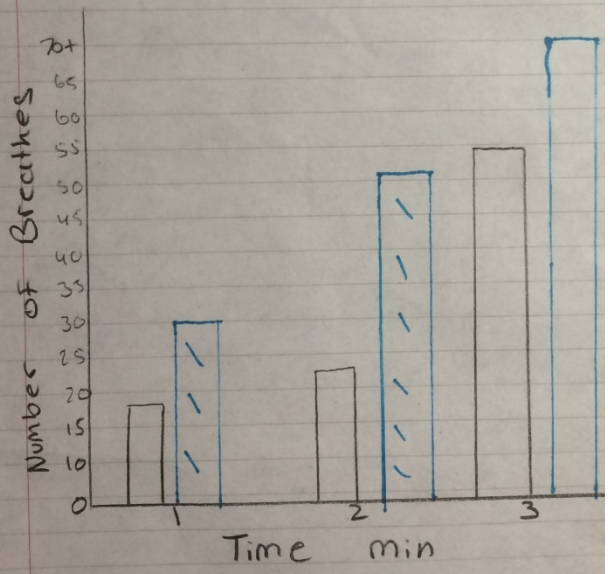
The Independent variable was putting water into one balloon and my dependant was the speed of which the balloon was expanded and deflecting. The controls are the speed of which the balloon is moving: the speed in which the balloons expand and shrink because the faster the balloon might moves the less oxygen will go in. How much water is poured into the balloon: the water represents the fluid that is made in the lungs when cold air is taken into the lungs. This is controlled because too much water my experiment will fail.

III. RESULTS

Roopman Sidhu

Time	1 min	2 min	3
With water	17	23	5
Without water	30	52	89

Weather affecting lu
Experiment Resu



IV. DISCUSSION & CONCLUSION

The hypothesis was correct; weather does affect our breathing. Based on my experiments results the balloon with water took in less air then the one with nothing in it. Also had a harder time pulling the balloon with water one because of its weight. During the first trial the balloon with no water expanded and deflated (inhale/exhale) 30 times for one minute. The balloon with water (fluid) went slower and didn't expand as much as the other one and it only expanded and deflated 17 times for one minute. To make sure my hypothesis was correct; the experiment was 2 more times and each time adding another minute. Though it wasn't part of my experiment to add the time I wanted to make sure.

The results support the other scientists' findings. Cold weather causes trouble breathing because the body automatically keeps the interior organs at a warm temperature; it can shock the lungs to rapidly breathe very cold winter air. In response to the cold air, the lungs become inflamed this causes the fluid from blood vessels to come out and go into the lungs. The alveoli are then filled with the fluid with little room for the oxygen to get through. When the oxygen can't get to the blood vessels they can't transport it to the organs to keep the body working. Symptoms are coughing, fever, shortness of breath.

V. APPLICATION

The information researched could be further researched by other professionals by doing test based on the time we are outside in the cold; How long are be able to stay outside without our body shutting down because of our lungs. The information found could be applied to not medical studies but also geographical studies knowing that in colder areas people are going to have harder time breathing than other places. It could be used in engineering and technology to make machines to help people that are having hard time breathing because of the cold weather conditions; at the hospital, school, home etc. The public could use this information so they know how to protect themselves from the weather conditions that could harm them.

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The Science Behind Beauty

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Abstract

For decades people had deemed others beautiful based upon skin colour and many other shallow reasons. The purpose of this experiment was to disprove this theory with a mathematical solution; the golden ratio of beauty. To do this, several pairs of edited photographs (of all races imaginable) were shown to the participants; one perfected according to the ratio, and the original. The results came to over 50% of participants liking the edited photos more, and no trends were seen when trying to find any bias against a certain race. This proved that the old standards of beauty had not seeped into the society we have today, and that we humans saw others beautiful due to mathematics. The eye approved of ideal proportionality in features rather than the subconscious preference of skin colour.

I. INTRODUCTION

a) How does the golden ratio influence people's judgement of beauty?

b) The discovery of the golden ratio made scientists believe it to be the foundation of how humans interpret beauty. This however rivals with historical facts; like in the 18th century when the Germans invented the notion of Caucasian beauty (Painter, 2016). It is important to know if beauty really is "in the eye of the beholder" or if there is a mathematical reason to how the "perfect" models are being selected. This research could bring to justice the reason why only a few face models are selected by companies, and why others must face hardships.

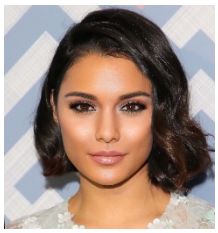
c) Considering that Windsor is a heterogeneous community, an appropriate research question can be, "What do you find most attractive about…" and an image would be provided. If an asymmetrical person is shown to a Caucasian over 50, then the response would be no because until the 1970s, standards for beauty were influenced by the government approved "ugly laws" (mostly in the U.S.) (tenBroek, 1966). But if this same person was shown to anyone who ethnically identifies as Asian, the answer would be yes due to how much their communities prize having lighter skin (regardless of asymmetry) (Li, 2018). Factors such as smiles and lower body proportion shall not be included because they can bias the opinion of the volunteer. The combination of images will only consist of symmetrical/asymmetrical people in all different skin colours.

II. METHODS

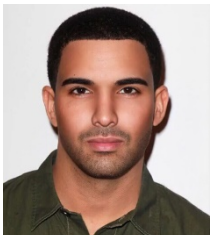
The images below will be needed to be used when comparing like photos with participants.

❖ Category 1 (C.1.): Images of people photoshopped to fit the golden ratio:

1 Black woman

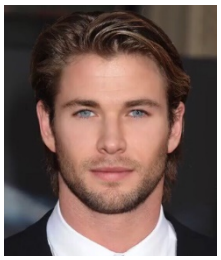


1 Black man

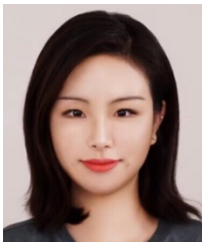


1 Caucasian woman

1 Caucasian man



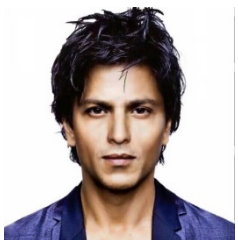
1 Central Asian woman



1 Central Asian man

1 South Asian woman

1 South Asian man

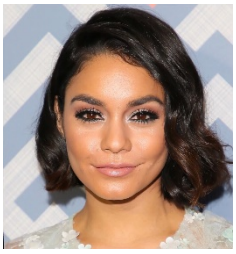


1 Model woman

1 Model man

❖ Category 2 (C.2): Images of them before being photoshopped which resemble closely to the respective images above:

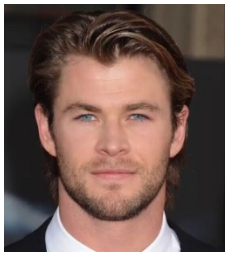
1 Black woman



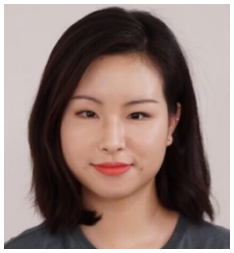
1 Black man

1 Caucasian woman

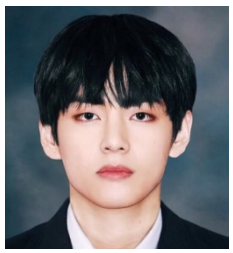
1 Caucasian man

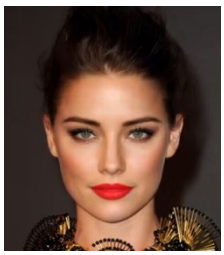


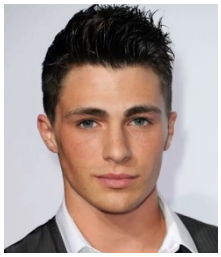
1 Central Asian woman



1 Central Asian man







1 South Asian woman 1 South Asian man


A chart was created, which recorded the answers from volunteers when asked, “Which image do you like most.” Only two images were compared at a time (each of the ten pairs were of the same ethnicity). The chart had looked something like this:

Age: 7 Gender: Male

First Photo Shown	*Second Photo Shown*	*Chosen Photo*
Black man (C.1.)	Black man (C.2)	First
Black woman (C.2)	Black woman (C.1)	First
Caucasian man (C.1.)	Caucasian man (C.2)	Second

Etc.

