

Senior Seminar

2020

The Neighborhood Academy



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Reliability of Galvanic Skin Response and Respirations in Detecting Deception Among

High School Girls

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Science Senior Seminar

The Neighborhood Academy

May 2020

Abstract

This project tested the accuracy of polygraph testing on minors by only using galvanic skin response and respiration rates. The equipment used to administer this polygraph test was a BIOPAC MP36 4-channel student lab system. The test used was the practice test which is a test that consists of seven numbers on a piece of paper and the number four is left blank. At the start of the test, the examinee fills in the number four and the examiner asks the examinee did they write each of the numbers listed on the paper 1-7, but the examinee is instructed to say no they did not write any of the numbers including the number four which they did write. The examinee knows that they are lying, so the essential idea is to see if the examiner is able to tell if they were lying by looking at the data collected. This is an important subject because polygraphs are used all over the world for many reasons, but they are also sometimes used with minors in juvenile centers. Since polygraph testing has been used on minors in juvenile centers as evidence in cases, they should be aware if polygraph testing is accurate for detecting deception or not. To evaluate how accurately a novice polygraph tester can detect deception using only two inputs of polygraph test. Deception would be harder to be detected through the examinees reactions during the test because of the lack of training on analyzing polygraph tests. In order to test the research question stated, twenty-five polygraph tests on female high school students grades ninth through twelfth were conducted. At the end of the study, only four out of the twenty-five examinees data showed they were lying on number four which shows that polygraph testing was not that accurate when detecting deception on minors without the proper training. The limitations of my study was the time limit to carry the study out and analyze the data professionally.

Introduction

A polygraph, known as a “lie detector,” is a device that is used to test different psychophysiological reactions to questions being asked in order to detect if someone is being honest or not. The psychophysiological reactions being tested are triggered by stress because as the examinee is lying their stress levels may increase. The autonomic nervous system is related to someone’s stress levels because when a person is nervous their stress levels begin to rise and the autonomic nervous system is something that people have no control over so when they get nervous and stressed they can’t change it. People can not control their autonomic nervous system which makes it challenging for the examinee’s lying to be unnoticed. (Evans 2). The general public likely associates polygraph testing with criminal cases, but these tests are also used as conditions of employment and probation. Polygraph tests are mostly used for security sensitive occupations, investigations, criminals, etc. There are two reasons why a polygraph test would be used in security sensitive occupations which are pre-employment and pre-clearance reasons. Pre-employment polygraph testing is usually used for careers with law enforcement to make sure the employees are able to be trusted and have not had a past that would disqualify them for the job. Pre-clearance screenings are screenings for current employees that are getting new positions or assignments such as national security (National Research Council 11).

There are two different types of polygraph tests: diagnostic and screening (Nelson 3). The diagnostic test is a test that consists of comparison questions in order to get information out of the examinees and/or get them to confess to something. Comparison questions consist of relevant and irrelevant questions to the situation that the polygraph test is for. The purpose of asking relevant and irrelevant questions during the test is to see if the examinee has more of a

psychophysiological reaction to the relevant questions or not. If the examinee does not have a strong response to the relevant questions and has a stronger reaction to the irrelevant questions, they are most likely innocent (National Research Council 254). The screening test is also known as the guilty knowledge test because the examinee has prior knowledge about the situation before the test begins. The screening test is usually associated with the sensitive occupations discussed above because the examinees are being asked about specific events in the past which means they would have prior knowledge about the situation before the test. For job purposes and investigations, the screening test is used to see if any information was leaked or if the examinee has committed the crime or not. The screening test is used because the examinee would have prior knowledge about the issue which would make them have guilty knowledge (Synnot, et al. 4). Before a screening or diagnostic test, there is a practice test given to make the examinee familiar with the instruments being used and what the process will consist of (Saxe 2). The practice test is used to get the examinee acquainted with what it is like to take a polygraph test and to make sure the test is able to detect deception.

Most polygraph tests are set up to collect data about four psychophysiological reactions: galvanic skin response (GSR), blood pressure, respiration rates, and upper and lower body movements. A galvanic skin response is tested by measuring the skin's conductivity, which is related to the sweat your skin produces from being nervous or lying (Bergstrom 1). An increase in sweat, increases electrical conductivity due to the presence of salt ions. GSR is also known as electrodermal activity (EDA). Like an increase in sweating, a change in blood pressure can indicate a stress response. If someone is more stressed about lying, their systolic blood pressure could rise (Mayo Clinic Staff 1). Systolic blood pressure measures the pressure that is on the

arteries as blood is being pushed through the arteries. A blood pressure cuff is used to record the examinee's blood pressure. Breathing patterns also offer insight into stress levels. In order to monitor respiration rates, the pneumo strap is connected to the examinee a few minutes before the test starts so the polygraph machine can pick up their respiration rates before the test begins. In order to see change, the examiner compares their respiration rates before the polygraph test to the examinee's respiration rates during (Labott-Stewart 1). Many examinees try to control their breathing pattern by trying to control their upper body movements which is the reason for the upper and lower body sensors. The upper and lower body sensors pick up any movements from the examinee and are not trying to control any physical reactions to pass the test. For example, many people try to clench their toes or squeeze their hands to try to control their physical reactions (Mulroy 1).

In order to test the validity of polygraph testing, you have to be able to tell the difference between a failed or passed test. A misconstrued idea is that the examinee is tested to fail or pass by each question but that is not true; if an examinee lies on one question, then they fail the whole test. Polygraphs are still sometimes used as evidence in cases and are known to be up to 90% accurate when done professionally (Vogel & Baran 3). Even though polygraph tests are known to be 90% accurate people still try to find ways to trick the test in order to pass it by doing certain movements such as clenching their fist, curling their toes or by changing their breathing pattern.

There are not as many studies associated with polygraph testing and minors and polygraph tests are used less frequently with minors than adults. The main issue found with administering polygraph tests on minors is that most children have short attention spans and their

intelligence levels have not developed enough for the complexity of the polygraph test, so they figured it would be unfair to use polygraph tests as evidence in juvenile centers (Craig and Molder 1). The youngest known age of polygraph testing on juvenile minors is the age of six. A study known as the Abrams study was conducted with forty students grades fourth through eighth and the results showed that it is harder to detect deception the younger the person is. The results showed that for “4th and 5th grades detection of deception rates were 69 percent and 57 percent compared to the grades sixth through 8th the detection of deception rates were between 83 percent and 94 percent” (Craig and Molder 1). Testing among minors has not been accepted as evidence as much as they would for adults because the younger the person is it will be harder to get the accurate data from their test.

This study will be testing the validity of polygraph testing by testing high school girls grades ninth through twelfth by using only two of the four normally tested psychophysiological reactions. The hypothesis was that polygraph testing on minors would not be as accurate at showing deception. The two psychophysiological reactions that will be used in the study to test the validity of polygraph testing are galvanic skin response and respiration rates. This study fills in the gap for the lack of polygraph testing with high school students. In the article ‘The use of law enforcement polygraph test with juveniles’” spoken about above, the study only covered the accuracy of polygraph testing with grades fourth through eighth. In another article, ‘Police Questioning of Minors: The Best Truth Verification for Juvenile Suspects’, that also covers polygraph testing on minors they state that they have to take extra measures such as controlling how much stress the child is under and having an environment where they would feel the most comfortable (CVSA 2). It can become difficult doing testing on minors because you can find

difficulties trying to find ways to control certain things to make them comfortable. However this study covers polygraph testing on the grades ninth through twelfth which will further test the theory that it is more challenging to detect deception on minors.

Experimental

Participants

A convenience sample of twenty-five high school girls grades ninth through twelfth were chosen to participate in this study. All participants were students from The Neighborhood Academy which is a college preparatory school located in Pittsburgh, Pennsylvania. All participants were either African American or bi-racial; there were eight ninth graders, five tenth graders, seven eleventh graders, and five twelfth graders who completed the study. The class roster was used to recruit the amount of students needed from each grade. Everyone that was asked to participate in the study agreed to sign a consent form to take the polygraph test. A copy of the consent form is given in Appendix A.

Equipment

Electrodermal activity and respirations were recorded using an electrodermal attachment and a pneumo strap from BIOPAC. Two disposable electrodes (BIOPAC part #EL507) were placed on the palm of each participant's non-dominant hand. Sensors were connected to a BIOPAC MP36 4-channel student lab system and measurements were recorded using the Student Lab Biopac application. Files were named using a numeric code representing each participant and stored on a separate server from the key matching names and codes.

Procedure

The testing procedure followed a script (Appendix B) that was modified from a professional script used by Assured Polygraph Services when administering an acquaintance practice test (Corcoran, Kevin. Personal Interview. 18 November 2019). The acquaintance test began by welcoming the examinee, making them feel comfortable, asking the examinee to turn off all electronics, explaining what the polygraph test will consist of, applying the sensors and explaining what each sensor is for, signing a consent form, explaining test behavior instructions, running through a practice test, and beginning the test and recording the data. The numbers test is a test that has seven numbers vertically on a piece of paper with a blank space for number four. The examiner asks the examinee which number is missing and the examinee fills in the number four, after the examiner asks in the order the numbers are written did the examinee write each number and the examiner will say no for every number. The reason why the examiner says no to everyone including the number four they wrote is for the polygraph test to pick up their normal physical responses while not lying and when lying to be able to see a difference.

Data Analysis

In order to analyze the data, the Biopac Student Lab 4.1 was used which is the program that was used in order to collect the data. The main focus in order to tell if deception was detected was EDA. After each question was asked, the examinee would have five seconds to give a response or not so I would check within that five second mark to tell if there was an increase or decrease within their EDA. To tell if there was a decrease or increase we would look at the initial point their EDA was at before the question and where the line for EDA was within five seconds after the question was asked.

Results and Discussion

Out of the 25 polygraph tests performed only four of them were used to show deception accurately. Figure 1 illustrates a professionally administered polygraph test that shows what an EDA response should look like for deception compared to non-deception. This was referenced as an example when performing our own data analysis. While analyzing the data, the tests were separated into four different categories depending on the results after the test were analyzed. The categories used were false positives, significant response to question four, bad data due to a poor signal or error, and false negatives. Figures 2-8 shows representative data from individuals in each of those categories

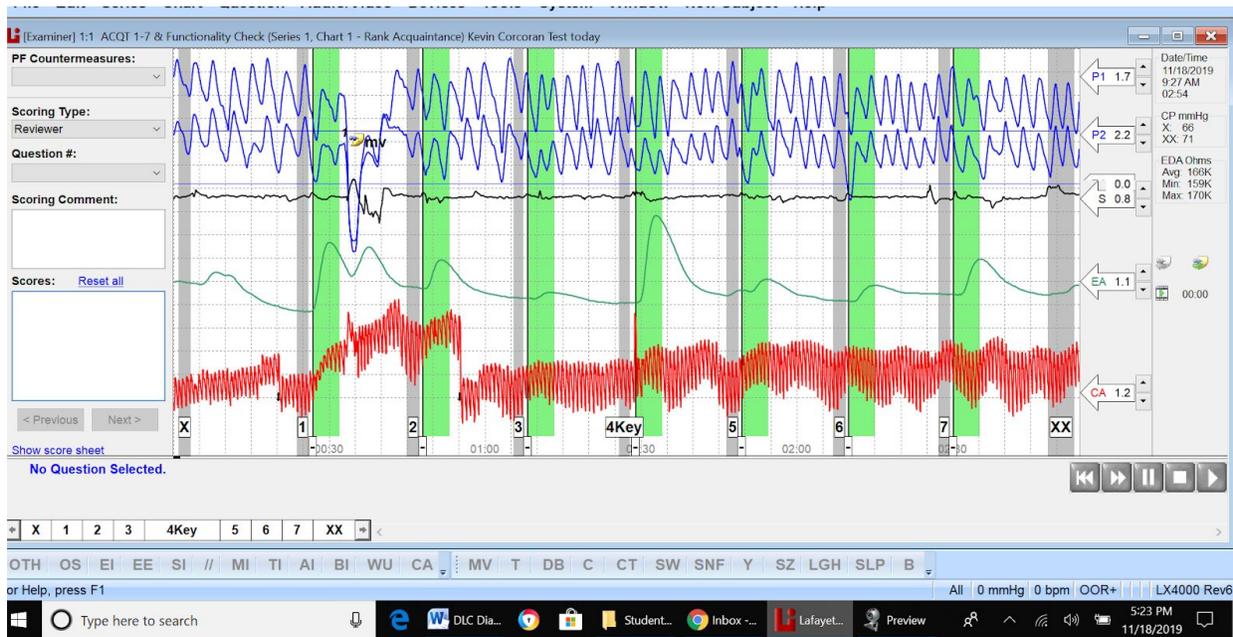


Figure 1. Results from a professionally administered practice test on the author by Kevin Corcoran at Assured Polygraph Services. The electrodermal response is in green which indicted deception because of the huge increase after question 4.

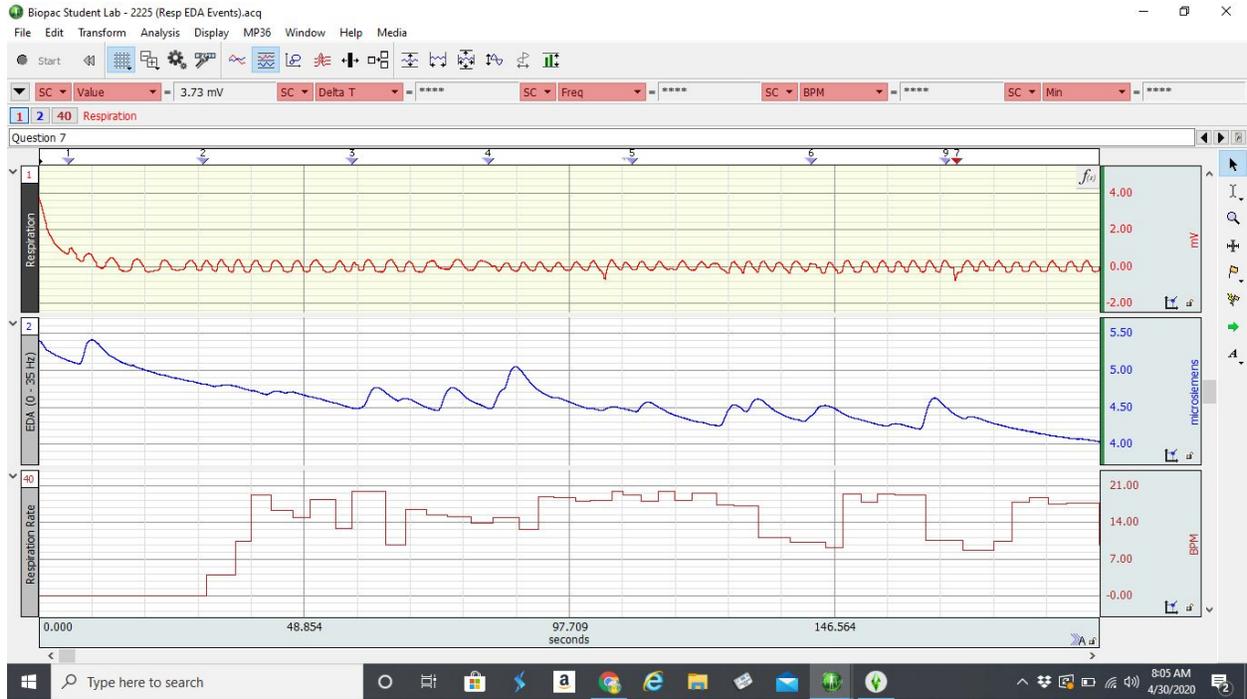


Figure 2. This is the best test that shows detection of deception out of the four people in this category because of the huge increase in the person's electrodermal response after question 4. Electrodermal response is indicated with the blue line in this polygraph test.

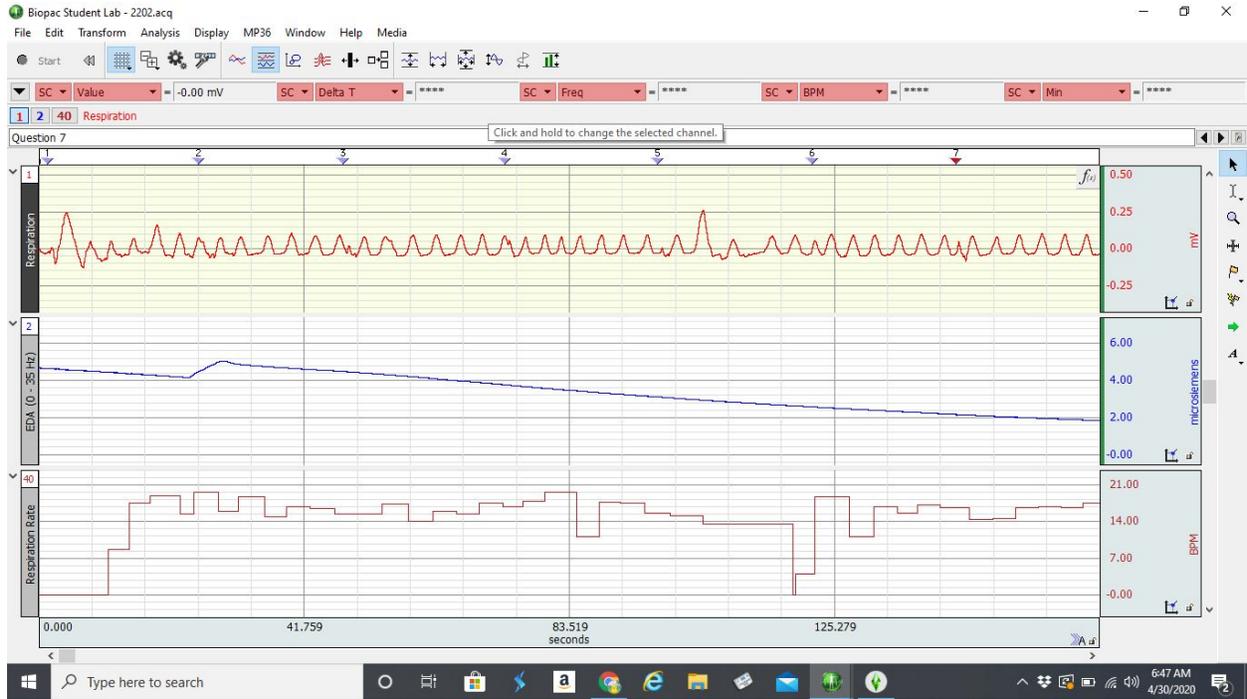


Figure 3. This is an example of a false negative which means that there was a response to another question but there was not a response to question four. Eleven of the examined tests were put in the category of false negative test. When looking at the person's electrodermal response, there was an increase after question two was asked but there was no response to question four.

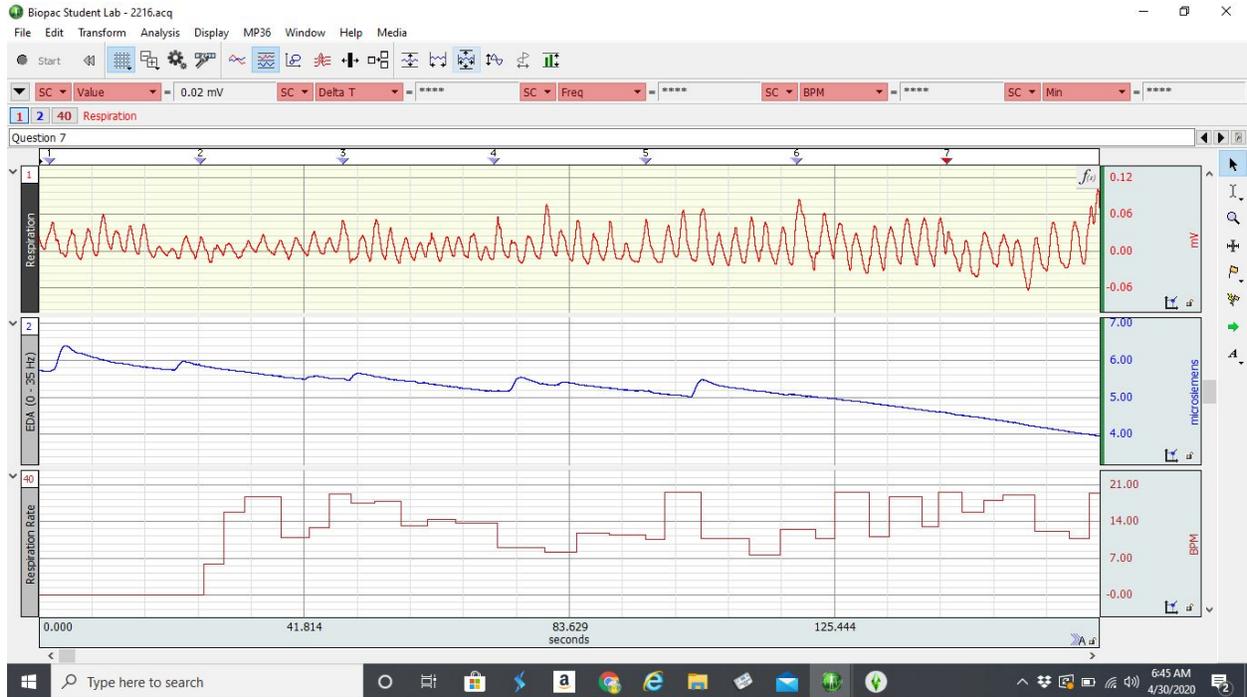


Figure 4. This is an example of a false positive which means there was a response to number four but the person also shows significant responses to other questions being asked as well. By looking at the blue line which shows the person's electrodermal response, you can see the person had a response after every question except for six and seven. Seven out of the twenty-five students tested were put into the category of a false positive test.

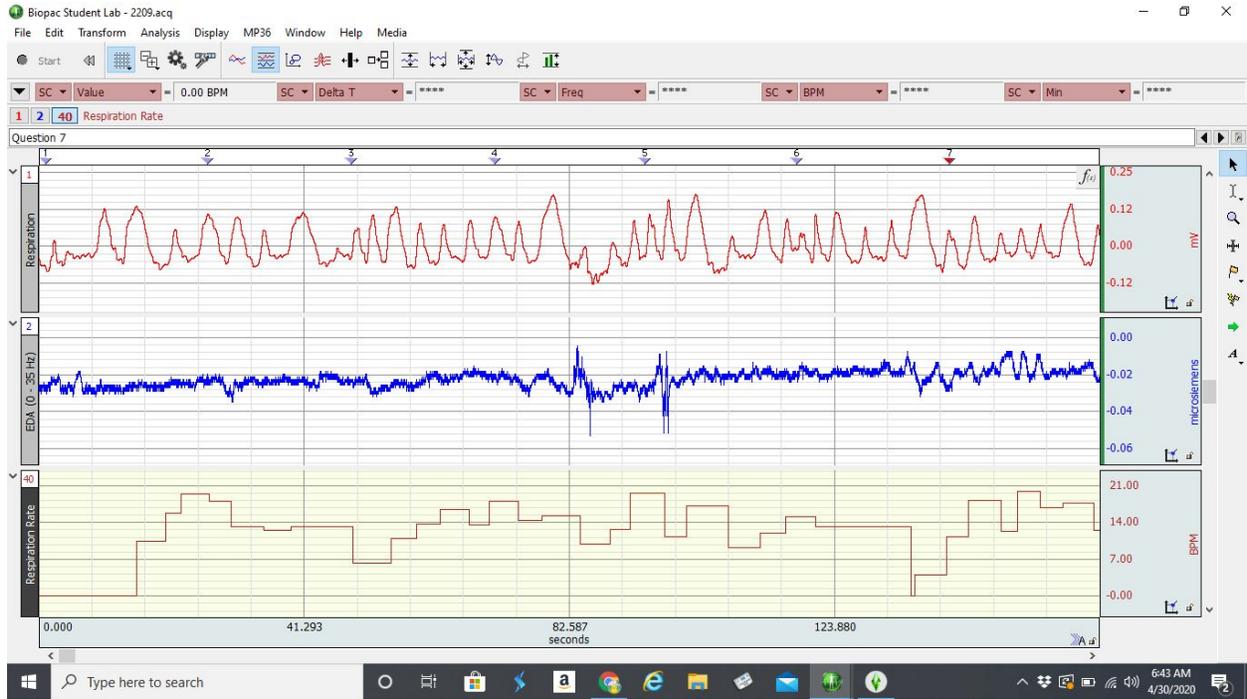


Figure 5. The image above is an example of bad data that was not able to be used within the study because the equipment was not applied correctly or there was a poor signal while collecting the data. Three of the tests were considered as bad data. If you take a look at the numbers next to the EDA data, you can tell that the person's range of EDA values was shown to be in the hundredths place which is not possible.



Figure 6. While the focus was on EDA in order to detect deception in one of the case studies collected, the examinee did not give any response within their EDA, however the person's respiration rates had a significant decrease and rise after being asked question four.

Conclusion

Analyzing EDA without professional training led to poor accuracy in detection of deception because without the proper training it was harder to tell if there was deception or not. The results collected agrees overall with the statements and explanations given on polygraph testing on minors. Most of the data was not able to detect deception correctly mainly because a lot of people had an electrodermal response to other questions instead of number four. The results correlate most with the Abrams study because both studies were testing minors and participants were told to lie in order to detect deception. Although in both studies the participants were supposed to lie, each study was not able to do a good job at detecting deception.

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Appendix A: Consent Form

CONSENT TO POLYGRAPH (LIE DETECTOR) TEST

Tajah Alexander

Dr. Nutbrown

I, _____, agree to participate in the polygraph (lie detector) test. The results that will be collected from the polygraph test will be used as the data in my, Tajah Alexanders, Senior Seminar project.

I agree that I have not been forced to submit to this test or to sign this consent form and I understand that I have a legal right to refuse to submit to this test.

Examinee

Date

Appendix B: Script

Welcome

Before we get started, if you have any electronics on could you silence them or turn them off and I want you to know that it is okay to feel a certain level of anxiety or nervousness right now. So, if you do feel that way, it is okay and normal.

Expectations

I will give you an overview of what to expect today. The testing process should take approximately 10 to 15 mins. I will explain the polygraph instrument and sensors being used. I will also explain where they go on your body and what they do; I will administer a practice test called an acquaintance exam to you to get you acquainted with what it is like to take a polygraph and get you settled in.

Applying the Sensors

Let me take a moment to explain the sensors that we will use today. I will be using these electrodes to monitor your Galvanic skin response which measures the increase of sweating on your palms. Also, I will be using this chest strap which monitors any of your upper body movements.

- **Take a deep breath in and release WHILE APPLYING STRAP**

Test Behavior Instructions

Do you have any objections to taking this test today? I am going to read aloud the consent and release form. If you have any questions, please ask me. *Read the consent and release form to the examinee*

“I, _____, agree to participate in the polygraph (lie detector) test. The results that will be collected from the polygraph test will be used as the data in Tajah Alexander’s Senior Seminar project.

I agree that I have not been forced to submit to this test or to sign this consent form and I understand that I have a legal right to refuse to submit to this test.”

Begin (eye contact)

I am going to do a practice test. In preparation for the practice test, I have a series of numbers on this piece of paper. You will notice that there is a number missing. Which number is missing? (four). I want you to write a big number four on that blank line.

Now, what I am going to do during this practice test is I am going to ask you in this order,

“Did you write the number 1?” “Did you write the number 2?” “Did you write the number 3?” “Did you write the number 4?” “Did you write the number 5?” “Did you write the

number 6?” “Did you write the number 7?” What I want you to do is answer NO to each question, including to the number four. When you say the required NO to the number four,

that is obviously incorrect because you and I both saw you write the number four, and that is exactly what you are instructed to do here. Any questions? When you answer NO to the

other numbers, you are answering them truthfully and correctly. This will also give me an opportunity to observe normally expected physical responses. What I am going to do now is

I am going to review this with you, and I want you to answer NO to each question including to the number four, so you know exactly what you must do during the practice test, so let’s

practice: “Did you write the number 1?” (NO), “Did you write the number 2?” (NO), “Did you write the number 3?” (NO), “Did you write the number 4?” (NO), “Did you write the

number 5,” (NO), “Did you write the number 6,” (NO), “Did you write the number 7?”

(NO). Good job, that is exactly what I want you to do during this practice test.

[Note that actual test will take longer because you will wait 20 seconds between each question.]

Begin the actual Test

Do not speak throughout the test unless answering yes or no to the questions being asked, and please stay as still as possible.

“Did you write the number 1?” (NO), “Did you write the number 2?” (NO), “Did you write the number 3?” (NO), “Did you write the number 4?” (NO), “Did you write the number 5,” (NO), “Did you write the number 6,” (NO), “Did you write the number 7?” (NO).

- **20 seconds between each question**

- (3 mins altogether)

ACQUAINTANCE TEST FEEDBACK

Excellent! Thank you for participating in my Senior Seminar project.

- Can you go get _____ so I can begin their test?

The Death of Len Bias: *The Pittsburgh Post-Gazette's* Coverage of the War on Drugs

Diamani Boyd

Humanities Senior Seminar

Spring 2020

Abstract

The purpose of our study was to see how race, criminality, and drug usage were portrayed by *The Pittsburgh Post-Gazette* during the War on Drugs. Our newspaper analysis was unique because it was centered around the public overdose of Len Bias, a famous, black NBA player. By analyzing coverage of cocaine usage before and after his death, we could see how the media impacts its readers' perceptions of drugs and drug users. We found that while *The Post-Gazette's* coverage was not explicitly racialized, cocaine usage was linked to criminality, which is often associated with black Americans. Finally, we found that prison was painted as a saving grace, which could lead people to think that prison is the answer to America's drug problems.

Introduction

In the 1970s and 80s, Nixon and Reagan passed many laws that created the War on Drugs. Many of these laws enforced higher incarceration rates within the black community. This was because jail sentences for using and selling crack cocaine were harsher than for powder cocaine. This would have a devastating impact not only on individuals who were arrested, but also on their families and communities.

Why were harsher laws enforced while Nixon and Reagan were in office? The media portrayed African Americans, particularly men, to be the perpetrator of criminal behaviors. News scripts associated young black men with crack cocaine, and tied crack use with violence and criminal behavior.¹ By doing this, the media influenced its audiences to take harsher stands against drug users, which could impact the policies created by politicians.

Our study aimed to see whether *The Pittsburgh Post-Gazette* tied race, drug use, and criminality together in its reporting. To do this, we conducted a newspaper analysis of all articles on cocaine published in June of 1986. This month was of interest because a famous NBA player, Len Bias, overdosed on cocaine. By analyzing whether this death had an impact on the reporting, we assessed whether the media may have led audiences to demand harsher drug laws.

Literature Review

In 1970, President Nixon implemented the Controlled Substances Act. Although he had not yet declared it, this law began President Nixon's War on Drugs. His stated motivation for the War on Drugs was medical safety. In his speech to Congress on June 17, 1971, Nixon referred to

¹ Franklin D. Gilliam and Shanto Iyengar, "Prime Suspects: The Influence of Local Television News on the Viewing Public," *Midwest Political Science Association* 44, no. 3 (July 2000): 561, JSTOR.

drug abuse in the US as, "public enemy number one."² Nixon used the term public enemy to describe drug use, but it was clear that he had other enemies that he was targeting with the War on Drugs. Nixon's aide John Ehrlichman said, "You want to know what [the War on Drugs] was really all about. The Nixon campaign in 1968, and the Nixon White House after that, had two enemies: the antiwar left and black people."³ Ehrlichman's quote showed that Nixon had different motives than what he publicly displayed. Ehrlichman insinuated that Nixon's War on Drugs was in part an effort to get reelected in 1972. By incarcerating black voters, who were less likely to vote for him, and energizing many white, Southern voters, Nixon used the War on Drugs to get votes.

Nixon requested \$350 million dollars for drug enforcement. This was an additional \$155 million from the year before.⁴ Moreover, Nixon's 1970 Controlled Substances Act enforced the schedule level of drugs, mandatory sentences, and no-knock warrants. Some of these new laws seemed illogical. For example, marijuana was classified as a schedule 1 drug. The 1972 commission that advised the President on drug policy, "unanimously recommended decriminalizing the possession and distribution of marijuana for use."⁵ However, Nixon declined to take this recommendation and created the Drug Enforcement Agency (DEA) in 1973.

With the same intentions as Nixon, Reagan attempted to rid the United States of drugs. Reagan re-announced the war on drugs in 1982, making his vice president, George Bush, the Chief Coordinator of the drug policy. Cocaine use was increasing in the 1980s, and by 1986

² Richard M. Nixon, "President Nixon Declares 'War' on Drugs," *Gale in Context: U.S. History*, last modified June 17, 1971.

³ Nixon, "President Nixon."

⁴ Nixon, "President Nixon."

⁵ "A Brief History of the Drug War," Drug Policy Alliance, accessed October 18, 2019, <http://www.drugpolicy.org/issues/brief-history-drug-war>.

crack was cheap and available in a lot of places.⁶ Although drug use had increased in the US, the drug policy wasn't the only policy that Reagan was trying to enforce.

Black people are held accountable at a much higher rate than other demographics, and were arrested for crimes that whites and hispanics actually committed at higher rates. For example, despite the fact that whites and Hispanics made up 66% of crack users, 80% of those arrested for crack were African American.⁷ African Americans not only got arrested more often, but they also served more time in prison. On average, African Americans serve 3.5 years more for drug offenses than white Americans.⁸

Another major problem with Reagan's drug policy was that he did not stop the problem at its root, meaning he did not make an effort to contain the big drug traffickers. Although the Reagan administration wanted to target major traffickers, the DEA and police forces tended to target street level dealers instead. Seventy-Three of crack defendants were low-level drug users.⁹ These policies were punitive; Reagan decided to throw drug addicts in jail rather than helping them. Instead, Reagan could have invested money in rehabilitation centers or other resources that get at the root of why people are using drugs to face their problems.

Reagan believed that harsher jail sentences would deter drug use. This brought on the Anti-Drug Abuse Act on October 27, 1986. The Anti-Drug Abuse Act established different mandatory minimums for crack rock versus powder cocaine. Reagan wanted the mandatory minimums to be different for crack rock and powder cocaine because he stated that they were two different drugs. However the only difference there is that they were prepared differently, and

⁶ Deborah Vagins, "Cracks in the System: Twenty Years of the Unjust Federal Crack Cocaine Law," *ACLU*, October 2006, 1, accessed November 4, 2019.

⁷ Vagins, "Cracks in the System," 1.

⁸ Vagins, "Cracks in the System," 3.

⁹ Vagins, "Cracks in the System," ii.

crack rock is made with baking soda. Despite this, under The Anti-Drug Abuse Act, five grams of crack rock equaled a minimum of five year federal prison sentence while it took five hundred grams of cocaine powder to equal the same sentence.¹⁰

Reagan wanted the mandatory minimum to be different between the two drugs because he believed that crack caused more violent behavior. This is simply untrue. Out of 414 violent crimes in New York City in 1988, only three involved crack, and in two of those cases the crack user was the victim.¹¹ Reagan also believed that crack caused psychosis and death at higher rates than powder cocaine, but crack cocaine has been shown to be no worse than powder cocaine. In 1988, the act was amended to put maximums on sentencing so people would not be sentenced harshly. However, for crack the max was 20 years, while for powder cocaine the max was one year.¹² This led to a large racial disparity in the prison system. With mass incarceration, by the end of the 1980s there were more black people in jail for nonviolent drug offenses, than there were white people for violent crimes. The Drug Policy Alliance stated that, “the number of people behind bars for nonviolent drug law offenses increased from 50,000 in 1980 to over 400,000 by 1997” (See Image 1).¹³

¹⁰ Vagins, "Cracks in the System," i.

¹¹ Vagins, "Cracks in the System," 5.

¹² Vagins, "Cracks in the System," 5.

¹³ "A Brief History of the Drug War," Drug Policy Alliance, accessed October 18, 2019, <http://www.drugpolicy.org/issues/brief-history-drug-war>.

Incarceration rates skyrocket in recent decades

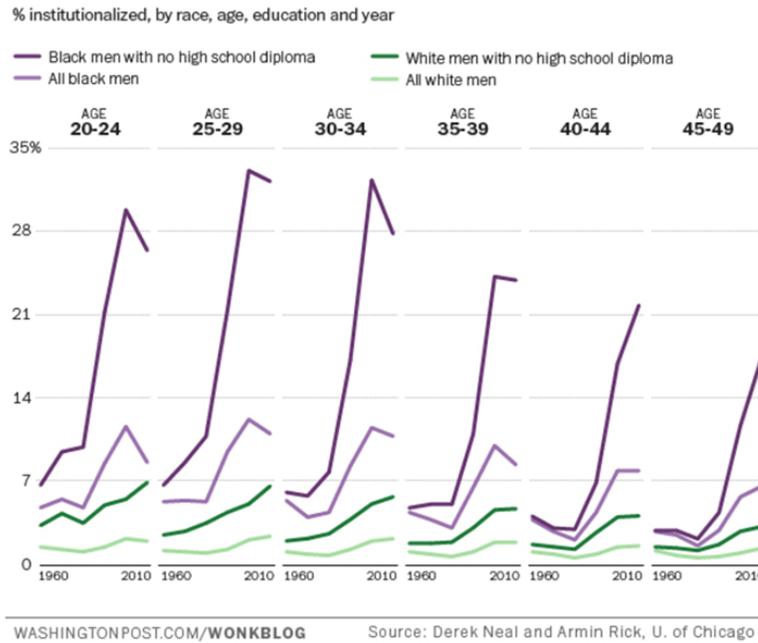


Image 1. Race and Incarceration Rates During the War on Drugs.¹⁴

The War on Drugs didn't end with Reagan, even after Reagan was out of office numbers were still skyrocketing. Between 1980 - 2000 the number of incarcerated people rose from 300,000 to over 2 million.¹⁵ Reagan's policies had long-term negative impacts on many people, particularly on African Americans. How did those policies come to be? Why did the general public largely support them? To understand this, it is necessary to look at the impact of the media.

¹⁴ Sandro Galea, "Families and the Effects of Mass Incarceration," School of Public Health, last modified June 26, 2016, accessed October 18, 2019.

¹⁵ Michelle Alexander, *The New Jim Crow: Mass Incarceration in the Age of Colorblindness* (New York: The New Press, 2012), 6.

The Impact of Media

Today, television shows like *Law & Order* and local news show crime as a, “made-for-TV version of the criminal justice system.”¹⁶ TV shows and local news often don’t show anything further than criminals being dealt with by putting them in jail. The show assumes that the streets are safe after a criminal is put in jail. This ignores that incarceration often does not have a happy ending for that person or their community. Alexander argues that the media does not focus on the corrupt criminal justice system, like police stop-and-frisk policies or pushing innocent people to take plea deals.¹⁷

Additionally, the media can lead people to think that race can be a determinant for probable cause. If they associate blackness with criminality, they give police more room to suspect criminal behavior, or probable cause. This was seen in Melissa Barlow’s media analyses of cover stories about crime from *Time* and *Newsweek* magazines between 1945-1990. Barlow’s thesis says that the media starts portraying young black men as criminals because of militant civil rights activists. She stated that, “crime began to be racialized in the current form in the 1960s, when criminals began to be equated with ‘young black males.’”¹⁸

Franklin Gilliam and Shanto Iyengar conducted an experiment to see if news viewers associated race and ethnicity with violent crime and criminal behavior. To do this, Gilliam and Iyengar played tv news scripts, showing different groups a white, black, or no perpetrator. Out of the group that viewed a clip with no perpetrator, 60% claimed they saw one. 70% of those people

¹⁶ Alexander, *The New Jim Crow*, 59.