An order was chosen for the photos to be revealed in and copies of the same chart were printed for each volunteer. After 20-30 volunteers were chosen, their information was recorded on the data chart. The default question was asked to each, and the images were shown in the order decided earlier. This was done with as many people as possible for accurate data. After collecting data, graphs were created to identify trends in the type of photos chosen. It was done so to answer the questions, “Did specific ethnic groups choose certain kind of people more often? Did younger kids have relatively similar taste?”

Independent Variable:

The **photos** used shall remain in the same order and will all be as alike in structure as possible. For example, all photos shall be non-smiling and front face shots. This is to ensure that no one is biased to choose a smiling person over a non-smiling person. The photos/comparisons need to be structured so that the data *only* revolves around if the golden ratio was why certain photos were deemed more beautiful.

Dependent Variable:

The **reactions/choices** of the volunteers are the result of the independent variable. That data is needed to further prove the initial question of the golden ratio.

Controlled Variables:

Questions will be asked by the **same person** to avoid prejudice and changes in the response. The **tone** of the question will remain neutral with every volunteer to acquire fair results. The **area** in which the volunteers are being tested shan't be too loud so that they aren't forced to rush their final decision.

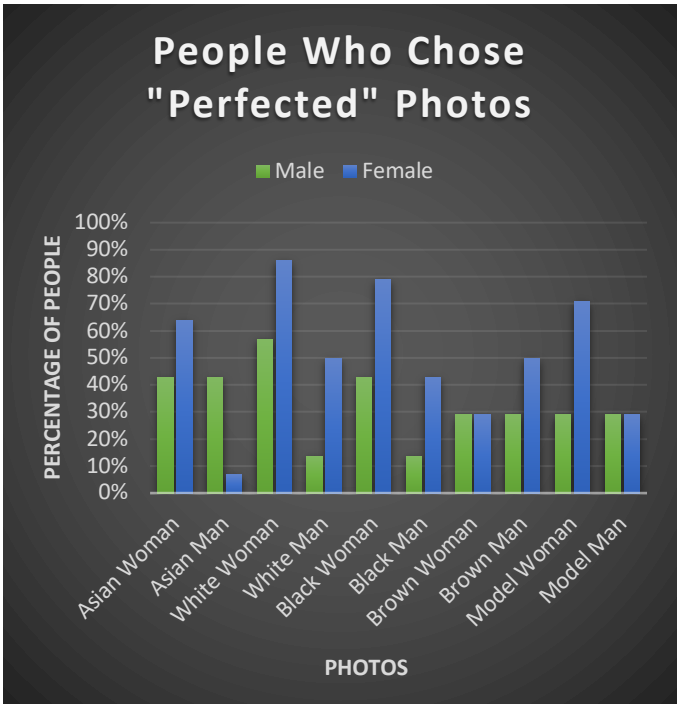


Figure 1

III. RESULTS

(Genders of participants >)	Male	Female
Asian Woman	43%	64%
Asian Man	43%	7%
White Woman	57%	86%
White Man	14%	50%
Black Woman	43%	79%
Black Man	14%	43%
Brown Woman	29%	29%
Brown Man	29%	50%
Model Woman	29%	71%
Model Man	29%	29%

^ (Types of people in photos)

Table 1

(Ages >)	13 - 19	20 - 35	36 - 49	≥ 50
Asian Woman	50%	75%	75%	33%
Asian Man	30%	25%	25%	33%
White Woman	80%	75%	75%	66%
White Man	20%	50%	25%	100%
Black Woman	60%	50%	75%	100%
Black Man	20%	25%	50%	66%
Brown Woman	40%	0%	50%	0%
Brown Man	40%	25%	50%	66%
Model Woman	60%	25%	50%	100%
Model Man	30%	0%	50%	33%

Table 1

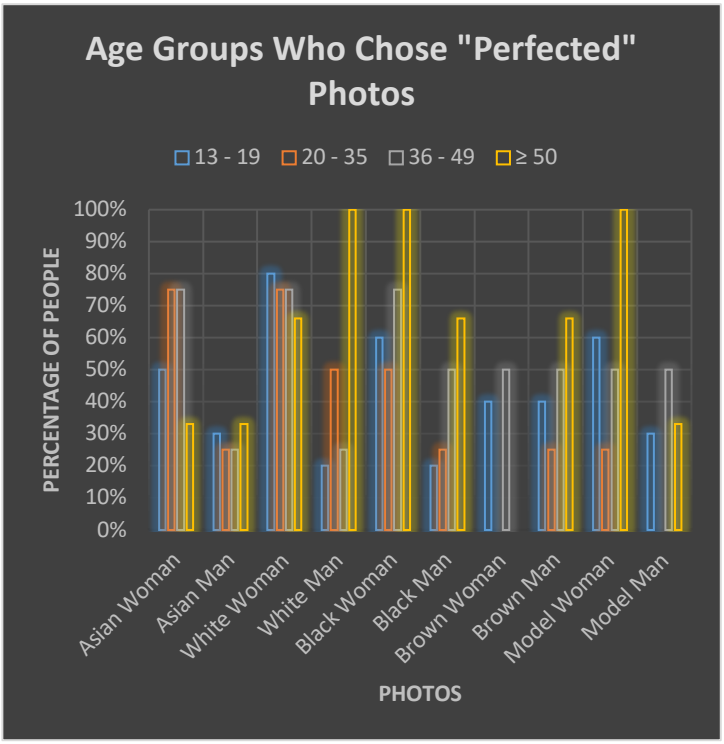


Figure 2

The records above were the percentages of people who deemed the "perfected/photoshopped" photos the more beautiful of the pair.

IV. DISCUSSION AND CONCLUSION

A) In a sense, the hypothesis *was* correct but not for the reasons described earlier. Yes, the older the volunteers, the more likely they were to choose the photoshopped image of the pair presented. The initial reasoning behind these answers was due to the older generations' upbringing (during the period of "ugly laws"), they would choose the prettier image. But it was observed that this was the case for most of the younger volunteers as well. The only reason the results show that less of the younger volunteers were judgemental, was due to the flaws in the actual photos themselves (explained in B). So, to answer the question, yes upbringing does influence the responses (because if you don't have access to the news, you wouldn't have any models to compare normal people to), but this is only a fraction of what influences beauty standards. From the results, no matter the age group or gender of the participant, the eye *will* be drawn to a symmetrical face (the basis of the universal standard of beauty). For example, the average percent of people (both tables) who choose the photoshopped image usually totally to over 50% (White Woman: 1st graph = 72%, 2nd graph = 74%)

B) When men were asked to decide between photos of other men, they judged their looks more harshly than when judging women (for most of the male participants thought both photos of the woman shown were fine). The same went for women when judging other women. As seen in Figure 1, the photos of the white woman, black woman, and the model woman were deemed by the female participants flawed, and therefore there was a high percentage of women who chose the photoshopped version of those photos. As for the results derived from the four age groups, they were not quite based upon the degree of how judgemental each group is (ex. older people will pick photoshopped images due to the influence from the "ugly

laws"). Age only played a part in the results because some of the celebrities were recognized and therefore the photoshopped images of them seemed not "perfect" (as they were intended to) but rather misshapen through the eyes of the youth. But as the older the volunteers became, the less biased their answers (for they did not recognized the celebrities). Therefore (for example), there is a clear upward trend in the answers for the black man's image (Figure 2). That man was a recognized celebrity, and this swayed the younger participants to not choose his "perfected" (or through their perspective, "deformed") image.

V. APPLICATION

Now that the results have been finalized, they can be shared with people who are insecure about their skin colour and reassure them scientifically that that isn't the problem. We can further research the extent of the golden ratio when used to photoshop people, because there is certain to be a limit to how much one can photoshop without creating an artificial looking image (in other words, unattractive). This information can also be used to help psychologists when they provide counsellors to patients, because rather than having a white person talk to a white patient (to make the patient feel more comfortable), they can use some one with a symmetrical face (and make the patient open up more because they like the therapist). The general public would feel better knowing that if they ever feel neglected due to their face, they know it isn't due to skin colour.

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Increasing pH Levels of Water with the use of Phytoplankton

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Abstract

The experiment was conducted to figure out if the pH levels would change if phytoplankton was added to a water bucket with carbon in it. This was relevant because ocean acidification (the reduction of pH in water due to excess carbon absorbed in the water) impacts marine organisms due to a quick change in the environment. Different amounts of phytoplankton were poured into a relatively large amount of water and carbon. Throughout the rest of the day, pH levels were tested and recorded. After plotting pH levels on a line graph, it was clear that pH levels were increasing throughout the day. From the results, it was seen that pH levels increase when phytoplankton is in a water body. This showed that the presence of phytoplankton in a large water body can actually reduce pH levels.

I. INTRODUCTION

Ocean acidification has been happening since the 1750s and has taken a toll on not just oxygen levels, but also on the lives or organisms (Ocean Health Index, 2019). Sea snails in Ischia, Italy were found to be much smaller than in previous centuries due to the water being more acidic. This has made sea snails vulnerable to fish, which disrupts the food chain in those areas (Down To Earth Staff, 2018).

It also has caused many side effects, including volcanic carbon dioxide seeping off Shikine Island, Japan, which lies on the border of temperate and tropical climates. As these affects continue to get worse, it is more important than ever to find a solution. Phytoplankton are micro-organisms that are plants, therefore they need to go through photosynthesis during the day time, which involves the absorption of carbon dioxide. In some areas where lots of plants or reefs are around, such as Florida, pH levels are also very high (University of Florida, 2018), which is possibly because the plants there take in lots of the carbon dioxide.

For an attempt of solving this big issue in a form factor that can be experimented with, the project was based off the following question: How does the use of phytoplankton affect the pH of a water body with carbon in it?

If phytoplankton is added to a water body with water in it, then pH levels will increase because the phytoplankton will photosynthesize using the carbon in the water, leaving the amount of acidity in the water to shrink.

II. METHODS

A couple days prior to the experiment, a bottle of phytoplankton that was bottled only days before the experiment was kept in a fridge at 3° Celsius. 3 litres of water were poured into empty, transparent

buckets. As testing on just plain water did not have any significance to the project, two teaspoons of powdered carbon were spread throughout the bucket of water (coal mainly comprised of carbon would be the same thing).

After leaving the water and carbon for 18 hours, 2 oz of phytoplankton was dipped into the bucket. A pH sample was taken using pH paper immediately, then more pH samples were taken in increments of 3 hours up to the 9-hour mark, the end of the day. The experiment was repeated with 4 oz of phytoplankton as well.

The independent variable in this experiment was the amount of phytoplankton placed in the bucket along with the carbon and water. The dependent variable was the pH level, as that was the value that was tested through the increments of 3 hours. The control variable was the amount of carbon and water used. This was controlled to make the pH levels comparable due to the phytoplankton being exposed in the same conditions.

III. RESULTS

The results are divided into tables and graphs. For a direct comparison between 2 oz and 4 oz of phytoplankton, refer to Figure 1. For individual pH levels at all different times, refer to Tables 1 and 2.

Table 1: This table shows the changes of pH levels and carbon levels quantitatively and qualitatively when 2 oz of phytoplankton was added.

Changes of pH and Carbon with 2 oz Phytoplankton							
	pH Levels						
Time	Water (5L)	Water + Carbon Immediately	Water & Carbon After 18 hours	Phytoplankton just added	3 hours after	6 hours after	9 hours after
Attempt 1	7	7	6	6.5	7.5	7.7	7.8
Attempt 2	7	7	6	6.6	7.5	7.8	7.9

Table 2: This table shows the changes of pH levels and carbon levels quantitatively and qualitatively when 4 oz of phytoplankton was added.

Changes of pH and Carbon with 4 oz Phytoplankton							
	pH Levels						
Time	Water (5L)	Water + Carbon Immediately	Water & Carbon After 18 hours	Phytoplankton just added	3 hours after	6 hours after	9 hours after
Attempt 1	7	7	6.1	6.4	7.5	7.7	7.9

Attempt 2	7	7	6	6.5	7.6	7.8	7.9

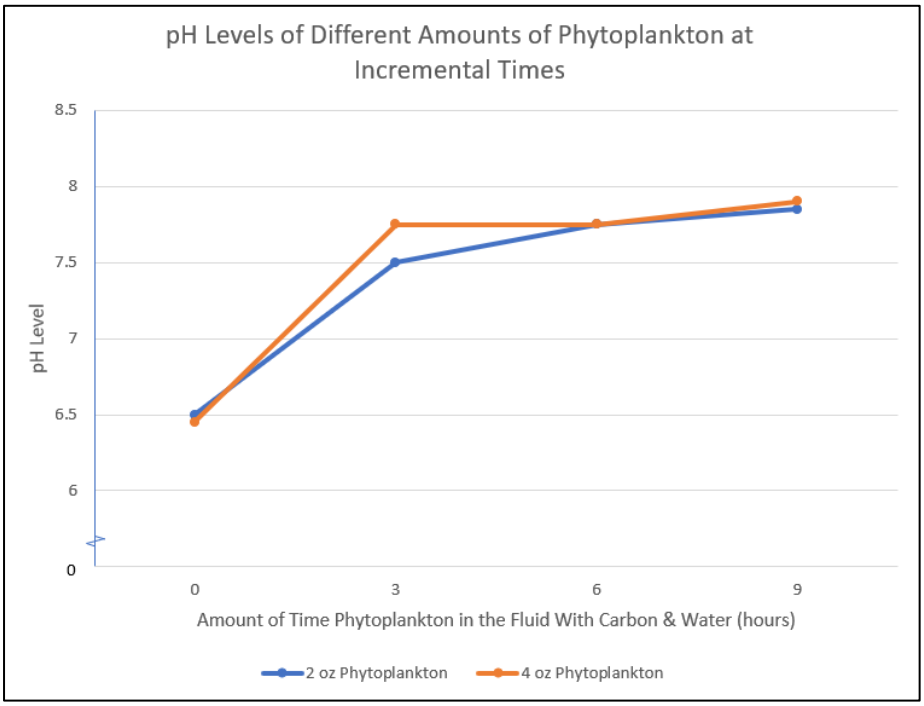

Figure 1: This line graph shows the averages of each amount of phytoplankton used from the multiple tries that the experiment was conducted.