¹⁷ Alexander, *The New Jim Crow*, 59.

¹⁸ Melissa Hickman Barlow, "Race and the Problem of Crime in 'Time' and 'Newsweek' Cover Stories, 1946 to 1995," *Social Justice* 25, no. 2 (Summer 1998): 177, JSTOR.

claimed the perpetrator was black.¹⁹ Because viewers associated criminality with blackness, they also began associating crime with individual failings of African Americans, particularly black males.²⁰ When asked why crime was so rampant, many people agreed to the statement that it was due to, “failure of some groups in society to instill proper morals and values in their children.”²¹ This is saying that black parents and communities fail to raise children because a parent is in jail but ignores why so many black males are in jail in the first place.

Hypotheses

This study analyzed 64 articles that referenced cocaine in *The Pittsburgh Post-Gazette* in June of 1968. The first hypothesis states that *The Pittsburgh Post-Gazette*'s coverage of crack cocaine use will be racialized. Gilliam and Iyengar's experiment showed that news viewers associated race and ethnicity to violent crime and criminal behavior.²² The second hypothesis states that *The Post-Gazette*'s coverage will link cocaine usage with criminal behavior. In Barlow's analysis of *Newsweek* and *TIME* cover stories from 1945-1990, she found that the media portrayed young black men as criminals.²³ Finally, the third hypothesis states that *The Post-Gazette*'s coverage of Len Bias' death will call for stricter incarceration policies. In October of 1986, only four months after Bias' death, President Reagan signed the Anti-Drug Abuse Act, which established higher mandatory minimums on crack cocaine users.²⁴

¹⁹ Franklin D. Gilliam and Shanto Iyengar, "Prime Suspects: The Influence of Local Television News on the Viewing Public," *Midwest Political Science Association* 44, no. 3 (July 2000): [Page #], JSTOR.

²⁰ Gilliam and Iyengar, "Prime Suspects," 565.

²¹ Gilliam and Iyengar, "Prime Suspects," 565.

²² Gilliam and Iyengar, "Prime Suspects," 5.

²³ Barlow, "Race and the Problem," 177.

²⁴ Vagins, "Cracks in the System," 1.

Methods

For this project we conducted a newspaper analysis of *The Pittsburgh Post-Gazette*. To locate articles, we used the Carnegie Library Database to access *The Post-Gazette's* archives. We filtered our search using the keyword "cocaine" to pull results from June 1 - June 30, 1986. This date range was used because Len Bias overdosed and passed away on June 19, 1986. By looking at articles before and after his death, we can see how the newspaper reported on cocaine laws and use before and after his public death. June 1986 was also a critical time to look at drug coverage because President Reagan would sign the Anti-Drug Abuse Act into law on October 27 of the same year. Analyzing newspaper articles is important because it can point to why laws surrounding drug use change because the media can influence its readers.

Results

Our first hypothesis was that the coverage of crack cocaine would be racialized. Our newspaper analysis did not support this. The *Post-Gazette* tried to avoid mentioning any kind of race except for when it came to reports of international drug smuggling. In domestic cases of drug dealing, race was never brought up. Additionally, photographs rarely were presented next to drug cases, making it impossible to know the race of the person being profiled. Even though *The Post-Gazette* was generally not racialized, one article did have slight racial overtones. In this article, Mike Littwin, a writer for the *Post-Gazette*, stated that, "Bias was a 22 year old, and his life was uncommonly good...He wrote poetry, he was intrigued by interior decorating, he lived a life within himself."²⁵ This is slightly racialized because Bias was seen as different than the

²⁵ Mike Littwin, "Bias' Life a Broken Promise," *ProQuest Historical Newspapers: Post-Gazette* (Pittsburgh, PA), June 20, 1986, 1.

typical black man: he was exceptional. This painted him in a really positive light, and inherently contrasted him to common people.

Our second hypothesis was that newspaper coverage would link cocaine usage with criminal behavior, which was supported by our newspaper analysis. *The Pittsburgh Post-Gazette* had multiple articles that linked cocaine usage with criminality, young Americans, and violence. For example, Deborah Vagins, an author from *The Post-Gazette*, reported that, “56% of the people tested at the time of their arrests for serious crimes in New York and the nation's capital were found to be using illegal drugs.”²⁶ This is in contradiction with other reports from the time period however. In a 1988 study on violent crime and drug use in New York City, of 414 violent crimes, only three involved crack, and in two of those cases, the crack user was a victim.²⁷

In many articles *The Post-Gazette* painted crack as a more violent drug than cocaine. One example was an article highlighting Newark, New Jersey’s school district, which initiated an “Attack on Crack.” *The Post-Gazette* stated that, “ “The 55,000 students in the state’s largest city learned the deadly lesson of “crack “ yesterday, as teachers dropped usual morning subjects to talk about the highly potent and addictive form of cocaine.” Although this shows that it was widely believed that crack was more addictive and harmful than powder cocaine, *The Post-Gazette* did not correct this false assumption.

Although race and crack were not explicitly tied together in *The Post-Gazette*, the newspaper did use some coded language. Melissa Barlow argued that coded language can link young black people to crack usage and violence without explicitly tying them.²⁸ For example, in

²⁶ "Newark Schools Teach Students the Deadly Lesson of 'Crack'," *ProQuest Historical Newspapers: Pittsburgh Post-Gazette* (Pittsburgh, PA), June 14, 1986, 1.

²⁷ Vagins, "Cracks in the System," 6.

²⁸ Judith Baughman et al., "The War on Drugs," *American Decades* 9, no. 5 (2001): 152, Gale in Context: U.S. History.

a piece on Russell Morris' life, *The Post-Gazette* claimed that he was, "a victim of the Miami lifestyle,"²⁹ and stated that crack was an inner-city problem. Readers could easily understand that these words targeted black and brown communities, who were a visual symbol of the inner-city.

The third hypothesis, that the coverage of Bias' death would lead to stricter sentencing laws, was partially supported by our newspaper analysis. While the newspaper highlighted already strict laws around drug sentencing, it also painted prison as a saving grace. This can lead readers to think that prison rehabilitates drug users more than it actually does.

The Pittsburgh Post-Gazette showed that drug laws had inconsistent and often harsh sentences for drug users and sellers. For example, the paper reported that, "two Penn Hills men who sold a half-pound of cocaine...face a maximum sentence of 75 years in prison."³⁰ This harsh sentence was settled before the mandatory maximum for powder cocaine was passed in the amended Anti-Drug Abuse Act of 1988.³¹ Although the paper painted the picture of punitive drug sentences, it did not explicitly call for stronger sentences after Bias' death. In fact, the paper showed the need for immunity laws in order to punish sellers instead of users of drugs.

The Post-Gazette showed that immunity was given during the Len Bias case. The night of Len Bias' death, two of his friends, Speedy Jones and Terry Long reported to the doctors that, "Lenny had one beer."³² They were afraid of being punished for Bias' cocaine use, and therefore were not completely truthful. In order to get people talking, *The Post-Gazette* published multiple articles that referenced immunity. They published that attorney Alan Goldstein, who represented

²⁹ Barlow, "Race and the Problem," 177.

³⁰ "East Brief," *Post-Gazette* (Pittsburgh, PA), June 19, 1986, 1.

³¹ Deborah Vagins, "Cracks in the System: Twenty Years of the Unjust Federal Crack Cocaine Law," *ACLU*, October 2006, 2, accessed November 4, 2019.

³² John Eisenberg, "Questions Surround Death of Bias," *Post-Gazette* (Pittsburgh, PA), June 20, 1986, 1.

several of Bias' friends, said his clients, "will testify if granted immunity."³³ That being said, Marshall, the judge in the case, "will not grant immunity to anyone who supplied cocaine to Bias."³⁴ A case like this will lead us to believe two things. First, the public actually wanted sellers, not users, to face harsh punishments. Second, it showed that athletes seem to have more leeway when it comes to the law, a theme that was in the coverage of cases outside of Bias' death, too.

Despite the fact that the *Post-Gazette* called for more lenient immunity laws, they still influenced their readers to think that prison was the answer to stop drug crimes. Several articles highlighted cases in which people said prison saved them, but none focused on mounting evidence of recidivism. One example that highlighted prison as a saving grace was an article about Stacy Keach, an actor who was back on tv after cocaine arrest. *The Post-Gazette* stated that, "Free of the cocaine habit that landed him in a British jail for six months, Keach said of his life now, 'It's a day-to-day existence, but I feel very good, and lucky to be alive.'" ³⁵ Keach was arrested in 1984 for smuggling 1.3 oz. of cocaine into England and he was sentenced for nine months but was released early. In another case, a man named Russell Morris took what was called the black man's cure: prison.

"'It was almost a relief when the sirens went off,' Morris says now. His wife claims the day he was arrested, his prayers were answered. After serving 3 years in prison his wife claims 'Now he's found God. That's changed him around a whole lot. He needed that little solitude, to be left alone.'" ³⁶

³³ Eisenberg, "Questions Surround," 1.

³⁴ "Former Kiski Star to Testify about Bias," *Post-Gazette* (Pittsburgh, PA), June 24, 1986, 2.

³⁵ "Mike Hammer to Be More like Stacy Keach in Fall," *Post-Gazette* (Pittsburgh, PA), June 18, 1986, 1.

³⁶ "Mike Hammer," 1.

When *The Pittsburgh Post-Gazette* shows prison as a saving grace, it avoids the fact that most people are not saved by prisons. Once people are in jail, they are most likely to go back, which is called recidivism. Mass incarceration has lasting negative outcomes not only for the individuals incarcerated, but also for black families and communities. Over 11 percent of black kids have an incarcerated parent compared to 1.8 percent of white children.³⁷ More than half of imprisoned parents were the breadwinners in their homes before going to prison.³⁸ Mass incarceration, therefore, leads to intergenerational cycles of poverty.

Conclusion

Trying to control a drug problem, President Nixon and Reagan put millions of black people in jail, leaving them to deal with the cycles of poverty, recidivism and mass incarceration. Many authors have conducted experiments in trying to see how the media portrayed black people, criminality and cocaine usage during these presidencies. Our newspaper analysis aimed to see how these factors were portrayed or connected in *The Pittsburgh Post-Gazette* in June, 1986. We found that *The Post-Gazette* did not explicitly tie race with crack cocaine usage, but instead it tied crack with criminal behavior. This is important because we know that many peoples' implicit biases lead them to connect crack and criminality with black perpetrators. Finally, *The Pittsburgh Post-Gazette* did not explicitly call for stricter drug laws, but they painted prison as a saving grace. However, not everyone who goes to jail was saved from addiction. Recidivism rates remain high, which hurts not only the individual but also their families and communities.

³⁷ Galea, "Families and the Effects," School of Public Health.

³⁸ Galea, "Families and the Effects," School of Public Health.

There are many areas for expansion in this research. Future researchers should conduct analyses on television news coverage. This could be interesting because unlike newspapers, tv offers a visual script for its audiences to view. Researchers should also try to learn more about news reporters, and the biases that they themselves may have. Finally, as more immigrants come to the United States, researchers should look into how news sources report on criminality and all people of color in the United States. The media is important in shaping its viewers' attitudes and can have a huge impact on their perceptions and the nation's policies.

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Academic Performance in African American Students:

School Belonging and Identity

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Abstract

Past research has shown that school belonging and identity congruence with one's school is correlated with academic performance. The reasoning behind this study was to investigate if identity congruence and school belonging did in fact matter at a small, college preparatory high school with a 100% African American student body. We hypothesized that identity congruence and school belonging were positively correlated with academic performance. Students (9th-11th grade) were asked to describe their school as if it were a person only using five adjectives. A week later, students were then asked to take a school belonging questionnaire and describe themselves using five adjectives. We compared the results of the adjectives used to describe their school, so that we could measure the identity congruence between the students and the school itself. We found that there were no significant correlations with identity congruence or school belonging to academic performance. Since a majority of the adjectives used to describe the school were negative, this may explain the lack of relationship for identity. Furthermore, because of the limited variance in belongingness in the school, we were unable to come to a conclusion about the role of belongingness in this specific sample. Our study suggests that there should be additional research on this topic.

Introduction

How one identifies with their community has a big effect on their development both socially and academically (1). In this study, we researched how student's identification with The Neighborhood Academy will affect their overall academic performance. The importance of this study is to make teachers and administrators aware of how their students' grades may be affected by how they fit in with school. School belonging, as shown in previous studies, is positively correlated with academic achievement (1, 2, 3). If students' grades are affected negatively because they do not identify with or feel like they belong in the school, then addressing this lack of identity might help improve academic achievement for a better future. The issue of belongingness and academic achievement is especially important for African American students. In Pittsburgh, African American students are on average 2.2 grades behind white students (4). Therefore, focusing on identity may create a solution for decreasing that gap in academic performance.

School/Group Belonging Academic Performance

School belonging is dependent on who a student's friends are and how much that student and group identify with the school. One study found that the higher the group identity the better cooperation and better outcome for the group, even when faced with a collective failure (5). For TNA, the more a student identifies with their friend group, the better they should perform academically because they have a higher sense of group identity. Other research has suggested that if the student has friends that do worse in school, then they do worse too, and if you identify more with your friends than the school then that lessens the effect of school belonging (6). In correlation with TNA, if everyone is failing then they will blame the school, but if one student individually is failing in their friend group then they will blame themselves and not the school.

Ting Liang focuses on the correlation between school belonging, academic emotions, and academic achievement. Self-determination theory describes the direct relation between school belonging and academic achievement. It states that the inner need to develop connections with other peers can create a positive effect on one's performance. Through making those connections it satisfies the students' need to have relatedness contributes positively to motivation, engagement, and learning. These positives are mediated by academic emotions- positive and negative emotions that motivate behavior (7). In their study, 407 junior high students completed a survey. The researchers found that the school belonging and achievement relationship was mediated by positive activating emotions. This suggests at TNA, students with a higher sense of school belonging will likely do better academically, especially if they are geared towards learning.

School Belonging and African Americans

School Belonging for African American students and their academic performance is particularly unique compared to school belonging in a general sense. For African American students, school belonging is how well the students identity matches with the school's but also whether or not they're affected by stereotype identity threat. Not only does stereotype identity threat play a role in affecting academic achievement, but also cultural-ecological theory. Booker breaks school belonging down as part of cultural-ecological theory. Stating that, "student academic achievement is a direct result of dynamic interactions occurring between individuals and social context in terms of the school environment." The theory feeds directly into stereotype identity threat because if the student has a bad experience with a group or norm, they feel as if they do not belong with the culture because of their ethnicity, which negatively affects their grades (1). Booker found through her studies that African American students that feel as if they don't belong in school perform worse because they believe more in stereotypes and have a negative interaction while trying to fit in. This theory directly relates the idea that culture within a school is critical for African American students to develop a strong sense of school belonging and therefore increase academic achievement.

Robin Goode completed a smaller study that states that a female African American's academic performance may be more affected not only by self identity but also their gender (2). So if they feel as if they do not receive the help and support that they feel is necessary for them to thrive academically then they will academically feel worse because they do not feel like part of the school. This feeling of not belonging is not only amplified by the fact that they're a minority but simply because they are a compounding factor in today's society being a female and an African American. For female students in TNA it is important for them to receive support and help not only peers but more so teachers for them to develop a stronger sense of school belonging to academically perform better.

A strong sense of belonging and positive interactions with the majority group within a school improves academic performance (8). There are also other factors that feed into the school belonging and academic such as: the identification-connection divide and the participation-identification theory. Black students must initially identify with the purpose of the school, to feel like they belong, so that they succeed. Firstly, the identification-connection divide is the perspective of black students wanting to do well and belong but because of negative interactions with the majority group makes it hard to do so. In TNA's case, the majority are the black students so having a negative interaction with a group of students makes them feel like they are not part of the culture. As previously mentioned by Booker African American students require a strong supportive culture to develop a strong sense of belonging.

Secondly, the participation-identification theory states that students must participate and identify with the positive purpose of school in order to succeed. This highly correlates with how TNA's system works, because if the student does not participate in class as a student their grade will generally reflect that you do not participate. Source H focuses on school belonging dependent on likeness, comfort, and tolerance in school communities but mainly for black students. For most black students in this study they felt that the less amount of differences between them and their peers that occurs makes them feel as if they belong. At TNA there are small amounts of major differences between students so the application of that idea barely correlates. For African American students have a distinct relationship with effort and academic achievement. If African American students are more geared to to learn and participate in class in order to exceed and break racial boundaries they perform better academically. With TNA it is generally a part of the curriculum to participate in class to at least stem effort into succeeding and getting good grades.

Identity

Identity is dependent on how one perceives themselves. The identity is also dependent on how strongly one associates with their culture and also where they grow up. Khanna states that, during the era of Jim Crow segregation, a percentage of those with lighter skin chose to pass as white. Now it seems that those with lighter skin choose to identify as black (9). This is due to the ability of bi-racial people to make choices. Bi-racial people may choose to identify as black or white depending on their surroundings or the current situation and which will benefit them most. At TNA this type of situation rarely occurs given that the majority of the students are African American. However, the idea that changing how a person identifies affects their ability to academically achieve. This is important because a student can choose to relate their identity with TNA's in order to benefit themselves better. The ability to not just choose but also to change how you feel is important because it directly relates to how your school belonging is affected.

Social and personal identity threats affect how students feel about their place in school. Laar found that students with high ethnic identity and high social identity stereotype threat tended to believe that they were admitted into college due to affirmative action and in turn performed worse. Meaning that students that identify strongly with their race but also believe in the negative stereotypes that are associated with their race perform worse academically. For TNA students this can be particularly true not only if they believe in their stereotype threats but also if they highly identify with being African American. Another point or finding was that students with high ethnic identity and low stereotype belief had no negative effect on their grades, no matter what they believed about the affirmative action (10). The

main implication found in this source was that a strong, positive identity with a group is protective against negative effects on grades. Research also suggests people who feel like they belong to a group that has a bright future, will work harder and perform better academically (5). TNA welcomes African American students with a promise of college and to break the cycle of generational poverty. This leads most students to believe that they are part of a school or group with a better future, which causes them to perform better academically.

The first hypothesis for our study is that students with more identity in common with TNA's, will have higher grades. To measure this part of the study we had the students use adjectives to describe themselves and TNA, then choose which adjectives match between the student and TNA. Secondly, we hypothesize that students that have a higher belonging with the school, will have higher grades. Source H stated that african american students with higher belonging due to the culture of the school would perform better academically. We will have students take a school belonging questionnaire then compare the results with their grades to see if the evidence supports the hypothesis.

Methods

The participants for our study were students 9th through 12th grade and faculty that also worked with those students. All the students and faculty were approached during their homeroom period and asked to use five adjectives on individual notecards that they feel describes the school. There are 136 students attending The Neighborhood Academy, which is a private college preparatory school but only 62 students and six teachers participated. The following week, the students were approached again and given a survey that measured school belonging and self identity.

After we received the collective pile of notecards we sorted the adjectives given into multiple general categories. Once the notecard pile is sorted we handed the categories out to teachers and seniors to review the piles for reliability. If there was disagreement, the issue was discussed until agreement. The reviewers agreed with us on 97% of the words. Then, when we collected the surveys and after having them filled out by students we determined their identity congruence by counting how many of their adjectives matched the categories. We then retrieved the GPAs of the students that filled out the survey to see if school belonging and identity congruence were related to their grades.

Category Name	Total Cards	Percent Student Cards	Common Words
School Care : +	60	83%	Caring, supportive, small
School Ignorance : -	42	100%	Unorganized, Broke, forgetful
School Fun : +	30	96%	Funny, smart, lively
School Toxicity : -	22	100%	Toxic, annoying, Stressful
School Hypocrisy : -	16	100%	Secretive, Fake, Hypocrites
School Motivation : +	15	8%	Enduring, Resilient, Purposeful
School Chill : +	15	100%	Calm, Chill, Close knit
School Stress : -	7	100%	Stressful, Draining, Mentally Exhausting
School Boredom : -	4	100%	Boring

Table 1. Adjectives Used to Describe School. The table above shows the categorized notecards from adjectives that students used to describe the school. The rows are organized in order of least to most amount of cards in each pile.

Results

The topic of this project is to research and find the relationship between identity congruence and school belonging to overall academic performance. Students were first asked to describe TNA (The Neighborhood Academy) as if it were a person using five adjectives. Then, a week later we came back around and had students fill out belonging and identity questionnaires to match. The Identity questionnaire was meant to categorize their adjectives used to describe themselves with the positive and negative groups of adjectives associated with the school. While the belonging questionnaire was meant to measure the sense of belonging TNA students had with TNA. Then, both were measured against their GPAs.

We found that the 11th grade had the lowest average belonging (26 ± 8.5) but the highest average GPA (3.6 ± 0.7) between the three grades that were tested. Surprisingly the 9th grade had a higher average GPA (2.8 ± 0.4) than the 10th grade (2.4 ± 1.6) even with having a slightly less average belonging score (27.2 ± 5.0 vs. 28 ± 2.8). The school GPA for 9th-11th grade was averaged to (2.9 ± 0.5). There were six faculty and 62 students involved in this study. (M= 30.6%, F= 69.4%)

In order to investigate the relationship between positive identity congruence and GPA, we conducted a Pearson correlation coefficient test. We compared how many positive adjectives used to

describe the person to how the school was described. There was no significant relationship between positive identity and GPA ($r(60) = -0.03$, $p = 0.42$). This suggests there is little to no connection between positive identity congruence and how one does in school.

Furthermore, the relationship between negative identity congruence and GPA, also had little relation ($r(60) = 0.2$, $p = 0.1$). Finally, we performed a third Pearson correlation coefficient test on total identity congruence finding that there was also barely any relation between identity itself and how well a student performed academically ($r(60) = 0.2$, $p = 0.03$). Belonging and GPA had little to no relation with each other just like identity and GPA as did ($r(60) = -0.03$, $p = 0.4$). The lack of relationship is also shown here in this scatter plot below.

School Belonging vs. GPA

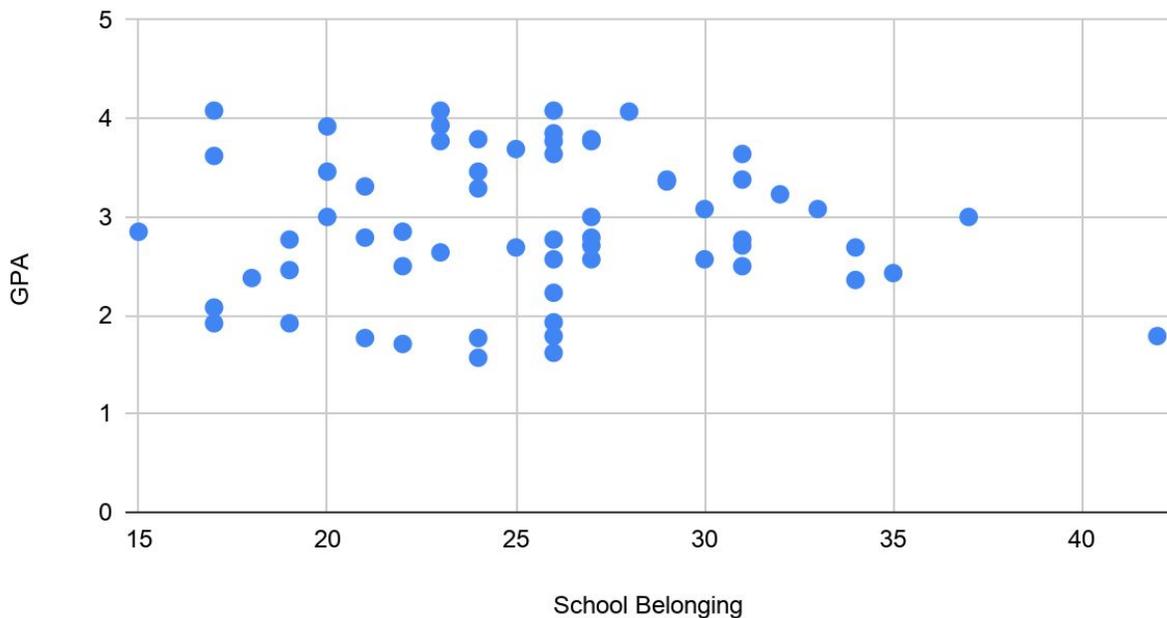


Figure 1. Relationship between School Belonging and GPA. *The figure above shows the weak relationship between students' school belonging and their overall academic performance ($r(60) = -0.03$, $p = 0.4$). The samples of 62 students showed that there was no correlation between how much one belongs to school and one's GPA.*

Discussion:

We tested the relationship between academic performance and school belonging, while also testing the relationship between academic performance and identity congruence. After testing we found that our first hypothesis relating academic performance and school belonging was not supported at all

(Figure 1). For the second hypothesis there was no relationship found between academic performance and identity congruence with TNA, meaning that the hypothesis was not supported by the given evidence. The relationship was not found for positive, negative or total identity congruence.

Our research focusing on the relationship between academic performance and belonging was inconsistent with prior research (7). One source found that for African American students' academic performance had a positive relationship with belonging. Keonya Booker, found that bonds of association tend to give students a strong sense of belonging, which provides for the distinct relationship between academic achievement and effort. The relationship between academic achievement and effort is specific for African American students that can be negatively associated or positively associated with each other. Altogether, we suggest that academic achievement is more dependent on what kind of school a student goes to and where they go to school. Because TNA is so small and students and teachers know each other well, there might not be enough variation in belongingness, compared to a normal high school, limiting our ability to measure school belonging.

The results of our research focusing on identity congruence and academic performance were not consistent with prior research as well (8). One study implied that students with a strong aboriginal cultural identity, or a white culture identity (they go to majority white school), tend to do well in school. More so we hypothesized that students with more identity congruence with TNA's are more likely to have higher grades because it would be in accordance with cultural matching theory. The Cultural Matching Theory is the idea that students with more identity congruence with school and teachers do better overall. In our study, students saw TNA negatively, with 73% of words used were negative. Therefore, students' identity congruence did not match with the school's, as they used only positive words for themselves. This disconnect means that we cannot make any broad conclusions about the role of identity at TNA.

There were four main limitations for our study as a whole in the study that we believed could have benefited the results of our study. One, which was our biggest factor, was that we only used TNA for collecting data, instead of using other surrounding schools to help better identify the relationship between academic performance and identity congruence and belonging. Another limitation was that we used the 9th- 11th grade instead of the entire highschool which we believe time affects a student's sense of belonging. If the middle school were to report their school belonging we feel as if they would record a higher score because the programming for the middle school is centered around belonging.

Thirdly, we also believed that we could have used more positive categories as opposed to negative categories for identity congruence. This is so that there would not be a one sided group of negative identities for the school and to increase the variety within the project itself. Having more positive inputs would result in more variability within the project, allowing us to better determine if there's a

relationship between academic performance and identity congruence. Finally, if we used a different belonging test like the Psychological Sense of School Membership test there might have produced more varied results. The reason being is because the PSSM scale is a longer test, which leads us to believe that it would have measured belonging more accurately and with more adding variance.

For future research, the first thing we would recommend is that we use the entire highschool instead of 9th-11th grade to provide more variety. Variety will overall just add more detail to the relationship between belonging, identity congruence and GPA. Then after adding more involving the entire highschool body we can add more categories to see if it'll do better at showing the relationship between belonging, identity congruence and GPA. More students means more categories because that adds more mindsets which also adds different opinions on the school so it'll overall add more variance in categories.

The major takeaway is that belongingness at TNA may still matter, even though it was possibly measured poorly in this study. The primary author believes that research supports the idea that school belongingness is important. Events like Blue and Orange, which is an event where the school splits into two sides and competes for points or group events, is an example of positive school belonging, but many students are negative towards it, so they don't give the chance to belong. TNA should focus on activities students already would like, which is what the student government was originally meant to push for. Student government started out strong with advocating for students but started to slow down in doing so because second and third term are the busiest for students within TNA. Students and teachers should consider trying harder to make it feel like they belong and that they could have a place in the school besides being strictly negative. Without these events serving as a catalyst students or teachers will not be motivated to try and build those relationships with each other. The challenge of a small school is that the reputation and opinions carry year to year and are hard to change how students feel towards a subject or teacher.

This project overall shows faculty at TNA that since many students already view the school negatively, it blocks any form of belonging or congruence between the students and school. We suggest that the reasoning behind this is that students already developed an ignorance towards trying to build a relationship with their teachers whether it's because of race, family issues or just prejudice. Therefore due to our results we must conclude that we are unable to give any conclusion about belongingness at TNA.

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Water Quality Study of Pucketa Creek Before Operation of a Nearby Fracking

Wastewater Injection Well

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Science Senior Seminar

The Neighborhood Academy

May 2020

Abstract

Environmental contamination from hydraulic fracturing (“fracking”) and wastewater injection wells is a growing concern. Pucketa Creek is a small creek located in Plum Borough near Pittsburgh, PA, and is downhill from a proposed injection well of hydraulic fracturing wastewater. To establish the initial health of Pucketa Creek prior to operation of the injection well, we collected monthly water samples at three locations along the creek between November 2019 and February 2020. Measurements taken on-site included temperature, dissolved oxygen, specific conductivity, and pH. Water samples were also analyzed in the lab using ion chromatography and inductively coupled plasma-mass spectrometry (ICP-MS) to detect both anions and cations, respectively. Specifically, seven anions were monitored and all were either below the detection limit or within recommended limits for drinking water. Thirty cations of main group elements and transition metals, as well as uranium, were also monitored. Many of these ions were below the detection limit of the instrument for both the transition metals and the group elements. The pre-injection well results show that none of the ions pre-injection wells were dangerous within the series of tests. This study is important because we want to understand if the placement of an injection well can negatively affect freshwater and our results provide a baseline for comparison once an injection well is operating. With our collaboration with Dr. John Stolz, Cassandra Ziegler, and Duquesne University we were able to conduct this experiment.

Introduction

Hydraulic fracturing is a modern method for extraction of natural gas from shale, but this technique generates large quantities of wastewater that cannot be easily treated and recycled. Shale is a sedimentary rock composed of clay and minerals, and geologists have discovered areas where significant amounts of light hydrocarbon gases (e.g. natural gas) are trapped within layers of shale (1). This natural gas can be turned into a mainstream source of energy production. For instance, natural gas accounts for a quarter of U.S. electricity and provides heat for 56 million U.S. residents and businesses (2). Oil companies access this shale gas through hydraulic fracturing (“fracking”), which involves forcing fissures open in subterranean rocks by introducing liquids at a high pressure (Figure 1). The fracking fluid used to force out the shale gas become further contaminated with brine from the shale deposit. Hence, injection wells have been used for disposing of these salty wastewaters underground in depleted conventional oil wells (Figure 1). Spills from injection wells could contaminate surface waters in surrounding areas.

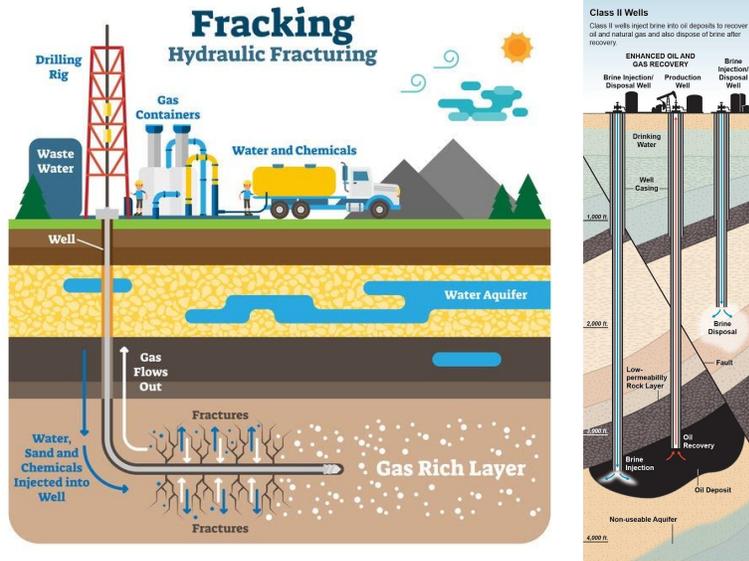


Figure 1. A typical fracking set-up using horizontal drilling (left, 3) and an injection well (right, 4).

The United States is home to over a dozen shale plays, as shown in Figure 2 (5). The Appalachian Basin is home to three major types of shales: Marcellus, Utica, and Upper Devonian (Figure 3) (6). There are a considerably large amount of fracking operations and wastewater injections in southwestern PA. Such growth occurred near Pittsburgh because this region sits on a large amount of Marcellus shale (7). Laws and regulations prohibiting hydraulic fracturing were set up in 2010 in attempts to prevent the growth of fracking in the city of Pittsburgh (7). The main counties where drilling still occurs include Allegheny, Washington, Greene, and Fayette (Figure 4) (8).

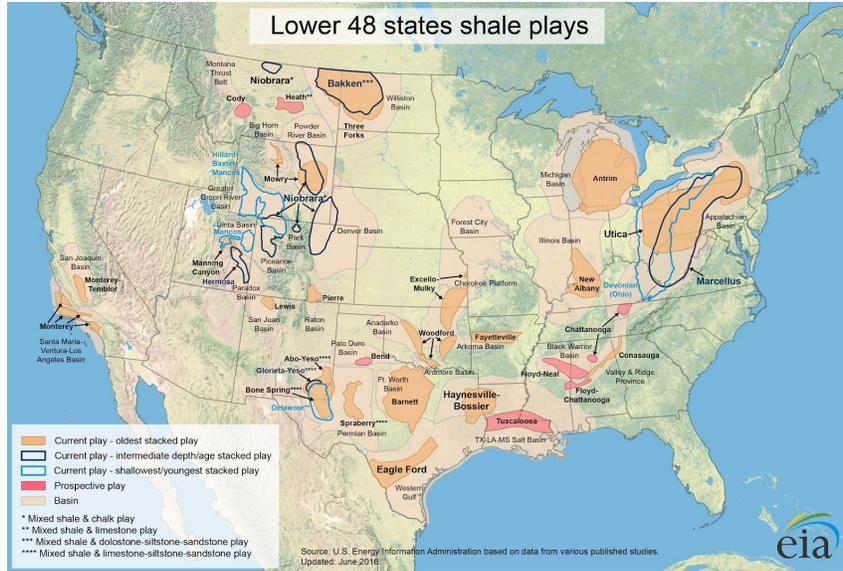


Figure 2. A map showing the lower 48 states shale plays. (5)

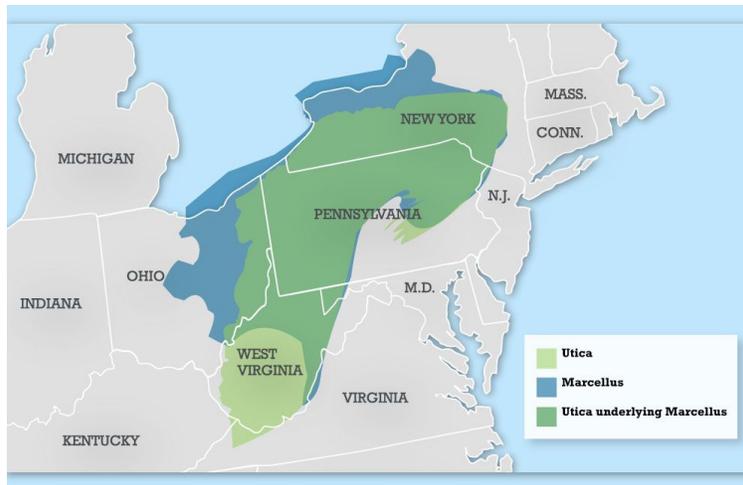


Figure 3. A map to show where in states Marcellus and Utica lie. Utica underlies Marcellus shale. Both Marcellus and Utica shale is heavily located in Pittsburgh. (6)

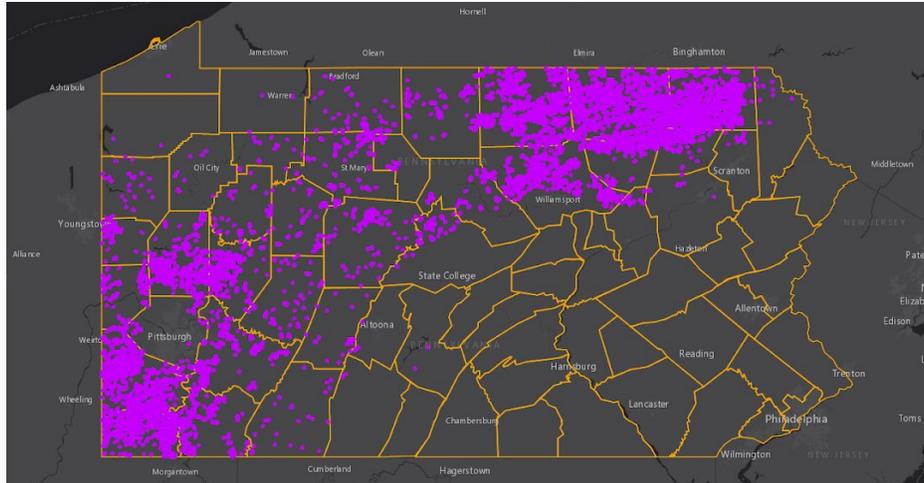


Figure 4. A map indicating locations of Allegheny, Washington, Fayette, and Greene county and county lines that separate other counties in southwestern Pennsylvania. Each purple dot represents where fracking wells are proposed and current fracking wells are operating all throughout Pennsylvania. (8)

Much research in southwestern Pennsylvania has been led by Dr. John F. Stolz, a professor at Duquesne University, who hosted a symposium to raise awareness of fracking in 2013 (9). A series of papers published by Dr. Stolz addressed potential environmental contamination in rural communities in southwestern Pennsylvania near hydraulic fracturing operations (10-14). Contaminations could include volatile organic compounds (VOC), naturally occurring radioactive material (NORM), and total dissolved solids (TDS) (10). Total dissolved solids consist of inorganic salts and some small amount of organic matter that are dissolved in water (10). Because the flowback and produced waters that return to the surface during hydraulic fracturing are high in TDS, contamination in the environment from these waters are likely to be higher in TDS. TDS are measured by specific conductivity, which quantifies electrical

conductivity within the salt waters. Identifying the specific ions present in solution requires ion chromatography or inductively-coupled plasma-mass spectrometry (ICP-MS).

Reports of groundwater contamination in southwestern Pennsylvania community coincided with unconventional shale gas extraction activities that started late 2009 (11). Color was the most common change in the well water used by these households, but indications of weird taste and odor issues have been reported. This was tested over an 18 month period. The lab concentrations selected anions (chloride, bromide, sulfate, phosphate, nitrate, and nitrite) and tested for E. colis. In conclusion they had found that there has been an increase in water issues since 2010 in Southwestern Pennsylvania with results showing elevated cations and anions.