IV. DISCUSSION & CONCLUSION

Yes, the hypothesis was correct. The pH levels of the water's surface increased (becoming more basic) by using phytoplankton exposed by the sun. The pH of the water with the carbon was either 6 or 6.1, and with 3 hours of the phytoplankton being absorbed into the water, the pH levels increased by 1.5 or 1.6. At the end of the nine hours of the experiment's duration, the pH levels were very close to 8 (7.8 and 7.9).

Phytoplankton sucks in carbon dioxide in the process of photosynthesis. It is justifiable that the most amount of phytoplankton did the best because It had the most photosynthesis taking place. The pH levels in Florida water bodies can suck in the most carbon (University of Florida, 2019), and therefore has some of the highest levels of pH for water (which are good for the organisms living in the water). By increasing the pH by manipulating the phytoplankton's vital process of photosynthesis, the results of the experiment proved that pH levels do increase when phytoplankton is added.

V. APPLICATION

It is bad enough that pH levels have already dropped 0.1 from the 1750s, but they are expected to drop another 0.4 by the end of the century if pollution does not slow down (Scientific American, 2019). Seeing how effective using phytoplankton was in such small quantities, this can be expanded to a global solution to ocean acidification: have more marine plants in the waters to take in a lot of excess carbon dioxide in the waters. If more scenarios and different control variables are tested, this project can expand into a solution that researchers of ocean acidification may find very useful, and even slow down or stop ocean acidification from getting to the point where it is completely irreversible.

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Spending more time on electronics affects the mental health

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Abstract

How does spending excessive amounts of time on electronics affect mental health and how do the chances of developing a mental health disorder change? Students in grade 8 that all attended the same school were asked to complete a mental health assessment which tested for chances of developing a mental health disorder. Each student had to use electronics for a certain number of hours for a whole week and redid the test after the week ended. As the students spent increasingly more hours on electronics, the students were more prone to developing a mental health disorder as percentages reached above 70% for the student spending 6 hours a day for a week. Spending excessive amounts of time on electronics made the students more anti-social, as the students spent more time on electronics in an imaginary world and were away from the real world. Therefore, spending excessive amounts of time on electronics makes people more prone to developing a mental health disorder which can affect the way the students think, act and interact with others.

I. INTRODUCTION

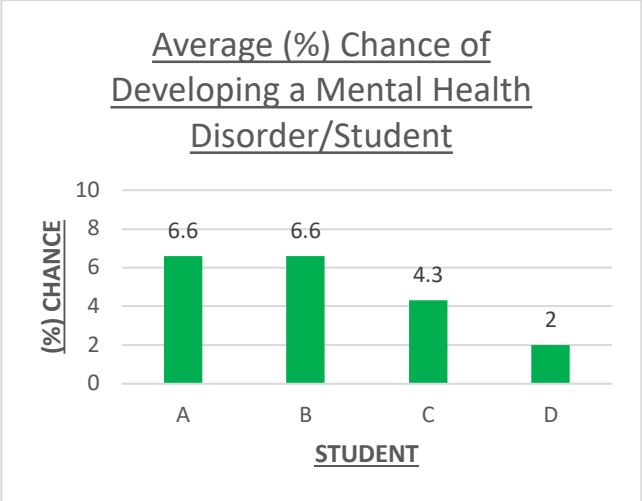
The purpose of this project is to prove that spending long hours on electronics affects your mental health. The addiction of electronic usage can develop mental health disorder which can affect your social life, academics and cause emotional problems that can last long term. Teenagers are at the highest risk of developing a disorder as 34% of Ontario high school students indicate a moderate-to-serious level of anxiety and depression (Boak, 2016). Because the brain is being affected by electronics gray matter atrophy (brain degeneration) occurs in the lobe of the brain (Patterson, 2015). Electronic companies have recently applied a blue light filter to devices. The blue light emitted by the screens of electronic devices leads to macular degeneration and can suppress melatonin. When the melatonin is compressed, sleep becomes irregular which is a common symptom of a mental health disorder (Patterson, 2015) Teenagers will tend to use their electronics very often, but how many hours can someone spend to where someone negatively affects their mental health. How does spending more time on electronics affect the mental health. This has been proven by many websites and professionals around the globe. Therefore, if people spend excessive amounts of electronics then it makes them more prone to developing a mental health disorder because of social media

conversation and posts, the blue light effect and being away from the real world for plenty of hours.

II. METHODS

The experiment requires 4 subjects which are 4 grade 8 students that all attend the same school. All students have the same teachers meaning the subjects all receive the same amount of work and relatively equal amounts of stress. All students were required to a mental health assessment acquired from *Psychology Today* which asks 60 questions relating to the student's mental health. The website will then list the chances each student has to develop a mental health disorder. The test was digital, and each student had 30 minutes to complete the assessment in an empty room with no possible distractions. After all students had completed the assessments, they were all given iPads. Each student would spend a certain number of hours for a week as they were restricted to using only social media.

Student A wasn't allowed to use electronics at all for a week. Student B was only allowed 2 hours a day for a week. Student C was allowed 4 hours a day for a week. Lastly, student D was only allowed 6 hours a day for a week. Once the week is over, the students returned to the exact same test location they came earlier. All students were asked to complete the exact same assessment from *Psychology Today* and the percentages of developing a mental health disorder for each student were



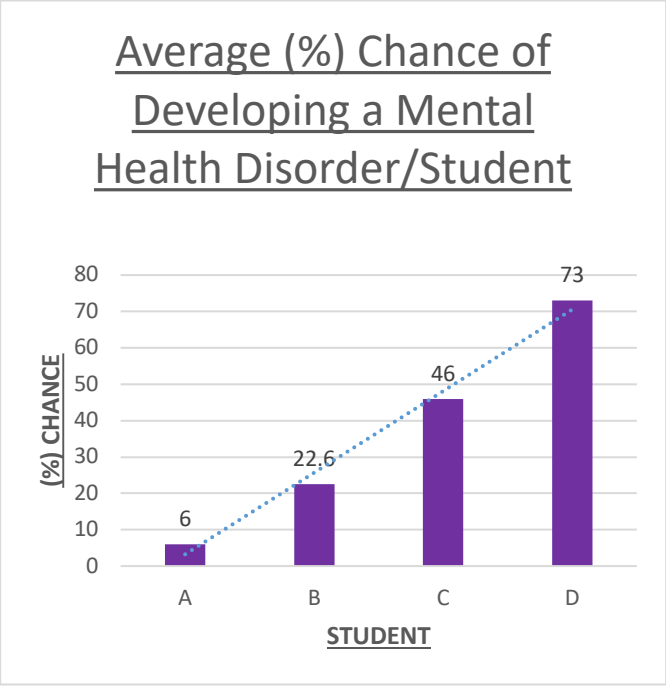
recorded. The controlled variables in the experiment were the ages of students, school and teacher because all students would have the same amount of stress and relatively equal amounts of physical activity. The device the students used was an iPad and the brightness were set to the same on all devices. This is because smaller screens and larger screens can affect the data. Lastly, all students used the electronics at the same time because different weeks can affect data as stress levels can chance due to homework or external factors. The independent variable was the hours spent on the electronic devices because each student had to spend a different number of hours on the iPad. The dependent variable was

the Psychology Test as it assesses for possible mental health disorder chances.

III. RESULTS

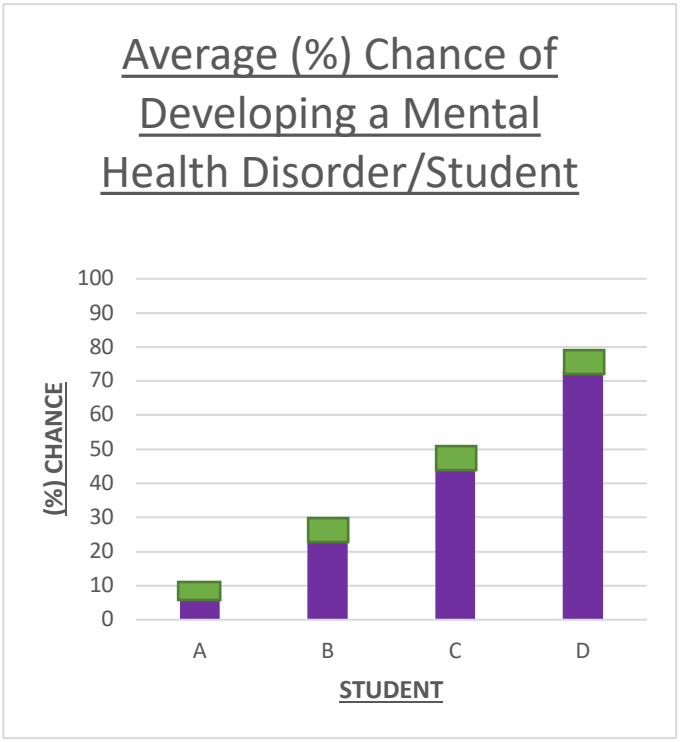
Once the data has been collected from the students, it was interpreted into bar graphs for the student's percentages of developing a mental health disorder. These were the results before the students used the electronics.

These are the average percentages of each student of developing a mental health disorder out of the 3 mental health disorders tested for. After the week was over the percentages were recorded and also put into a bar graph where each student's percentage of developing a mental health disorder is averaged. These were the results for the students after using the electronics for a week.



As shown in the graph above, as student A spent no time on electronic devices it's chances of developing a mental health disorder were only averaged at 6% between Bipolar disorder, Generalized Anxiety Disorder and Depression Disorder. Student B that spent 2 hours a day a week on electronics had an average percentage of 22.6% of developing a mental health disorder. Student C spent 4 hours a day and averaged 46% of developing a mental health disorder. Lastly, student D that spent 6 hours a day for a week was the most prone of developing a mental health disorder, averaging 73%. Then, both graphs were compared from before and after the experiment.

The green bar represents the percentage of developing a mental health disorder before the experiment. The purple bar represents the percentage of developing a mental health disorder after the experiment.


Average (%) Chance of Developing a Mental Health Disorder/Student
100
90
80
70
60
50
40
30
20
10
0
(%) CHANCE
A
B
C
D
STUDENT

IV. DISCUSSION AND CONCLUSION

The hypothesis was proved correct by the data collected. As the student spent more time on electronics the student was more prone to developing a mental health disorder. Before the experiment all students had similar chances of developing a mental health disorder from 2-6.6%. After the experiment the student that spent no time on electronic screens had an average of 6% of developing a mental health disorder. Student B and C that spent 2 and 4 hours a day for a week averaged 22.6 & 46% of developing a mental health disorder. Student D that spent 6 hours a day for a week averaged an astonishing 73% of developing a mental health disorder. There is a clear inclining slope from least amount of time spent on electronics to most time on electronics proving that if someone spends more time on electronics is more prone to developing a mental health disorder compared to someone who doesn't use electronics for a week. Some possible sources of error can be if the student is experiencing excessive stress from external factors and depending on how much time the students spend doing physical activity. Dr. Chris a local psychiatrist explained that the more time you spend on electronics the more you are away from the real world and in an imaginary world. This makes you more anti-social and eventually developing into serious mental health disorders.

V. APPLICATION

Further research can be done by asking more professionals in the specialized fields like professors at universities and discussing how the electronics affect the mental health. This information can be useful for teenagers that are now gaining access to their personal electronic devices and they should be educated on how these devices can seriously affect the mental health. This research can be used in field of study in psychology for modern technology.

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Increasing Number Of Organ Donors

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Abstract

The purpose of this project is about increasing the number of potential organ donors. This question is important because Canada has a low organ donation rate and many people die each year due to not getting an organ transplant in time. The procedures involved giving subjects a survey with five questions relating to organ donation. Then the subjects were given information about how to become an organ donor. The same survey was given again to the subjects and the before and after results were compared. The results showed that before given information 50% of subjects wanted to become organ donors and 50% of the subjects were willing to tell others how to become an organ donor. It also showed that 20% of people knew how to become an organ donor. After giving information the results showed a 20% increase in people who want to become organ donors and people willing to tell others how to become organ donors. There was an 80% increase in the number of people who knew how to become an organ donor. In conclusion, the data showed that by giving information to people on how to become an organ donor this increased the number of potential organ donors.

I. INTRODUCTION

The purpose of this SCICAN is to raise awareness and understanding of the problem of organ donation shortage, give solutions to the problem, and inform people on how they can help by getting involved. The significance of this project is that it showed that when given information people were more likely to become an organ donor. Canada has a low organ donation rate compared to other countries. In Canada, the organ donation rate is 21 donors per million people (Canadian Institute for Health Information, December 2018, *Organ replacement in Canada: CORR annual statistics*). The question is does giving information to people on how to become an organ donor it would increase the number of potential organ donors? The hypothesis is if we give information to people on how to become an organ donor, then there will be more organ donors because more people know how to become an organ donor.

II. METHODS

The methods in this experiment in Trial 1 involve gathering subjects, giving a survey, and recording results. In Trial 2, you use the same subjects, but this time you give them information, then you give the same survey again, record the results and compare (Wang, S. 2019, *SCICAN! Section 4: Methods & Materials*). The independent variable is the number of people, and the person's prior knowledge about organ donation. The dependent variable is the person's attitude on organ donation before given information and after given information. The control variables are the survey questions and information given. The survey questions are control variables because they need to be the same for all subjects to compare the results before given information and after given information. How the information is given, and the amount of information is also controlled so the subjects all get the same amount of information in the same way. This ensures that the experiment is fair and consistent.

III. RESULTS

The results showed an increase in the number of potential organ donors because by giving information on why and how they could become one answered many questions preventing people from becoming organ donors (Wang, S. 2019, *SCICAN! Section 6: Observations & Results*).

Table 1: Results of organ donation survey questions before giving information

Table 1

Subject	Question 1	Question 2	Question 3	Question 4	Question 5	Percent Yes	Percent No
1	Y	Y	Reason: To help people	N	N	50%	50%
2	Y	Y	Reason: To help people and for research	N	Y	75%	25%
3	Y	N	Reason: Wants their body to be respected and not touched	N	Y	50%	50%
4	Y	N	Reason: To help people	N	Y	50%	50%
5	Y	N	Reason: Doesn't want organs to be taken out	N	Y	50%	50%
6	Y	N	Reason: Only wants to donate to family mem	Y	Y	75%	25%
7	Y	N	Reason: Doesn't want organs to be taken out	N	N	25%	75%
8	Y	Y	Reason: Donate when deceased	N	N	50%	50%
9	Y	Y	Reason: Mom made person an organ donor	Y	N	75%	25%
10	Y	Y	Reason: To help people	Y	Y	100%	0%
Total % Yes	100%	50%		20%	50%	60%	
Total % No	0%	50%		80%	50%		40%

The results in Table 1 showed that 100% of subjects knew that they could become an organ donor which is question 1. 50% of subjects wanted to become an organ donor which is question 2. It also showed that 20% of subjects knew how to become an organ donor and 50% of subjects were willing to tell others how to become an organ donor if they knew.