Ions are the main focus in this series of studies conducted by Dr. John Stolz. Several publications investigated the composition of fracking fluid and both surface and groundwater near fracking operations. Ion chromatography is an efficient means to determine anionic composition, but the wide range in anionic content of these fluids poses a challenge to analytical studies developed for “natural waters” (12). The results of this test study indicate that with the use of UV/VI and conductivity detectors, the seven anions were able to be tested (12). Bromide and Chloride were the high concentration anions in this test study. The bromide levels in conventional brines are easily comparable to that of unconventional brines. Flowback and produced water generated by the hydraulic fracturing of unconventional oil and gas plays contain an abundance amount of cations typically in a high salt matrix (13). Here, cation chemical composition associated with natural gas and oil development tested surface and groundwater using ICP-MS and ICP-OES (13). The results were flowback and produced brines that served as their testing waters. High concentrations of the eight ions tested were found.

Previous studies focused more on fracking operations that are active, not the wastewater injection sites. In addition, they focused more on drinking water from wells. Penneco, an oil and gas company, proposed an injection well be placed in Plum Borough to hold waste water. An article by the Department of Environmental Protection (DEP), issues out that they approved the oil and gas company Penneco to build the injection well (15). The people of Plum Borough were not pleased by this due to their concern for their air and water quality. Figure 5 is a topographical map to show the location of the injection well site relative to Pucketa Creek.

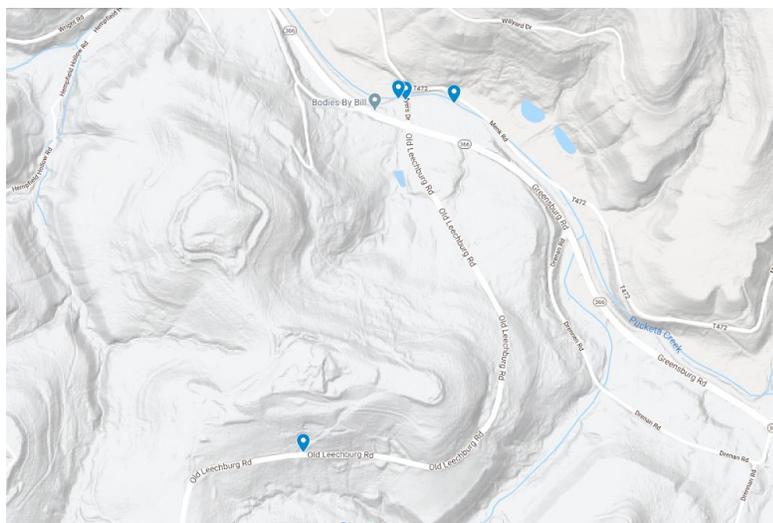


Figure 5. Topographical map of proposed injection well site and water sampling locations along Pucketa Creek.

This research project focused on a stream study to establish the health of Pucketa Creek in Plum Borough before the input of the injection well. The study is to determine if the input of an injection well that stores fracking wastewater may affect the health of nearby water surfaces. We tested this from November 2019 - February 2020. We measured the following data on-site: TDS, temperature, pH, conductivity, and dissolved oxygen. The concentrations of specific cations and anions were measured according to prior research using ion chromatography and

ICP-MS (12-13). These analyses of water samples were made possible through a collaboration with Dr. Stolz and Ms. Cassandra Ziegler at Duquesne University's Center for Environmental Research and Education. Concentration data were then compared to published recommended limits for various ions to assess the current health of Pucketa Creek's water.

Experimental

Water Sampling

Water samples were collected monthly from three sites along Pucketa Creek (Figure 6) between November 2019 and February 2020. Site 1 is an upstream location behind a house, Site 2 is a culvert passing under Myers Drive, and Site 3 is downstream from the culvert by approximately 70 ft.. Water samples for ion chromatography were collected in cleaned and twice-conditioned 1-L glass bottles and temporarily stored in a cooler on ice during transport. The water samples were then carefully stored in a laboratory refrigerator, until they were analyzed via ion chromatography. Water samples for ICP-MS were prepared on site by transferring 100 mL of collected water into a glass bottle that contained concentrated nitric acid



Figure 6. Overview map analyzing the three sites where water samples were collected. (site 1. Upstream Pucketa Creek, site 2. Culvert, and site 3 Downstream Pucketa Creek)



Figure 7. Multiple pictures showing the locations of site one, two, and three of Pucketa Creek.

On-site Water Analysis

In addition to the collection of water for laboratory analysis, water was tested at each site using a YSI Professional Plus multiparameter water quality meter. Two samples were tested at each site on each date of collection. The following measurements were recorded: temperature, dissolved oxygen (% and mg/L), pH, pressure, specific conductivity, conductivity, and total dissolved solids. These data are reported in Table 1 in the Appendix.

Ion Chromatography analysis of anions

Ion chromatography was performed according to published procedures (12). Specifically, the ion chromatography system used by the Stolz lab at Duquesne University was a Dionex ICS-110 with DS6 heated conductivity cell and DAD-3000 UltiMate 300 Diode Array programmable UV/VIS detector. Data were collected and analyzed using Chromeleon 7 Chromatography software. The method was identical to one previously described (12).

ICP-MS analysis of cations

Water samples were analyzed by ICP-MS in the Department of Geology and Environmental Science at the University of Pittsburgh according to the procedure described by Cantlay, et al. (12) (Determining conventional and unconventional oil and gas well brines in natural sample II: Cation analyses with ICP-MS and ICP-OES)

Results & Discussion

The concentration of total dissolved solids (TDS) measured on site by the YSI Professional Plus Multiparameter water quality meter is reported in Figure 8. Site 2 consistently had higher concentrations of TDS than the other two sampling locations. Because the water from Site 2 flows into the creek upstream from Site 3, the TDS at Site 3 are higher than Site 1, and much lower than Site 2 due to dilution. Site 2 is the culvert, which is why we believe it had such a high amount in TDS. A culvert is a tunnel underground in which water travels. By what the graph indicates we came to the conclusion that many TDS were picked up from the roads and traveled through the culvert, leaving TDS within the culvert water. However, the TDS is much lower than the 1,000 ppm concentration limit stated by the World Health Organization (WHO) (16). For drinking water, the US EPA suggests a limit of 500 ppm for TDS, which was only

exceeded at Site 2 in November and December, indicating road salt run-off (17) The TDS measured qualifies the creek as fresh water (18). The concentration of TDS, in general, decreased for all three sites from November to February. This is likely due to temperature-related solubility of salts; specifically, most salts are more soluble at higher temperatures and November had the highest water temperature of all the sampling dates..

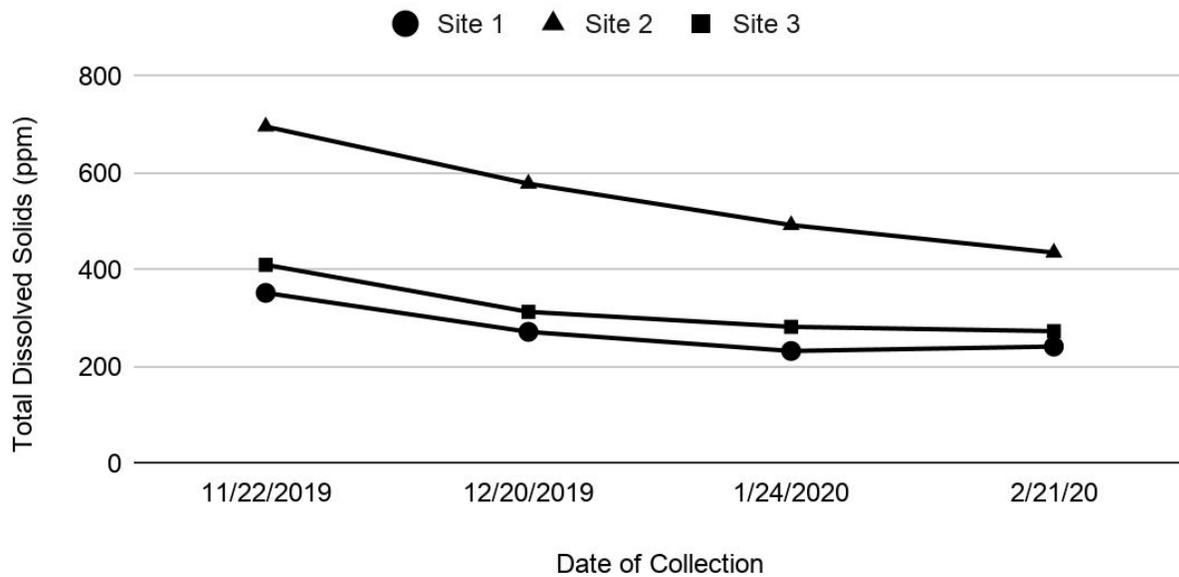


Figure 8. Total Dissolved Solids recorded on every date from the three water sample locations.

Ion chromatography is a method to detect ions concentrated in water; an ion chromatography system was used to measure the concentration of anions in Pucketa Creek. Seven anions were tested, but only three had concentration levels that indicated they were above the detection limit for each date of collection. These were chloride (Cl^-), nitrate (NO_3^-), and sulfate (SO_4^{2-}). Fluoride (F^-) was only detected on February 21, 2020, with a level of 0.1 mg/L. Hence, no other significant concentrations were measured for the other anions, which were

nitrite (NO_2^-), bromide (Br^-), and phosphate (PO_4^{3-}). The concentrations of chloride (Cl^-), nitrate (NO_3^-), and sulfate (SO_4^{2-}) at each site on each collection date is summarized in Figure 9.

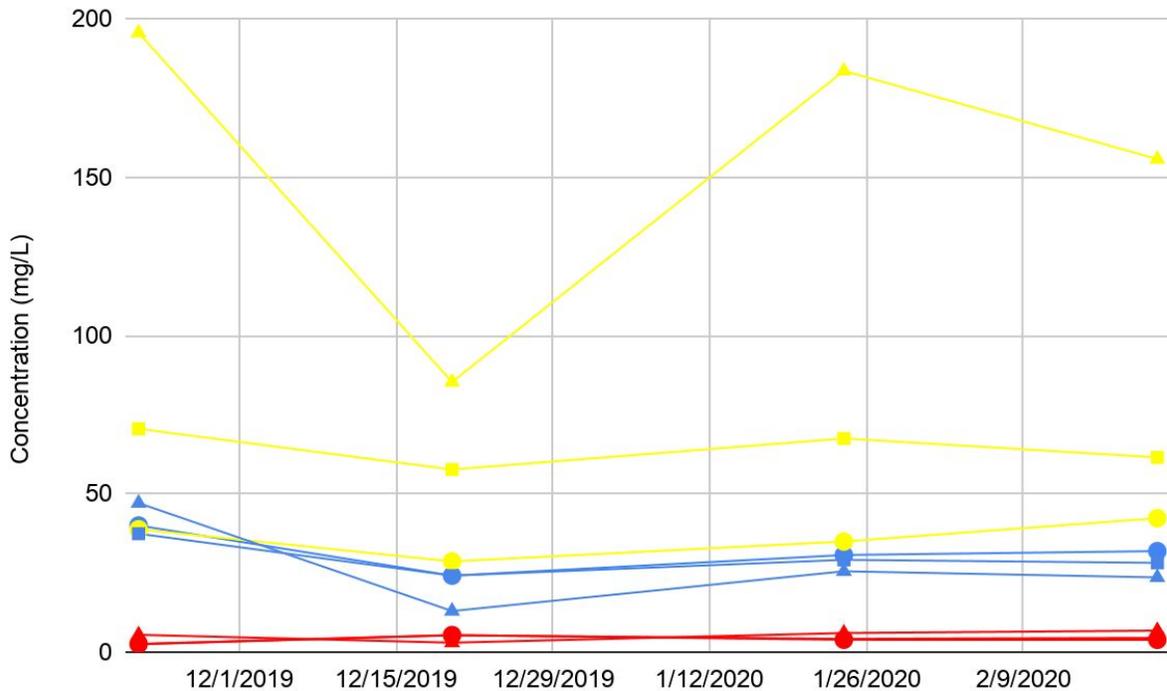


Figure 9. Indicates three measurable ions tested out of seven, and their concentration for every site on every date of collection. Chloride is (blue), nitrate is (red), and sulfate is (yellow). The circles (site 1), squares (site 2), and triangles (site 3).

The concentrations of nitrate, chloride, and sulfate are all under the limit for healthy drinking water and, therefore, are healthy concentrations for surface water, as well (17).

According to Figure 9, chloride and nitrate concentrations remained relatively stable throughout each date of collection. The culvert (Site 2) showed a significantly higher sulfate concentration than the Pucketa Creek samples, which suggests a source of that anion comes from activity

associated with road transportation. Again, even this higher concentration of sulfate is below the limit for drinking water which is 250 mg/L (19) and is not an issue for Pucketa Creek.

ICP-MS data is summarized in Table 1 and Table 2 in the appendix. Table 1 lists concentrations of main group elements. The main group elements with concentrations higher than 1 mg/L included: sodium, magnesium, and calcium. All other elements are either below the hazardous awareness of the instrument or the concentration does not raise concerns. Aluminum was high for drinking water, but it is unlikely to cause negative health effects in the ecosystem. Aluminum concentration limits are .001-0.05 mg/L and the highest it exceeds in our data is 0.4 mg/L(20). This means that throughout the chart the concentration limits for aluminum are considered to be unsafe for drinking. Sodium concentrations in Pucketa Creek ranged between 17 mg/L and 59 mg/L, which is comparable to the 30-60 mg/L concentration recommended for drinking water by the EPA (21). Calcium, along with magnesium, determines how “hard” a water sample is. Calcium carbonate concentrations between 60 mg/L and 120 mg/L are considered to be moderately hard, in our data calcium does not exceed 113 mg/L (22).

The ICP-MS data for transition metals, bismuth, and uranium are given in Table 3 of the appendix. Several ions were below the detection limits. These ions include vanadium, arsenic, silver, and bismuth. (V, As, Ag, and Bi). Cadmium(Cd) was below the detection limit on two of the four collection dates and is unlikely to be of concern. All other elements that had measurable concentrations were still low enough in those concentrations not to raise any concerns about the health of the creek. The rest of the ions were not measurable to compare with safe limits.

This data collected is all pre-injection well. The injection well has not started operating yet. This data shows Pucketa Creek’s water and how healthy it is before the injection well is

built. Therefore, this data will be utilized to compare and contrast the data that we have now (pre injection well) and the data that could be collected after the injection well is built. From the data gathered, we can conclude that Pucketa Creek is very healthy and that there are no concerns that stand out. The anions analyzed do not reach the concentration limits of what would be considered harmful.

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Appendix

Table 1. On-site measurements from YSI Professional Plus multiparameter water quality meter

Site		11/22/2019	12/20/2019	1/24/2020	2/21/2020
1	Temp (°C)	8.65	1	3.2	0.75
	DO (%)	93.95	139.6	128.45	124.4
	DO (mg/L)	10.97	19.8	17.17	17.77
	pH	7.81	8.81	9.27	8.39
	Pressure (mmHg)	738.4	753.95	742.95	754
	Spf. Cond.(µS/cm)	541.4	417.6	356.75	370.85
	Cond. (µS)	372.85	226.6	208.45	199.5
	TDS	351.91	271.44	231.89	241.05
2	Temp (°C)	8.35	3.55	5.15	3.75
	DO (%)	94.2	105.05	133.1	95.95
	DO (mg/L)	11.03	13.88	16.92	12.67
	pH	7.87	8.18	8.8	8.12
	Pressure (mmHg)	738.6	753.95	743.1	753.95
	Spf. Cond.(µS/cm)	1070	888.5	757	669.45
	Cond. (µS)	729	525	469.55	396.95
	TDS	695.5	577.53	492.05	435.14
3	Temp (°C)	7.6	1.3	2.95	0.9
	DO (%)	94.2	108.95	106.8	106.3
	DO (mg/L)	11.24	15.36	14.4	15.15
	pH	7.94	8.15	8.54	8.07
	Pressure (mmHg)	738.8	754.1	743.15	754.05
	Spf. Cond.(µS/cm)	630.8	481.15	433.5	419.75
	Cond. (µS)	421.5	263.1	250.95	226.3
	TDS	410.02	312.75	281.78	272.84

Table 2. ICP-MS Data for Main Group Elements Tested (bdl = below detection limit)

Collection Date	Site	Concentration (mg/L)													
		Li	B	Na	Mg	Al	Si	P	K	Ca	Sr	Sn	Cs	Ba	Pb
11/22/2019	1	0.001	0.03	27.67	9.23	0.024	3.01	0.11	3.35	51.35	0.19	<0.0001	<0.00001	0.04	0.0002
	2	0.003	0.04	58.98	25.43	0.077	4.25	0.12	2.8	113.32	0.92	<0.0001	0.00001	0.05	0.0013
	3	0.002	0.03	32.59	12.61	0.07	3.57	0.11	2.8	65.77	0.34	<0.0001	0.00001	0.04	0.0004
12/20/2019	1	0.003	0.03	17.18	5.85	0.09	3.28	0.1	1.2	28.32	0.15	0.0033	0.002	0.03	0.0016
	2	0.004	0.04	40.8	20.9	0.047	3.23	<0.01	1.22	75.3	0.98	0.0019	0.0007	0.06	0.0008
	3	0.002	0.03	21.83	9.05	0.053	3.21	bdl	1.08	37.13	0.32	0.0012	0.0003	0.04	0.0004
1/24/2020	1	0.002	0.02	19.95	6.98	0.091	2.81	bdl	1.12	33.11	0.18	0.0007	0.00006	0.04	bdl
	2	0.003	0.04	41.16	21.82	0.084	3.11	bdl	1.15	80.29	1.1	0.0005	0.00004	0.07	0.0001
	3	0.002	0.02	21.81	9.04	0.063	2.47	bdl	0.74	37.61	0.34	0.0003	0.00002	0.04	bdl
2/21/2020	1	0.004	0.02	19.59	7.12	0.4	3.32	bdl	0.96	31.11	0.15	0.0019	0.00071	0.03	0.0006
	2	0.004	0.04	40.25	20.75	0.022	3.13	bdl	1.01	68.8	0.82	0.0014	0.00051	0.05	0.002
	3	0.004	0.02	23.31	9.77	0.543	2.94	bdl	0.98	41.71	0.31	0.0011	0.00033	0.05	0.0009

Table 3. Concentration of Transition Metals, Bismuth, and Uranium

Collection Date	Site	Concentration (mg/L)																		
		Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	As	Se	Rb	Mo	Ag	Cd	Sb	W	Bi	U
11/22/19	1	0.004	bdl	0.004	0.02	0.72	0.0002	0.001	0.185	0.016	bdl	0.007	0.0005	0.0012	bdl	<0.0001	0.0001	0.0021	bdl	0.0004
	2	0.004	bdl	0.005	0.11	1.29	0.0004	0.003	0.138	0.02	bdl	0.007	0.0007	0.0009	bdl	<0.0001	0.0001	0.0019	bdl	0.0021
	3	0.002	bdl	0.006	0.07	0.89	0.0003	0.002	0.105	0.013	bdl	0.006	0.0006	0.0004	bdl	<0.0001	0.0001	0.0016	bdl	0.0006
12/20/19	1	0.003	0.002	0.002	0.06	0.21	0.0021	0.005	0.005	0.027	<0.01	0.002	0.0022	0.0026	0.0012	0.0013	0.0033	0.0168	0.0021	0.0015
	2	0.002	0.001	0.002	0.08	0.61	0.0011	0.004	0.005	0.004	<0.01	0.002	0.0013	0.0014	0.0006	0.0006	0.0015	0.0126	0.001	0.0025
	3	0.001	0.001	0.003	0.04	0.29	0.0006	0.002	0.003	0.001	<0.01	<0.001	0.0008	0.0009	0.0002	0.0002	0.001	0.0116	0.0005	0.0006
1/24/20	1	0.001	0.001	0.002	0.03	0.23	0.0004	0.002	0.002	0.002	<0.01	<0.001	0.0005	0.0005	bdl	bdl	0.0007	0.0074	0.0001	0.0001
	2	0.001	0.001	0.005	0.05	0.66	0.0004	0.004	0.002	0.002	<0.01	0.002	0.0006	0.0006	bdl	<0.0001	0.0008	0.0066	0.0001	0.002
	3	0.001	<0.001	0.002	0.03	0.26	0.0003	0.002	0.001	0.001	<0.01	bdl	0.0004	0.0003	bdl	bdl	0.0009	0.005	0.0001	0.0005
2/21/20	1	0.001	0.002	0.002	0.06	0.43	0.0012	0.004	0.003	0.006	<0.01	0.001	0.001	0.0017	bdl	0.0006	0.0024	0.01	0.0009	0.0009
	2	0.001	0.001	0.004	0.04	0.51	0.0007	0.002	0.001	0.003	<0.01	0.001	0.0009	0.0015	bdl	0.0004	0.0017	0.008	0.0007	0.0021
	3	0.001	0.001	0.004	0.08	0.57	0.001	0.004	0.003	0.015	<0.01	bdl	0.0007	0.001	bdl	0.0003	0.0015	0.006	0.0005	0.0009

Airport Security: Constitutionality of Hard and Soft Security

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Humanities Senior Seminar

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Introduction

In 2002, the US government formed the Transportation Security Administration (TSA) to prevent terrorist attacks like those of September 11, 2001 from happening again. TSA made many changes to the way that airport security functioned, both through hard and soft security measures. TSA's hard security, or physical checks of people and luggage, became much more thorough. For soft security, TSA expanded data mining services like CAPPS to cover all passengers. Since this expansion, there has been a lot of debate about the Constitutionality of these expanded searches. Although the hard security measures used in daily airport security are considered constitutional, the unseen soft security measures are unconstitutional because they are hidden from the view of the average traveler.

Formation of the TSA

Airport security has gone through changes in the leadership of the security system. Originally, security was controlled by the Federal Aviation Administration (FAA). The FAA, however, did not have its own security force, so the protocol the FAA had in place was executed by locally hired private security for each airport. The usage of private security for airports was not always as effective as needed, allowing multiple mishaps. During the time period between 1949-1985, there were 1,539 people killed in 87 airplane bombings and 498 successful worldwide hijacking attempts¹. In the time span of 1968-1972 alone, there were 130 hijackings in the United States.² The high demand for a more stringent, universal airport security began shortly after the 9/11 attacks with President Bush signing the TSA Modernization Act on

¹ Aron Driessen, "The Effectiveness of the Change in Aviation Security in the United States of America after 9/11," Aviation Facts, last modified April 2017, accessed November 25, 2019, <http://aviationfacts.eu>.

² Driessen, "The Effectiveness," Aviation Facts.

November 19, 2001.³ This enabled the formation of the Transportation Security Administration (TSA).

TSA has operated under the control of the Department of Homeland Security since its formation in 2003. The head director of TSA is David Pekoske, who finds ways to execute the laws being made by the executive branch. David Pekoske was formerly the Vice Commander of the Coast Guard prior to his nomination for the position as the 7th head director of the TSA.⁴

With TSA taking over airport security, a new controversy was brought about. TSA only covers security at major airports, while smaller airports are allowed to use private security that is approved by TSA.⁵ Some citizens believe that higher paid private security will perform better than the TSA. However, many airports prefer TSA over private security because the equipment has to be maintained by the security force, so the usage of private companies is more expensive for the airport compared to the amount the airport would have to pay for if the TSA ran security.⁶

The regulations of TSA are different from other countries abroad. The International Civil Aviation Organization is in charge of overall international flight regulations, while TSA protocol covers all inbound flights to the United States.⁷ Even though TSA has a robust security system, it is not the most thorough in the world. An example of a difference in security protocol can be seen with the Israeli Airline El Al. El Al has more strict security and thorough searches, which slows down the rate of processing its passengers. The El Al security system also extends outside

³ Major Garrett, "Bush willing to bypass Congress on airport security, House ally says," *CNN*, October 29, 2001, [Page #], accessed January 28, 2020, <https://www.cnn.com/2001/US/10/29/rec.airport.security/index.html>.

⁴ Transportation Security Administration, accessed April 9, 2020, <https://www.tsa.gov>.

⁵ April Gasparri and Brian Stashak, interview by the author, Pittsburgh International Airport, Pittsburgh, PA, November 18, 2019.

⁶ Gasparri and Stashak, interviewed by the author.

⁷ Driessen, "The Effectiveness," *Aviation Facts*.

of the terminal. Prior to entering the airport, each vehicle is scanned for explosives. El Al security mandates that each passenger, luggage bag, and carry on must be scanned by hand, dog and electronically. Ticket buyers are also questioned about the destination of their flight, who purchased tickets, and the reasoning of the trip to pick out possible red flags. Families will even be split up to check if the stories match.⁸ The effectiveness of this does come at the price of efficiency, however. The amount of people El Al processes in a year is about the same as the amount of people US airlines process in two days.⁹ This means very large changes would have to be made to US security in order to handle the volume of US travelers.

Airside Responsibility

Prior to 9/11, airline crews were trained to comply with any perceived threats to the safety of the crew and passengers. After 9/11, the US government and airlines came to realize that this new era of attackers tend to care less about their personal safety and are willing to die to achieve their goals. Airlines quickly changed orders from complying to survive to methods to defend when necessary.¹⁰ An initial method deployed by airlines in the time thereafter included placing metal bars to reinforce the security of the cockpit.¹¹ In February of 2002, a man attempted to break his way into a cabin on a Boeing 777 with reinforced doors. The attacker managed to poke his head through a hole he created within the bottom of the cabin door but was stopped by the copilot, who was wielding an ax.¹² The reinforced door gave the pilots extra time to respond to the incoming threat to the cockpit.

⁸ Driessen, "The Effectiveness," Aviation Facts.

⁹ Driessen, "The Effectiveness," Aviation Facts.

¹⁰ CNN, "Bulletproof Cockpit Doors A Reality," CNN, April 4, 2003, [Page #], accessed April 4, 2003, [https://www.cbsnews.com/news/bulletproof-cockpit-doors-a-reality/..](https://www.cbsnews.com/news/bulletproof-cockpit-doors-a-reality/)

¹¹ CNN, "Bulletproof Cockpit."

¹² CNN, "Bulletproof Cockpit,".

A secondary method of defense from attack onboard a plane is the Arming Pilots Against Terrorism Act of 2002. This brought along the Federal Flight Deck Officer Program, which allowed for pilots qualified by the US Department of Homeland Security to carry firearms to defend the cockpit from possible hijackers or threats.¹³ To prevent any threats from the crew themselves, the FAA mandated mental health checks. According to the FAA, the requirements for pilots are it is required that all pilots undergo a medical exam with an Aviation Medical Examiner. If the pilot is under 40, they must pass the exam annually. If the pilot is over the age of 40, the FAA requires them to be examined every six months. These exams help to ensure that pilots themselves are mentally fit to keep passengers safe.¹⁴

In addition to pilots and crews, air marshals also serve as an important piece of airside security. Their roles grew exponentially after the September 11th attacks. After 9/11, the US government reached a state of "Shock and Lock." Shock and Lock is the act of the government rolling out numerous, strict, and sometimes unnecessary laws and security rules after a state of emergency as an attempt to control the situation and prevent it from occurring again. One result of Shock and Lock was that the government wanted more air marshals after 9/11 to help cover more flights. The high increase in the number of air marshals post 9/11 changed the scope and ability of the program. Prior to 9/11, there were 33 full time Air marshals who were considered elite, meaning that they were in the top 1% of shooters. Intelligence analysis located weak points in security, and Air Marshals were placed in those locations. The requirements to qualify to pass Air marshal training was modified to lower standards after 9/11 to help produce more agents

¹³ Major Garrett, "Bush willing to bypass Congress on airport security, House ally says," *CNN*, October 29, 2001, [Page #], accessed January 28, 2020, <https://www.cnn.com/2001/US/10/29/rec.airport.security/index.html>.

¹⁴ FAA, "Aviation Medical Examiners," *FAA.gov*, accessed April 9, 2020, <https://www.faa.gov>.

because of the inability for many people to meet the older requirements. Once the number of air marshals skyrocketed, the relations the Air marshals once had with intelligence was weakened because of the large size. On October 16, 2005 TSA fully took over the Air marshal program from the FAA.¹⁵

In support of the new additions of air marshals, airside security expanded its methods of profiling passengers on board. The Quiet Skies program is an Air Marshal executed plan which observes passengers for any suspicious activities on flights. The objective of the program is to, “decrease threats by unknown or partially known terrorists...and to identify and provide enhanced screening to higher risk travelers.”¹⁶ Once a passenger is flagged to be placed onto the Quiet Skies list, the passenger stays on the list for 90 days or 3 observed trips.¹⁷ The Quiet Skies program will flag passengers who fly frequently to adversarial places and avoid people clearly traveling for business or family. Air marshals also document and look for any key red flag behaviors exhibited by passengers, such as documenting whether they change clothes or shave while traveling, abruptly change direction while moving through the airport, sweat, tremble or blink rapidly during the flight, use their phones, talk to other travelers, or use the bathroom, among many other behaviors.¹⁸

Landside Security

¹⁵ Brian Michael Jenkins, "The Breach of Security at San Jose's Airport Raises Broader Issues," rand.org, last modified May 13, 2014, accessed October 18, 2019, <https://www.rand.org/blog/2014/05/the-breach-of-security-at-san-joses-airport-raises.html>

¹⁶ Brian Michael Jenkins, "The Breach of Security at San Jose's Airport Raises Broader Issues," rand.org, last modified May 13, 2014, accessed October 18, 2019, <https://www.rand.org/blog/2014/05/the-breach-of-security-at-san-joses-airport-raises.html>.

¹⁷ Camila Domonoske, "TSA's 'Quiet Skies' Program Tracks, Observes Travelers in the Air," editorial, NPR, accessed October 2, 2019, <https://www.npr.org/2018/07/30/633980912/tsas-quiet-skies-program-tracks-observes-travelers-in-the-air>.

¹⁸ Wired Staff, "'Secure Flight' Replaces CAPPs II," *Wired*, , accessed October 2, 2019, <https://www.wired.com/2004/08/secure-flight-replaces-capps-ii/>.

After the formation of the TSA, airports began to use different procedures for landside security. TSA rapidly increased the size of security using metal detectors, x-ray machines, metal detecting wands and pat downs to check for any possible threats. Another new security method used by TSA is facial recognition. Before 9/11, the amount of baggage that received screening for explosives was only about 5%, and screeners missed about 20% of possible dangerous items.¹⁹ Today, TSA requires that all baggage be screened for explosives and that baggage must be tied to a passenger boarding a plane.²⁰

Not every landside search done by TSA has an actual target; these random searches are called symbolic searches. Examples of a symbolic search is a small number of random searches in a subway system of over four million riders a day. The actual chance of catching a terrorist with a bomb is very low, but the searches are done publicly to make people feel safe rather than actually stop a possible bad actor. Symbolic searches also make the public become more comfortable with higher security because the searches make it look as if the searches are working because they have not found anything.²¹

Over the years security abilities have increased to the point where methods and procedures used by TSA could be updated, but TSA is slow to change until proven necessary. For example, today's screening machines are able to detect liquids, but TSA has yet to change the no large capacity liquids ban.²² TSA needs to find ways to become more efficient with the

¹⁹ Libby Nelson, "the US once had more than 130 hijackings in 4 years here's why they finally stopped," vox.com, last modified March 29, 2016, accessed October 18, 2019, <https://my.noodletools.com/web/bibliography.html>.

²⁰ Gasparri and Stashak, interviewed by the author.

²¹ Driessen, "The effectiveness," Aviation Facts.

²² Driessen, "The effectiveness," Aviation Facts.

way it uses its resources rather than wasting time on something that can be monitored by machines.

Although efficiency is necessary, it does come at a cost. Even with the expansion of hard security, TSA airside security still allowed approximately 25,000 breaches for every 7.6 billion passengers, which resulted in thousands of objects getting through security checkpoints. A downside of doing such a high rate of searches allows more room for error. Another alarming example of this issue is the high percentage of mystery guests who make it through security; the average busy American airport misses 95% of its mystery guests.²³

When considering security efficiency and effectiveness, the opinion of the public often greatly impacts the introduction of any new methods. Politicians are less likely to implement an unpopular rule based on what they believe the public will think of them to increase the chance of a reelection. A secondary factor holding back changes are the costs of new security methods. For example, in response to 15,000 rockets being lost during the Afghan and Libyan wars, there was a concept to equip the commercial airlines with anti air defenses, but the price is around 40 billion dollars.²⁴ The idea is considered not practical until a plane is attacked and is labeled as a “high cost, high complaint” situation.²⁵ Many methods are seen as a waste of resources until an attack actually happens.

Hard Security Constitutionality

After September 11, 2001, the government had to change their view of airplanes, which were now not only a form of transportation but also a weapon of mass destruction. This view by

²³ Driessen, "The effectiveness," Aviation Facts.

²⁴ Brian Michael Jenkins, "Aviation," RAND CO., last modified 2012, accessed November 25, 2019, <https://www.jstor.org/stable/10.7249/j.ctt1q60kx.2>.

²⁵ Daniel J. Solove, "INTRODUCTION: PRIVACY SELF-MANAGEMENT AND THE CONSENT DILEMMA," *Harvard Law Review* 126, no. 7 (2013): [Page #], <http://www.jstor.org/stable/23415060>.

the government means that a citizen should not have the same rights when boarding a plane compared to the rights one has when boarding a train or driving a car. Therefore, the government requires that everyone must go through security before boarding a plane. Although the 4th Amendment rules that the search and seizure without a warrant is unlawful, airport security is justified because people give consent to be searched in order to board the plane. Past acts of terrorism, with 9/11 being the clearest example, show that there is a clear need for stringent hard security practices in airports. Despite flaws, TSA implements methods to attempt to protect individuals' rights while keeping the general public safe, and the need for increased security outweighs people's concern for TSA's overreach in its hard security checks.

The 4th Amendment is unclear and complex, and the court continues to be inconsistent in their rulings in cases involving the 4th Amendment. The 4th amendment states that, "The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized."²⁶

The fourth amendment is necessary to the idea of freedom within America because it allows citizens a sense of privacy and boundaries for what is considered intrusion. The fourth amendment brings about the question of what is and what is not considered a reasonable search. The searching of person and property can only be done within a particular location and when there is probable cause to do the search."The right of the people to be secure in their persons, houses, papers, and effects against unreasonable searches and seizures" by stipulating that any

²⁶ Cornell Law, "Fourth Amendment," Legal Information Institute, accessed April 21, 2020, https://www.law.cornell.edu/constitution/fourth_amendment.

search conducted must be made on reasonable grounds. Meaning the security is unable to search people prior to airport grounds or checkpoints. Airport security checks are considered as reasonable searching because the view the government has on planes. Since planes are large, have a high speed, and are full of fuel they are to be considered as a possible weapon when placed in the situation. These searches are to prevent the possibility of a plane being weaponized and are agreed to at the purchase of a ticket in order to board a plane. The use of symbolic searches are not reasonable because they are a waste of resources that can be used elsewhere rather than emotional support. The security puts in checks where they know they are very unlikely to find a dangerous item just for the view of the public. Those types of checks are there to really make the public feel better about security rather than actually finding a possible weapon with low probability.

Hard security not only takes place landside, however. The Air Marshal Quiet Skies Program is another form of airside hard security which is considered constitutional. To defend the belief that the Quiet Skies program should continue to be considered constitutional, Camila Domonoske argued that, “if other citizens can see you, the government and the police are allowed to see you... They're also allowed to keep notes on what they observe.”²⁷ This argument conveys the idea that there is no public privacy. If a person is in view of the public eye, then they are also able to be viewed by the government.

The real concern with landside security deals not as much with the 4th Amendment, but more so with the 14th Amendment. The 14th Amendment deals with the equal treatment of all race, ethnicities and genders. Hard Security is prone to some form of profiling. To combat the

²⁷ Camila Domonoske, "TSA's 'Quiet Skies' Program Tracks, Observes Travelers in the Air," editorial, NPR, accessed October 2, 2019, <https://www.npr.org/2018/07/30/633980912/tsas-quiet-skies-program-tracks-observes-travelers-in-the-air>.

high possibility of racial profiling, TSA follows the reasonable clause rule and a “but/for” rule. This means that when TSA agents see suspicious passengers, they are trained to ask themselves, “but for this person’s perceived race, ethnic heritage or religious orientation, would I have subjected this individual to additional safety or security scrutiny?”²⁸ The training proved to be successful when tested in a study. In 2002 during an observational study, between 5 and 10% of passengers were selected for extra inspection. The study claimed that most of those selected were white, which differed from the control group who had not received the bias training.²⁹

The changes to hard security have been very effective. Since 9/11, there have been zero hijackings in the United States.³⁰ Although the number of global bombings has stayed the same, none of those have taken place in the United States. The fact that people consent to these searches and TSA has implemented successful steps that have been taken to reduce profiling means we should continue to utilize these effective security protocols.

Soft Security Constitutionality

Airport soft security is the scanning of identification and data mining for background information. The soft side of airport security uses this information to both verify each person’s identity and locate any possible threats before they reach the airport.

TSA PreCheck is a well-known form of soft security. It is a government run program that scans an individual's fingerprints and background information for signs of becoming a possible

²⁸ Solove, "INTRODUCTION: PRIVACY,"

²⁹ Deborah von Rochow-Leuschner, "CAPPS II and the Fourth Amendment: Does It Fly," in *Journal of Air Law and Commerce*, [Page 143], previously published in *Journal of Air Law and Commerce*, <https://scholar.smu.edu/jalc/vol69/iss1/6>.

³⁰ Aron Driessen, "The Effectiveness of the Change in Aviation Security in the United States of America after 9/11," *Aviation Facts*, last modified April 2017, accessed November 25, 2019, <http://aviationfacts.eu>.

threat. PreCheck looks for any current or past crime investigations, customs violations and travel history. What makes PreCheck a Constitutional form of soft security is that it must be applied for and is not done without the knowledge of the consumer. Therefore, like many hard security measures, individuals actively agree to the search. Additionally, PreCheck is effective because it allows TSA to focus on bigger threats rather than the common people and frequent travelers.³¹

TSA's PreCheck is more acceptable in comparison to CAPPs because PreCheck is government owned and must be signed up for. On the other hand, CAPPs is a privately owned program that individual airlines can hire in order to look for passengers who have a chance of being a threat to plane safety before that person gets to the airport. This is done through data mining of the ticket holder's information. Unlike PreCheck, CAPPs data mining is done without the knowledge or consent of the passenger. There are several reasons why airlines should stop the use of CAPPs.

First, CAPPs is limited to only screening passengers with baggage, which leaves any passenger without luggage unaffected. This is part of the reason why the 9/11 hijackers got through security. Although 11 of the 19 hijackers were flagged as potential risks, none of them brought bags.³² Since the hijackers did not have bags, the security did not use the information gathered by CAPPs. The CAPPs system has an error rate of 1/1000 when a bag does contain explosives and a .75/1000 rate when a bag does not have explosives inside. CAPPs is not used by all airlines but is being considered to be implemented across the board.

The view towards soft security's process of profiling varies by race. The idea of selective screening was tested during a study and the studying concluded that half as many nonwhites

³¹ Jenkins, "Aviation," rand co.