Table 2: Results of organ donation survey questions after giving information

Table 2

Subject	Question 1	Question 2	[redacted]	Question 4	Question 5	Percent Yes	Percent No
1	Y	Y		Y	N	75%	25%
2	Y	Y		Y	Y	100%	0%
3	Y	N		Y	Y	75%	25%
4	Y	Y		Y	Y	100%	0%
5	Y	Y		Y	Y	100%	0%
6	Y	N		Y	Y	75%	25%
7	Y	N		Y	N	50%	50%
8	Y	Y		Y	N	75%	25%
9	Y	Y		Y	Y	100%	0%
10	Y	Y		Y	Y	100%	0%
Total % Yes	100%	70%		100%	70%	85%	
Total % No	0%	30%		0%	30%		15%

The results in Table 2 showed that 100% of subjects knew that they could become an organ donor which is question 1. There was a 20% increase in the percent of people who want to become an organ donor when compared to Table 1, which is question 2. It also showed that an 80% increase in the percent of subjects knew how to become an organ donor and a 20% increase in the number of subjects willing to tell others how to become an organ donor if they knew.

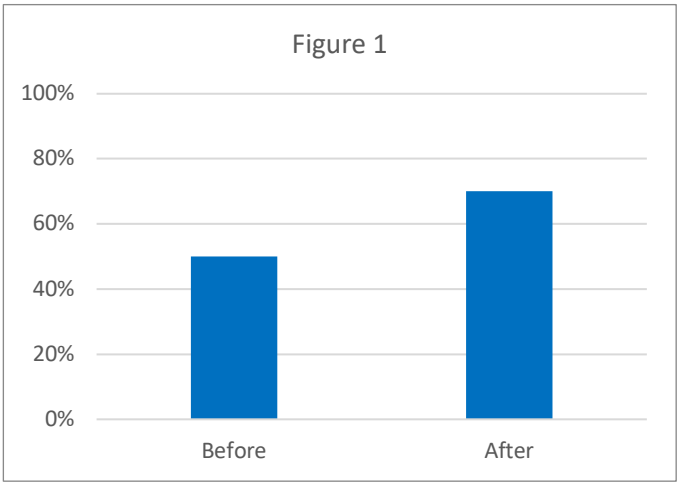

Figure 1: Percent of people who want to become an organ donor before giving information and after giving information

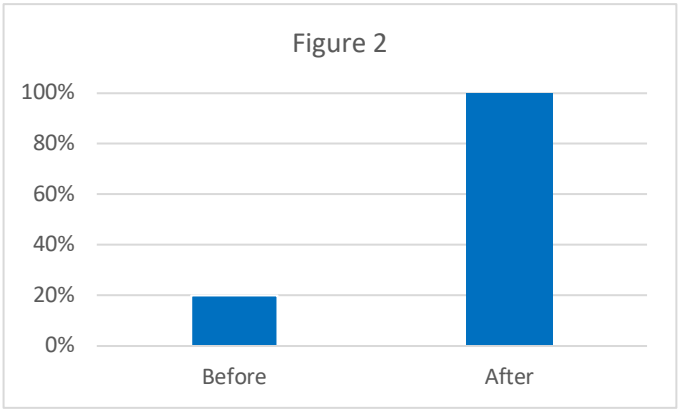

Figure 2: Percent of people who knew how to become an organ donor before giving information and after giving information

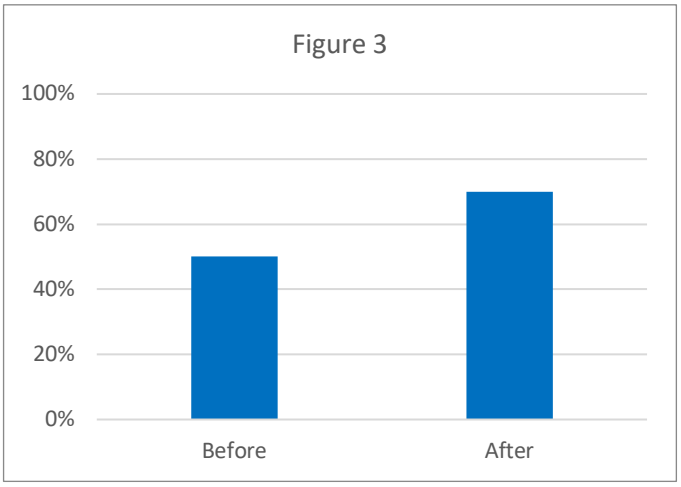

Figure 3: Percent of people willing to tell others how to become an organ donor before giving information and after giving information

IV. DISCUSSION & CONCLUSION

The hypothesis was correct. The amount of potential organ donors increases when given information on how to become one. According to the results, in the first trial, the subjects were not given information on how to become an organ donor. Fifty percent of the subjects who participated answered yes to the question “Do you want to become an organ donor?” In trial two the subjects were given information on how to become an organ donor and seventy percent answered yes to the question “Do you want to become an organ donor?” This is a 20% increase in potential organ donors by just giving information on why it is

important and how they can become an organ donor. There were five questions given in the experiment: 1. Did you know you can be an organ donor? 2. Do you want to become an organ donor? 3. Why do you want/don't want to become an organ donor? 4. Do you know how to become an organ donor? 5. Would you let others know, such as your family/friends on how to become an organ donor? The more questions answered "yes" the better. At the end of the experiment, 25% more people chose "yes" than in the first trial. This shows that by giving information to people on how to become an organ donor, the number of potential organ donors increases.

The results showed an increase in the number of potential organ donors because by giving information on why and how they could become one answered many questions preventing people from becoming organ donors. Prior to the experiment the majority of people, 80% didn't know how to become an organ donor. After the experiment, that percentage decreased to 0. Even though 50% of people in the first trial wanted to become an organ donor only 20% of people knew. That prevented 30% of people from becoming an organ donor. After reading the information there was a 20% increase in people agreeing to donate their organs and a 20% increase in the number of people willing to tell their family/friends on how to be an organ donor. This experiment showed that by just giving information there was a 20% overall increase in the number of potential organ donors. By giving people the information, this increased the number of potential organ donors and also increased the number of people willing to tell others how to become an organ donor (Wang, S. 2019, *SCICAN! Section 7: Discussion & Conclusion*). My results are consistent with what other investigators have reported because it is logical to assume that it is necessary to provide information to people who don't know how to become an organ donor, so after reading the information they understand how to become one. This finding can be applied to many other situations where people don't know about an issue and don't know how to participate to solve the issue.

V. APPLICATION

Further research could be done to questions such as how can we give information in a way that increases results? Or what percent of subjects perceive misinformation as being true? This information can be applied to other fields of study such as psychology, marketing, or sociology. For example, in psychology we can find out why giving information increases number of participants, we can also apply this to marketing where we see if giving more information on a product increases sale of the product or if giving too much information decreases sales of a product. We can also apply this information to sociology because we can see if giving information helps solve social problems.

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Differences Between the Impacts of Fast-Paced and Slow-paced Video Games on Teenagers' Moods and Behaviors Following a Gaming Session

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Abstract

It is well known that video games psychologically affect teenagers, but parents tend to limit their access to video games in general although different video games can have different impacts on teenagers. To help them decide what type of video game the teenagers should play, the effects of the two most generic types of video games, fast-paced and slow-paced, were compared. Four teenagers were asked to play a fast-paced and a slow-paced game, and their moods and behaviors were assessed after playing each game. A significant difference was found between the moods and behaviors after each session. The teenagers were in a worse mood, were less energetic, were harsher with their family/friends, and had violent urges after playing the fast-paced game than after the slow-paced one. Using these results, teenagers can have more control over how they feel and behave after a gaming session by picking the right type of game, and parents can decide which type of video game they should allow the teenagers to play.

I. INTRODUCTION

Parents around the world are worried that video games are negatively affecting their child's brain and causing them to feel or act a certain way, especially since WHO classified "gaming disorder" as a mental health condition recently (Scutti, 2018). The brain takes some time to go back to its normal state after a gaming session, so the session can leave an impact on the child's brain for a few hours or even the rest of the day, depending on what type of video game they were playing (Baker, n.d.). This is concerning because although violent games aren't meant to be played by teenagers in most cases, 44% of parents let their child play a game that is recommended for an older age (Davis, 2018). Knowing how a certain type of video game affects a teenager's mood and behavior after the session would not only help parents decide which games they should allow their child to play based on their behavior, but it would also let teenagers know how they will feel after playing a certain game, giving them more control over their mood. To do this, a simple question that can be asked is: How does the impact video games have on a teenager's mood and behavior following a gaming session differ depending on the pace of the video game played?

The hypothesis is that if the video game is fast-paced and involves violence or otherwise makes the teenager feel aggressive during gameplay, then the teenager will feel angry and be easily annoyed for some time after playing the game because the brain requires time to go back into its normal state after a gaming session (Baker, n.d.). On the other hand, if the video game is slow-paced, then it will leave the teenager relaxed and feeling better because slow-paced games are casual and relaxing.

II. METHODS

A teenager was asked to play Apex Legends, a fast-paced first-person shooter, for 2 hours in one sitting between 12 pm and 6 pm on a Saturday. They were instructed to minimize any distractions (e.g., phone, family members) during the session and to not play video games at any other point during the day. Three hours after the gaming session, they recorded, on a typical five-level agree-disagree scale (1-strongly disagree, 2-disagree, 3-neutral, 4-agree, 5-strongly agree), how strongly they agreed with these statements on a survey sheet:

1. I have been in an overall positive mood since the gaming session.
2. I feel more energetic after the gaming session than I did before.
3. I have been harsh with my family members and/or friends after the gaming session.
4. I have had the urge to break an object or perform other violent actions since the gaming session.

The teenager then played Minecraft, a slow-paced sandbox game, for the same 2 hours and in the same setting the next day and recorded how strongly they agreed to the same statements 3 hours after that session. The entire procedure was repeated with three

other teenagers, and all of their responses were collected.

The independent variable in this experiment was the pace of the video game being played, one being fast-paced and the other being slow-paced, and the dependent variables were the mood and behavior of the teenager following the gaming session, measured by the responses to the statements. The time of the two gaming sessions was kept the same to avoid different levels of energy based on the time of day; distractions were minimized and the duration of the sessions was kept the same to ensure similar sessions; phones were forbidden to avoid changes to mood and behavior caused by external factors (any event in the person's life); and the fixed 3-hour duration between the gaming session and the responses allowed the same amount of time for moods and behaviors to occur on both days.

III. RESULTS

There was a significant difference between the responses after the two games, which proved that the pace of the game had an effect on the impact the game had on the teenagers' moods and behaviors after the gaming sessions. The difference between the responses can be seen in Table 1, which shows how strongly the four teenagers agreed with each of the four statements on the survey sheet 3 hours after playing Apex Legends and 3 hours after playing Minecraft.

Table 4: Teenagers' Responses to Statements Evaluating Their Moods and Behaviors

Teenager	Statement 1		Statement 2		Statement 3		Statement 4	
	Apex	Minecraft	Apex	Minecraft	Apex	Minecraft	Apex	Minecraft
1	2	4	4	3	5	2	2	1
2	4	5	5	2	2	1	1	1
3	3	5	3	3	1	1	4	1
4	2	4	4	2	3	2	4	1

Figure 1 shows the responses on a bar graph where the red bars represent the average teenager agreement level to each statement after playing Apex Legends and the blue ones represent that after playing Minecraft.

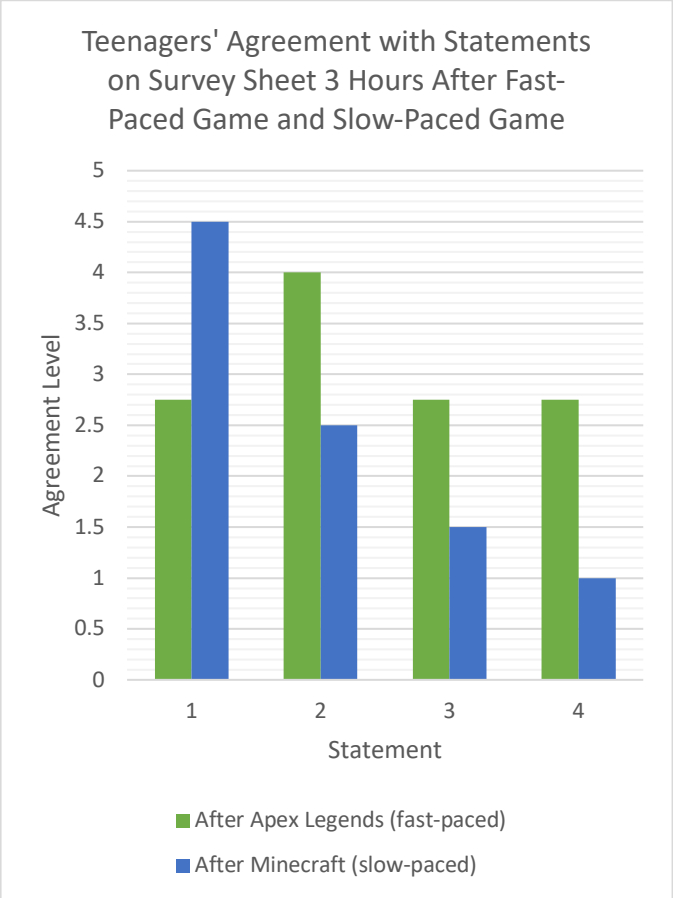

Figure 1: Averages of the Teenagers' Responses to Statements Evaluating Their Moods and Behaviors

Overall, the teenagers were in a worse mood, were more energetic, were harsher with their family/friends, and had violent urges after playing Apex Legends than after playing Minecraft.

IV. DISCUSSION & CONCLUSION

The hypothesis was that a fast-paced video game that makes the teenager feel aggressive during the gaming session would leave them feeling angry for some time after the gaming session, and a slower game would leave them feeling better and more relaxed. The average response of 2.75 to Statement 3 after Apex Legends being significantly higher than that of 1.5 after Minecraft means that the teenagers were harsher with their family and/or friends after playing the fast-paced game and that the hypothesis was correct. Moreover, the average Statement 4 responses of 2.75 and 1 after Apex Legends and Minecraft respectively show that they had some urge to break an object or perform other violent actions after playing the fast-paced game while none of them had the same urge after the slow-paced one. Responses to Statement 1, which were, on average, 4.5 after Minecraft and 2.75 after Apex Legends, show that the slower game put the teenagers in a much better mood, which was also a part of the hypothesis. Finally, the teenagers felt more energetic after the fast-paced game than after the slow-paced one, as shown by the average responses of 4 after Apex Legends and 2.5 after Minecraft to Statement 2.