³²Rochow-Leuschner, "CAPPs II and the Fourth," in *Journal of Air Law and Commerce*, [Page 145].

supported profiling as white study participants. In another study done by Koh, it was concluded that 73.9% of people would rather have selective screening over universal screening if it saved them an hour to get through security.³³ In a study I completed I found that 74% of black respondents disagreed with selective screening while 66% of white respondents disagreed with selective screening.³⁴

Data mining is the process of pulling information from the internet and is used to create a dragnet using information to predict possible security threats. Data mining is believed to be ineffective and is a breach of privacy rights. A computer system is able to profile someone like a TSA agent can, but the computer uses personal data compared to what the agent can see on the surface. The computer pulls purchase history such as online purchases, travel history, ownership of a car, and mortgage information to build a class profile. Although the computer is unable to see a passenger physically it is able to data mine to find out the passenger's ethnicity, gender, and religion based off of the information pulled from social media and official documents. The profiling never really goes away, it just becomes based on a different factor ranging from ethnicity, religion, gender, or class.

Data mining also brings problems with the privacy of travelers. The private company doing the actual data mining for CAPPS allows third party usage from the government. In Shakir's survey of Americans, most respondents do not approve of the gathering of information via private companies and believe it is better to give consent to the government to pull the information themselves.³⁵ Additionally, the error rate of the CAPPS system is extremely high at

³³ Cavusoglu, Huseyin, Byungwan Koh, and Srinivasan Raghunathan. "An Analysis of the Impact of Passenger Profiling for Transportation Security." *Operations Research* 58, no. 5 (2010): 1287-302. Accessed April 21, 2020. www.jstor.org/stable/40983988.

³⁴ Interview by Shakir Daniel, The Neighborhood Academy, Pittsburgh, PA, March 18, 2020.

³⁵ Interview by Shakir Daniel, The Neighborhood Academy, Pittsburgh, PA, March 18, 2020.

around 1%. Although this sounds small, that means over 6 million Americans are flagged without cause per year.³⁶ This is so problematic because people are mistakenly placed on the no-fly list, it is incredibly hard to get off it. Finally, data mining, unlike random hard security, has no “feel better” effect that hard security brings because it is mostly unknown to the public.³⁷ If public searches are meant to make the public feel better about traveling, data mining has no such benefit.

With a third party doing the data mining, personal information can fall into the wrong hands and be misused or lead to identity theft. The government may use the information gathered for unauthorized purposes, and “function creep” is inevitable as other government agencies seek to use data.³⁸ This can lead to arrests at the airport for reasons unrelated to airport security. Additionally, if systems like CAPPs use individual’s search history as a means to predict criminal behavior, this data mining infringes on Americans’ first amendment rights. It is unconstitutional to collect personal data to plug into algorithms to predict future crime behavior for thought crimes.

Finally, the usage of CAPPs and data mining are unconstitutional because the data can be spread through third party sources without permission. During the 2003 Acxiom and Torch case, JetBlue gave away information of clients to the Department of Defense Contractors without permission. The courts ruled that, “although the action was found to be lawful, it violated...the privacy protection policy.”³⁹ This ruling may impact how people conduct themselves when

³⁶ Rochow-Leuschner, "CAPPs II and the Fourth," in *Journal of Air Law and Commerce*.

³⁷ Solove, "INTRODUCTION: PRIVACY,"

³⁸ Solove, "INTRODUCTION: PRIVACY,"

³⁹ NBC News, "Passengers Sue JetBlue over Privacy," *Aviation on NBC News.com*, September 23, 2012, accessed November 25, 2019, http://www.nbcnews.com/id/3087481/ns/business-us_business/t/passengers-sue-jetblue-over-privacy/#.XdvumS2ZPOQ.

purchasing goods or searching the internet. The process of data mining takes away people's first amendment rights if they are afraid to act because of government intrusion.

Conclusion

The Formation of the TSA brought changes to security that helped prevent attacks similar to September 11, 2001 from happening again. The changes brought by TSA serve as a deterrent to occurring attacks on the US with zero attacks since 9/11. To go even further TSA implemented CAPPs to prevent possible attackers from reaching airports at the cost of privacy for the public. This privacy invasion is considered unconstitutional because the average traveler doesn't know about the CAPPs program.

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Don't Take It Personal... or Should You?
The Effect of Personality Based Advertisements on Anti-Vaping Messages

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Introduction

Vaping has become an ever growing controversial issue that is mainly affecting teens. The FDA has received over 1,100 samples of vaping and vaping devices from 25 states with around 895 of these samples connected to patients with lung related issues (1). This prevalent issue has plagued the younger generations of society. Anti-vaping advertisements have been made in hopes of deterring the populus from attemping and or perpetuating this problem, yet previous ads seem to be ineffective (1). The purpose of this study is to use the big five personality traits, also known as the five-factor model of personality, to customize ads tailored to each trait archetype in order to see if this is an effective way to deter teens from vaping.

The five personality traits are as follows, openness, conscientiousness, extraversion, agreeableness, and neuroticism. Openness is described as the depth and complexity of an individual's intellect, imagination or inner life (2). When it comes to tailoring advertisements for those with a strong affinity towards this trait, information/information-emotional advertising appeals can cause consumers to have a positive attitude towards brands and brand choice which creates a higher rate of purchasing (3). It has been noted that there is a connection between personality and eye movement patterns. People with high openness did not differ their mean fixation time between ads showing a photo and one showing information/price. This means open people may be willing to examine the entirety of an idea, even if it is complex (4).

Openness is often described as intellectual stimulation, so according to research, when creating a tailored ad it's best to create a transformational ad rather than an informational one (5, 7). A transformational ad is when an experience is attached with the brand that is being advertised. This form of advertising is intended to help identify the associations of experiences used which, therefore, makes the takeaway from the ad something different altogether (7). The reason this is so effective is due to the fact that open people tend to process non-meaningful stimuli for a longer period of time in their pursuit of seeking information (8). Considering the following, it's safe to assume that an anti vaping ad would be most effective if focused on cases possibly linked to vaping such as hospitalization of young teens due to complications in the lungs and other facts. Hearing about one of their stories would cause an open person to internalize that information, thus making them reconsider any possibility of vaping.

Conscientiousness is the tendency to deny immediate gratification and act in a way approved by most people (2). The data on the connection between personality and eye tracking movements is somewhat skewed. Based on the initial idea of conscientiousness, researchers expected that more focus would go towards price/text ads, but this was not the case, making this personality trait inconclusive (4,

6). With this being said conscientious people still value order, achievement and efficiency (5). With these characteristics in mind, it is still possible to create an effective ad.

Conscientiousness has a goldilocks effect when it comes to the type of ad and attitude towards the ad (7). Due to this happy medium, those with a conscientiousness trait will more than likely favor comparative, two-sided, and informational ads as more favorable (7). Comparative advertising is when competing brands target one another with either a direct or indirect comparison. A two-sided advertisement points out the pros and cons of a product instead of a one sided ad that only shows its good side. An informational ad is the opposite of a transformational ad; its purpose is to convert beliefs and attitudes by presenting information about the product and the brand. With all these favorable factors in mind it is safe to say that an ad giving both the pros and the cons would be the best course of action. Letting a conscientious person make the logical decision with all the information applicable within the ad is the best way to deter them from attempting or continuing to vape.

Extraversion is just one part of the two way spectrum where a person gains/recharge energy through the interactions they have with others. The other half is introversion which is extraversion's polar opposite. Introverts lose energy from interacting with others and replenish this lost energy with solitude (2). Extraversion has a stronger association with graphic ads than ads with price/text. Extroverts seek and are overall better at finding stimulation than the other traits which makes arousal a major factor for extraverts when tailoring their ads (4). When it comes to extroverts' attention towards advertisements, those with intricacy are usually appealing and more likely to resonate with them (8, 5). Considering the two polar personalities within this domain a high level of complexity is usually needed for an ad to be effective.

Extroversion based ads must encompass the type of ads used with the attitude directed towards it. Advertisements best suited for extroverts are transformational and informational ads. Advertisements of this nature are appealing to extraverts since they have a strong affinity towards purchasing intentions and attitude towards the ads (7). It should be acknowledged that extroverts have a strong correlation with the credibility of ads which plays a major role in the ads effectiveness (9). As for introversion there is a connection between body resources and fear response since they are more likely to fear social rejection or financial loss rather than physical harm (10) An ad that shows someone's social standing as questionable due to vaping is likely to deter extroverts

Agreeableness, often confused with extroversion, focuses on the person's orientation towards others. This is based solely on agreeable people's interactions with others (2). Agreeableness is slightly more difficult to design ads for compared to other traits The data varies so much in different testings making the results inconclusive such as the accuracy in pinpointing eye fixations in some ads. Previous

eye tracking tests show that initial attention catchers can vary or the data can just be void depending on what methods are used. These methods are usually conscious/unconscious transfer of traits from one aspect to another (11).

Agreeable people tend to transfer traits in two different manners. The first is brand personality traits transfer (BTT) from brands to the celebrities or spokespeople endorsing them. The second is spontaneous trait transference (STT) which is a process in which people transfer traits they would associate with one person or item to another where there is no logical reason to associate the trait (H). Agreeableness is a commonality with extroversion in their disposition towards ads and type of ad. The two ad archetypes that are best suited for agreeable people are transformational and non-comparative ads (7). Since agreeable people tend to stay away from controversial things, ads that show no real competition with one another are much more preferable. An anti-vaping ad with indisputable evidence that has the support of a large number of people is likely to persuade agreeable people. It is believed that depending on who the spokesperson is in the ad, the effectiveness of this tactic is likely to increase due to STT.

Neuroticism is more than likely the most misconstrued of the big five personality traits. Often assumed to be a facet of meanness or incompetence, neurotic people are considered to be less confident and comfortable with themselves due to their emotional instability and temper (2). When viewing graphic ads neurotic people tend to have longer fixation and dwelling time due to prolonged processing of information to find the possibly self detrimental aspects of what they are viewing (8). Due to this habit neurotic people find more meaning in graphic ads and ignore ads with price/text all together (4). It should be noted that tailored ads of appeals were not as effective in neuroticism as the other big five in a previous study (5).

Neuroticism is inversely correlated with emotional stability similar to extraversion and introversion. Neurotic people showed significant favorability towards transformational and comparative ads (7). The need for validation and clarity are common with neurotic people which makes these tailored ads effective. Although tailored ads were ineffective in a previous attempt the current goal is to deter the viewers of these ads rather than appeal to them. Emotional instability has been linked to fear and is related to the need for body resources (10). Ads that show approval and reassurance about anti-vaping should be most effective for those worried about their health.

In the current study, we will investigate the correlation between people's personality traits and the advertisements tailored to them. Our overall research supported the claim that people generally prefer ads tailored to their strongest personality. This experiment is unique compared to others because the goal of these ads are to appeal to the dissuasion of the viewer with anti-vaping. We hypothesised that people

would prefer ads tailored to their strongest trait rather than other ads. We believed this because the research has supported this in previous studies (3-11).

Methods

The participants were 9th through the 11th grade students from The Neighborhood Academy. We had two focus groups, which reviewed the designs of the five advertisements to ensure they represented each personality trait. The first group of adults identified a problem with the openness ad. The second focus group were senior students that received the modified openness ad which confirmed that the revised ad reflected openness accordingly.

The materials used were The Big Five Personality IPIP quiz, four ads found online and one ad that was created similar to other celebrity based ads but tailored for TNA students' specific culture knowledge. The Big Five personality quiz is a personality test used for the sole purpose of measuring an individual's personality based on the five main categories. The original test was altered only to give clear directions to the students on how to answer another section where they would rate the ads as well.

With both focus groups, one individual was tested at a time. All five ads would be placed in front of them and we would explain each personality trait and what each trait looks for in an ad. After each explanation they would select the ad they felt fit that trait the most. Each person was informed that each of the five ads was for a specific trait although they were given the option to pick the same ad more than once to increase the probability that at least a few guesses would be correct especially since each traits sub categories overlap which causes for each ad to be interpreted differently.

After both focus groups pointed out a problem with the original openness ad and the effectiveness of the new one, the actual test was able to be conducted. The quote used by the girl in the original ad did not highlight key focal points for openness such as experiences. Instead the quote made the girl in the ad seem more fearful which, therefore made the ad seem more neurotic. After changing the quote we had students take the test by classes. First the students would answer the questions on the IPIP quiz and then order the ads on the back with the first ad being the most compelling/effective one to the students and the last one being the worst.



This ad is used to represent openness since the person in the ad is sharing their experience with vaping which is an action that tends to resonate with open people. This ad shows the hospitalization of a person with some sort of breathing complication due to vaping.



This ad targets conscientious people solely with facts since they generally prefer to make decisions for themselves. After acquiring the knowledge they are left with the decision on whether or not they want to vape.



Extraverted people tend to listen to those with a high social media presence. So if people with a negative social presence are surrounded with a product it is likely that the negative trait will transfer.



Agreeable people prefer to stay out of disagreements/debates that would cause them to choose sides. This ad gives a clear indication of what the majority of people prefer to side with.



Neurotic people are usually more fearful of external harm before internal harm. This ad shows both an external and internal harm to the body due to vaping.

Results

The purpose of this experiment was to see if an advertisement tailored to a specific personality factor would be preferred by something strong in that personality. Due to limitations from COVID-19 school closures, we did not survey enough students to use a statistical test. Therefore, it was decided that the next best course of action would be to separate the scores from those most relevant to each trait (high scoring of each category of Ocean) and tally their responses to each ad.

	1	2	3	4	5	Total
Openness	7	4	2	9	6	28
Conscientiousness	5	1	6	2	4	18
Extraversion	8	4	4	0	0	16
Agreeableness	3	7	5	3	5	23
Neuroticism	1	8	6	3	5	23
Total	24	24	23	17	20	

Table 1. Ratings of ads by Personality. Rows represent the number of surveys that responded to each rating of a particular personality focused ad. Only participants with a 3.5 or above on that particular personality trait were counted for that ad. Some participants had a 3.5 or above in more than one ad and are represented multiple times in the table.

We counted the number of people who displayed a high level of openness (3.5 or higher). Twenty eight participants showed a level of openness. In total, 15 of the participants rated the openness oriented ad a 4 or 5, while 13 rated the same advertisement a 1 or 2 (Table 1). Because of the lack of clear pattern in the total, it does not appear that people with a high level of openness uniformly prefer an openness advertisement.

Continuing with the same method as before, only those with a score of 3.5 or higher were counted for conscientiousness. Only eighteen of the participants showed levels of conscientiousness. Six participants gave the conscientiousness ad a score of 5 or 6, but another 6 participants also gave the ad a score of 1 or 2 (Table 1). It seems as though there is no pattern in the overall data for this tally, so it is safe to assume that just like the openness ad conscientiousness people do not consistently prefer conscientiousness ads

The next group that to be calculated was extraversion. The participants in extraversion had the lowest amount of people that showed high levels of this trait. No one with a high level of this trait gave the extraverted ad a score of 4 or 5 but 12 participants did give it a score of 1 or 2 (Table 1). Although this

information shows that the extraverted ad was disliked by those that show high levels in this trait, the opposite can be said. Those who did not meet the 3.5 cut off seemed to rate this ad for the most part consistently better than those who were considered more extraverted. Is it possible that extraverted ads are more preferred by those who do not demonstrate extraversion as their dominant trait?

Agreeableness was next on the list to be calculated on the list to be calculated. Eight participants rated the agreeable ad with a 4 or 5 yet ten participants rated it as a 1 or 2. There seems to be a greater disapproval for the agreeable ad than anticipated (Table 1).

Last but not least is the group that displayed high levels of neuroticism. Similar to those in the agreeableness category eight participants rated the ad as 4 or 5 and 9 rated otherwise leaving 6 participants who rated the ad as a 3. Similar to the first two traits, openness and conscientiousness, this ad seems to lack any real indication of a clear response to whether or not the ad is over deemed acceptable to neurotic people but it is safe to assume that the participants did not uniformly agree with it.

Discussion

The initial goal of the experiment was to see if people's dominant personality trait or traits corresponded with the ads tailored to those personalities. As far as the results go, the five personality traits, openness, conscientiousness, agreeableness, neuroticism all had no real pattern. The results for Extraversion were also inconclusive leading to more questions than answers. Every participant with an extraversion score above 3.5 rated the extraverted ad as a 3 or lower whereas those with a lower score of extraversion had a strong association with the extraverted ad mostly rating it as a 4 and/or 5. The results of my research has proven that my hypothesis was not supported.

Our results were inconsistent with prior research from Hirsh on the effectiveness of rating ads (2). Scores for non targeted ads did not predict effective ratings for Hirsh but the opposite was the case for our experiment. Hirsh also had larger correlations with ads that matched for four of the five traits. The difference in our research was near polar to that of Hirsh since the ads that matched the traits did not have a strong correlation. This is interesting because it could suggest that there is no real definite way to tailor ads or the ads could have just very well have not been good representations of the big five traits.

Rauthmann's research results coincide with ours in regards to dwelling time over certain ads (8). Although there was no eye tracking system in our possession we did notice some similarity with Rauthmann's results and the responses given to us about the ads. Longer dwelling time and eye fixation occurred with three traits. There are accounts from the participants in our study that are consistent with that claim revealing that ads for openness, extraversion, and neuroticism evoked more thought about the ad and made their decision on rating the ad more difficult. It's interesting that more thought is put into the

importance and relevance of the ad for openness, extraverted and neurotic people rather than agreeable and/or conscientious people since they seem to have a stronger sense of self surety.

In another study done by Ruathmann and others, the results were not entirely consistent with ours (7). In his other eye tracking study Ruathmann noted that there were high levels of eye fixations involving extraversion, conscientiousness and neuroticism. As mentioned before the traits that seemed to have the most fixation in our study excluded both conscientiousness and agreeableness. This presents two possibilities, one being that although we spoke with some of the participants and how they felt about the ads there is still too much of a discrepancy to verify if there is a true consistency between the two sets of data. The other possibility is that there were other factors that caused fixation in the conscientious ad to be greater than the openness ad in this test.

There were two factors that hampered our research and one major error that could not be overlooked. One of those limiting factors was that a number of participants had difficulty following the directions which lead to inaccurate and sometimes failed tests. The major error was that the names were made optional on the test since that wouldn't be recorded but many of the students who left their names blank were the same ones that didn't meet all the requirements of the personality test. As for the other unforeseen factor, the outbreak of Covid-19 had prevented us from correcting these previously stated errors which therefore changed our method of processing the data acquired.

As for any future test under these circumstances, there are a few minor changes that could go a long way. If state of the art equipment is at your disposal then these recommendations won't benefit you. Make sure you thoroughly explain your directions for the participants you will be testing and immediately check the test as soon as they are returned to you to prevent any inaccurate test results. Another suggestion would be to require names on each test even if the information will not be disclosed to help alleviate any problems that may present themselves. After some feedback from the participants many felt it was hard to pick between some of the ads when it came to rating them. If possible eye tracking technology may prove useful in deciphering where ads fall in people's personal opinions.

Overall the hypothesis of this experiment failed in providing consistency between the ads and the participants strongest traits. The easiest personality traits to work with were conscientiousness, extraversion, and neuroticism. These ads were easier to tailor to the specific personality trait while incorporating an anti-vaping message. The openness trait had difficulty due to the fact that sharing experiences around anti-vaping lead to a trait transfer of neuroticism viewed by many of the participants. Agreeableness had the same level of difficulty since it was also interpreted by some as a neurotic image. It is true that all five of the big personality traits have similar facets but there should be a way to make

each trait clear and noticeable within each ad for the majority of people with enough research. Even with failure comes more knowledge and hopefully this failure inspires others to carry this knowledge further.

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The Quiet Wheel Needs the Oil: Anxiety Recognition and Interventions

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Abstract

The purpose of our study was to find out whether teachers can recognize and effectively accommodate students with anxiety. This study is important because an increasing number of students struggle with anxiety, and only 40% of students with mental health disorders graduate from high school ("Problems at School", p. 2). It is also important because teachers are well equipped to help students who may not feel connected to or have access to professional help. Our study used vignettes and interviews to see if teachers recognized and accommodated students with anxiety in their classrooms. We found that only some teachers recognized symptoms of anxiety and felt they had enough training to successfully accommodate students with anxiety in their own classrooms. Many teachers recognized that students with anxiety need help, but chose to intervene with more disruptive students first in order to keep calm in their classrooms. Teacher training programs should give teachers more tools to address student anxiety within their classrooms.

Introduction

Anxiety is a mental health disorder that is the result of either someone's genetics or environment. It impacts many people, yet often goes untreated. One reason this could be is because schools overlook symptoms of anxiety, which are often nondisruptive. This is unfortunate because anxiety can have a strong negative impact on a person's education. However, it is possible to make small changes in schools that could help students and their families who live with anxiety.

The aim of our study was to see if symptoms of anxiety were recognized by teachers. To do this, we gave teachers short stories of two students with different disorders to see if teachers recognized anxiety-related symptoms. We then wanted to know whether teachers had the training and ability to help students with anxiety. To address this, we asked multiple questions about anxiety, teachers' training on mental health disorders, and how they would help students struggling with anxiety in their own classrooms.

Literature Review

An Overview of Anxiety Disorder

Anxiety is a mental health disorder that affects many people. Twenty percent of children will experience some mental health problems in their youth (Loades & Mastroyannopoulou, 2013, p. 150). These problems can lead to either emotional or behavioral difficulties that might follow them throughout their lives. However, every person with anxiety is different and may have different symptoms. Symptoms can include restlessness, difficulty concentrating, perfectionist tendencies, repetition of tasks, and increased worry (Hadwin et al., 2010, p. 380).

Anxiety can be caused by genetics or environmental factors. When anxiety is passed down through family genetics it is called trait anxiety. State anxiety, on the other hand, is triggered by environmental factors or what the person is surrounded by (Tysinger, 2010, p. 2).

Trait and state anxiety often go hand-in-hand because people with trait anxiety are more likely to get state anxiety. While it is more difficult for schools to treat trait anxiety, they can more easily address state anxiety by changing their environment. For example, state anxiety tends to increase when the focus of attention is on a single student rather than a group (Hadwin et al., p. 380). If teachers know that one-on-one work triggers anxiety, they could have interventions with groups of students instead of individuals. In Peterson's (1977) study, she found that state anxiety is increased in student-centered classrooms (p. 779). She stated that, "High-anxious students do better in a highly structured situation in which they know exactly what to do" (Peterson, 1977, p. 779). When everyone's attention is on the teacher rather than the student, students may feel more comfortable and able to focus.

Anxiety and other disorders often correlate with each other. One disorder that often goes with anxiety is agoraphobia. Agoraphobia is when a person is apprehensive about going to different situations and environments, which keeps them from straying far from their house. About 1% of Americans live with agoraphobia (Taylor, 2006, p. 951). Another disorder that correlates with anxiety is depression; about one in three people with depression also have an anxiety disorder. (Taylor, 2006, p. 951). Lastly, people living with anxiety are more likely to use drugs and alcohol as a coping mechanism (Taylor, 2006, p. 951). It is unclear which disorders cause others, but helping people who live with anxiety may also help alleviate other problems.

Anxiety's Impact on School Completion

Students with anxiety have challenges that make completing school difficult. In fact, one in ten people have difficulty at home or school because of their mental health disorders, and 80% of those people do not get the help that they need to better function in their environments ("Problems at School", p. 1). The consequence of this is bad for school completion because students with mental health disorders have the highest dropout rate in the country. Only 40% of

students with mental health disorders graduate. This is much lower than the average graduation rate of 76% (“Problems at School”, p. 2). Even more severe consequences for people living with anxiety are having health problems, being unemployed, displaying criminal behavior, and becoming incarcerated (Tysinger, p. 2). For people who have mental health challenges, it is important to see those challenges in schools so that people can get the help they need.

One area that anxiety can be seen is in students’ reading. Although anxiety does not have a significant impact on reading fluency, it has a significant negative impact on reading comprehension (Tysinger, p. 2). Younger students may have to use more working memory to accomplish reading fluency, so anxiety over reading out loud might be higher in younger students (Tysinger, p. 3) This is because of the Processing Efficiency Theory (PET).

PET is when a student with anxiety has to use more energy in their working memory because it is already being used by worrying about the task they are trying to complete (Hadwin et al. p. 381). Tysinger argues that, “worrying thoughts disrupt the functioning of working memory by placing demands on the limited cognitive resources available for processing and storage” (Tysinger et al., p. 3). Because of this, some tasks are harder than others because when focusing on more complex tasks, the brain has to multi-task. For example, anxiety has a larger impact on speaking than on written assessments (Tysinger et al., p. 3).

Hadwin et al. conducted a study for children ages 9-10 to test task efficiency and effectiveness among students with anxiety. Task effectiveness is related to how well students know something, or how well they can do on assessments (Hadwin et al., p. 380) Task efficiency is the amount of time and effort needed to complete an assessment well (Hadwin et al., p. 380). Hadwin et al. used The State-Trait Anxiety Inventory for Children (STAIC) questionnaire and divided students into high anxiety and low anxiety groups. They then gave an efficiency and effectiveness test, where students had to memorize a sequence of numbers

forwards and backward. Hadwin et al. found that students with low and high state anxiety have the same performance effectiveness during assessments. However, they found that students with high anxiety take a significantly longer time to complete the assessment (Hadwin et al., p. 388 - 389). This study aligns with PET. Because anxiety impacts efficiency, schools should address mental health disorders.

How do Children and Schools Address Mental Health Disorders?

Teachers recognize students' anxiety in schools but do not always have the training to accommodate or help students' needs. In Loades and Mastroyannopoulou's research, they presented teachers with stories that highlighted either emotional or behavioral health problems and asked teachers to identify and rate the severity of the potential disorder. Teachers recognized both emotional and behavioral disorders in the vignettes, however, they recommended that students with behavioral disorders receive help at higher rates. They viewed behavioral disorders, like Oppositional Defiant Disorder, as more severe (Loades and Mastroyannopoulou, p. 151). Teachers were more likely to identify boys with behavioral disorders and girls with emotional disorders (p. 154). This may be because students with behavioral problems may disrupt the entire class, not just themselves.

Although anxiety is sometimes ignored, schools are the best place to treat anxiety because of the comfortability and financial situation of the student. Students often show symptoms of anxiety at schools, where they may be less comfortable than when they're at home. Also, sometimes students cannot access care because of their financial situation. Low-income students may struggle with payment for services or transportation to and from appointments (Herzig-Anderson et al., p. 2). Additionally, minority parents more often associate mental illnesses with negative stigmas, and because of that they do not seek out the help that their child needs (Loades & Mastroyannopoulou, p. 150). Because of these reasons, 30% of

kids with mental health challenges never receive treatment (Loades & Mastroyannopoulou, p. 150). Schools should play a big role in helping students with anxiety.

There are some programs that already exist to help students with anxiety. First is The Cool Kids Program. The Cool Kids Program puts children in groups of 8-10 who meet for one hour for eight weeks (Herzig-Anderson, p. 6). The program focuses on life skills, such as assertiveness, social skills, and coping with bullying. There are some limitations to the program, however. Having medical professionals lead the sessions may give different results because the students do not know them in the way teachers or counselors might. Also, schools might not have the finances to pay for children to be in the program.

Another existing program that helps students with anxiety is the Baltimore Child Anxiety Treatment Study (BCATS). This program was different because it focused on primarily black, low-income, urban students. The program focuses on psychoeducation, but also helps students develop problem-solving and coping skills (Herzig-Anderson). The program teaches students to calm themselves and lessen worrying thoughts.

There are other ways schools address mental health that may help students deal or cope with having a disorder. For example, teachers can set flexible deadlines so that students can feel secure that their work is good enough to turn in ("Problems at School," p. 2). Deadlines can make students with anxiety feel rushed, and they might not do as well as they can. Additionally, teachers and students can set interventions for when a student is starting to show signs of anxiety, like heavy breathing, shaky hands, sweating, or pacing ("Problems at School," p. 3). Having a safe place in schools where students feel comfortable to talk can also help relax them. Students, parents, and teachers should set short-term goals that the student has to work towards, but are attainable ("Problems at School," p. 3). Finally, it is important to keep parents

involved with the program to show the children's progress and teach parents coping strategies, too.

Methods

In our study, we interviewed three middle school and three high school teachers at a college preparatory school in Pittsburgh, Pennsylvania. The six teachers chosen represent a wide range of teaching experience. The primary author asked four questions about how they recognize and accommodate students with anxiety. The primary author then provided each teacher with two vignettes from Loades and Mastroyannopoulou's research. The vignettes highlight two fictional students; one with an anxiety disorder and one with an oppositional defiant disorder (ODD). The teachers were asked five questions to see if teachers recognized symptoms of anxiety and how they would address those symptoms in their own classrooms.

Results

Our first hypothesis was that teachers will recognize symptoms of anxiety in students. This was partially supported in our interview data. All six teachers interviewed identified the anxiety symptoms in the vignettes right away, showing that they knew symptoms of anxiety. When given a vignette highlighting oppositional defiant disorder (ODD), however, they categorized aggressive symptoms with anxiety. Only two out of six teachers recognized that the student displaying ODD symptoms were not associated with anxiety. One of those teachers identified it as a behavioral disorder, while the other noted that the symptoms may be due to poor family relations.

When asked what signals show that a student has anxiety, teachers identified three major groups of symptoms. First, all six teachers stated that students with anxiety disengage in class. Ms. Reeves¹ stated that, "if they are quiet or shut down in class," that can be a result of

¹ All names are pseudonyms.

anxiety. Mr. Hawkins also stated students will, “completely shut down and do nothing,” if they are anxious. Ms. Markey said students will, “want to leave the room a lot,” when they feel anxious. Next, three out six teachers stated that students with anxiety are often fidgeting and moving around a lot when they are anxious. Mr. Sloan noticed that, “In general, [students with anxiety] are fidgety, not paying attention.” Mrs. Lee added they can be moving around a lot and cannot sit still, wanting to get out of their seats. Symptoms that teachers did not note, but that often signal anxiety, include taking longer testing times, lower reading comprehension scores, and struggling particularly with oral assignments.

Our second hypothesis, that high school teachers will often not address nondisruptive anxiety due to a lack of training was supported through interview data. While all teachers acknowledged that nondisruptive anxiety deserved attention, many of them acknowledged that it would not always get addressed in the classroom. This seemed to be for two reasons. First, many prioritized helping disruptive students over nondisruptive ones. Second, only two of the six teachers interviewed had explicit training to help students with anxiety.

All teachers found symptoms of anxiety concerning, even when it was nondisruptive. After reading the vignettes of students displaying ODD and anxiety symptoms, Ms. Lee stated that, “I think both of them have equally concerning behaviors.” Both Mr. Finch and Ms. Markey followed up by saying that they would want to intervene early with students with anxiety. Mr. Finch said he would try to help, “as early as possible...because I think when students have anxiety, if they reach a point there's like a shut down and you can't, at least in the short term you can't get them back.”

Although teachers noticed and wanted to help nondisruptive students with anxiety, disruptive students were more likely to get teachers' attention. Three of the six teachers used the adage, “the squeaky wheel gets the oil,” when describing classroom interventions. Mr. Sloan

acknowledged that, “the kids who are the loudest, the kids who are the most disruptive,” tend to get the most attention. Similarly, Mr. Finch argued that, “In a perfect world, you would help both equally. In a slightly less perfect world ...it's most likely what gets addressed is the individual that has the behavioral issues because what that is doing is bringing the whole class into it.” It seems like with limited time and resources, teachers usually prioritized helping students with disruptive over nondisruptive behaviors.

Only two of the six teachers interviewed claimed that they had training to address the needs of students with anxiety. Teachers with training more often knew intervention techniques to help students in the classroom. For example, Ms. Lee, who had taken classes in educational psychology, had multiple ideas for how to accommodate students with anxiety. She said teachers could give students extra time on assignments and give them explicit study techniques such as making flashcards. Teachers without training were more likely to state that students with anxiety need help outside of the classroom, typically from mental health professionals. Five teachers said they would direct students to therapy or church support groups. These resources can be really helpful, but they also take treatment outside of the classroom.

Recommendations

While all of the teachers interviewed found symptoms of anxiety to be concerning, the majority of them said that realistically students with disruptive behavioral disorders would more likely get more attention than a student with a nondisruptive anxiety disorder. This has bad consequences, because as Mr. Finch said, students who do not have their needs met will often start, “checking out.” When they start shutting down, students become less focused on their schoolwork and less involved, which can hurt their grades. This is one reason why treatment and accommodations should be made in school.

When asked how they would intervene or accommodate students with serious anxiety, teachers cited that their early interventions would be sending students to therapists outside of the classroom. While therapy is helpful, students may need help from schools as well. First, teachers are many times the best options to help students because they have a balanced relationship with students. Medical professionals may increase students' anxiety because the students do not know them, and some students may have a negative stigma towards therapy (Loades & Mastroyannopoulou, p. 150). Additionally, some families do not have the ability to seek out treatment due to economic issues; many cannot afford either treatment or transportation to that treatment (Herzig-Anderson, p. 6). Schools could provide treatment that would otherwise be unavailable. Another reason why teachers should provide interventions for students with anxiety is to help prevent students from missing too much class time. If students miss class, they are more likely to drop out. Currently, only 40% of students with mental health disorders graduate. ("Problems at School", p. 2). Keeping students in class would be a good first step in helping correct this number.

If schools are going to keep students with anxiety in the classroom, teachers need to know how to handle situations that anxiety might impact. In our study, only two teachers reported having the training to address the needs of students with anxiety. Mr. Finch stated that he, "had worked with individuals in crisis prior to teaching. So I had some experience with it. Not that anxiety is a crisis, but you go to look for those signs." Although it is good that teachers had training working with severe cases of intervention, anxiety is not necessarily considered a crisis. Many teachers did not view anxiety as a crisis when they said they would intervene with a student with disruptive behavior rather than a student with anxiety. Teacher training programs should put more focus on mental health disorders to help prepare teachers for situations that they are likely going to encounter.

There are many ways to change classroom practices to better fit different students' needs. For students with anxiety, a good first step would be to identify the symptoms of anxiety and discuss them with parents. Herzig-Anderson et al. (2012) says that interventions are so important with parents because it can help them get their own anxiety under control if they have it. Once symptoms have been identified and discussed with parents, there are many things in the classroom that a teacher can do. Teachers should differentiate instruction for students with anxiety. Teachers can provide detailed goals and objectives to the whole class so that students know what they are expected to know (Peterson, p.782). Teachers can also work with students before class so that the student feels confident in their answers prior to sharing with the whole class (Peterson, p.782). A final step that teachers could easily take is allowing students with anxiety more time on tests. This is important because students with anxiety use their working memory with their worrisome thoughts, which means they have to accomplish two things at once, which is more difficult and takes longer to do (Hadwin et al., 2010, p. 381).

Although it would be helpful for teachers to do more interventions in the classroom with students, there are also areas for research to expand. First, researchers could use more subtle vignettes to see if teachers are able to identify less extreme symptoms of anxiety. The vignette we used displayed an extreme form of anxiety, which may have made it easy for teachers to identify. This may have led teachers to believe outside help was needed. Future research should also focus on specifically how anxiety impacts academic outcomes. Many studies showed generally how mental health disorders hurt teens, but did not have specific statistics about anxiety. Finally, as we try new techniques for addressing anxiety in the classroom, researchers need to evaluate the techniques so that we can use the most effective ones.

Conclusion

The rate at which anxiety is growing is very concerning, especially among young people. If anxiety goes untreated, it can have negative impacts on those living with it. However, schools are not currently doing enough to help students with anxiety. Our research showed that even though teachers recognized symptoms of mental health disorders, they struggled to specifically categorize them as signs of anxiety. Even when they did recognize the symptoms, they did not know how to help students within the classroom. Additionally, behavioral disorders seem to currently get more attention than nondisruptive anxiety. Steps need to be taken to correct this. Teachers need to be trained to identify anxiety and given tools to help with it. While families need to be involved, teachers are well positioned to have interventions with students in the classroom. Even if small steps are taken, there will be a big, positive impact on students with anxiety.

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The Effect of Fish Feed Protein-Content on Ammonia Production in an Aquaponics System

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Abstract

The focus of the project is exploring how the amount of protein given to fish in an aquaponics system will affect the ammonia levels in the water. The study of aquaponics is interesting because it provides a new way to produce food in a controlled environment anywhere during any season and time. Research with tilapia and white sturgeon in aquaculture settings shows an increase in protein in fish feed leads to an increase in ammonia excretion. In our study there were three identical aquaponic systems built. They had 10-gallon tanks, rosy red fish, and sweet basil plants. The fishes was fed fish feed and the waste that they produced was the nutrients for the plants so they could grow. The water from the fish tank was pumped up to the plants and the water overflowed back into the fish tank. Due to COVID- 19, the project was interrupted and we were not able to get enough research to analyze any important findings. We were supposed to change one of the three fish tanks protein levels to see if there would be a change in the ammonia levels. Unable to continue testing but was able to observe the plants grow. However due to lack of results, future studies are proposed and discussed in the paper.

Introduction

Aquaponics is an alternative way of farming. Aquaponics does not use soil or take up large quantities of land to produce plants. Aquaponics combines aquaculture and hydroponics. Aquaculture is raising, breeding, and harvesting fish in a controlled environment for food or repopulation (1). Aquaculture can help repopulate fish, decrease overfishing in the ocean, and can be studied for scientific research. Hydroponics is when plants are being grown in a soil-less environment. Without soil, the plants get their nutrients by a solution that is added into the water. Using hydroponics, plants can grow in any location, season, and use less space (2). In aquaponics, the water from the fish tank is cycled to the plants so that the ammonia waste from the fish is ultimately being used as nutrients for the plants. Then the water from the plants gets cycled back to the fish tank. With this cycle, there is less water being used than in a traditional farm or garden (2).

Fish waste is used as the nutrient source for the plants. Ammonia excreted by the fish is converted into nitrite by the bacteria in the water and then to nitrate by other bacteria (Figure 1). When the ammonia levels reach a certain level microbes begin this nitrification process(3). Nitrification is when microbes oxidize ammonia and ammonium to nitrate(4). The plants absorb nitrogen in the form of nitrate (5). Hence, the plants filter the water for the fish. (5).

AQUAPONICS BASIC DIAGRAM

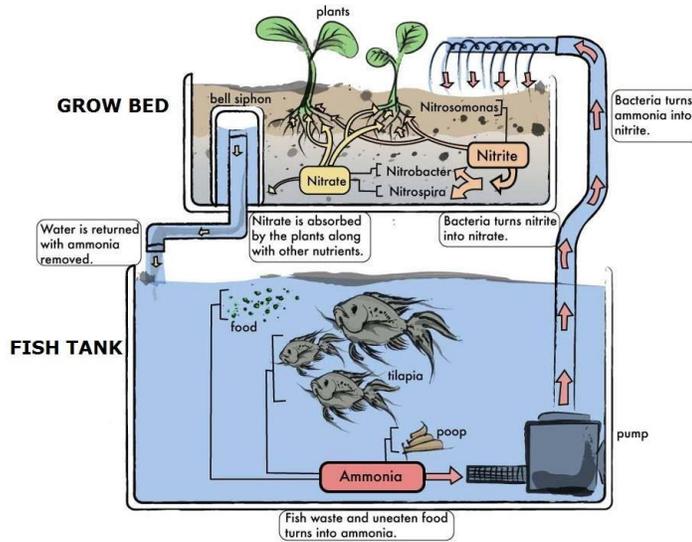


Figure 1. Typical aquaponics set up illustrating the nitrogen cycle.