The reason behind the differences in the teenagers' moods and behaviors after each game is the fact that the brain requires some time to go back to its normal state after a gaming session (Baker, n.d.). Because of this, the way a video game makes a teenager feel during the session will likely determine their mood and behavior for some time after. Aggression is encouraged and rewarded in fast-paced games, and the aggressive feeling the player feels while playing the game stays with them even when they haven't played the game in hours. Differences between the effects of a fast-paced game and a slow-paced game are accentuated when the gaming sessions are long, which is what happened in this experiment with two-hour long sessions. The overall worse mood, energetic feeling, harsher behavior, and violent urges after Apex Legends can all be explained by the aggressive feeling that lingered from playing the fast-paced game. The three-hour period between the gaming sessions and responses was enough time for the teenagers' moods and behaviors to change as they continued on with their day, but not enough for the effects of the gaming session to fully disappear as the brain was still in the process of reverting to its normal state.

Although some external factors were controlled, factors like the amount of sleep the teenager had gotten the night before could not be controlled, which may have affected the teenager's mood and behavior and made the results inaccurate. However, they can only be inaccurate to a small degree as, on top of being based on four teenagers and showing a

significant difference between the responses after each game, the results coincide heavily with other researchers' results such as "an increase in aggressive behavior following violent video games" (Baker, n.d.).

V. APPLICATION

This experiment can be done on a larger scale with more teenagers and in a more controlled environment to achieve more reliable results. The teenagers can be asked to respond to more statements with more than five levels of agreement to assess their moods and behaviors more accurately. The experiment can also be repeated with a different duration of gaming session, a different duration between session and responses, and different video games to gain understanding of how a certain duration of a certain type of video game affects a teenager's mood and behavior for a certain duration. Although the variables in this experiment were set while taking most high-school gamers into consideration, changing each of them makes the data more relevant to a specific group of teenage gamers. These results can be used by teenagers and their parents to decide which type of video games the teenagers should buy and play, knowing what the impact of the games will be on the teenagers' moods and behaviors after the gaming session.

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Significance of Thinking Positively

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Abstract

What is the importance of thinking positively? This is an important topic to discuss as a lot of us go through a downfall in our life and struggle to get back on our feet. We should make sure we have a positive mindset to get through these downfalls as if we don't, we can harm our health and future. After conducting several experiments, I finally got the results I was going for. I asked 10 subjects to complete a task before and after watching a motivational video and they showed drastic results. As I finished and collected my observations and data it showed me that after my subjects had watched the encouraging video, they were more motivated to do the task I had asked them and did it efficiently. Furthermore, if you are motivated and have a positive mindset you can get many things done more efficiently.

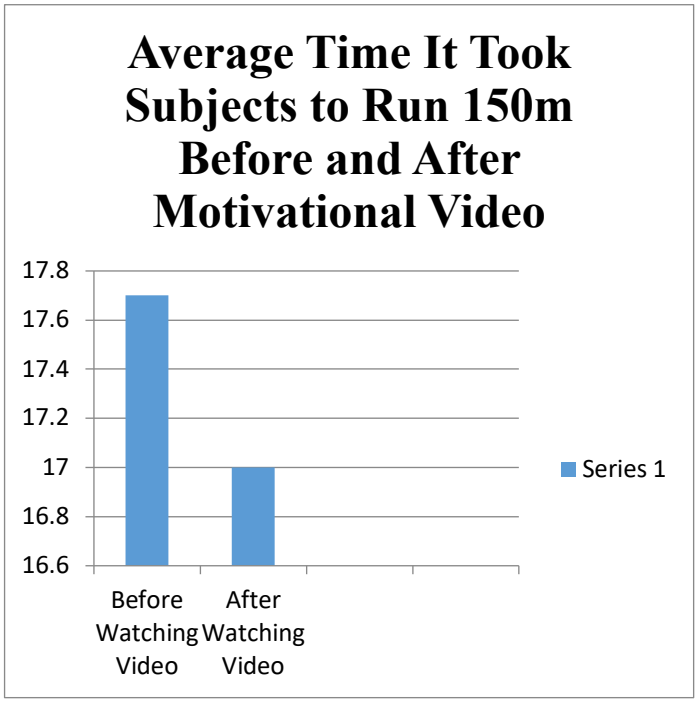
I. INTRODUCTION

People view positive thinking as just a simple emotion, while there's more to it. (Lyubomirsky, 2014, para. 1). Positive thinking is very beneficial for our mental health primarily because it eliminates any form of paranoia and negative thoughts that can cause depression and stress. So what are benefits that make thinking positively so important? If you are more self-aware and confident then you are proven to be happier because "Chemicals released in the brain in response to happiness include endorphins, dopamine, serotonin and oxytocin." (Siegel, n.d., para. 1). If you think on the brighter side of things, you are likely to be more motivated.

II. METHODS

10 grade 10 students were gathered after school on the school track. Each subject was made to run 150m. The amount of time they took was measured using a timer. After they had ran 150m they were each given 10 minutes to rest to lower their heart rate back to their original state. After the short break, they were to watch the same motivational video individually. Once they had completed watching the motivational video they were made to 150m again and were timed with a timer. The results were recorded. The independent variable would be the amount of motivation. The dependant variable would be the time it took the subjects to run. There are a few controlled variables. One of them would be the timing, because all the subjects should have the same amount of energy. Another one would be the setting, because the ground should be flat so that the subjects don't trip or fall.

III. RESULTS



Bar graph above indicates the difference in seconds it took for 10 subjects to run 150m before and after watching motivational video and is averaged.

	Before Watching Motivational Video	After Watching Motivational Video
Subject 1	**19 seconds**	**17 seconds**
Subject 2	**18 seconds**	**16 seconds**
Subject 3	**19 seconds**	**21 seconds**
Subject 4	**20 seconds**	**20 seconds**
Subject 5	**16 seconds**	**15 seconds**
Subject 6	**21 seconds**	**19 seconds**
Subject 7	**17 seconds**	**17 seconds**
Subject 8	**14 seconds**	**13 seconds**
Subject 9	**15 seconds**	**16 seconds**
Subject 10	**18 seconds**	**16 seconds**

Table above shows the exact timing it took for all 10 subjects to run 150m before and after watching the motivational video and is not averaged.

IV. DISCUSSION & CONCLUSION

After conducting the experiment, it was concluded that the hypothesis was in fact correct. After making each of the subjects watch a motivation video after they have ran 150m, the majority of them showed improved results by running a smaller amount of time. This showed their motivation to run faster and beat their previous time.

Positive thinking increases productivity. After watching the motivational video, the subjects were able to complete the 150m run faster than they did before. The average pace of running of all subjects decreased by 0.7seconds. These results relate back to the main question as it proves that promoting positive thinking in the subjects caused their athletic abilities and motivation to increase. While conducting the experiment the timings may not have been accurately measured. This would affect the results since my graph data is quite close together, a small mistake in the timings of how long it took the subjects to run would go a long way as small differences in conducting experiments may alter the results.

V. APPLICATION

Athletes and students can find this information useful as it shows the difference of how just by watching a short video that motivates you, can make you a better person. By thinking positively, people will be able to push past their abilities to the maximum extent. If people stay in an optimistic headspace, they are more likely to be more healthy. In the mind and the body. The general public would probably learn a lot from this information as everyone can improve their headspace and mind. Everyone has flaws they can fix. Furthermore, all of

the information collected throughout the entire experiment could be helpful to a large range of people.

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