In an aquaponics system plants are grown in a grow bed. It is similar to a field when growing plants. A grow bed can be a tray, tube, tank, or container in which plants are grown. A deep grow bed will produce stronger plants than in shallow trays (6). There can be different grow beds created to use in an aquaponics system, including: media filled, floating raft, and nutrient film technique (NFT). Media bed is when the grow bed is filled with clay beds, sand, wood, gravel, and other items. The plants are placed in the media bed where the fish water floods and drains (6). The raft is created with a foam or wooden plank with holes created so net pots with plants can be placed in the hole having the roots in the water (6). The last technique that can be used is the Nutrient Film Technique. In NFT the plants are suspended in the air while water runs at the bottom of what the plants are resting in (6).

When the grow bed is chosen there should be a consideration of which plants should be used in an aquaponics system. Since the plants are in a controlled environment the climate can be changed to benefit the plant's condition(6). With an aquaponics system, there can be any plant chosen to grow in the system. It will depend on where the system is set up. The plants can be grown in a greenhouse so they can get sunlight or in an indoor system where they can get their sunlight source from lights. Some plants that are commonly used in an aquaponics system are tomatoes, beans, spinach, lettuce, and basil. However, most plants might need extra nutrients added to them (7).

A crucial part of the aquaponic system is the fish. When considering plants there should also be a consideration of which fish will be used. Warm weather plants can not be placed in the same environment as a cool water fish. Either the plant would die from not having the right temperature or the fish would go into hibernation or die from not being in the right environment. This could either be caused by the temperature of the room or the water. There are many different types of species of fish that could be used in the aquaponics system. The most common fish that are used are tilapia,catfish, and koi/goldfish.

A crucial piece to the aquaponics system is the fish, the fish provides nutrients for the plants and the choice of fish can provide food. Tilapia is the most common fish that is used. The temperature in the tank ranges from 25-30 °C if any lower than the given temperature they will not thrive, grow, eat, and then eventually die. (8). Tilapia is a good fish when first creating an aquaponics system. Tilapia is the best fish to use because it's not as expensive as other types of fish in a tank (9). When choosing catfish the best temperature for growth for them is 24–30 °C, but they can survive in water with a temperature up to 38 °C. Their growth is reduced at

temperatures lower than 18 °C (10). Catfish are not as commonly used because they can get easily stressed and are fragile fish if you take them out of the tank and do not handle them with care (11). Lastly, Koi can be in a tank with a temperature of 0-35 °C. Koi can survive in either extreme cold weather and warm weather, this fish is good in almost any environment (12). Koi is often chosen for display and is often chosen for hobbyists. However, the fish is very expensive and is not edible like tilapia and catfish. (12). Then if considering building a small and cheap aquaponics system goldfish would be your safe choice. They can be purchased at any pet store, cheap and good for school aquaponic system set ups.

Stopping to feed will allow the natural nitrogen cycle to catch up with the nutrient load. After that change the water between 25%-50%, this is helping remove some ammonia. This is helpful for small systems/ tanks (13). The reason why the water has to be carefully monitored is that high levels of ammonia can cause fish fatalities. The protein in fish food is the primary source of nitrogen (14). There have been different sources of feed to give fish different levels of protein. For instance, fish meals have 25-65% of protein while plant source contains 5-15% protein. It has been reported that fish excrete from 60 to 95% of feed nitrogen as ammonia and that 1 kg of feed will produce 19.5 g of TAN (Total Ammonia Nitrogen) and possibly as much as 300 g TAN (12). The generally acceptable level of ammonia in fish culture waters is 0.0125 mg/L. It has been shown in studies that the ammonia production rate has been shown to increase within 2 hours of feeding many fish species(13). Temperature and pH can affect the TAN. Also the time of day many of which feeding occurs may influence the timing and magnitude of ammonia production (3).

Because other studies show a correlation between the protein in fish feed in other fish such as tilapia, we wanted to find out if Rosey Red fish would also have a significant ammonia change because of the protein given to them. The Rosey Red will be fed each day the same amount of food and then test to see if there would be a change in the ammonia, and nitrite, and nitrate level. After seeing if there's any change, changing one of the tank's protein levels, increasing the protein to see if there would be a significant change in the ammonia, nitrite, and nitrate levels.

Experimental

Aquaponics Set-up

For the aquaponic system set up, three 10-gallon tanks had four Rosey Redfish in each tank. When filling the tanks up with tap water, there was an API stress coat added before adding the fish in the tank. Before placing the fish in the tanks, each fish was weighed and distributed between each tank trying to get an approximately equal mass of fish in each tank. In Tank 1 the mass of the fishes was equal to 0.152 g. In Tank 2 the mass of the fish was 0.141 g. Finally, in Tank 3 the mass was 0.154 g.

In each tank, there was a submersible pump (Jebao Pp300Lv Water Pump 40 GPH) that pumps the water through the 1/4-in x 1-ft vinyl tubing into the grow bed of the plants. The grow bed for the plants was a plastic shoebox. In the shoeboxes, there were clay beads that act as a replacement for soil (GROW!T GMC40l, 4mm-16mm, Clay Pebble).

The basil plants were placed in between the clay beads which hold water and nutrients for the plants. In the middle of the shoebox was a standpipe constructed from a 2.5" piece of 3/4"

PVC pipe inserted in a 3/4" male PVC adapter with 2 o-rings in the middle with a 3/4" female PVC adapter. Figure 2 shows an image of a standpipe.



Figure 2. Student-crafted standpipe

The standpipe directs the flow of water back to the tank from the grow bed, cycling the same water through the system. When the water in the grow bed gets to the top of the standpipe it filters back down into the fish tank. We used long fluorescent lights that hang a few inches over the plants that are being held up by a thick wood plank. The lights are on a timer for 8 hours a day. In Figure 3 there is an image of the complete setup of the aquaponics system.



Figure 3. Final aquaponic system set up with the fish tanks and plants.

Fish tank water-testing, fish-feeding, and temperature protocol

Each day the fish were fed approximately 4 grams of fish food (API® Tropical Community Fish Flakes). The fish food was weighed on a scale for consistency. After feeding the fish there was approximately thirty minutes wait before testing the water. This gave the fish a chance to eat and digest their food and excrete their waste. Then samples of water from each tank would get tested. The water was getting tested for their ammonia level with an ammonia kit (Salifert Ammonia test kit), and nitrite level was tested with a nitrite kit (API Nitrite NO₂⁻ test kit).

None of the tank's water was heated and temperatures were recorded before the fish feeding daily. The average temperature between the three tanks was between 20.2 to 20.8 °C. The greatest variation was in Tank 3, though the temperature only fluctuated 1.3 °C over those two weeks. Hence, even though we did not have a heater for the tanks they kept a constant temperature. However, Rosey Red fish prefer to live in water between 21°C to 26 °C. All three

tanks had an average of about 21°C, the tanks could have been warmer but without using a heater the fish was thriving well in a colder environment than what it is used to.

Preliminary Results

Due to unfortunate circumstances, we were not able to complete the aquaponics system experiment. This was due to COVID-19. Unable to continuously go up to the school to measure the ammonia, nitrate, and nitrite levels, feeding the fish and monitoring the changes that were occurring because of school being closed. However, was able to collect a few days of data. What was collected was ammonia and nitrite levels in the water. But not the nitrate because the test kits were delivered without my knowledge of arrival. In each tank, ammonia and nitrite were tested.

When testing the fish tank water, ammonia and nitrite levels in the water on March 10 through March 13 were below the detection limit of the test kits. The next time the ammonia and nitrite were tested was March 18. In all the tanks there was no change in ammonia. However, there was a change with the nitrite levels. In Tank 1 the nitrite levels increased by 1.0 ppm, then in Tank 2 by 0.25 ppm, while in Tank 3 the nitrite level was undetectable. Continuing with the aquaponics system and tracking the ammonia and nitrite levels, watching to see if it is increasing with protein in fish feed.

Anticipated Next Steps

If the aquaponic system could have continued, there would have been more tests on nitrite, nitrate, and ammonia in each tank tracking to see if the protein in the fish food affects the amount of waste that is produced by the fish. Then I would change the protein level in the fish food, then feed it to the fish in one of the tanks to see if there is a significant change in the

ammonia, nitrate, and nitrate levels. Two out three of the tanks would have received the normal amount and brand of feed.

Reflection

The original vision for this project was different from what was actually done. We wanted a system that could be big enough so we could have cooked fish and serve basil. Then basil was always the plant that was going to be used in the aquaponics system. They would have been in one big media bed then have three small and separate media beds. The reason why we did not go for a big scale system was for budget purposes. However, not having a large system end up being the best choice. Due to COVID-19 the system would have spent a large amount of funds to build and not keep up with the proper maintenance with the aquaponic system. When visiting different aquaponic system labs and set up we met Dr. Roy Weitzell at Chatham University's Center for Sustainability. He gave us the idea to use shoe size media beds and how to create our aquaponic system. Also doing a small system allowed us to do multiple trials to run. So if something went wrong with Tank 1 we have two other tanks to rely on and study what went wrong. Then tilapia was the fish we wanted to use instead of Rosey Redfish.

If I could redo this project, then I would change the goldfish to tilapia in larger tanks. With having tilapia they may be able to grow and produce more waste than what the Rosey Red produced. Also, I would change the pump that was used in the tanks. In Tank 2 and Tank 3 a few of the fish had to get replaced because the fish got sucked into the side of the pump and died. Then would change the pump to one that has a smaller vent. If tilapia would have been used in this experiment I believe that they would not die in the pump because they would be larger than

the intake. Also lastly recommend using a heater for the tanks to keep the fish warm. The fish was just a bit under the preferable temperature the fish are used to.

Conclusion

The construction of the three aquaponics systems was successful. The aquaponic system housed Rosy Red fish and sweet basil plants, but the study of fish-feed protein content on ammonia production was not completed due to extenuating circumstances. Hopefully other students from The Neighborhood Academy will find this project interesting and want to build on to it. Seeing the final outcome would be interesting to see if it would differ from other studies. Also to see if they could build a bigger system then what we did. If COVID-19 did not not interfere with the aquaponic system, the system would have turned out very successful and would have gathered great data.

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Adultification Bias: Life Choices Between Success & Failure

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Humanities Senior Seminar

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Abstract

The purpose of our study was to investigate whether experiences of adultification in childhood impacts decision making in young adulthood. This study surveyed and interviewed seven African American adults who graduated from The Neighborhood Academy in Pittsburgh, Pennsylvania between 2008-2009. Interviews highlighted how childhood adultification influenced the participants' thoughts and actions surrounding college decisions, career paths, and finances. We found that while adultification did have some negative impacts on participants' lives, mentorship guided and stabilized them as they moved into adulthood. This research highlights the need to address adultification, but also address underlying stereotypes often attributed to African American children and adults. Additionally, schools, nonprofits, and community leaders should emphasize the need for reliable mentors in the lives of African American teenagers.

Introduction

Adultification is a term that is becoming more oftenly used in the African American community. It can refer to many things both in and outside of the home; overaging young boys and girls through stereotypes or forcing children to take on extensive caretaking roles are only two examples. Although adultification can occur for children of any race, it is often associated with black children and teens. As this term is becoming better known, it is also being more extensively studied. These studies have pointed out negative ramifications of adultification, and popular articles about the studies can go as far as painting the African American community as deficient in child raising. Although adultification can have negative impacts, it can also build resilient young adults, a fact too often ignored by popular articles and researchers.

Adultification can not only build character, but it can also inform individuals to make empowering choices as they enter adulthood. With consistent mentorship, adultification during childhood can build resilience in young adults that helps them overcome challenges. Knowing the importance of mentorship, it is extremely important to invest their time and knowledge in building lasting relationships with all African American youth.

This paper is divided into several sections. First, the literature review tells how adultification alters views of childhood, and highlights how adultification can impact boys and girls differently. Then, the paper offers results from our qualitative study. It first shows results from a self-created survey which highlighted seven young adults' experiences of adultification at home and school as they grew up. Then, through interview data, it shows how those experiences of adultification impacted decision making as these same people became young adults. It

concludes with describing how mentorship plays a major role in changing the outlook of negative impacts of adultification of African American children.

Literature Review

Assumptions of Childhood and Racial Adultification

Adultification is a term founded by a Georgetown study that shows that many people perceive and treat minority children, specifically African American children, as if they are older than they really are.¹ Author Leila Kamali argues that black boys are most vulnerable to being adultified at the ages of 5-6, but goes into full effect when they are at the ages of 8-9.² For black girls, adultification starts earlier than it starts for black boys. In a 2017 Washington Post article, a worried black mother stated that her daughter, who was a toddler, was being commented on for having, “curves”.³ This is a clear example of the first form of adultification, which deals with cultural stereotypes and assumptions used by adults and America’s society on minority children, without knowledge of who they really are.⁴ In addition, the second form of adultification deals with household surroundings, and states that children who are adultified at home are overexposed to knowledge and roles that only adults should be aware of.⁵ Both forms of

¹ "Research Confirms That Black Girls Feel the Sting of Adultification Bias Identified in Earlier Georgetown Law Study," Georgetown Law, last modified May 15, 2019, accessed April 14, 2020, <https://www.law.georgetown.edu/news/research-confirms-that-black-girls-feel-the-sting-of-adultification-bias-identified-in-earlier-georgetown-law-study/>.

² Kamali, "He Looked," 39

³ Davis, "A study," 1.

⁴ Rebecca Epstein, Jamilia J. Blake, and Thalia Gonzalez, *Girlhood Interrupted: The Erasure of Black Girls' Childhood*, [Page 4], accessed January 22, 2020, <https://www.law.georgetown.edu/poverty-inequality-center/wp-content/uploads/sites/14/2017/08/girlhood-interrupted.pdf>.

⁵ Linda Burton, "Childhood Adultification in Economically Disadvantaged Families: A Conceptual Model," *National Council on Family Relations* 56, no. 4 (October 2007): [Page 329], <https://www.jstor.org/stable/4541675>.

adultification affect boys and girls, but often in a different manner. The struggle is the same, but the stories are different.

Not only can children be adultified in the society that surrounds them, but they can also be adultified in their households by their own families. Adultification has many other words that are synonymous to being adultified in the household such as Peerification, Spousification, and Parentification. Although different terms, each of these describes children taking over adult roles. For example, children who are adultified in the household are more likely to serve as “quasi- parents” to their siblings.⁶ A big responsibility of taking care of a sibling like he or she is their own often also comes with having a job and working in order to support them. For male adolescents this means that they are the “man” of the house. For female adolescents this is them stepping up and being the mother, in most cases, but this is not always true. Those two examples follow the guidelines of both peerification and spousification; children fill the role of a co-parent within the household. Parentification often occurs when the parents either pass away, are incarcerated, or are addicted.⁷ This forces children to have to step up in order to take care of themselves and siblings.

Gender and Adultification

Adultification for African American girls is seen through stereotypes that were brought down from generations before their own mothers. Many stereotypes that are held against them come from a time when slavery was still prevalent, those stereotypes being a jezebel and a mammy. A jezebel in this case was a black woman whom wanted sex and a mammy was a black woman who took care of a slave owners family. After many generations of these stereotypes

⁶ Burton, "Childhood Adultification," 334

⁷ Burton, "Childhood Adultification," 334

being used, they became internalized by people of all races. In black communities, internalized racism is exposed in the relationship between mothers and their daughters. In a Washington Post article, Davis states that, “Any black mother could’ve told the researchers that, from the time they are talking and walking, little black girls are deemed ‘fast,’ a word synonymous with promiscuity. Their ‘attitudes’ are frequent topics of conversation, while their ‘sassiness’ is taken as a rebellious streak. And this is all before they reach elementary school.”⁸ Black mothers do not make it easy by stereotyping their own daughters, but schools also use these stereotypes against black girls, making it harder for them to live everyday life without seeming as if they are being overly aggressive or sexual. For example black girls are given punitive dress codes, in which they have to dress a certain way and wear their hair a certain way to not catch the attention of certain people, or in a way that they won’t get categorized as grown.

Adultification for African American boys is very complex. There are systematic barriers in place that only allow boys to be seen as a baby or a man, with no childhood in between. When seen as a baby until ages 5-6, boys are identified as cute rather than intelligent. This switches quickly, by ages 8-9, to being seen as a man.⁹ Because America has such strict rules towards the way a black man should act, this gives black males no room to make mistakes or grow. Success for them is seen as either pass or fail. With little help, resources, or support from American society, in many cases black boys fail. Howard C. Stevenson, professor of African studies at the University of Pennsylvania argues that, “While Black male youth are ‘becoming’ and developing racial and gender identities, American society represents them in very static ways, and

⁸ Jonita Davis, "A study found adults see black girls as 'less innocent,' shocking everyone but black moms," *Washington Post*, July 13, 2017, 1, accessed November 19, 2019, <https://www.washingtonpost.com/news/parenting/wp/2017/07/13/a-study-found-adults-see-black-girls-as-less-innocent-shocking-everyone-but-black-moms/>.

⁹ Kamali, "He Looked," 39.

consequently they also present themselves in static ways.”¹⁰ Stevenson calls this hypervulnerability, when black males are given presented identities and forced to act upon one’s emotions and American societies’ opinions of them.¹¹ Taking away childhood from black males can either go two ways: they can use it to their advantage and push past it to success, or they can succumb to it by joining gangs or landing in prison. Kamali agreed that if you take away childhood, gang violence can be one of the first places that young men turn to in order to fulfill the idea that they are men.¹²

Because black boys are given identities and often act on them, in many cases of police brutality, this gives police more of a motive to say that their actions are justified against black males. Black boys are followed in stores, while they are in groups, and while walking by themselves just because there is a notion deeply ingrained in the society of America that puts a target on black males' backs. People ask why black males act the way they do, but from a psychological perspective, deviant behavior often stems from built up anger and hurt towards the world in which they should be able to call home. Howard Stevenson, the Chair of the Applied Psychology Department at the University of Pennsylvania stated that, “Childhood should be full of surprises, not solely choices between good and bad. We ask Black boys to become men without experiencing a childhood or shedding a tear and wonder why they die so young.”¹³ Instead of black boys being given the chance to be mentored and helped, they are policed and controlled.

¹⁰ Howard C. Stevenson, "Boys in Men's Clothing: Racial Socialization and Neighborhood Safety as Buffers to Hypervulnerability in African American Adolescent Males," *Adolescent Boys: Exploring Diverse Cultures of Boyhood*, 33.

¹¹ Stevenson, "Boys in Men's," 33.

¹² Kamali, "He Looked," 39.

¹³ Stevenson, "Boys in Men's," 63.

Methods

In our study we surveyed seven African American young adults who all attended The Neighborhood Academy, a college preparatory high school in Pittsburgh, Pennsylvania. All seven participants graduated in either 2008 or 2009, which means that they are between the ages of 28-30. Four of the participants were females, and three were males. Two different surveys were given to the participants based on their gender. Each self-created survey aimed to measure whether participants had been adultified at home, in public, or at school.

After receiving all seven responses to the self-created survey, participants were sent a follow-up email to schedule an interview with the primary author. Two male participants and one female participant responded and were subsequently interviewed. The purpose of the interviews was to see how each participant made choices as they moved into their adult life, and identify ways that experiences of adultification may have altered their decision making when it came to college, work, finances, and their own families.

Results

Adultification in the Community

Out of the seven individuals surveyed, five voiced that they had personally been adultified in their communities during their childhood, whether by teachers, store owners, or police. All three men cited incidents of adultification, and two of the four women did as well. Everyone who was surveyed felt uncomfortable by police presence due to experiences either directed towards them or towards someone they knew. Not only did they feel uncomfortable by police presence, they also felt uncomfortable when in stores. In addition, they find it as a common and recurring event that takes place everywhere they go. When asked if he had ever

been followed around a store, Jake replied, “It is common,” as if patrolling and discomfort should be expected. When the same exact questions were being asked to Chris, he replied that being followed in stores is, “uncomfortable and frustrating.” When it came to police presence, he stated that it was, “uncomfortable. Not for myself really, but more so for my peers. I had friends and family that had bad encounters with police, which made me untrustworthy of police in general.” Seeing how police acted towards his peers could have caused secondary trauma, which made his trust for police decrease.

Five out of the seven people who were surveyed said that they have been stereotyped by a teacher in their lifetime, either in high school or in college. Participants were frank and unambiguous when answering questions about this topic. When the males were asked if they had ever been racially stereotyped by a teacher, Chris replied, “yes,” Jake stated, “commonly,” and Tyler replied, “Yes. There are too many [experiences] to type.” This goes to show just how commonly black males are talked down to by their own teachers. Not only is this stereotyping common for black boys, it is also common for black girls. Katie expressed that, “One of my teachers called me a black monkey and a cheater.” Megan went into more detail to what was said to her and how it made her feel by stating that, “I have been described as sassy and having a lot of attitude as a grade school student. It was annoying and frustrating. I often felt as if I was being ignored and labeled instead of listened to, loved and guided. I felt I did have an attitude and there was a good reason for it even though many adults overlooked it as disrespectful and unnecessary.”

This shows that this stereotyping goes as far as grade school and is a huge problem in the school system. This is common for both black male and females nationwide. For black males,

although they make up only 8.6% of public school enrollment, they account for 22% of expulsions and 23% of suspensions.¹⁴ 52.0% of black girls are suspended on multiple occasions, while white girls are suspended at a rate of 22.7% on the same multiple occasions.¹⁵ Although teachers' biases are not the only cause of this disproportionate number, they certainly are an important factor.¹⁶

Adultification at Home

Out of the seven individuals surveyed, five reported being adultified at home during some part of their childhood. Three of those surveyed had to take on intensive care-taking roles in their homes, and three women internalized stereotypes surrounding black women.

Being a primary caretaker was a common experience among both the men and women we surveyed. For example, Tyler showed signs of being a quasi-parent, but was very unaware of the fact that he himself was a child when he was forced to take care of his younger siblings. When asked if he had to take care of his family growing up, he said he did, "for a short period of time...two to three weeks...I cooked, cleaned, got myself to school, got my brother to school. At this age I wouldn't consider myself a child though, I was at least 14 or 15." Tyler's self-analysis that he was not a child at this age is surprising but normal for children who have been adultified. They are often not aware they are being adultified because it becomes part of their everyday life. Another reason that Tyler may not have acknowledged this experience as adultification is because in this case Tyler experienced short term adultification. Short term adultification has

¹⁴ Huguley et al., *Just Discipline*.

¹⁵ Huguley et al., *Just Discipline*.

¹⁶ 1. James P. Huguley, Ed,D et al., *Just Discipline and the School-to-Prison Pipeline in Greater Pittsburgh*, accessed April 28, 2020, http://www.heinz.org/UserFiles/Library/Just_Discipline_and_the_School_to_Prison_Pipeline_in_Pittsburgh.pdf.

been shown to have less detrimental effects than someone who has dealt with long term adultification, usually due to persistent poverty or parental health problems.¹⁷

Katie experienced long term adultification, but showed great signs of self-sufficiency and resiliency during a family crisis. When asked if she ever had to take care of herself for an extended period of time, she said, “Yes, from the whole time I was 14 when I started living with my dad because he rarely came home.” Then when asked how emotionally connected she felt with her parents, she concluded that,

“With my mother I had a great connection. With my father he would hug me and say he loved me but actions weren’t there. He abandoned me, literally leaving me and my sister in the house for weeks at a time. He also would forget things like picking us up for practices and he never came to any of my games in High School. He had a drug addiction problem and is now passed away. My mom unfortunately passed away when I was 15 from cancer.”

Katie’s story highlights how parents’ health problems can lead to adultification in multiple ways; either through extended illness and death, or through parents struggling with addiction. As a way of taking care of herself, Katie did hair and other jobs such as dish washing and working at a grocery store to make ends meet. Someone experiences long term adultification when they are taking care of themselves or others for a long period of time. Being put in that type of environment can cause the childhood of a young boy or girl to drift away and cause them to think more adult-like.

¹⁷ Burton, "Childhood Adultification," [Page 330].

When it came to family economics, only one out of the seven surveyed said that they were responsible for taking care of the bills. This was surprising because multiple researchers highlighted that children who were adultified were more likely to pay or help pay the bills of their households.¹⁸ The one survey respondent who did take on bills at a young age was Chris. When he was asked if there was a time in which he ever had to take care of his siblings, he said, “I’ve kept my family afloat by taking on all the bills.” While Chris was the only one to say that he has done so, the others had support from other older siblings or parents; Chris on the other hand did not. Future studies should look at the birth order of those who are adultified to see if older siblings, who often bear the brunt of caretaking for younger siblings, are impacted by experiences of adultification differently than their younger siblings.

Finally, three women surveyed experienced adultification through stereotypes and uncomfortable events that sexualized them at a young age. These three women all shared different experiences, but in many ways they share the same story because they were children who were innocent. These experiences changed the way they live their everyday life as black girls to rush them to become black women. Britney shared two different experiences that altered the way she thought about herself as a child. When asked if there was ever time in which someone made her feel uncomfortable about herself, she said, “I remember when I was in elementary school and one of my uncles told me I was ‘too busty’ and needed a better bra so that I wouldn’t attract grown men.” She was then asked if she was aware of stereotypes towards black females by family and society, and she concluded by saying “Yes... For example, one of my best friends in fifth grade started shaving her legs and I asked my mom if I could and she said ‘For

¹⁸ Burton, "Childhood Adultification,"

what? No one should be seeing them!’ At the time I equated shaving legs meant I was having sex, but now I’m like well what about when I was wearing shorts? Or a dress?”

The same questions were asked to Megan and Katie, and Katie explained how she was stereotyped as a young girl. She said, “When I was a kid I was told I would be pregnant by my teen years.” Megan stated that, “I was cat called, taken advantage of sexually 3 + times.” Unfortunately, this is not surprising; the rate of sexual assaults for black women is 3.5 times higher than any other group in the country.¹⁹ Even when black women are not sexually assaulted, they are still affected by the stereotypes that sexualize them. For example, Britney stated that, “When I was younger it made me feel as though a lot of my worth was defined by my physical/sexual identity, especially being around men. It was almost as if that was the only thing men would see in me was this ‘fast’ or ‘too grown’ attitude.” Stereotypes degrade self-worth, which can cause black girls and women to see themselves as the symmetrical version of how the American society sees them. Internalizing these stereotypes leads to further cycles of stereotyping black women by treating their daughters how they were treated, or trying to over protect them from what they have been through however, still adultifying them.²⁰

All those surveyed had some experience of being adultified. They all also had some support from home, found their own ways to make money, and all dealt with stereotypes from either family or the public. Research has shown that adultification has negative impacts on children’s futures. Three of the most common negative results of adultification include dropping out of high school or college, self degradation, and experiencing the hardships of adult life at an

¹⁹ Angela Neal-Barnett, "To Be Female, Anxious, and Black," Anxiety and Depression Association of America, accessed March 2, 2020, <https://adaa.org/learn-from-us/from-the-experts/blog-posts/consumer/be-female-anxious-and-black>.

²⁰ Davis, "A study,"

early age. However, in terms of the three respondents interviewed and their decisions with college, finances, work, and family, adultification appears to have built resiliency and determination.

College Decisions

The three interviewees all had the drive to complete their college degrees even though it was hard. What seemed to carry them through was that they had a vision of why they were there. People who are adultified can choose two routes: give up or use it as a motivation to keep pushing. Chris and Brittney are examples of people who have used their own struggles as a way to keep going. Chris stated that, “I was faced with something trying, but due to the fact that I had family and due to the fact that I had [hard experiences] I could draw back on... I was still able to manage and get to college and graduate college. So the determination I developed... helped me see the things that I had got through as an adult.” Chris deciding to finish college showed a lot about his character and shows just how resilient he is. Graduating from college while being a black male is important for the simple fact that not many do, especially when they were tasked with supporting family throughout the process. On the other hand Brittney felt as if her graduating from college was not enough for her, and she was driven for more education in order to become a counselor. She stated that, “I think up until 25 I was in survival mode, so I was always thinking about what’s the next best thing, I got to get a job. I graduated from undergrad, still wasn't really satisfied... I just changed the perspective on finding meaningful work opposed to just surviving.” Her drive to find a way out of day-by-day survival helped her keep going and find both stability and happiness in her own adulthood.

Work

When it came to finding a job and focusing on her career path, Britney was able to experience and see what she did not want, which pushed her to go for jobs that she felt passionate about. Adulthood can make finding dream careers harder for others because they have large adult responsibilities to take care every day, which takes away from being able to focus on setting and working towards future goals for themselves.

Britney's story also highlighted another way that adulthood can impact a career path: it can make people either money or mission driven. While interviewing Britney, she told a story of how she was brought up being money motivated to have financial stability. She stated that, "with the way I was brought up, I was very money motivated because I needed to make money to survive. That's what was always in my head. Get a degree, get a job, make good money." However, when she surrounded herself with mentors who encouraged her to follow careers of interest to her, she felt confident to move her career in a way that was more mission driven. Reflecting on this, she said, "I think that I have been blessed to be in the position that I am in now where I have learned to be more mission driven. I think that in my heart of hearts that's what I always wanted. I love people, I love helping people, I love teenagers, I love working with adolescents and helping people figure out who they are, what they want, breaking cycles."

Finances

For Chris and Britney, the financial struggles of their parents took a huge toll on how they manage their money today. Chris stated that, "My mother was unemployed for two years, so I had to take on the responsibility of taking on the burden of what my mother had to do, so it really taught me a lot about budgeting and really saving money." Some research has pointed out that taking on financial responsibility as a child can lead young men into criminal activity. For

Chris on the other hand, as he took on the male stereotype of being the man of the house and paying all the bills, it taught him how to be responsible with his money and how to save and budget. It helped that he saw himself as a breadwinner because he learned how to make money and use it towards what he needed before anything else; a budgeting skill that many adults today do not have. On the contrary, Brittney stated that, “I think that initially because I grew up not having a lot of money when I started making money I didn’t know how to manage it. So I spent a lot on instant gratification.” Because she did not have to take care of the bills while she was younger, she had the willingness to spend her money how she wanted, which caused her to spend it on things she did not need. She saw how her spending had to stop as she became an adult and had to become more responsible.

Relationships and Family

After the trials and tribulations that came along with being adultified themselves, each of the interviewees wanted to make sure that their future children never have to go through what they did. All showed some way of wanting their children to have a financially stable home and life. What was surprising was how each interviewee defined stability; it seems as though the gendered ways interviewees were adultified may have impacted their views of what parents should provide. Jake and Chris only talked about having a financially stable home, while Brittney wanted a home where her children could be emotionally connected to her. This is not to say that the males would not want the same emotional connection, but it shows that they have the notion of just being the man of the house and being the one that protects and takes care of the family financially. Chris stated that before he had kids he, “would want a job and a solid foundation and a roof over my head and things in order” As a father, Jake stated that, “I have

money just sitting for if I die my daughter is set and so is my girl.” On the other hand Brittney added that, “So I feel like with my kids I just want them to know that I am there for them and emotionally. And that there won’t be anything that they can’t come to with. And I can say don’t do this or protect yourself from this but if you still decide to do it, we’ll get through it together, opposed to just disciplining you or dismissing you for it.” Because of the type of adultification Brittney went through with her own family stereotyping her, this may be a reason why she wants her home to be an open and safe place for her future children.

Importance of Mentorship

Mentorship is what starts the growth of many people who once thought they would not be able to do something that they wanted to do or that they love because of the obstacles that stand in their way. Not only does mentorship bring motivation, but it develops character and resiliency in someone. A mentor can be anyone from a parent, a teacher, or even a coach.

Mentors played an important role in the lives of all of our interviewees. Each male respondent said that they had positive emotional relationships with their parents and families. Not only did they have their families, but they had also stated that staff at The Neighborhood Academy played a big part in mentoring with love and disciplining them with tough love. When Chris was asked if he had any mentors that played a big part in his life, he expressed that, “Rev. Thomas Johnson was one, not only his sternness but his belief in me was one thing... Mr. Jernigan, he seen something in me really early and was always encouraging me, but was also hard on me, but in the right ways.”

Not many African American males are able to experience what Chris did throughout their lives. According to Stevenson, when America sees African American males, they see them as,

“the blind leading the blind.” This perpetuates stereotypes of black men as damaged and incapable of mentoring black boys. However, our study showed the positive influence of many black men on the lives of young people, and not just young boys. When Britney was asked if she had a mentor that played a big part in life, she expressed that she, “...really just surrounded myself with people like Anthony Williams. His wife was one of my mentors and they really helped me to evaluate what’s important to me and ways that I can find something that I would enjoy doing for the rest of my life.” In this case even though she felt there was no connection with her mother she made a connection with others that helped her career path. Consistent, reliable mentors can open doors and help adultified children see a different path for themselves as they truly do move into adulthood.

Conclusion

Because the research of this paper was focused around alumni from The Neighborhood Academy, our results may not reflect experiences of all young people. Future researchers should focus on adults who went through a public school system, were homeless, or lived in poverty consistently through their childhood. Those who have gone to The Neighborhood Academy have experienced some sort of mentorship and discipline from being at the school, as well as extended school days, which may have mitigated experiences of chronic poverty at home. Many public school students may have not been able to experience that mentorship or structured time at school, which could lead to different stories and paths. Also, future researchers should not just focus on African American children and adults. Although adultification is often associated with African American children, there could be a comparison of all races because adultification could happen to anyone, especially children living in poverty. Finally, it is important to conduct

observational studies to see if adultification by parents is a generational cycle that is being passed down. It's only with this information that we can know what could be done to stop those cycles.

After all the negative effects of adultification, there are underlying positive effects that prepare children for adulthood even after they were not able to enjoy a full conception of western childhood. Even though adultification has a very negative connotation towards African American children, it also has the capacity to build character in those that use being adultified to their advantage. When adultified children have consistent and reliable mentorship, experiences of adultification can guide young adults to pursue meaningful work and home lives, and can build resilience in the face of hardship.

The Effect of Video Game Play on the Mental Health of High School Students

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Abstract

Previous studies would suggest that video game play sometimes decreases mental health, while other research suggests it may improve mental health. The main objective of this study was to investigate if video game play affected high school players' mental health and if sleep played a role on mental health of players. We gave a self made video game play survey and the DASS 21 mental health questionnaire to sixty nine 9-11th grade students. We found that moderate (1-7 hours per week) video game play reduced stress to the player, but not depression or anxiety. Sleep negative relationship with game play and depression. We conclude some video game play may reduce stress, but too much might be harmful.

Introduction

It is common for adolescents to play video games. Four out of five American households have a device to play video games, and 115 million play regularly (1). Mental health concerns, such as stress, anxiety or depression are very common among adolescents, due to the day to day problems they face when going to school and in their family environment. For example, in 2017, “31% of high school students reported depression almost everyday, for two or more weeks in the past year (2) Because some research suggests that video games can improve mental health well being (3, 4), it is important to look at that relationship here at The Neighborhood Academy.

Benefits of Video Games on Mental Health

Research shows video games can reduce the amount of stress a person feels when playing (3). In a study of 60 Indian students aged 18-20, participants played Tetris four times a day, for 10 minutes each for two weeks. Results showed a significant reduction in perceived stress levels after intervention. This suggests that casual play can reduce stress by filling one’s working memory, suppressing the person from feeling stress and taking their mind off of stress.

Also, research shows that a simple 2D platform co-op video game improves a person's mood and depression (4). In a study of two groups of depressed students, one group was told the game was meant to help, the other was told the game was just for fun. For both of the groups, the video game improved their moods. However the group that was told it was meant to help them, felt less autonomy or self-control. This suggests that a single session with a casual game can improve mental health.

Video games can give a player positive frustrations while playing the games, which can be one way games improve mental health (5). When a player plays games, they could receive positive frustrations which could be hierarchical goals (goals of increasing difficulty), holdouts (forcing a player to wait to achieve), narrative frustration (when the story of the game creates a connection, which motivates the conflict) and near misses (just missing a goal, but giving hope it’s possible). The more times a player plays and fails it motivates them to continue to achieve. Once the player achieves the goal, their brain produces dopamine, which makes one feel good when overcoming an obstacle that has been challenging. These positive frustrations keeps the player motivated to play and increases their mood.

Casual Video Games (CVGs) are fun easy to play games that are not complicated to the average player (6). Examples of casual video games are Bejeweled, Bookworm, Crosswords, and others. Cvgs have been proven to change the brain waves to improve moods. It changes the brain by taking the player's mind off stress. In a study where 57 males and 44 females took part in the experiment, the participants

completed a Profile Mood State Questionnaire and then played a CVG of their choice. The results were that playing a Cvgs of the player choice improved mood and decreased perceived stress.

Different games trigger different things (5). For example, first person shooters would trigger cognitive benefits of faster reaction and spatial skills. Also some video games give a motivational pull where the game is designed to pull the player in and to meet the end goal. Video games also have a lot of social benefits where if a video game player plays with friends it's more fun than playing alone. There means more online play over the years because this reason makes it less stressful and makes more interacting with others. Video games are designed for players to engage with their systems and for these systems to, in turn, react behaviors.

Online play in video games has had a huge role in coping with depression in stressful situations, like in divorced households (7). In a study of Korean children, researchers found that people from divorced families play more games, and are more likely to be depressed. But, if a player lives in a community with high levels of aggregate divorce, game play is also related to depression, even if that player is not divorced. However, the video game provided a medium where the player can talk to friends about their problems. In this way, the game is a form of therapy for friends.

Mental health disorders are serious medical issues that can cause serious injuries or even death (8). Depression and stress,” which can easily have a negative impact in the brain (which can lead to further harm) or even how “you” interact with people. Cvgs (Causal Video games) are easy to play games that can relax the brain and escape reality. Video games have benefits like relaxation, sense of control, challenges, learning opportunities and immersion.

Negative Effects of Playing Video Games

Video games can affect the players mental health for the negative. Mental health represents a protective factor for sleep quality, while intensity of video game playing represents a risk factor (9). In a study, 217 people were separated into two groups: low quality and high quality sleep. People with low sleep quality had higher game duration and with more intensity of video game usage. People who play with more intensity, have worse mental health than people who played longer, showing that the intensity mattered. People with higher quality have better mental health. Basically saying if the player is losing sleep over the game then this can affect the players mental health condition over the lack of sleep.

When people lack sleep and quality of life due to high video game play, they could be addicted (10). There are six factors to video game addiction. Salience is when a player can only think about playing the game instead of other things. Players with tolerance have to play more and more to get the same satisfaction from the game. Mood describes the pleasant feelings from playing the same, while a

player in withdrawal experiences discomfort when away from the same. Finally, addicted players avoid major responsibilities in life because they cannot stop playing. In a study where 576 adults participants completed an online survey that included a computer addiction engagement scale, depression anxiety scale, and approach/ avoidance scale, there was a direct effect between video game addiction and symptoms of each condition measured, with anxiety and showing the largest relationship followed by stress and depression.

Study Hypotheses

The research says video games might help with mental health by improving moods through immersion and a sense of accomplishment, however, the games have been shown to hurt sleep quality, cause frustration, and addiction. In this study, we investigated the positive and negative effects from playing games in a small, college preparatory high school where stress levels are high, and mental health concerns are common. This is important because parents and administrators could use our findings to help students lower their stress levels.

We hypothesize that there will be a difference in mental health (stress, anxiety and depression) between low, moderate and serious players, as measured by total playing time per week. This is because some studies find serious players may suffer (9, 10), but more casual players have positive effects (6, 2, 5). Second, we hypothesize that there will be a positive relationship between sleep per night and mental health. This is because research says if video games are played frequently and in a long duration, sleep quality will be poor and may result in poor mental health (9).

Methods

This survey was a collaborative effort between two video game researchers. Some questions related to video game play, some mental health, and other to academics. The participants were 9th through 11th grade from The Neighborhood Academy, a college preparatory, private high school. There were 69 students who participated in the study, 74% female and 26% male. The ethnicity of all the students were black or bi-racial. Thirty students did not agree to participate or did not show.

Mental health was measured using the DASS21 survey, which asked about the participants feelings using number 0-4, zero meaning the participant did not experience frequently, and 4 meaning the participant did experience it frequently. Also there was another self created survey that asked how much participants played video games and slept in the past week. The survey was given during class time with teachers permission, given to a group of 8-12 students at a time. The students finished the survey in about 5-10 minutes, then both primary researchers collected the data and put it in a spreadsheet.

Results

The purpose of this experiment was to compare video game play with sleep duration and mental health. We and another researcher gave a survey to 69, 9th through 11th grade students at The Neighborhood Academy. Then we put the data in a spreadsheet to calculate their mental health and see how much the students play video games and how much the student sleeps in a week.

In our sample (Table 1) we noticed that males play more than females. With the males total average play being 19.3 hours and the females being 1.9 hours. Also we observed in the sample that the non-players stress and anxiety levels were the highest out of the type of players. The stress level was 9.5 and anxiety was 6.9. As a group, the sample's mental scores were all considered normal. One student (1%) had a stress score of 15, which is considered mild. Twelve students (18%) reported mild or moderate anxiety. For depression, one student reported severe depression, and 16 (24%) reported mild or moderate depression.

Type of Player	VG Hours per Week	Stress	Anxiety	Depression	GPA	Males	Females
Male (n=19)	19.3	6.6	4.5	4.5	2.6	--	--
Female (n=48)	1.9	8.9	5.9	6.9	3.0	--	--
All (n=67)	6.8	7.9	5.5	5.6	2.9	--	--
Non-Players (0 hours)	0	9.2	6.9	6.4	2.9	3%	97%
Moderate Players (1-7 hours)	3.7	6.5	4.9	4.5	3.1	24%	76%
Serious Players (7+ hours)	22	7	4.8	4.6	2.6	78%	22%

Table 1. Descriptive Statistics. Sixty seven students, grades 9-11, were surveyed about video game usage and mental health. The players were divided into three categories: non players (0 hours), moderate players (1-7 hours) and serious players (7+ hours per week).

For stress levels, a one-way ANOVA found a significant difference between self-reported stress and the type of video game player ($F(2,64) = 4.45, p = 0.01$). A Tukey HSD post-hoc test found a significant difference between moderate video game players ($M=6.5, SD=2.0$) and non-players ($M=9.2,$

SD=3.9, $p < 0.05$). There were no differences between serious games and any other group. This suggests that players who play 1-7 hours per week tend to report less stress than people who don't play at all (Figure 1).

For anxiety levels, a one-way ANOVA found that there were no significant differences between the type of video game player and anxiety ($F(2,64)=1.89$, $p=0.16$). For depression levels, a one-way ANOVA did not find any significant difference between self-reported depression and the type of video game player ($F(2,64) = 1.1$, $p= 0.33$). However, non-players reported anxiety and depression levels several points higher than moderate and serious players (Table 1).

Mental Health Scores for Serious, Moderate, and Non-Players

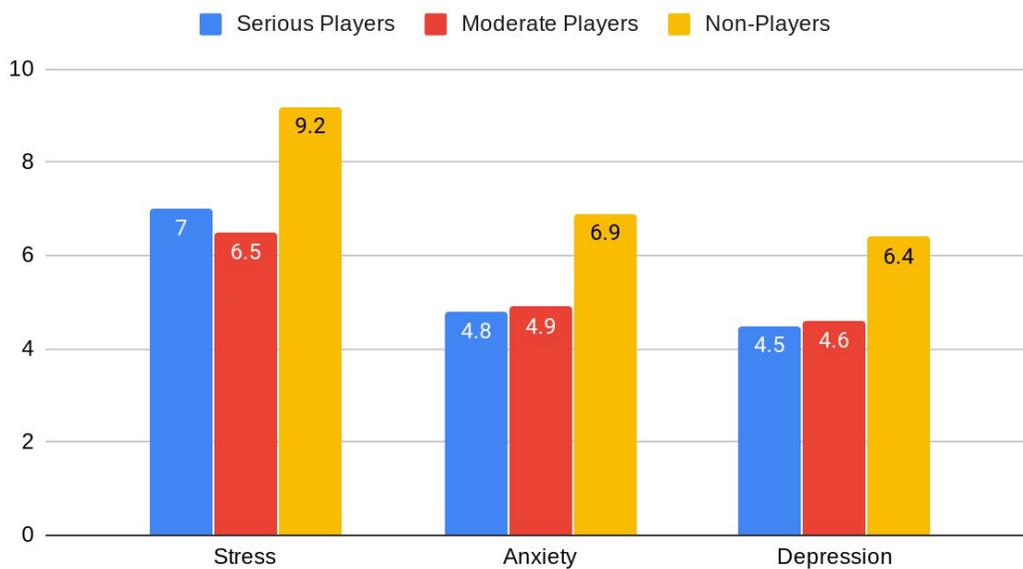


Figure 1. Mental Health Scores for Serious, Moderate and Non-Players. Sixty seven 9th-11th graders were surveyed about their video game play and their mental health. There was a significant difference between the stress levels of non-players and moderate players ($p=0.01$). This suggests that some video games may be beneficial to stress, but may or may not help anxiety and depression.

Depression Scores vs. Sleep

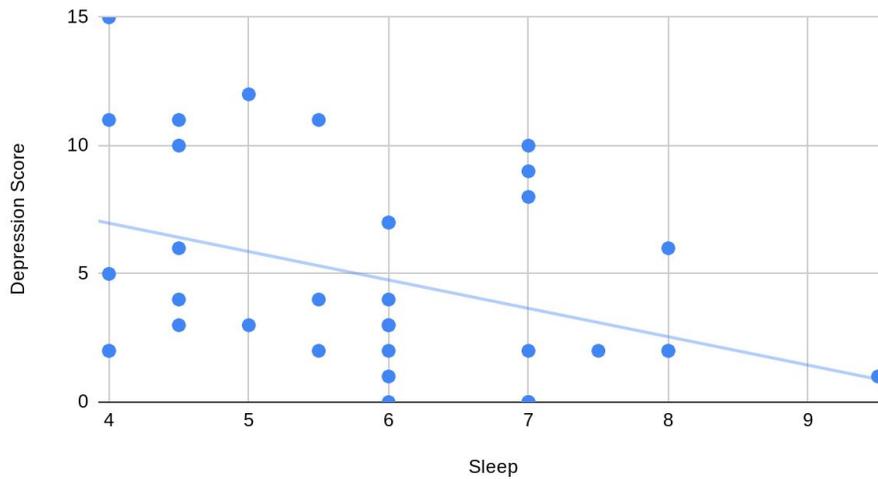


Figure 2. Depression Scores versus Sleep. Sixty seven 9th-11th graders were surveyed about their sleep and depression scores. There was a significant relationship between sleep and depression scores ($p=0.01$). The less a person sleeps then higher their depression scores will be.

Our last hypothesis is how sleep and mental health are related to people who play video games. A significant relationship was found on how long a person sleeps and video game play during the week ($r(33)=-0.38, p=0.01$). For video game players, the more one plays, the less they sleep (Figure 2). Regarding mental health and sleep, there was no relationship between stress and sleep ($r(33)=-0.12, p=0.31$), or anxiety and sleep ($r(33)=-0.22, p=0.10$). However, sleep has a negative relationship with video game play ($r(33)=-0.36, p=0.01$). Our data suggests overall stress and anxiety is not related to sleep, however depression may play a role for video gamers who play games and have less sleep (Figure 3).

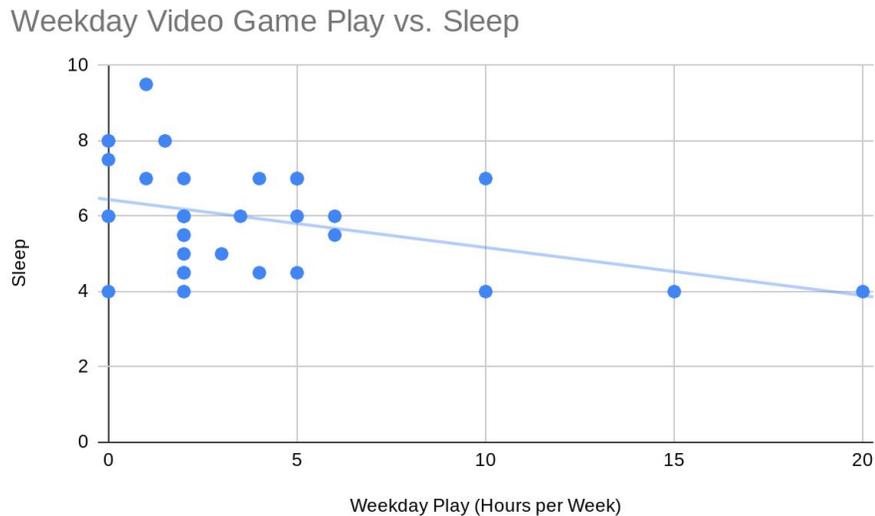


Figure 3. Weekday Game Play and Sleep. Sixty eight 9th-11th graders were surveyed and then 35 students reportedly played video games during a seven day week period. There was a significant negative relationship in the weekday video game play and sleep ($p=0.01$). This suggests that players who play more during the week sleep less during the week, perhaps because they are playing video games during the week.

Discussion

In this study, we found that video play may reduce stress if played at a moderate level (1-7 hours). However, we did not find any relationship between anxiety and depression, this made our conclusion to partially support our first hypothesis (Figure 1). Second, sleep and depression shared a relationship that the less sleep people tend to have depression (Figure 2). Also, more weekday play was related to less sleep (Figure 3). But our study cannot prove that video games are the reason why the player stays up.

Previous research found that some video game play reduced depression (4), while we also found that even the slightest video game reduces stress. Our findings are partially consistent that video games improve a player's mental health. In their study, they found that playing video games with a friend can lower depression because they connect with other humans (8). In our study, we did not know how they played, but teenagers in a high stress environment, might experience, sense of control or relaxation and immersion, which might improve mental health (8) Our findings are partially consistent, even though we did not see the players play co-op they could experience these effects.

One limitation was potential accuracy in surveys. An example of that is one student put 12 hours of play in a day, which didn't make sense. We addressed it by finding those people and asking in person.

However, it's possible that students were not accurate and we did not know. In the future, using a sample who is more reliable, or asking more specific questions or asking every day might improve the quality of the data. A second sample of the limitations was that a lot of people did not play, thirty two out of sixty two did not play at all. This limited the size of the group who played, making it hard to find significant relationships that might really exist.

In future research, it would be better if the player had a gamer log where they could write down how much they play the game each day. Next, was have the students actually play a game and see their mental health after playing the game. This would show how the players' mental health is at that time. Also choose a different survey than the DASS 21 survey that can show someone's mental health state, because the DASS survey had advanced vocabulary words that the students did not fully understand.

Our takeaway is that video game play may help the mental health of teens in a college-prep environment, if the player doesn't play too much. Too much in the sense that the players are losing sleep or avoiding their responsibilities to play the video game. There is some evidence between the relationship of sleep and depression, for video game players, so parents should keep kids from playing too much at night. However, we argue that video games are unlikely to be harmful if the time of video games is not abused.

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Asylum-Seekers, Illegals, or Immigrants: Analyzing Language's Impact on Policies

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Abstract

The purpose of our study was to analyze the language used in different hard news sources in order to see if the coverage surrounding immigration was objective. This is important because when Americans look to major news sources such as NBC, NPR, and Fox News, they expect them to give just the facts. Media also has the power to shape people's perspectives on immigration and immigration policies. We conducted a media analysis in order to see whether NPR, NBC, and Fox News used positive, neutral, or negative language when reporting on immigration. We found that they used similar rates of positive, neutral, and negative language when reporting on this topic. As more people consume opinionated pieces, researchers should consider analyzing the language used in editorials.

For many years immigrants have been facing murders, rape, gang violence, political struggles, and economic instability in their home countries, causing many to migrate to the U.S to ensure safety for them and their families. Immigration has become an increasingly important topic as places like El Salvador become more violent. In November of 2018, the media's opinionated coverage of this so-called "epidemic" has split the views of many Americans and has brought up many debates about whether Central American asylum-seekers should stay or be deported. Media has also affected the way people in power enforce foreign policies. Consider the messages an audience would take from the following two reports on Central American immigration.

"The killing of a loved one. An attempt at gang recruitment. A rape. Harassment by a police officer. A death threat over an outstanding extortion payment. Amid the justified uproar at the Trump administration's policies on America's southern border, often lost are the reasons many Central Americans leave their homes, and are prepared to brave the perils of the journey north, in the first place"

- Sofia Martinez, *The Atlantic* (2018)

"I do believe that we have been invaded. That we have been invaded by a horde, a rampaging horde, of illegal aliens. This has been a slow-moving invasion. I believe that's a fair description of what we have suffered here in this country. Because the nations has suffered. We have spent billions and billions of our tax dollars taking care of the illegals. Many families have suffered. They have suffered loss, they have been victims of crimes committed by illegal aliens."

- Todd Starnes, *Fox News* (2019)

Each of these two quotes have the power to reach large audiences and display the author's own biases towards asylum-seekers . In the first quote, Sofia Martinez is sympathetic towards immigrants and paints them as victims rather than criminals. She also paints the Trump Administration as the aggressors. Martinez seems sympathetic to immigrants by using the

positive word, “brave,” which signifies the arduous journey immigrants took to get to America. The utilization of the negative word, “harassment,” also paints immigrants as the victim. In contrast, Todd Starnes paints immigrants as criminals who bring crime to America and take all of its resources. He also makes it seem as if immigrants are violently coming into the country by utilizing the negative word, “horde.” The negative words in the phrase, “illegal aliens” paints immigrants as criminals who are not of human nature.

The purpose of this research is to analyze what language popular news sources use in their objective reporting on immigration. This is important because immigration continues to rise, however, policies surrounding immigration are growing tougher. At the same time, people do not know which news sources they can trust because of the rise of fake, or at least highly subjective, news. America is also becoming more polarized on the view of immigration and how to form policy around it. People look to the news to inform their decision making in order to shape their view of immigrants and immigration policy. Therefore it is important for news outlets to utilize neutral language when reporting. Our research question looked to see how mainstream media uses positive, neutral, or negative language that affects Central American immigrants and US immigration policy.

Literature Review

Explanation of the Asylum Process

Since the United Nations created laws surrounding the treatment of refugees in the 1950s, US Border Patrol clearly struggled with identifying and differentiating asylum-seekers and refugees (“Asylum,” 55). Having a clear understanding of the difference between an asylum-seeker and refugee can help better the asylum-seeking process. A refugee is defined as one who seeks refuge in a different country because his/her country of origin is too dangerous. Refugees are protected by the United Nations’ 1951 Convention Relating to the Status of Refugees (“Asylum,” 55). This agreement established the principle of “non-refoulement,” which states that while a refugees’ original country is extremely dangerous, the country of resettlement cannot send a refugee back until their life is not threatened (“Asylum,” 57).

Even though refugees are protected by international agreements, safety is not guaranteed for asylum-seekers. An asylum-seeker is defined as a person who seeks refuge in a different country because they are being persecuted on, “protected grounds.” Protected grounds are considered to be sexual orientation, race, ethnicity, political beliefs, domestic violence, and gender discrimination (“Asylum,” 55). Currently in the US, migrating due to economic instability in the country of origin is not considered to be a qualified reason to seek asylum. Many American politicians fear admitting too many low-income migrants, and argue that economic migrants could hurt other asylum-seekers fleeing on protected grounds (“Asylum,” 55). However, the lines often become blurred because while many asylum seekers come to America because their protected grounds are being persecuted, they are nevertheless considered to be economic migrants and are not welcomed.

In recent years, Donald J. Trump has been attempting to curb both economic migrants and asylum-seekers from entering the US. One way he has tried to do this is by making a deal with Mexico to limit the number of Central American asylum-seekers reaching the United States. In this deal, Trump wanted Central American asylum-seekers to claim asylum in Mexico, not the United States. This is part of a, “safe third country agreement” (Blitzer, 2019). A similar pact exists between the U.S. and Canada; anyone traveling through the U.S. who arrives at the official Canadian checkpoint to request asylum is turned over to the U.S. Department of Homeland Security. If Mexico agreed to a safe third country agreement, Trump said he would repeal his asylum ban.

However, not all Americans believe this agreement would be beneficial. Dr. Jeff Crisp, a migration expert at the London research group Chatham House, said areas of Mexico where asylums cross through are so dangerous that the US should not make this decision. Because the level of danger is so high in Mexico, Dr. Crisp argued that, “returning people to those countries could be considered in violation of the non-refoulement principle.” (Kingsley, 2019). Dr. Crisp was not the only one to believe this, as was evident when the Mexican President rejected the agreement.

Because this deal did not work, on November 9, 2018, the President signed a proclamation entitled, “Presidential Proclamation Addressing Mass Migration Through the

Southern Border of the United States.” This suspended the entry of all people entering without inspection at the southern border. It also guaranteed that any migrant who is physically present in the U.S. or who arrives in the U.S. at a designated port is not entitled to apply for asylum. Since then, Customs and Border Protection has rejected asylum-seekers at official ports of entry, from San Diego to McAllen, Texas, leaving large groups of asylum-seekers in camps near the US border in Mexico (Kingsley, 2019).

Crisis at the Border

For many years individuals have been migrating from El Salvador. This is largely due to the dangerous gangs known as MS-13 and Barrio 18. Originally, MS-13 and Barrio 18 adopted gang culture and identity from American culture. MS-13 can be traced back to the 1990s, when many Central American migrants were being deported from the US, particularly southern California, in mass numbers (Guéhenno, 2017). The number of gang members in MS-13 and Barrio 18 is high; an estimated 100,000 live in El Salvador, Honduras, Guatemala, and Mexico (Guéhenno, 2017). Gangs are so attractive mainly to young men because of extreme poverty. In El Salvador, 94% of the gang members do not have a secondary education, 80% do not have formal employment, and 70% lived on less than \$250 a month (Guéhenno, 2017). The desperation these people feel leads them to joining gangs that they might not want to join. When many imprisoned gang members were interviewed, many of them stated that they would leave their gang if they were employed (Guéhenno, 2017).

There are also many migrants coming over due to the Salvadoran government not being in control of the public. In El Salvador, gang members outnumber the police. There are an estimated 60,000 active gang members in El Salvador compared to the 52,000 police and military officers (Guéhenno, 2017). This means that gang members are 8% of the total population (Guéhenno, 2017). This is problematic because there are not enough police to enforce the law or to even fight against the mass amount of gang activity. Police are also underfunded and often the targets of gang violence, making the job unattractive to most people. According to the International Crisis Group, there were 45 police officers killed by gang members in 2017. To add on to this, El Salvador has a huge murder rate generally. While the

U.S murder rate is 5.0 per 100,000 people, El Salvador's rate murder rate is 103 per 100,000 people. A lot of this is due to femicide, which increased by 750 percent between 2012 and 2015 (Guéhenno, p. 11) This helps explain why a majority of migrants are women and their children.

Although immigration has been happening for decades, it has been framed as a threat ever since Trump came into the presidency. Trump premised his campaign and presidency on immigration enforcement. This has created plenty of problems, such as the false image of immigrants being criminals and a manufactured crisis at the border. By suspending the possibility of asylum on November 9, 2018, he further made Central Americans coming to the U.S look like a crisis.

One way Trump promoted feelings of anxiety is by using the word caravan. Although Trump has depicted a caravan as being a hostile group, Webster's Dictionary actually defines a caravan as a group of travelers journeying through hostile regions ("Caravan," 2020). The caravan that Trump talked about actually consisted of nearly five thousand people, about a third of them under age eighteen. An estimated three hundred of them were younger than five. The group tried to arrange van and truck transportation, but hundreds of them turned back or got deported by Mexican authorities when they reached Mexico City. Twenty-six hundred others received temporary legal status to remain in Mexico ("Caravan," 2020). This means the group of migrants coming to the U.S was much smaller than portrayed in the media.

Why Media Matters

Although the media is considered to be a good source of information, it has shown to be detrimental to certain groups of people. The main problem is that the media can create powerful stereotypes that are not factual. The media uses word choice to create an impression that the writer wants the audience to have (Berger, 2019). Berger (2019) states that, "Descriptions play an important role in the way writers portray people and their behavior and these descriptions play a role in the way we react to conversations about other people" (p. 188). An example of this is the idea of black people being the predominant beneficiaries of welfare programs. Bigler and Jeffries (2008) argue that although white Americans are more likely to use welfare, black Americans are associated with welfare use. They argue that the nightly news perpetuates this

stereotype (p. 120). This is a problem because it can depict certain groups of people as problematic, while it glorifies the “dominant” group.

Throughout the twentieth century, there has been harsh language used when talking about immigrants and immigration. The words used have powerful effects on how people think about race and ethnicity. For example, the term, “illegals” when used as a noun can be dehumanizing. Using the term in this way is, “as if they themselves, as human beings, were being called ‘illegal’ rather than just their immigration status” (Pena, p. 1). This essentializes people into criminals without taking into account their whole stories. Immigrants are not the only people who this impacts. Bigler and Jeffries (2008) analyzed news reports after Hurricane Katrina hit New Orleans. The news source showed two photographs of people taking food from abandoned stores. The description for a white couple described them as, “‘finding bread and soda’ while the caption below the photo of the black person described him as ‘looting ’” (Bigler & Jeffries, 2008, 121). Language that implies criminality is most likely associated with people of color.

The phrase fake news has been used a lot ever since Trump came into presidency. Fake news stories are false stories or events that appear as news and are distributed on the internet or media. However, the term has also been used to describe a political story that harms an agency or person. The Pew Research Center has found that Americans have very different views about fake news and different responses to it (Graham, 2019). The idea came about because Donald Trump used it as a way to disarm people who disagree with him. Fake news can also lead to the inability to distinguish between hard and soft news. Arthur Berger, Author of *Media Analysis Techniques*, said that hard news is supposed to be serious and deals with problems happening in the world. However, this form of reporting that is supposed to be objective is becoming politicized, making it more similar to soft news, or opinion pieces (Berger, 2019). News being politicized is such a problem because the news does not only give out information, but it now states its opinion and causes news to be reported differently.

Methods

We conducted a language analysis to compare the positive and negative portrayal of immigration and immigrants in three major hard news outlets. Using All Sides Media’s “Top

Online News Media Bias Ratings, we chose to analyze NBC which leaned left, NPR which was neutral, and Fox News which leaned right (See Image 1). We chose NBC and Fox News because they are largely watched and read around the country. We chose NPR because we wanted to see a neutral American perspective. All of these sources would be thought of as, “hard news,” that are supposed to show objective fact; we did not choose any articles that were labeled as opinion or editorial pieces (Berger, p. 250).

We analyzed five articles from each of the three news sources. The same search term was used for finding the articles for each news source. Examples of the search terms that were used were, “NBC News migrant November 2018” and “NBC news immigration November 2018.” The same search terms were used to ensure each news source was covering the same event, and all articles were published between late October and early December of 2018, a time when Salvadoran migrants were traveling through Mexico northward.

For our language analysis, we chose to code all nouns and verbs in the articles. These words could be coded as positive, neutral, or negative. The words were coded as if they were standing alone; we did not code them in the context of the sentence in order to avoid attaching our own bias of what may be considered negative or positive. There was also a neutral category, so we did not have to force an evaluation of positivity or negativity of every word. In order to make our analysis reliable, we tested intercoder reliability by comparing our code with one another, aiming to have over 75% accuracy rate. The point was to make sure that we are correctly, consistently identifying positive, negative, and neutral words (Bigler & Jeffries, p. 129 - 130).

AllSides™
Top Online News Media Bias Ratings

AllSides media bias ratings are based on multi-partisan, scientific analysis.
 All ratings are based on online content only – not TV, print, or radio content.
 Visit AllSides.com to view over 600 media bias ratings.

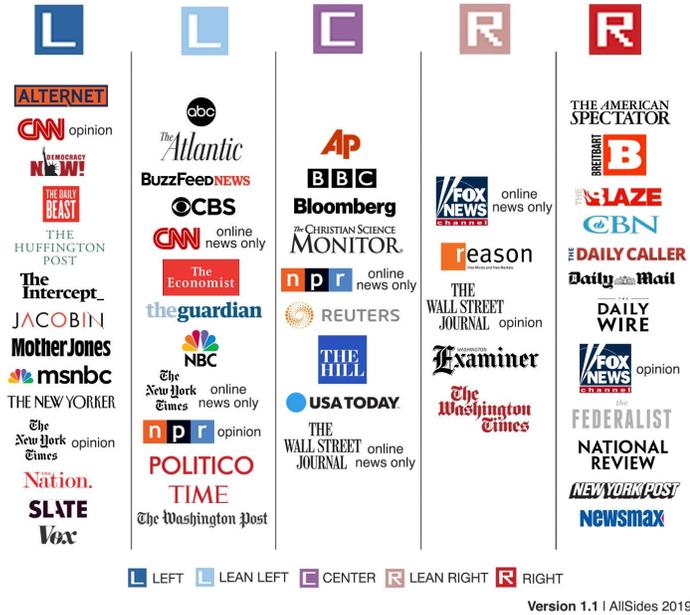


Image 1. AllSides Media Top Online News Media Bias Ratings. This image shows which news sources lean left, meaning they are more liberally biased, which sources are centered, which means they are neutral, and which sources lean right, which means they are more conservative.

Results

Inter-rater reliability refers to whether different raters reach the same conclusion in identifying certain words as positive, negative, or neutral. Inter-rater reliability was used for our study to ensure that there was not any bias towards a certain topic. This method was also used to see if there was an agreement on the tone a word carries. To ensure validity of our research, Ms. Hardy and I had to have over a 75% alignment in our word coding. If our observations significantly differed then our measurements and methodology were not correct and needed to be changed. However, our observations were very close, which meant our research is valid. Our rate of inter-rater reliability was 81% for Fox News, 85% for NBC News, and 88% for NPR News. For our research the average inter-rater reliability was 85.66%. This falls well above our goal of reaching 75% inter-rater reliability, and above Bigler and Jeffries (2008) rate of 78%.

Throughout the media analysis it was found that there were lots of commonly used positive words in each news source. An example of a commonly positive word used in each article was asylum and asylum-seekers. This word is positive because it portrays immigrants as a group who are coming to the US and finding safety because their protected grounds are being prosecuted. These words can have a positive effect on the reader because it can make them feel sympathetic for the hardships these people are facing. It can also cause the reader to change their ideology of immigrants and want to take action in order to help. Another example of a commonly used positive word is rights. Rights is a positive word because it implies that immigrants have rights that are naturally given to them and should be given to them no matter where they are. The effect the word rights can have on the reader is that it lets the reader know that these too are people who have universal rights that are ensured.

Although each news source had different viewpoints, there was a lot of commonly used negative language in each as well. An example of a commonly negative word is caravan. This word is negative because it is used to dehumanize the individuals immigrating to the United States. One of the definitions Merriam Webster supplies for a caravan is a train of pack animals (“Caravan”, 2020). By referring to this group of immigrants as a collective group of animals, it disconnects them from the reader and makes them seem less human than the reader. Another example of a commonly used negative word is alien. Such a word is negative because it portrays immigrants as inhuman and if they are from another world. This is so problematic because many asylum-seekers already do not receive just treatment, and using words like this could make people hate immigrants and not be welcoming towards them. The word alien has a negative effect on the reader because it causes them to not view immigrants as humans, which allows immigrants’ human rights to be abused and leads to many Americans fearing immigrants. Criminal was also a commonly used negative word that could alter the way people view immigrants. This word is negative because it portrays immigrants as a group of people who cause problems and are a threat. The word criminals also portrays immigrants as dangerous people who are coming to the United States to spread their crime and harm Americans. This word has a negative effect on the reader because it makes them view all immigrants as criminals, and if policymakers see a word such as this it can cause immigrants to be unfairly treated.

A Comparison of Noun and Verb Choice Between News Sources

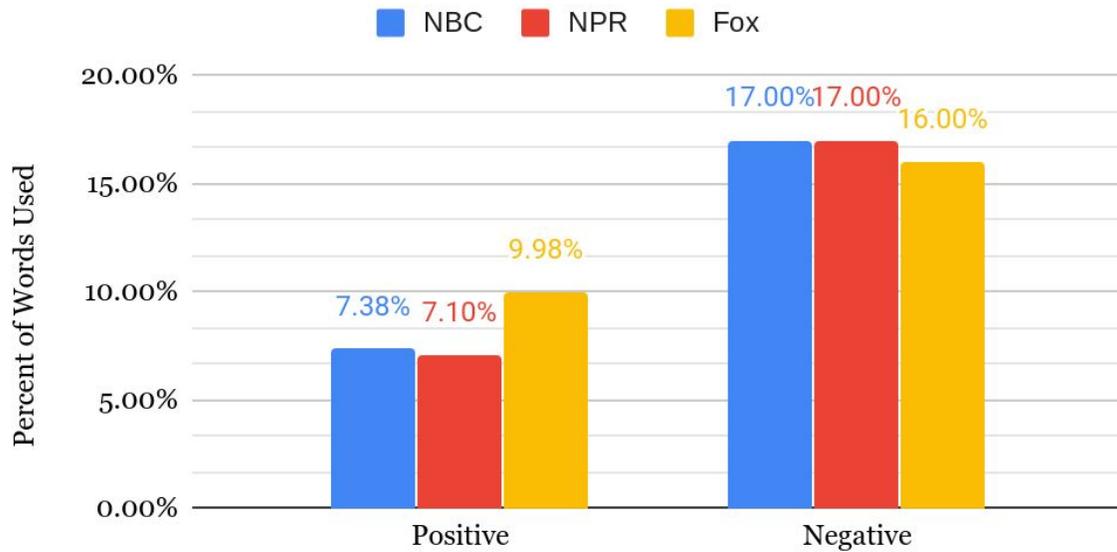


Figure 1. *A Comparison of Noun and Verb Choice Between News Sources.* This graph shows the percent of positive and negative nouns and verbs used in each News source. Out of all of the nouns and verbs in the five Fox News sources, 9.98% of them were positive, making it the most positive of our news sources.

In our media analysis we counted the number of positive, neutral and negative words from five articles in three different news sources (See Figure 1). NBC had 81 positive words, which was 7.38% of its total nouns and verbs, compared to its 190 negative words, which was 17% of its total nouns and verbs. NPR had 99 positive words, which was 7.10% of its total nouns and verbs, compared to its 236 negative words, which was 17% of its total nouns and verbs. Fox had 114 positive positive words, which was 9.98% of its total nouns and verbs, compared to its 183 negative words, which was 16% of its total nouns and verbs. In total, Fox was slightly more positive than NBC and NPR, and all three news sources used more negative language than positive.

Discussion

These results were unexpected. Fox News was the source we anticipated being the most negative, however, it was slightly more positive compared to NBC and NPR. We expected Fox to be more negative because according to AllSides Media, Fox tends to lean right, which means it is more conservative. Because conservatives tend to advocate for harsher immigration laws, we believed that Fox would use harsher language when describing immigrants and their actions. Although Fox was more positive than the others, they were all similarly negative towards immigrants. This could be due to three reasons.

First, all three sources were focused on reporting the news, not on editorials. We excluded editorials because they inherently give an opinion, and we wanted to see hard news sources, not opinion pages (Berger, p. 250). We did this to see what facts people received when they sought out objective news. Objective news sources are extremely important in fighting fake news because they allow people to form decisions and think for themselves, rather than allowing news sources to think for them. Our results show that the language used in Fox, NPR, and NBC was not inherently biased when read out of context. However, this did not account for the context of the language, and some words coded neutrally were used negatively or positively when read in context. For example, in an NPR article, Scott Horsely and Richard Gonzales stated that, “The Trump administration is taking steps to stem the flow of Central American migrants crossing the U.S. border from Mexico” (NPR 2018). All of the nouns and verbs were coded neutrally out of context. However, depending on a reader’s bias and in its context, “stemming the flow” of Central Americans could be interpreted as a positive or negative sentiment. Future studies should consider coding words in context.

A second reason that all of our sources may have had very similar counts of negative and positive words is that we excluded adjectives and adverbs. Highlighting nouns is especially important when discussing immigrants because news sources can dehumanize them by using terms such as, “illegals” (Peña, “Red Blue Dictionary”). Our result may have differed, however, had we focused on adjectives and adverbs, as most articles referred to immigrants as migrants, a neutral word.

There are several ways that future researchers could expand on this topic. First, researchers could code language in its context. The context could change the interpretation of a

seemingly neutral word, and give it a negative or positive connotation. Additionally, coding adjectives and adverbs would be helpful in portraying the overall tone of an article. Furthermore it would be helpful to know what news sources Americans are likely to absorb. As social media expands and opinion pieces are spread widely, it could be helpful to see how negative or positive those opinion pieces are.

Conclusion

Although immigration has been demonized throughout recent years, many of the immigrants leaving El Salvador are families coming over in fear for their lives, and most of the “criminals” were in fact asylum seekers. However, most of these asylum seekers are not granted asylum because of strict and xenophobic foreign policies. The media could play a large role in shaping people’s views of immigrants and immigration. Our media analysis sought to see if some of the most popular hard news sources utilized positive, neutral, or negative language when describing asylum-seekers. Our analysis showed that NPR, NBC, and Fox News all use similar rates of positive, neutral and negative words in their objective reporting. This was surprising because Fox and NBC were both labeled as slightly biased news sources, while NPR was supposed to be neutral. Our results showed that the language used in hard news sources may actually be more objective than anticipated. However, as more people consume opinion pieces, future researchers should focus their attention on analysis within context in editorials.

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Comparing the Thrust of Homemade and Commercial Model Rocket Engines

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Abstract

The topic of this project is to measure and compare homemade and commercial model rocket engine thrust curves. This is done to see how close homemade engines imitate a commercial engine in terms of thrust and impulse. Many people use model rockets in high school laboratory settings, so this paper is useful due to it amalgamating chemistry and physics into a high school lab project by using physics concepts and chemical formulas. In this experiment thrust curves were measured for three C6-7 rocket engines using a Vernier force probe and Vernier graphical analysis software. The most significant part of this experiment is that the thrust curves were comparable among all trials and matched well with Estes literature. The homemade rocket engines were to be produced using sugar and potassium nitrate (KNO_3) in varying ratios of fuel to oxidizer in the engine body. The stoichiometric ratio would be 6 g sugar to 7.7 g potassium nitrate. These varying sizes and amounts would subsequently be tested through trial and error to have an equivalent thrust curve to that of a C6-7 engine. Unfortunately the homemade rocket engine portion of the experiment was incomplete as a result of the COVID-19 pandemic.

Introduction

Many physics teachers incorporate model rocketry in their high school or college course due to the variety of physics concepts that can be discussed in the context of this fun hobby.

Model rocketry covers concepts such as thrust, force, impulse, acceleration, velocity, Newton's Laws of Motion. Model rocket kits are very accessible and affordable, such as Estes and Apogee model rocket kits (1, 2).

Model rockets can be used to illustrate Newton's law of motion. For instance, Newton's Third Law, which is defined as every action having an equal and opposite reaction, is the reason for a rocket's initial blastoff. The rocket engine produces a gas pressure that pushes downward against the air, causing the rocket to fly upward. This specific force is called thrust, which is a commonly measured characteristic of model rocket engines. The force of thrust is happening at the beginning of the rocket's flight but, once the impulse ends, Newton's first law of inertia keeps the rocket in flight. Impulse is defined as force multiplied by the time in which force acts (eqn 1), and is responsible for the change in momentum of the rocket according to the impulse-momentum change theorem (eqn 2).

$$\text{Impulse} = Ft \quad (1)$$

$$Ft = \Delta(mv) \quad (2)$$

The change in momentum is observed primarily as a change in velocity as the rocket launches from rest. This change in velocity is defined as an acceleration (eqn 3). According to Newton's Second Law, this acceleration is directly proportional to the net force acting on the rocket and inversely proportional to the mass of the rocket (eqn 4). The net force is the sum of all

forces on the rocket which may include thrust, gravity, and air resistance. Following Newton's Second Law the increase in thrust force from the rocket causes the acceleration of the rocket to increase as well. This law applies due to the fact that in order for the rocket to accelerate then more force has to be applied to the rocket.

$$a = \Delta v / t \quad (3)$$

$$F_{\text{net}} = ma \quad (4)$$

In addition to discussing previously mentioned physics concepts in the context of model rockets, students can determine their numerical values using modern equipment. Several laboratory experiments have been described in *The Physics Teacher*, which is a journal published by the American Association of Physics Teachers (AAPT) (3-9). The most common values calculated with model rocketry are velocity, acceleration, and thrust. Various types of equipment have been employed to calculate these terms, such as a high-speed video camera, altimeter, and force sensors.

Desbien (3) described using a high-speed video analysis camera to record a model rocket's flight. The procedure entails setting up a high-speed camera that recorded at 210fps (frames per second). A 210fps camera was utilized due to the fact that it is seven times faster than a normal camera, so it would, therefore, be able to capture the high-speed rocket flight. The camera recorded the rocket's launch in a time span of less than a second. Students used Vernier video analysis software to measure how far the rocket traveled between each frame of video and could divide that distance by the elapsed time to calculate velocity. By plotting a graph of these velocity values (y-axis) as a function of time (x-axis) in meters per second, the acceleration of the rocket could be determined as the slope of the best-fit line through those points (3).

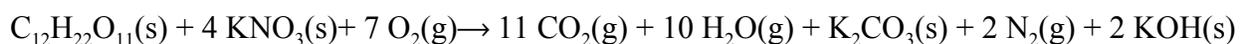
In another article, Horst reported using RockSim computer software to make a virtual-reality model of model rockets to test the effectiveness of various rocket designs and his students later built the actual model rockets (4). This experiment also used an AltAcc altimeter that is attached to the rocket to record the height data. The altimeter measures air pressure due to the barometric pressure sensor and is then compared to a preset air pressure value (10). This then allows you to receive the altitude the model rocket reached. An Excel spreadsheet was used to calculate acceleration, altitude, and velocity from the altimeter data (4). The experimental data was then compared to the predicted data of the rocket flight. As it can be observed the predicted data was fairly close to the actual model rocket flight that occurred.

Kim Penn and William V. Slaton described another experiment involving a Vernier force sensor, Estes rocket engines, and a mount to hold the rocket engine while the thrust is being measured (5). The Vernier force sensor measures the thrust of the model rocket engine. The article shows a picture of how to build the mount with the force probe attached. After the rocket thrust was measured the article displayed a graph. The x-axis represented the time in seconds and the y-axis represented force in Newtons. This article measured thrust and impulse (5). The set-up used in this article was the set-up used during our project with some minor adjustments.

The item that makes the model rocket fly into the sky is the model rocket engine and the fuel inside of the engine. The different engines commonly used in the rocket community are the Estes A-H engines in which these engines' total impulses are measured in the range of 18 N-s-80 N-s+ (1). These numbers provide the maximum total impulse of the model rocket engine. The Estes commercial engines are made with black powder or are composite. This black powder is made of charcoal, potassium nitrate, and sulfur. The composite engine is made of oxidizer

substance, made up of ammonium perchlorate (NH_4ClO_4) and rubbery binder, and fuel (11). The C6-7 engines used during this experiment were black powder engines that utilized potassium nitrate as its oxidizer.

Some people make their own model rocket engines and fuel. Homemade rocket engines are made of white sugar and potassium nitrate (KNO_3) (12). White sugar is a possible fuel because, as displayed below in the chemical equation, it is a sucrose ($\text{C}_{12}\text{H}_{22}\text{O}_{11}$) meaning that it has a low melting point which is good for the model rocket flight. The potassium nitrate is used in homemade rockets because it is a good oxidizer. An oxidizer is a chemical that adds oxygen to fuel. The fuel burns due to the oxidizer, because the oxygen needed for the combustion is included in the oxidizer (13). The oxidizer causes complete combustion because no additional fuel is left behind.



The intention of this study was to compare the thrust of the homemade and commercial model rocket engines by using the procedure reported by Penn and Slaton (5). It was arranged to make model rocket engines out of potassium nitrate (KNO_3) and white sugar. Potassium nitrate was chosen due to it acting as a good oxidizer for homemade engines. Model rocket engine bodies were made but due to a worldwide epidemic, the homemade model rockets were not produced.

Experimental

Preparation of homemade rocket engines

Rocket engines were to be made from the following mass ratios of sugar (Domino brand) to potassium nitrate (Fisher Scientific, reagent grade): 1g:1.3g, 1g:1.5g, 1g:2g. These ratios

theoretically leave no extra fuel in the rocket engine after combustion. This fuel would be packed into 2 in by 1.18 in cylinders of Kraft paper, using bentonite clay-based clumping cat litter (Scoop-Away) to plug the ends according to the procedure described in *We Have Lift Off* published by the National Science Foundation (14). Then, an igniter fuse will be inserted by being placed in a borehole at the back of the rocket engine.

Thrust measurements

The force of the model rocket engine was measured by a Vernier dual-range force sensor connected to a rocket engine holder by a threaded nut and bolt as described in Kim Penn and William V. Slaton's *Measuring Model Rocket Thrust Curve* article (Figure 1) (5). The force sensor was then supported on a ring stand which was held in place by a cinder block with the dual-range force sensor being connected via a lab quest mini to a Chromebook running Vernier's Graphical Analysis Software Version 4.10 (Figure 2). The Estes C6-7 commercial rocket engine was then placed in the end cap and held it in place with four 2-in $\frac{1}{4}$ -20 bolts. An engine starter was inserted in the back of the rocket to ignite the rocket and held in place by a plastic starter plug.

The leads of the starter were connected to low voltage wire, which was then connected to the leads of a 9-V battery cap for ignition. The computer operator was positioned behind a wall to ensure safety with the rocket being ignited 60-feet away. The data collection was started prior to the ignition. After the rocket engine's ignition was finished the calculated time of the rocket thrust was then stopped. Three Estes C6-7 rocket engines were tested.

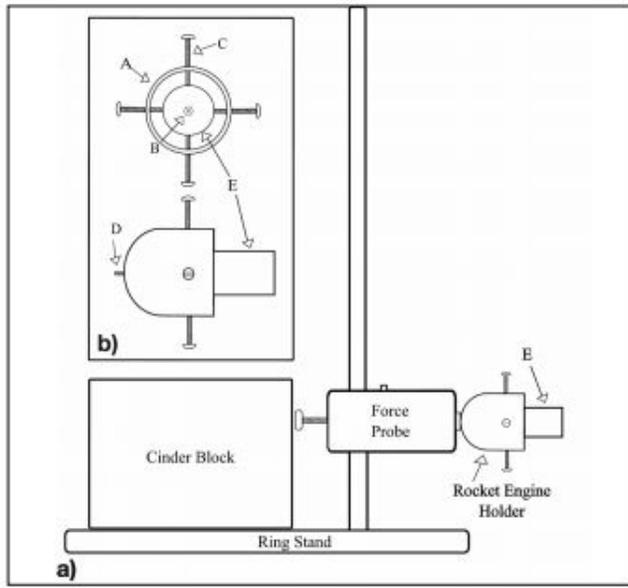


Figure 1. a) representation of the set-up that was utilized during the experiment. b) larger scaled visual of the side and front view of the model rocket engine holder. A: displays a 40 PVC end cap. B: threaded nut. C: 2-in 1/4 -20 bolt used to hold model rocket engine in place. D: threaded rod utilized to attach to the force probe. E: Model rocket engine (5).



Figure 2. Photographs of the experimental set-up. Left: Setup from figure 1 with minor red and white alligator clips to connect the low voltage wire and the engine starter. The force probe is

touching the cinder block directly allowing no room for the force probe to move. Right: Chromebook and a lab quest mini distanced approximately six feet away from the set-up.

Preliminary Results

Due to extenuating circumstances, the project was truncated. However, we did calculate experimental ratios of potassium nitrate and sugar, make model rocket engine bodies out of Kraft paper, and measure the thrust curve of three Estes C6-7 commercial rocket engines (Figure 3). The incomplete portion of the experiment was producing homemade rocket engines and collecting their thrust data to compare to the C6-7 commercial rocket engine.

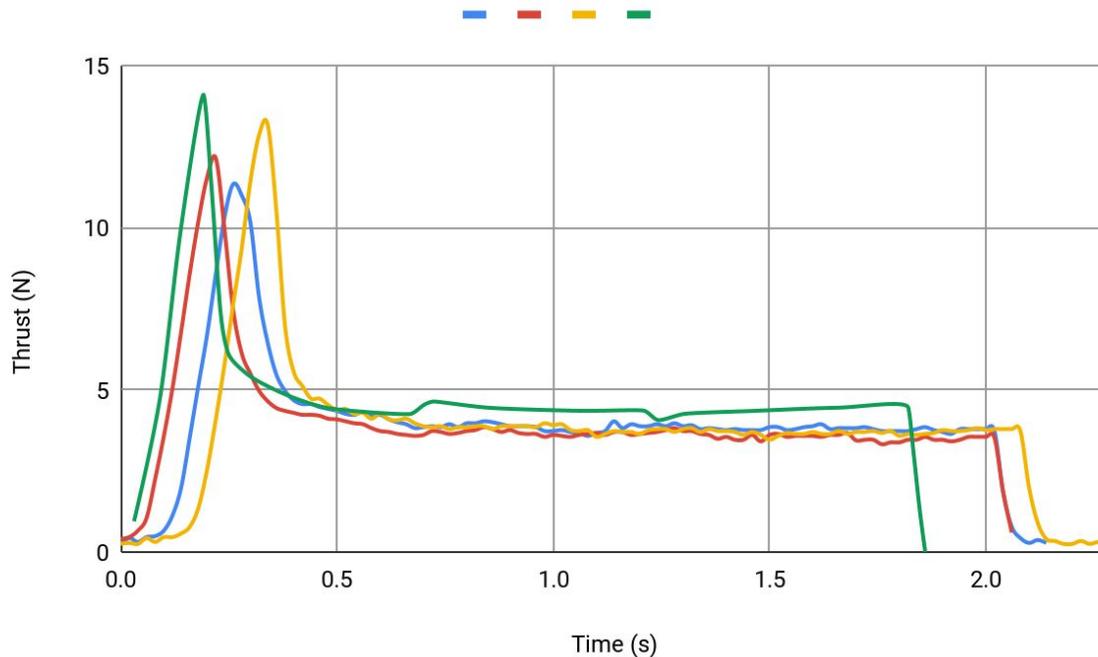


Figure 3. This graph shows trials 1-3 as well as the Estes literature of the C6-7 engine. All the data displayed on the graph is color-coded: Trial 1 (blue), trial 2 (red), trial 3 (orange), Estes literature (green).

The three Estes rocket engines tested were consistent in terms of thrust and were proximate to the literature provided by Estes. As it can be examined in Figure 2, the x-axis

displays the time that the thrust acted, with the y-axis representing the magnitude of the thrust (force) of the rocket engine in Newtons. On the occasion that further refinement of start times for the thrust curves was done showing an even greater alignment of the curves, it would be apparent that the commercial engine thrust curves were in the same proximity of the Estes literature with respect to thrust curve. The times of all three trials were on average around 2.3 seconds. The time-span of the data was shifted moderately but the force applied over time in each trial is nearly the same. As seen above none of the engines sustained an overall max force greater than 6 N.

Anticipated Next Steps

There were three trials taken to measure the thrust of the C6-7 engine. The next step would have been to make three replicates of homemade engines with each of the ratios of KNO_3 :sugar presented earlier in the paper. After the rockets were produced, their thrust curves would be measured following the same procedure as the commercial engines tested. The data collected from the homemade rocket engine trials would have then been transformed into a line graph. The graphs would then be used to compare the homemade and commercial rocket engine thrusts.

We anticipated that the thrust of the homemade rocket engines would increase as the ratio of potassium nitrate to sugar increased. A higher ratio of oxidizer to fuel should result in a greater thrust due to the fact that the reaction would cause a more complete and efficient combustion.

It was also anticipated that a greater amount of fuel and oxidizer will increase the thrust and time of the burn of the engines. As noted in the experimental section, various sizes of

engines were to be tested. Increases in fuel should increase the amount of heat and gas molecules produced, resulting in higher gas pressure and greater force. Therefore, we expect thrust curves to show larger forces applied over a greater length of time for larger homemade model rocket engines. For comparison, figure 4 shows the differences between C6-7 and F15-4 thrust curves. It is suspected that the fuel is the same in both of those commercial engines but the size (e.g. amount of fuel) is the major difference.

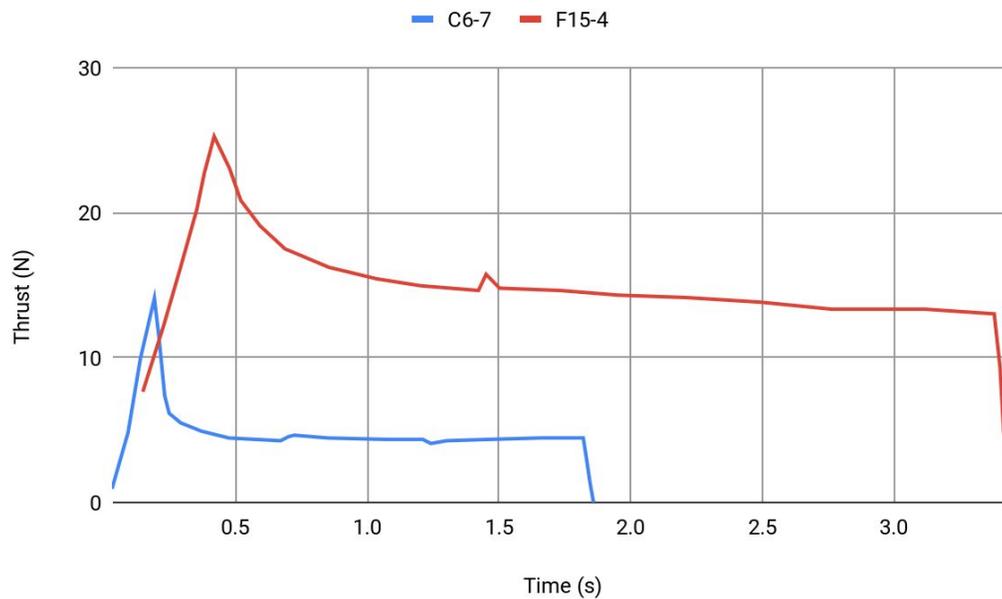


Figure 4. The graph above displays the differences in the thrust for both the C6-7 and F15-4 rocket engines. (14)

Figure 4 compares the thrust curves of an F15-4 and C6-7 model rocket engine. The C6-7 model rocket engines produced less thrust in comparison with the F15-4 model rocket engines. The force for the F15-4 engine is 25 Newtons. The C6-7 engine has a thrust of 12 Newtons as

seen in the graph above. The F15-4 engine had a 13 Newton difference on the C6-7 engine. The F15-4 engine is a greater size in contrast to the C6-7 engine.

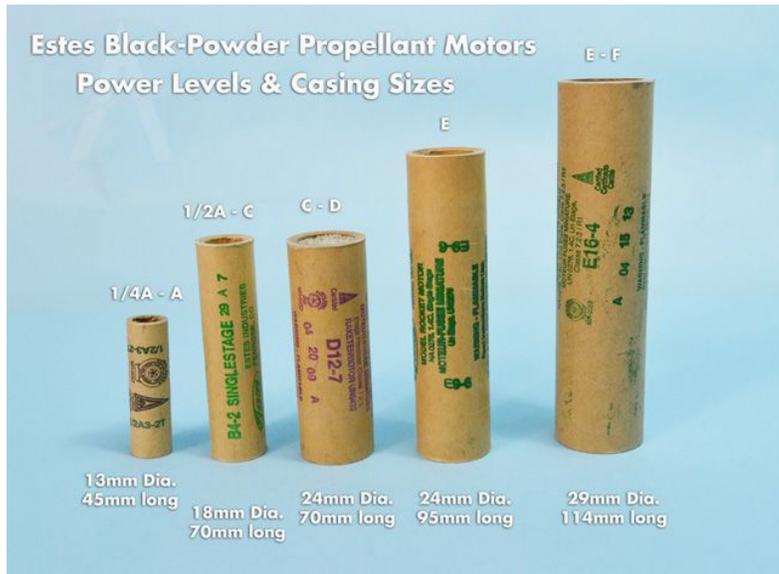


Figure 5. Comparison of A-F model rocket engine

Trial and error was used throughout the engine body production to generate an engine that has neighboring properties to a C6-7 engine in regards of thrust (force) and time. The data from the homemade rocket engine would then be compared to the C6-7 commercial engine in terms of reproducibility of thrust data in addition to which engine sustained a higher thrust.

Assuming the homemade rocket engines had multiple trials taken using equivalent amounts and ratios of KNO_3 and sugar the results for the homemade engines would likely be less reproducible with its results relative to commercial engines considering that commercial engines use different fuels and oxidizers formulations for its rocket engine. This is because the commercial engines have fewer flaws in its production from being professionally manufactured. Furthermore the homemade rocket engines would approximate to the C6-7 engine exceedingly

well with regard to thrust but it may experience a shorter time. Attributable to sugar being used as fuel for a homemade engine, the homemade engine burns quicker because sugar is flammable and has a fast reaction.

Reflection and Future Studies

A question that should be focused on in the future is how should the set up for the experiment be improved. Throughout the years there are new pieces of technology that can be utilized to get more precise and more results for a project such as this one. Another question that should be focused on is how to make homemade rocket engines more effective. Commercial engines are professionally produced so finding ways to improve the production process for homemade rockets may produce more effective combustions and data for homemade engines.

Although the experiment went fairly smooth there were many adjustments that could be made. The method used to construct the homemade model rocket engine bodies could have been more effective and adjusted in the future by making sure each of the homemade rocket engine bodies were rolled more accurately to the Estes C6-7 engines by using an object comparable in diameter to the C6-7 commercial engine. For future science labs at TNA students can compete in making their own homemade engines that mimic and C6-7 engine the most. This project could be further extended in future studies by building homemade model rocket engines with some using sucrose and others using glucose to see which type of sugar acts as the best fuel for a homemade model rocket engine. There are many other types of sugar that may act as a better fuel for the homemade model rocket engines.

Throughout the experiment there were only Estes C6-7 commercial rocket engines used so this project could have been adjusted by comparing model rocket thrust curves of other

C-ranked Estes commercial engines to see which of the C-ranked commercial rocket engines has the greatest thrust. Some things that can be suggested for future reference is using the various different methods discussed throughout this paper. The method of using a force probe may be one of the most efficient ways to measure thrust curves but the other methods discussed in the paper can collect data for many other factors as well such as acceleration. Those methods consist of equipment such as a high-speed video analysis camera to record the flight, Rocksim computer software to create a rocket simulation, AltACC altimeter to collect height of the rocket, etc.

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The Effect of Light Periodicity on the Growth of Basil in Aquaponics

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Abstract

The purpose of this project is to measure the effect of light periodicity on the growth of basil in an aquaponics system, which is the use of fish and plants growing together in one system. This experiment consisted of three fish tanks with Rosy Red fish and there would be sweet basil growing on top of the tanks in clay beds. We would be observing how the basil would grow under two different light conditions. The first condition would be 8 hrs of light on and 16 hrs of light off, while the other condition is 2 hrs of light on and 4 hrs off, to reach a total of 8 hrs of light for the plants during a given 24-hour day. Measurements of each plant for height and surface area in the three tank set-ups were to be taken two times a week, and the fresh weight and dry weight of the plants were taken at the end of the growing period. Since there was only two weeks to measure the plants due to unforeseen circumstances, only the plant height was able to be collected prior to distinguishing aquaponic systems as control and experimental. The measurements were recorded on three occasions and there was an overall positive growth among aquaponic basil plants. The average height of all plants in each grow bed was calculated and compared to the average initial height; Tank 3 had the highest average growth out of the three tanks. Further research needs to be conducted to fully understand how the light affected the growth, surface area, and fresh/ dry weight of basil.

INTRODUCTION

Aquaponics is an approach to farming that is growing in popularity by hobbyists, and is starting to gain traction in schools for educational purposes to provide hands-on project based learning (Hart 462). Aquaponics is an attractive alternative to traditional farming because it mimics natural systems, conserves water, and has fewer impacts on the environment than other types of agriculture (Love 2). According to Sylvia Bernstein, “Aquaponics is the cultivation of fish and plants together in a constructed, recirculating ecosystem utilizing natural bacterial cycles to convert fish waste to plant nutrients” (Bernstein pg 1). This is a type of agriculture that is used for growing plants and fish that humans will consume; without the two being grown together, it would not be aquaponics, but either hydroponics or aquaculture. Aquaponics is derived from hydroponics and may be confused because they are similar in some aspects. Hydroponics can be traced back to 1929 at the University of California. Many hydroponic systems are built in controlled environments such as greenhouses. Aquaponic systems can have operations in greenhouses and controlled environments as well, which draw on methods used by hydroponic practitioners (Love 1). They differ because in a hydroponics system chemicals get dissolved in the water to be used as the source of nutrients (Love 1). This water has to be constantly dumped out because the salts and chemicals can become too toxic for plants (Bernstein 4). In contrast, the system conserves the water by reusing it instead of allowing it to drain off (Bernstein 2).

Through this recycling water, the fish and plants are linked by the nitrogen cycle, as seen in Figure 1. Nitrogen (N) is an important part of the aquaponics cycle and it comes from the type of fish feed that is used. Fish are fed foods that are high in protein and contain high amounts of nitrogen. The fish will discharge waste, which contains ammonia (NH_3), and too much of this

could be toxic for the fish. In an aquaponics system, NH_3 is converted into nitrite (NO_2^-) during a process known as nitrification using the bacteria, *Nitrosomonas*. After NO_2^- is made, there is another bacteria, *Nitrobacter*, that converts NO_2^- into nitrate (NO_3^-) (Moore). The plants will then absorb the healthy nitrates as nutrients and the filtered water will then go back into the tank.

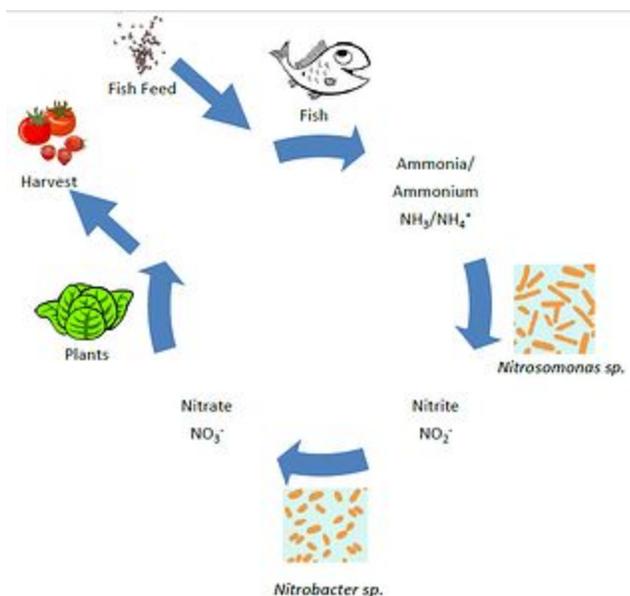


Figure 1. The flow of nitrogen in an aquaponics system (Moore)

When establishing an aquaponics system, the type of fish that is going to be used should be taken into consideration. In aquaponics, only freshwater fish should be used because plants can not withstand a high amount of sodium in the water (Bernstein 136). There are a variety of fish that can be used, but not all types thrive in the system. A type of fish that is frequently used in aquaponics is tilapia. This fish is popular because it is easy to grow, does not require warm water, meaning it could live in cold temperatures, and is ready to harvest in approximately 9-12 months (Bernstein 137). Other fish that would be ideal for an aquaponics system include goldfish, koi, and trout. Goldfish are used in aquaponics systems because they are easily accessible and adapt to water conditions. Koi are used for their beauty, and their high production

of waste. Trout is used because they are a desirable food choice and thrive in cooler temperature water (“Top 9”). The fish that is used could impact the number of plants someone has due to the amount of nutrients that is produced by the fish and the size of the tank. It is also important to think about where the system is going to be placed because that could also affect the type of fish that is going to be used. Tank placement could affect the water temperature and different fish require different temperature ranges.

Depending on where the tank is placed, could affect the conditions of lighting. Plants, also known as autotrophs, use energy from light to make their own food (“What is”). Autotrophs make their own food during the process of photosynthesis. During this, light energy, water, and carbon dioxide are absorbed and converted into oxygen and glucose (Bassham). Light energy is very important during this process because the light causes a chemical reaction to break down the carbon dioxide and water molecules to produce sugars (“What is”). Plants that do not receive enough light, will eventually lose their color and die (Koenig).

When growing plants, whether indoors or outdoors, the plants will need a sufficient amount of lighting to help grow. Light is an important factor that can affect plant development depending on the duration, quality, and intensity (Dou 1). Longer light duration would allow the plants to create enough food to survive and grow. Although plants need light, they should not be exposed to lighting for more than 16 hours because they need a period of darkness to develop (“6 Essentials”). If a plant receives too much light, the leaves could burn or become pale (“Light”). The duration of the light could also depend on the intensity of the light. The further away the light source is from the plant, the smaller the light intensity is, meaning a longer duration on the plant to deliver the same total amount of light. “Plants grown in low light tend to be spindly with

light green leaves. A similar plant grown in very bright light tends to be shorter, better branches, and have larger, dark green leaves,” (“Light”). Light output is measured in lumens, and light intensity is measured by lumens per square meter or lux (“Measure Light”). Light intensity can vary depending on the type of color used and the wattage amount contained in the bulb (Jeanty). Low light plants can survive with a range of 10-15 wattages, medium light plants thrive with a wattage of 15, and high light plants require 20 watts of light to promote growth (Jeanty). Since artificial light is being used, the intensity of the light will affect the development of the plant. Different wavelengths of light must be considered to produce healthy plants. They need red and blue light primarily for photosynthesis, red light is from 635-700 nanometers and blue light is from 450-490 nanometers (“Light”).

Previous studies have investigated the response of sweet basil to different (DLI’s) daily light integrals (Dou) and the growth and development of sweet basil and bush basil grown under three light regimes in a controlled environment (Aldarkazali). The first study investigated the effect of five different DLI’s on basil growth and quality. Those five DLI’s are 9.3, 11.5, 12.9, 16.5, and 17.8 mol*m⁻²*d⁻¹ and the plants each received a 16-hr photoperiod. The DLI’s were delivered to the plants with different intensities of the white fluorescent lamps that were used. The researchers grew the basil for 12 weeks, and at the end of the 12 weeks, they came to the conclusion that basil plants grown under higher DLI’s had larger and thicker leaves, and produced more yield (Dou). The second study investigates the effects of three lighting sources on the growth and development of sweet basil. The light sources that were investigated were white LED with wavelengths of; 451 nm blue, 550 nm green, and 620 nm red, the second light source was blue/red LED with wavelengths of 459 nm blue and 632 nm red, and the final

light source was high pressure sodium (HPS) which had wavelengths of 596 nm yellow. . The dark/light period of the lights were 8hr/16hrs. The researchers of the study came to the conclusion that LED lights had an advantage in promoting higher yields. The study was able to demonstrate that different light systems would influence the growth and yield of basil plants.

The intention of this study was to examine the effect of two light durations in 24 hours on the growth of sweet basil that is growing in an aquaponics system. The first duration of light was to be for a consecutive 8 hours with the light on, and 16 hours without lighting. The second duration of lighting was 2 hours of light on, and 4 hours of light off, and this was done until there was a total of 8 hours of light that the plant received in a 24 hour day period. I studied the height of the plants in centimeters two days a week for 2 weeks. This was the proposed study, but the research could not be completed due to extenuating circumstances.

EXPERIMENTAL

Germination of Basil Seedlings

The sweet basil seeds, which were donated by The Drew Mathieson Center, were grown using 2 in. peat plugs ([General Hydroponics Rapid Rooter](#)), that were placed in 2 in. net cups ([Akarden 2 Inch Garden Slotted Mesh Net Cups](#)). There were two seeds put into each plug and then the plugs were then placed in 20"x 10" grow trays that housed approximately 24 plugs, with a quarter-inch of water. There was also a heating pad ([VIVOSUN Durable Heat Mat](#)) that was placed under the grow beds to boost the germination process and was on for 24hrs a day and reached approximately 20 degrees Fahrenheit. Placed on top of the trays, were dome lids, to help maintain humidity for the plants. The basil seeds were being grown in the science lab under

fluorescent light with a timer that allowed the lights to stay on for 8 hours a day. The basil was kept in this spot for approximately six weeks and needed to be watered every day.

Aquaponics Set-up

Three identical aquaponics systems were assembled according to the schematic in Figure 2. These tanks were filled with water about 2 in. away from the top with tap water that was treated approximately 24-48hrs before the fish were added with a chemical to dechlorinate. The lights that were being used, are the same ones that were used for the germination of the basil and they were then hung above each fish tank, using an improvised stand and a wooden bar. The lights were placed

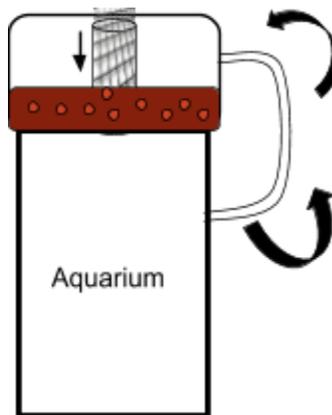


Figure 2. Shows the aquarium and the arrow shows the flow of the water from tank to plants.

on an 8-hour timer from 8 a.m to 4 p.m. A 13 5/8" x 8 1/4" plastic container was used to hold the plants and the clay bead. The container had a 2 in. hole in the middle with a 2 in. tall 3/4 in. diameter PVC piping, type schedule 40, placed into it (used as the draining to prevent overflow). There was a 6/16 in. hole placed on the side of the container with a 5/16th of an inch clear tubing (with an elbow connector). This was connected to the pp300lv-40 gph water pump ([Jebao Pp300Lv Water Pump 40 GPH](#)) to transfer water from the tank to the container. Once the container was placed on top of the fish tank, it was filled halfway with clay pebbles ([GROW! Clay Pebbles](#)). To prevent the pebbles from going down the drain, there was a mesh netting that was put around the PVC pipes.

When everything was running, there were 6 basil plants placed into each container. The basil plants were chosen based on their rate of growth equivalent to each other. Each of the

plants were approximately 2 cm in height when placed into the system. Figure 3 shows a completed set up of the aquaponics systems. The same steps were taken to get each tank running.



Figure 3. Shows the three tanks used for the aquaponics system with the containers on top. (from left, Tank 1, Tank 2, Tank 3)

PRELIMINARY RESULTS

I was not able to implement a full experiment due to an unforeseen closing of the school. However, growth data were collected over a period of 11 days after transferring the basil plants into the aquaponics system. Height measurements were recorded on three occasions and there was an overall positive growth among aquaponic basil plants (Figures 4-6).

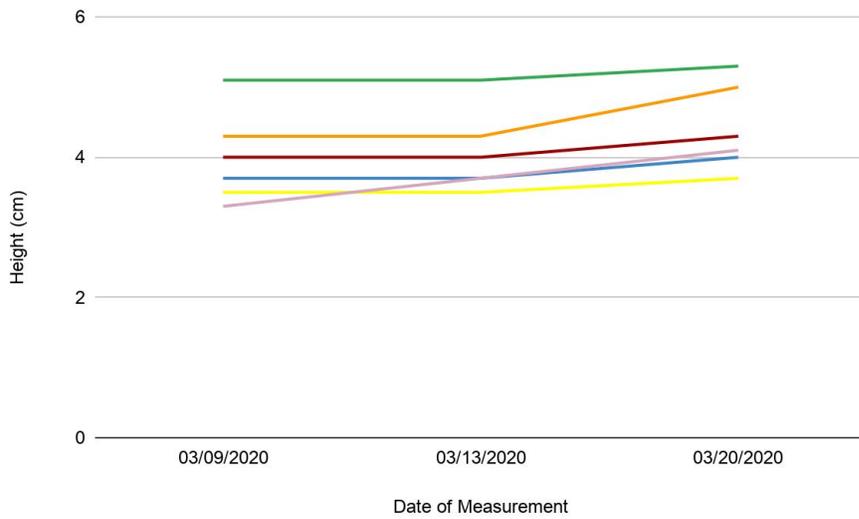


Figure 4. Height measurements of the six plants in Tank 1

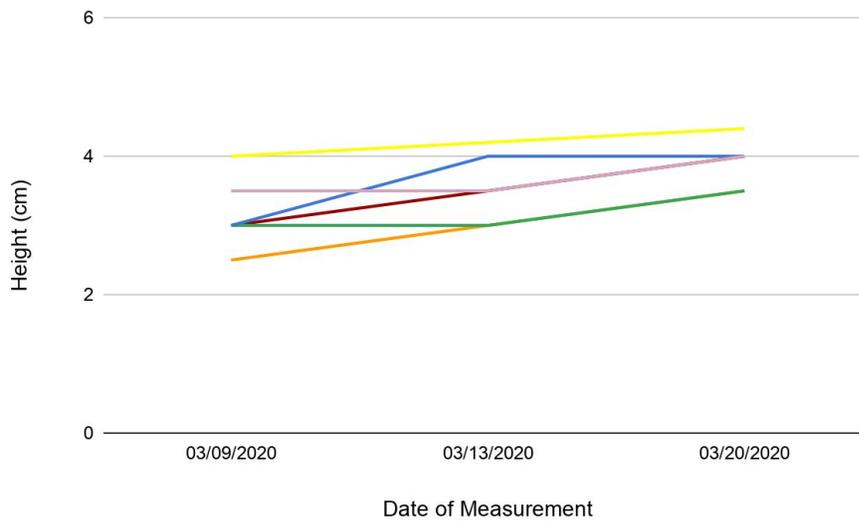


Figure 5. Height of six plants in Tank 2 overtime shows significant growth happening in week two for 6 plants

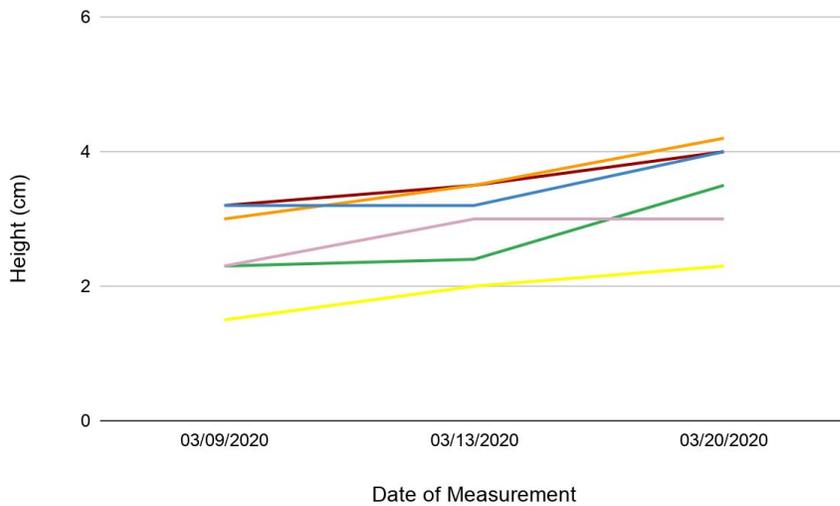


Figure 6. Height measurements of six plants in Tank 3 which had the shortest plant measurements at the beginning of the experiment

At the end of the two weeks, the average height of all plants in each grow bed was calculated and compared to the average initial height. Tank 3 had the highest average growth out of the three tanks, as seen in Figure 7. Figure 8 shows the average height of all plants in each tank on a measured day. During this experiment, the two tanks that would have been used could have been Tank 2 and Tank 3. This is because these plants in each of the tanks were closer in height at the start of the experiment.

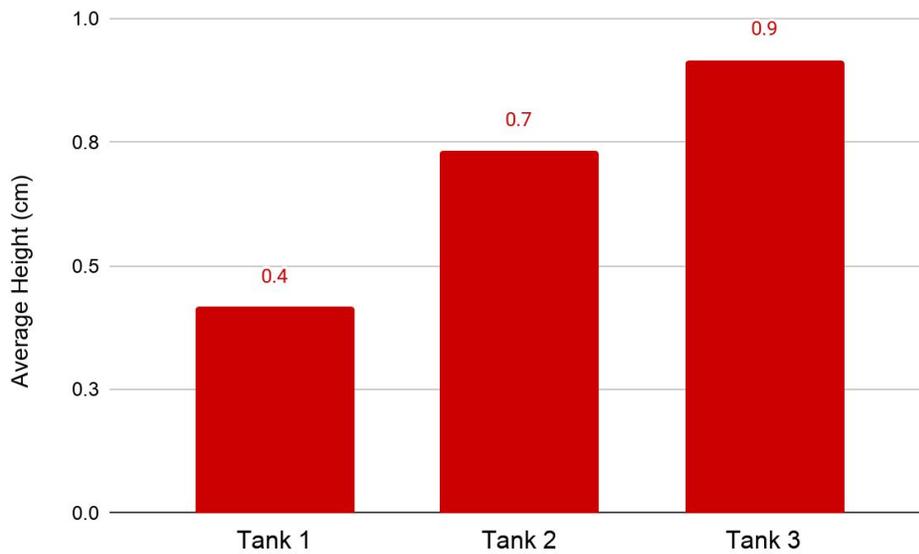


Figure 7. Average growth of basil in each tank at the end of the two week measurement period

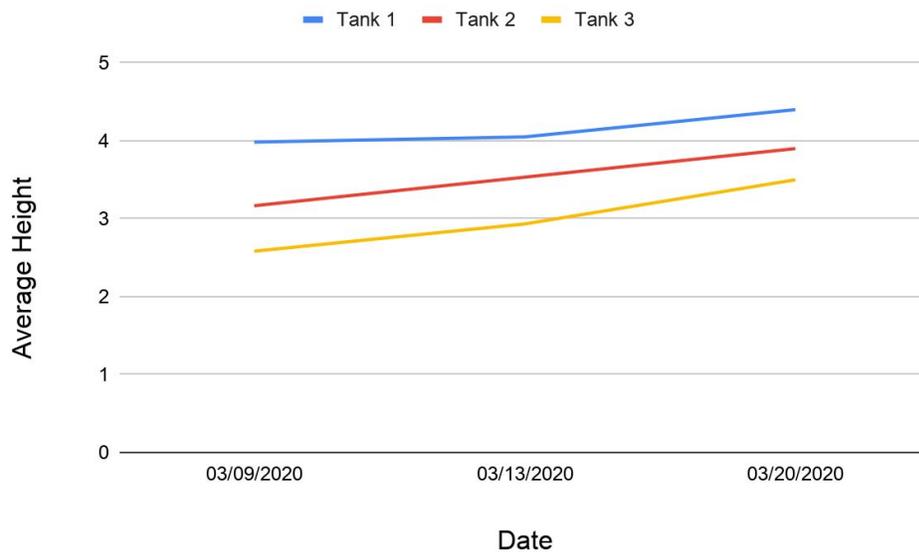


Figure 8. Average height of plants from the first week to the final week

Anticipated Next Steps

During the study, I was going to measure the growth of basil with two different light conditions. One condition was a constant 8 hrs light on each day, and the other light condition

was a repeating cycle of 2 hrs on and 4 hrs off, to reach a total of 8 hrs of light for the plants during a given 24-hour day. There was a two week period, where all the plants had the same light conditions and the fish were getting the same amount of food and this was done to stabilize the aquariums and to get the water flowing from tanks to plants. The light condition for the first two weeks of stabilization was a consecutive 8 hrs of light on and 16 hrs of light off. After stabilization, the light condition for Tank 3 would then change, and these plants would receive the light condition that has 4 hrs off light gaps, while Tank 2's lighting condition stays the same. In Figure 2, there are three fish tanks shown, and this is because Tank 1 is being used for a separate research project conducted by another student, who would change the fish feed in this tank. The plants in this tank received the consecutive 8 hrs of light because this is the average amount of light basil receives for growth (Michaels). Tank 2 and Tank 3 would be compared in this study because the fish feed would be consistent and would not affect the amount of fish waste produced and nutrients the plants receive.

The data that would be collected throughout this experiment is plant height, the surface area of leaves, and fresh weight/dry weight. Plant height would have continued to be collected using the centimeter side of a ruler. The surface area of the leaves would have been collected twice every week, using the millimeter graph paper method. During this method, the leaf is being positioned to be traced over graph paper, and then grids covered by the leaf are counted to give the area (Trimble). Although this method can be inaccurate, it would help give a sense of how much the sweet basil has grown over time, and how much space it is occupying. The fresh weight of a plant is what is measured after the plant has been taking out the roots for harvesting, while dry weight is the measurement of the plants after they have been dried in the oven, making

these the last measurements of the project. To measure the fresh weight, the plants will be washed off and measured on a scale to calculate the mass. To get the dry weight, the plants will be set in the oven on low heat overnight, and then measured the next day on a scale. These two measurements would be different because, for fresh weight measurements, the plants were washed off and the roots absorbed the water and that is also taken into account when weighing.

Predictions

There have been no recent studies found that compare the effect of photoperiodism on the growth of basil. This experiment would see if basil plants needed consistent light to grow and how much the growth would be affected with more dark periods. I believe that basil growth would be affected negatively by having more dark periods because this means that there would not be a lot of light for the plants to conduct photosynthesis over a period of time to produce enough food for themselves. I believe this to be true because photosynthesis occurs when there is light, and if the plants have short light intervals, then that will be less time for the plant to create food.

During this study, there would have been a potential room for error. This is because the experiment was being held in a public area, where students had access to tamper with the project. Also, at the beginning of the project, two fish had died and this means that each tank may have not gotten the same amount of fish waste to produce the same amount of nutrients for the plants. This could affect how healthy the plants are growing and at what rate.

If this study was to be continued in the future, I would recommend the researcher to have more than two weeks to collect data. The more time there is, the more data they will be able to collect and really watch how the basil grows over time in the system. The researcher should also

make sure that all the basil plants that are being transferred into the system have the comparable height measurements at the beginning to make sure all plants started at similar points of growth, to make data and height measurements more accurate. If there is a bigger budget when the experiment is conducted, I would recommend getting a larger aquaponics system. If the system is bigger, then the researcher will be able to use fish that will help the plants have maximum growth, such as tilapia.

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**Is Your Friend Really Your Friend? Do You Really Trust
The Person Closest To You? Find Out Next Time On Split
Or Steal!**

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Spring 2020

Abstract

The topic of this study was to find out if there was a correlation between trust and friendship when dealing with cooperation in a social dilemma when playing a Prisoner's Dilemma Game. Previous research has studied how some factors affect cooperation. We hypothesized that trust and friendship had a correlation between one another and that both would be key factors in predicting cooperation. Twenty eight 11th graders rated one another on a 1-9 scale dealing with friendship and situational trust and provided a dispositional trust level. Then each player was led to believe they faced 4 opponents they knew in Split or Steal, which is a variation of the Prisoner's Dilemma Game. The results were trust and friendship were highly correlated. Also friendship was the only determining factor for predicting cooperation while trust was not. Therefore the results suggest the most reliable people in a social dilemmas are people with high friendship levels rather than someone deemed trustworthy.

Introduction

The purpose of the study is to examine how trust and friendship predict cooperation during a social dilemma game like the Prisoner's Dilemma Game (PDG). This is important because most people would associate trust with friendship or vice versa, however, in an intimate environment like The Neighborhood Academy, this may or may not be true. There were two types of trust associated with the PDG, dispositional and situational (state) trust. Dispositional trust is a personality trait that describes how one views another's default trustworthiness (1). With situational trust, it depends on what is happening and or has happened at that moment and it also depends on the particular person (2). People often associate trust with friendship but that simply might not be true. According to Niven et al., who conducted a study on 38 grocery store workers who knew each other for an average of 4 years, the correlation between trust and friendship was only 0.30, so it might be possible to be friends without trust or to trust without being friends (3). In addition, coworkers trusted half of the employees but were only friends with a quarter. Understanding whether friendship or trust is the best predictor of cooperation can have a big impact on how members of a community behave.

Social dilemmas are situations that present the individual with a motivational conflict between acting on self-interest and concern for others. Many games are played to test out how people will behave in a social dilemma, for example, The Prisoner's Dilemma. The Prisoner's Dilemma Game is the best-known strategy game in social science for measuring cooperation (1). The PDG stems from a hypothetical scenario where two criminals have been captured by the police. They offer the prisoners each a private offer in which they can take the original plea of one year in jail but if they implicate their partner they will receive no jail time and their partner will get 20 years but if they end up "snitching" on each other they both receive 8 years. In this study, a modified form of the PDG will be used to measure cooperation.

Trust

Haesevoets studied the role of personality and situation when dealing with the prisoner's dilemma game (4). There were 3 personality traits that made one more likely to cooperate. Those were social value orientation, which is you value what's best for society, dispositional trust, and prosocial motivational factors, which are values motivated by society's benefits. Then there were two personality traits that made one less likely to cooperate, and they were Right-Wing Authoritarianism which is when one views society as having class, order, law, and structure, and the other is Social Dominance Orientation, which is one views the world as static meaning there is no need for change or no improvements are needed.

Tedeschi et al. investigated how two types of trust will tell whether someone will cooperate or not in a Prisoner's Dilemma Game (5). Seventy college students played the PDG 100 times and were at various times cooperated with or betrayed. They were asked questions dealing with trust, trustworthiness, forgiveness, and repentance. They found that people who trusted others were more willing to cooperate than those who had self-trust. This study was relevant because in the current study we will make people rate how much they trust someone they know. This also relates to dispositional trust as this article spoke upon trust in others while dispositional trust is how one views someone else's trustworthiness in general.

Balliet studied how important the outcome is impacted how much one trusts someone at that moment (2). In a meta-analysis of research on any social dilemma, the researchers found that the larger (the more at stake) the dilemma, the stronger the relationship between trust and cooperation there will be between the two or more parties. Also, when the situation was one-on-one, cooperation was more likely, but in a group setting, cooperation was less likely. The general outcome did not change when the game was played as a one-shot or multi-shot PDG. Finally, one thing that influenced cooperation was dispositional trust in others. This study is important because it suggests both types of trust play a huge role in cooperation with the PDG, but situational trust depends on how big the outcome is.

The decision to cooperate is also based on egocentric traits of how one views the situation (6). One hundred and fourteen people played the PDG on a computer, playing for real money, and researchers studied what information people use to make decisions. In general, players only looked at the risk and reward for themselves, but not others. This is important because it counteracts the bigger idea of the trust of others and cooperation. People might only show trust because of their own self-interest and could explain why a person could say they trust another, but still betray them.

Friendship

One factor that might affect cooperation is friendship. Research suggests that friendship is possible without trust (7). In a study on adolescent deviant's friendships. Deviants tend to be friends with other deviants because they have blackmailable secrets shared between each other. This suggests that one can have a friend they do not trust if they share enough secrets between each other. Therefore, it might be possible to have a friend without trust, who is still willing to cooperate.

Majolo et al, studied how cooperation differentiated between a friend and a stranger (8). They used 20 students between the ages of 18-22. They played 15 rounds but only counted the first 10 and they did not play each other face to face. The big findings dealing with cooperation in general was that when playing with friends the cooperation rate was 86%. When switched to a stranger the cooperation rates were dropped down to 61%. So friends cooperated more but both groups had over a 50% cooperation rate.

With continuously playing the game with the strangers the trust and cooperation rate raised more and more.

Study Hypotheses

First, we hypothesized that there is a correlation between trust and friendship. This is because research has found a weak correlation between trust and friendship (3). Second, we hypothesize that there is a difference in the rate of cooperation between weak, moderate and strong friendships. This was made because research states that one is more likely to cooperate with a friend and when playing with a stranger it will take some time to build that cooperation (8). Next, we hypothesize that there is a difference in the rate of cooperation between weak, moderate and strong dispositional trust. Overall, researchers have found that those with dispositional trust are more likely to cooperate with another individual. Finally, we hypothesize that there is a difference in the rate of cooperation between weak, moderate and strong situational trust? (3)

Method

My participants are 11th graders attending The Neighborhood Academy. There are 28 students in total, with 4 (14%) boys and the other 24 (86 %) girls. No students chose not to participate or were unable to participate. We made a self made survey with a list of all current 11th graders and next to each name there are two boxes, one for trust rating and the other for a friendship rating. Each on a scale of 1-9. There are 3 sections for the scaling 1-3 4-6 and 7-9. For trust in that same order goes none, somewhat, and great. For friendship in that same order it goes associate, friend, close/best.

After we collected the data about the scaling of friendship and trust during class, during the next 2 week we pulled participants one by one during advisory and tutorial periods and to play Split or Steal. Split or Steal is a game where you play against somebody to earn a grand prize. There are three scenarios that can happen for the end game First, is that each player chooses split and they end up splitting the prize, Second, is one person chooses split while the other chooses steal and the person who chose steal ends up getting the whole prize, and the third, is each player chooses steal and neither of them get the prize. Participants were told they were playing against four other classmates that would be playing the game later. We recorded if they would split or steal for each other the players. In reality, the four students were only ghost players so we never ended up really asking them to play against the actual player. Once all 28 players were done playing we told them that the game was imaginary and that no one would find out if their classmate split or stole with/from them

Results

We study how friendship and trust can determine how one cooperates during a social dilemma. How we conducted this study was by playing a game called Split or Steal with 28 participants. Each participant was told to rate 1-9 the level of trust and friendship of the other 27 participants. For my hypothesis we said there is a correlation between friendship and trust, those with higher dispositional trust in their community would more likely split the prize.

First, we hypothesized that there is a correlation between friendship and trust. All 28 participants rated the other 27 people in the study on a one through nine scale, on a one through nine scale it rated how much of a friend they are and how much they trust them. A Pearson correlation coefficient test found a significant strong and positive relationship between friendship and situational trust ($r(647) = 0.91, p < 0.0001$). Trust and friendship ratings for any given 11th grader are fairly similar; participants tend to trust people to the same extent that they are friends with them.

We also hypothesized that people with higher dispositional trust in their community would be more likely to split the prize, or cooperate in the PDG. Participants were put into one of three categories based on how they trusted the school: none, somewhat and great. Twenty eight players each played 4 games. A Fisher exact probability 2x3 contingency table test found there was no relationship between level of dispositional trust and cooperation in the game ($p=0.18$, Table 1). Participants reporting great trust in the community cooperated 100% of the time, although there were only 4 people in that category. Of the twenty people who had some trust, split 50% of the time. People reporting no trust, split 61% of the time. Because the people with no trust often split, we cannot conclude that dispositional trust of an entire school is a good way to predict if one will cooperate.

Dispositional Trust	None	Somewhat	Great	Total
Split	4	10	48	62
Steal	0	10	31	41
Total	4	20	79	103

Table 1. Dispositional Trust and Cooperation. Each of 28 participants played the Prisoner's Dilemma against four different people. The number of split prizes (cooperation) was compared to how much they trust the community in general.

Likewise, a Fisher exact probability 2x3 contingency table test found there was no relationship between level of situational trust and cooperation in the game ($p=0.15$, Table 2). Out of the 51 participants reporting no trust in others, 65% cooperated. For somewhat out of the 31 participants 68% cooperated. Finally, for the 21 participants who had great trust in others they cooperate 43% of the time. Because those with none or somewhat trust cooperated more than those with great trust in others we can conclude that situational trust is not a good determining factor to predict who will cooperate.

Situational Trust	None	Somewhat	Great	Total
Split	33	21	9	63
Steal	18	10	12	40
Total	51	31	21	103

Table 2. Situational Trust and Cooperation. *Each of 28 participants played the Prisoner's Dilemma against four different people. The number of split prizes (cooperation) was compared to how much they trust their opponent as an individual.*

Finally, a Fisher exact probability 2x3 contingency table test found that there is a relationship between level of friendship and cooperation in the game ($p=0.02$, Table 3). Out of the 55 participants reporting associate level of friendship, 49% cooperated most of the time. This suggests there is a good relationship between friendship and cooperation; the best friend someone is, the more likely the person is to cooperate.

Friendship	Associate	Friend	Best/Close	Total
Split	27	18	18	63
Steal	28	8	4	40
Total	55	26	22	103

Table 3. Friendship Trust and Cooperation. *Each of 28 participants played the Prisoner's Dilemma against four different people. The number of split prizes (cooperation) was compared to how much they view their friendship with their opponent.*

Trust Vs Friendship

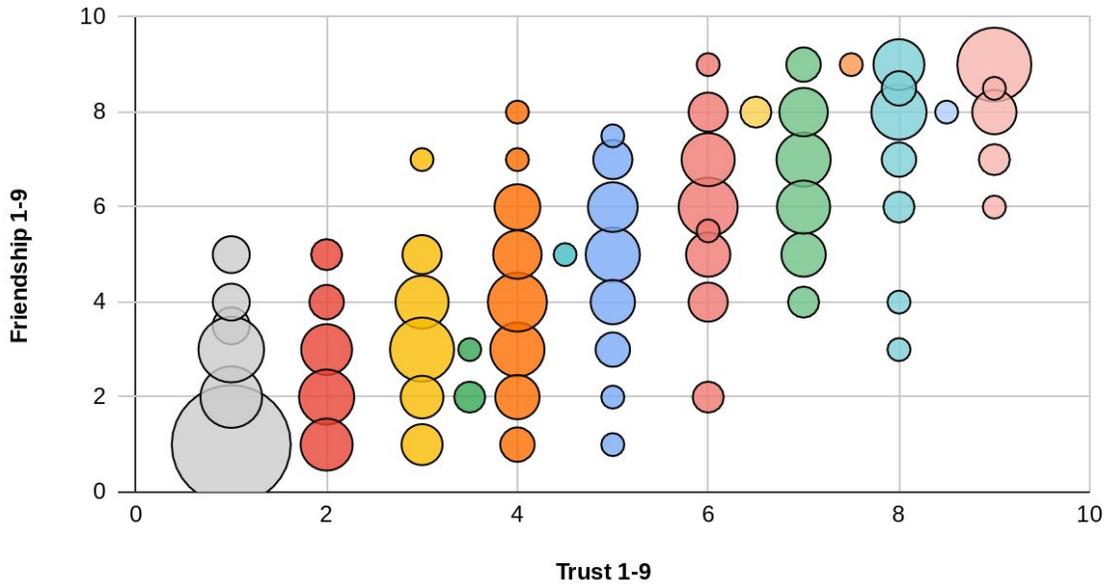


Figure 1. Trust vs Friendship. 28 11th graders were asked to rate the other 27 11th graders 1-9 dealing with trust and friendship. The size of the bubble represents the number of people who gave that specific result. Example, 143 responses rated friendship 1 and trust 1. We found a significant relationship between trust and friendship ($r(647) = 0.91, p < 0.0001$).

Friendship Cooperation Rates

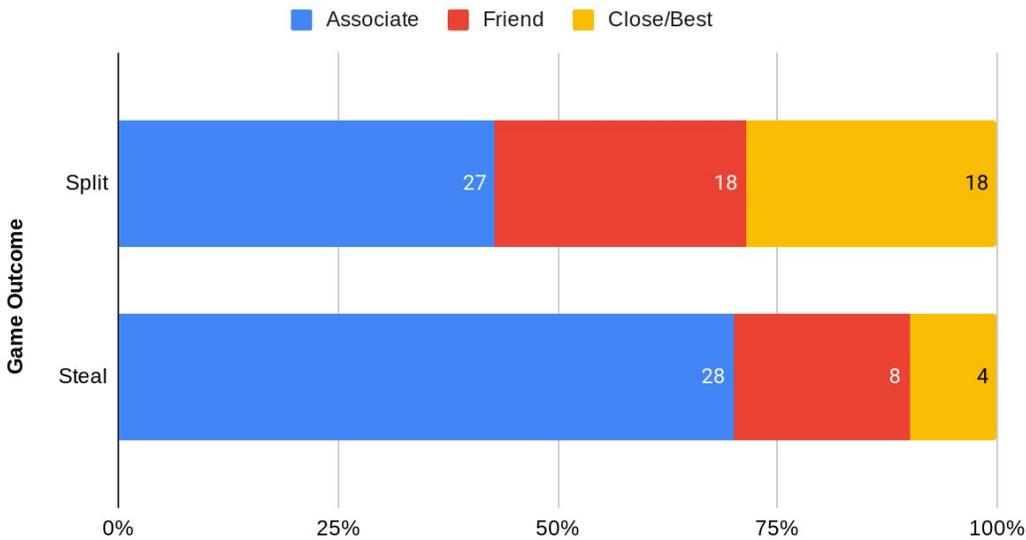


Figure 2. Friendship Cooperation Rates. 28 11th graders played split or steal 4 times against different classmates. The graph above shows how often the subjects split or steal depending on their friendship level. Friendship is a significant predictor of cooperation while both dispositional and situational do not.

Discussion

We hypothesized that there is a correlation between friendship and trust. This hypothesis was supported because we found that the more of a friend someone is to another, the more you trust them (Figure 1). We also hypothesized that people with higher dispositional trust in their community would be more likely to split the prize, or cooperate in the PDG. This was not supported because we found that participants with no trust had a higher cooperation percentage than those with great trust (Table 1). Next, we hypothesized that people with higher situational trust would be more likely to split the prize, cooperate in the PDG. This was not supported because we found that those with no trust had a higher cooperation percentage than those with great trust (Table 2). Finally, we hypothesized that those with great friendship will cooperate more during the PDG. This was supported because those who played against best/close friends cooperated more than those with associate level (Table 3).

We found that trust and friendship have a high correlation which was inconsistent with prior research (3). We found a significant, strong and positive relationship between friendship and situational trust. Trust and friendship ratings for any given 11th grader are fairly similar; participants tend to trust people to the same extent that they are friends with them. While previous research concluded that most people trusted those who were not their friends. We argue that trust & friendship depends a lot on the community - at TNA, a lot of time together day-to-day and over years so they know each other well, compared to a workplace. Workers may choose a place because of money, while TNA families chose for a shared vision of future success.

Previous research (4, 2) suggests dispositional trust predicts cooperation, while we found that dispositional trust could not. We might have gotten different results if we asked about the 11th grade community rather than the whole TNA community. This is because, when participants rated dispositional trust, they were asked about the whole TNA community, not the 11th grade. It is possible they could be more willing to trust their grade, instead of students they do not know.

We found that situational trust is not a good predictor of cooperation. This is inconsistent with other research, which found that situational trust was a good predictor (2). The bigger the prize/punishment the more likely that the two subjects would cooperate during the PDG. Because participants were led to believe the prize was money, they may have chosen carefully and took into consideration their opponents reputation when playing the actual game itself. For example, a student may rate an opponent as low trust because they had no experience to develop the trust, however, that the opponent might have a good reputation in the school, so then the player would split based on that and not trust.

Finally, we found that friends are more likely to cooperate with each other; friendship is a good predictor of cooperation. This hypothesis was proven consistent as other research (5). They had a 86% cooperation rate between close friends, while we had a 82% cooperation rate. Because of this, we conclude that friendship is a better determining factor than trust to cooperate in social dilemmas. This might be because those with high friendship levels are used to sharing secrets (7), so we suggest that after the game was played, they may have spoken to each other about their results, and would have high expectations the other person split, making it likely they would split as well.

We see three limitations in our study. First, we made the 11th graders rate the whole TNA community for dispositional trust instead of just their grade. This affected our findings because we assume that the 11th graders have more trust in their grade rather than the whole TNA community. Therefore it is possible that dispositional trust could be a determining factor for predicting cooperation. Another possible limitation we must take into consideration is that after the subjects played the PDG they talked to fellow classmates about the answers they gave for each other. We believe that they did not talk at all but this would not really affect our study because they would still have to trust that their opponent was telling the truth. Finally, the last limitation was the size of the prize. We do not believe this mattered either because we told them that there was a cash prize but we never stated how much the cash prize would be. Also people took into consideration the reputation of their opponent as a determining factor so even if they did have low trust levels they knew them as a good person. We recommend to future researchers to include more subjects in the study. We only had enough time to study the 11th graders so that is the reason we did not. With other grades there would be more of a chance to play a "stranger" rather than someone you are in class with everyday.

In conclusion, dispositional and situational trust are not good predicting factors for cooperation in the PDG in our sample of 11th grade students. While friendship is a good predicting factor for cooperation in the PDG. This is important because teachers usually always tell students to not work with their friends, but this study shows that working with friends humans will be more than likely to cooperate.

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The Effect of School Climate and Parenting Style on Academic Achievement

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Mathematics Senior Seminar
Spring 2020

Abstract

Previous research suggests that there are positive and negative relationships between parenting style and academic achievement, and school climate can potentially mediate the effects of parenting. The purpose of this study was to apply previous research and confirm those relationships in a sample of African American students in a college preparatory program. Freshmen, sophomores, and juniors responded to the Parental Authority Questionnaire and School Climate Survey to obtain the students' perception of their school's climate and their perception of how they are parented. No significant relationship was found between school climate and academic achievement, however, there were significant relationships between permissive and authoritarian parenting styles and academic achievement. While results suggest that school climate has little relation to academic achievement in this sample, parenting style does. The cultural implications for parenting styles and academic achievement are explored more in depth.

Introduction

A positive environment can have a powerful effect on the students who attend a school (1). In this study, we examine the connection between parenting style, school climate, and academic achievement. The relationship is important due to the fact that one of The Neighborhood Academy's goals is to mitigate the effects of negative parenting and/or low socioeconomic status on academic achievement. Considering that The Neighborhood Academy services a student population in which 58.3 % of students qualify for free and reduced lunch, the results of this study could have a powerful impact on how the school functions. Students will be surveyed about their perception of the school's climate and their parents' style of parenting. Their grades will be drawn, with permission, from academic records and used to evaluate the association between the three variables.

School Climate & Academic Achievement

School climate influences students' emotions, sociability, and academics in many ways (1). Perry defines school climate as, "the heart and soul of the school. It is about the essence of a school that leads a child, a teacher, and an administrator to love the school and look forward to being there each school day" (L). School climate has four components: community, safety, institutional environment, and academics, which are broken down into three to four components of their own.



Figure 1. Components of School Climate. The figure above depicts a diagram of the components considered when evaluating school climate.

Academic climate is associated with performance in primary and secondary school.

Wang and Degol claim that schools that set high academic standards, stress commitment to students, exhibit effective leadership, and emphasize mastery goals tend to have higher-performing students (2). Warm teacher-student relationships, frequent communication between parents and schools, and appreciation for diversity cultivate an environment that is conducive to learning and promotes optimal achievement and motivation among students. Institutional and safety seem to be less significant as effects fade as other factors are controlled for (2).

Davis and Warner conducted a study in New York City, connecting school climate to academic achievement. The study consisted of an analysis of surveys about school climate taken by teachers, students, and parents. Results demonstrated that parents, students, and teachers having positive perceptions of the school climate are positively associated with academic achievement (1). It was found that being eligible for free or reduced lunch is directly and negatively associated with academic achievement. However, in their study, the school climate explained more of the variance in academic achievement, compared to background characteristics such as race and poverty. This is significant because being African American or Hispanic was negatively associated with academic achievement (1).

Parenting Style and Academic Achievement

Raul and Ahmed claim there is a predictive association between parenting and academic performance in school students (3). Parental involvement is separated into seven variables; parent-child discussions about school, parental aspirations and expectations, parenting style, reading at home, checking homework, school involvement, and house rules and supervision (4). Parenting style was found to be the greatest predictor amongst the seven.

Parenting style is compartmentalized into 3 types: authoritative, authoritarian, and permissive. Each different type is specified based on the amount of responsiveness and demandingness from the parent (4). Permissive parents are predominantly responsive. Singh's study of parenting styles' relation to mental health and self-esteem concluded that permissive parents tend to produce low self-esteemed children (K). High self-efficacy has been found to be positively associated with students' grades, and responsiveness was positively correlated with high self-efficacy (5).

Authoritarian parents are predominantly demanding (4). Raul and Ahmed organized a study in Pakistan strictly focussing on the impact that authoritarian parenting has on a student's academic achievement. Through the study, some significant conclusions were drawn. Authoritarian parenting style

is associated with lowered academic performance. Domination and power practice demands children to strictly follow rule and regulation as the basis of their decisions, however, authoritarianism did describe a large part of the outcome (38%), but in a negative way (3).

Authoritative parents are equally demanding and responsive (4). Raul and Amhed, although studying authoritarianism, found that firm and supportive parenting practices are associated with academic success (3). Indifferent parents are neither responsive nor demanding; neglectful (4). A study in Norway concluded that neglect is negatively correlated with self-perceived school competence and a significant predictor of school competence (6). Singh, who studied parenting styles and their relation to mental health and self-esteem, concluded that the permissive parenting style is negatively associated with self-esteem (7). Low self-efficacy is negatively correlated with academic achievement (5). Therefore, drawing a direct connection between permissiveness and lower academic performance.

School Climate, Parenting Style, and Academic Achievement

From 2008 to 2010, 1.5 million high school students from 92 public high schools were surveyed about their family structure, school climate, and grades. For single parent and homeless children, school climate had the largest moderating effect (8). For students in foster care, the effect was promotive but not protective (8). It helped their GPA, but how much it helped was much smaller than in other groups.

Hopson and Weldon conducted another study investigating the impact of parental expectations on academic success in the context of school climate. Parental expectations had no effect on students with no connection to their school (9). Parental expectations are most related to students with a connection to their school. More than anything else, family income and gender had the greatest effect on grades (9). They concluded that school climate is a factor between parental expectations and grades, which magnifies the effect of “good” parenting, but does not help or negate the bad.

Berkowitz et. al ran another study seeking out multiple results. There was a search for associations between socioeconomic background, inequality, school climate, and academic achievement. A meta-analysis of 78 studies concluded that positive school climate contributes to higher academic performance and decreases the effects of poor socioeconomic status and other negative predetermining factors (10). The effect of school climate is mitigating, not eliminating. Also, they state that schools would improve academic achievement if funding was directed towards school climate and not towards educational purposes (10).

In the current study, we investigated how school climate and parenting styles impacted academic achievement. Overall, research suggested that there were connections between how students are parented, how they feel about their school, and how they perform academically. However, there was limited

research on the connection between the three. Our experiment consisted of African American students from a private college-preparatory high school called The Neighborhood Academy. We had all students, ninth through eleventh, take a survey about the school climate and a survey about the way they are parented. With consent, their grades were also pulled from the system.

We hypothesized that there is a difference in the GPA of different parenting styles. Research suggests that authoritative parenting styles are associated with high performance (6). Second, we hypothesize there is a significant positive relationship between school climate and GPA. This is because students, parents, and teachers' perceptions of school climate positively affect academic progress (1). Finally, there will be a greater difference in the benefits of a positive school climate for less effective parenting styles. Research suggests students indifferent and neglectful parents receive the greatest aid from a positive school climate (8).

Method

The participants were students from 9th through 11th grade from The Neighborhood Academy, a college preparatory, private high school. There were 61 students requested to participate, 24% male and 76% female. All 61 students accepted and completed the surveys. The materials were the PAQ and the School Climate Survey. The PAQ is the Parental Authority Questionnaire, and it is a survey used to identify the parenting style of an individual's caregiver. The School Climate Survey is a survey that is used to identify the way an individual perceives their relationships, opportunities, school safety, and school connectedness. We modified the PAQ to be comprehensive to all students and applicable to all family situations. The word "mother" was replaced with "caregiver" so that students who are not parented by their mother can apply the questions to their life.

After modifying the PAQ, both the PAQ and the School Climate Survey were given to the 61 study participants over a one week period. On the PAQ, the surveyees were to rate how much the question related to their caregiver on a scale of one to five. The participants were categorized by summing up their scores on specific questions. All questions were associated with either authoritative, authoritarian, or permissive parenting. For the School Climate Survey, participants were to score each statement relating to school climate on a scale of one through five based on their agreement of the statement. The score of the school climate survey was evaluated by averaging their scores. The surveys were completed during class and participants were not given any incentives.

Results

The purpose of this experiment was to observe how perception of school climate affects GPA, how parenting style affects GPA, and how school climate affects GPA within each parenting style. Students were surveyed to determine what style of parenting best fits that of their caregiver, and students were also surveyed to obtain their perception of their school's climate. Each student's GPA was pulled and then used to observe correlations.

Our first hypothesis was that parenting styles would relate to students' GPA. We used all respondents' scores on the Parental Authority Questionnaire to investigate the parenting score with GPA. A Pearson correlation coefficient Test revealed that there was a significant negative relationship between permissive parenting and GPA ($r(59) = -0.26, p = 0.02$) Students who have more permissive parents seem to have lower GPAs. There was a nonsignificant negative relationship between authoritative parenting and GPA ($r(59) = -0.009, p = 0.5$). However, there was a significant positive correlation between authoritarian parenting and GPA ($r(59)=0.21, p=0.049$).

To further explore the connection between parenting style and GPA, we assigned each student a parenting style, based on the highest scoring style category. A one-way ANOVA test revealed that there was no significant difference in GPA between the three parenting styles ($F(2,56)=0.64, p=0.53$). Students who are parented by authoritarian (3.02 ± 0.71) or authoritative (2.97 ± 0.70) parents have similar GPAs, but students who are parented by permissive (2.53 ± 0.86) parents have a much lower GPA. The lack of significant difference in the data is most likely due to the lack of primarily permissively parented students present ($n=3$).

Authoritarian Parenting vs GPA

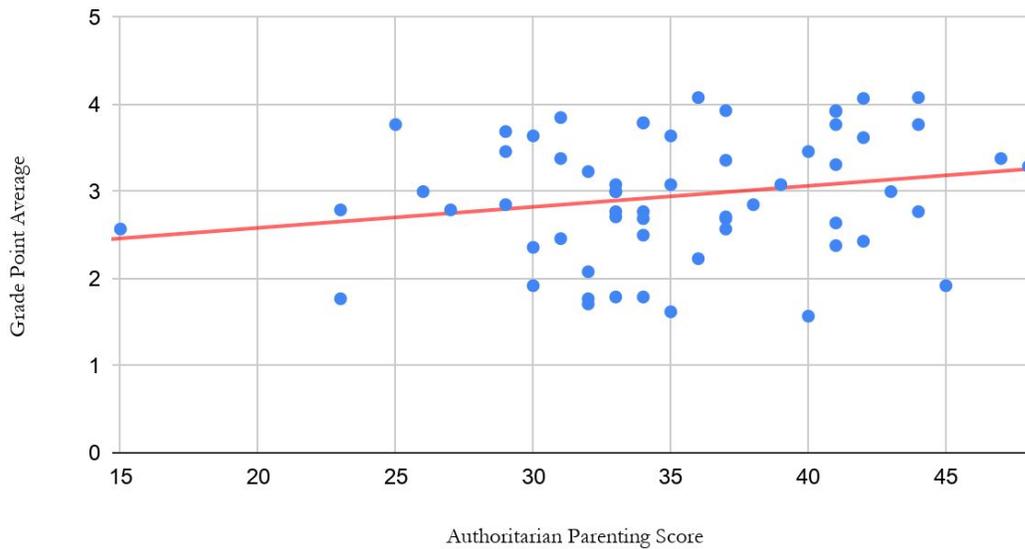


Figure 2. Authoritarian Parenting vs. GPA. The figure above depicts a statistically significant, weak correlation between the authoritarian parenting score of a student's parent and the student's grade point average ($r(59)=0.21$, $p=0.049$). Based on a survey of freshmen, sophomores, and juniors, the more authoritarian the student's parent, the greater the student's GPA tends to be.

Permissive Parenting vs GPA

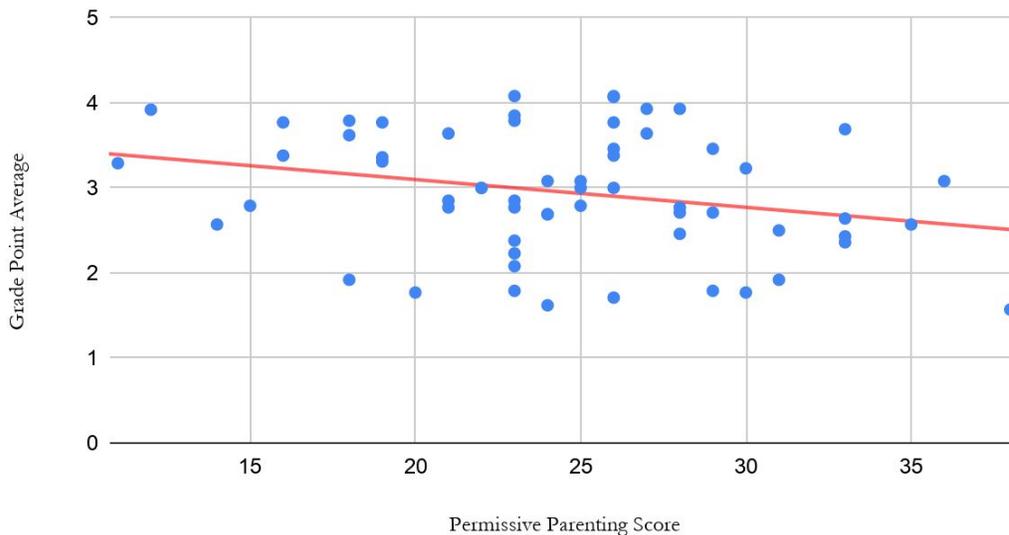


Figure 3. Authoritarian Parenting vs. GPA. The figure above depicts a statistically significant, weak correlation between the permissive parenting score of a student's parent and the student's grade point average ($r(59)=-0.26$, $p=0.02$). Based on a survey of freshmen, sophomores, and juniors, the more permissive the student's parent, the lower the student's GPA tends to be.

Regarding school climate and GPA, a Pearson correlation coefficient test revealed that there was a nonsignificant positive relationship between perception of school climate and GPA ($r(59) = 0.1$, $p = 0.22$). Having a higher perception of the school climate does not necessarily mean a student will have a higher GPA.

There was a 3.3 mean score of perception of school climate with a standard deviation of 0.7. We also found the average score of each question and identified the scores that fell outside of one standard deviation as outliers. Questions 8, 9, and 15 fell below and questions 2, 4, and 6 were above.

Averaging a score of 2.2, statement 8, says “At school, I help decide things like class activities or rules.” Averaging a score of 2.5, statement 9 says, “At school, I do things to make a difference.” Averaging a score of 2.2, statement 15 says, “The teachers at this school treat students fairly.” These statements mostly directly related to the student's personal involvement at school.

Averaging a score of 4.0, statement 2 says, “At my school, there is an adult who tells me when I do a good job.” Averaging a score of 4.3, statement 4 says, “At my school, there is an adult who always wants me to do my best.” Averaging a score of 4.2, statement 6 says, “At my school, there is an adult who believes I will be a success.” All of these statements are related to their interactions with an individual adult in the building.

School Climate vs GPA

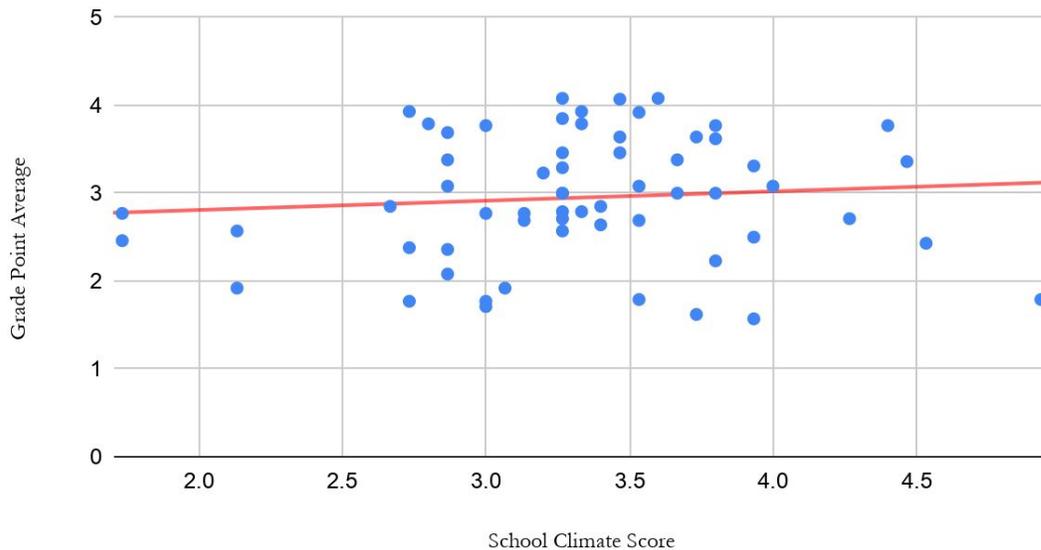


Figure 4. School Climate vs. GPA. The figure above depicts a statistically insignificant, weak correlation between a student's school climate score and the student's grade point average ($r(59)=0.1$, $p=0.22$). Based on a survey of freshmen, sophomores, and juniors, the greater the student's perception of school climate, the greater the student's GPA tends to be.

To investigate how school climate and GPA interact within each parenting style, a linear regression was calculated for each parenting style. For students with authoritarian parents, there was a nonsignificant linear relationship ($p = 0.19$). GPA can be predicted by the function $GPA = 0.19(C) + 2.3$, where C is the climate score. For every 1 point increase in school climate, there is on average a 0.19 increase in GPA. For students with authoritative parents, there was also a nonsignificant linear relationship ($p=0.4$). GPA can be predicted by the function $GPA = -0.04(C) + 3.1$. For every 1 point in school increase in school climate, there is essentially no effect on GPA. The lack of students with permissive parents and the similarity of their GPAs may be the reason for the lack of significance.

Discussion

We hypothesized that all parenting styles would influence GPA, and this hypothesis was partially consistent with our data. Two of the three styles had significant relationships with GPA; permissive (negative) and authoritarian (positive). We also hypothesized that school climate had a direct correlation to GPA, and we hypothesized that worse parenting styles would receive the greatest boost from school climate. Both these hypotheses were inconsistent with our results as there was found to be no relationship between school climate and GPA.

Hypothesis one is partially consistent with previous research. Authoritative parenting had a positive relationship with grade point average (6), but we did not find similar results. Sources 4, 11, and 3 found a negative relationship between authoritarian grade point average, however, we found a positive relationship. For permissive parenting style scores, we and researchers all found negative relationships (7). Contrary to our findings, research says Authoritative is the better parenting style as it balances demandingness and responsiveness (4). Culture may play a role in which parenting style is considered to be better. White middle class families might value an even mixture of being demanding and responsive, but in a 100% black sample (mix of low and middle income), the values might be different. In a study of black and white parents conducted from 2008 to 2010, 47% of Caucasians prefer obedient children over self reliant children whereas 74% of African-Americans do. Therefore, we argue that authoritarianism is more valued amongst African Americans. Black parents averaged a score of 0.78 in authoritarianism. In the same study, white parents averaged a score of 0.60, which is an authoritative style of parenting (12). Nearly a 20% gap in the value placed in authoritarianism leads to culture seeming to be relevant in which parenting style is most effective. Black families tend to value authoritarianism and whites tend to value authoritativeness.

Hypothesis two is inconsistent with research. According to previous research, school climate

should be positively correlated to grade point average (1). The disconnect between results might be that the extreme scores in school climate produced lower grades, and higher performers had a middling school climate. If a student likes school too much, you might not be here to learn, and those who hate it don't work. High performers might feel stress and therefore view teachers and school differently. This difference may stem from the college preparatory agenda that the school has which is unlike the public schools that were used in other studies.

Our results from hypothesis three can not be deemed consistent with prior research. The values of the slopes make sense, +0.19 (authoritarian) and -0.04 (permissive). Authoritarian parenting is positive and permissive parenting is negative, as they should be, but the lack of p-value means it's hard to say. Parents might have less influence due to the extended school day, and The Neighborhood Academy is very authoritarian, which we already know improves grade point average. Our small sample for permissive makes it impossible to reflect on the effects of the parenting style. It may just be an artifact of TNA. During summer academy, there is high 9th grade attrition, and poor performance at other schools, so those students are most likely not accepted.

One limitation is that parenting styles overlap as they all consist of the same factors, demandingness and responsiveness, just different proportions. A student can have high scores in all categories, but authoritative parenting could barely beat out the other two parenting styles and that is the category the student is placed in. Twenty-five of sixty-one students were placed in a category while another parenting was within 5 points of the score. Another limitation would be the lack of parenting style variation. There were a decent amount of students who viewed their parents as authoritative and authoritarian, but there were so few students who viewed their parents as permissive. This may be because permissively parented children are not admitted to TNA or it could be because permissiveness is so normal that it goes unnoticed by the students. Also the demographics of the school could be a factor. Our school is 100% African American and a mix of middle and lower class students, and other studies were typically middle class white students. These limiting factors withheld some potentially useful information and data.

For future researchers, I suggest surveying a group with more varying socioeconomic classes and races so that if parenting is cultural based, there can be a more accurate comparison. Another suggestion would be to survey the parents to see if how they view their parenting differs from how the students view the parenting. This will potentially give two lenses into how the child is parented therefore providing more accurate results.

Having a higher perception of school climate does not necessarily mean there will be a higher GPA in a particular school environment like TNA, which has it's only strong culture, extended hours, and

stress. Authoritarian parenting is beneficial to a student's academic achievement in an environment as such, and permissive parenting is detrimental. Authoritativeness seemed to have no significant effect on students' academic achievement, however all other sources concur that authoritative parenting is instrumental to better grades. Due to culture seeming to be a significant factor, results may vary as environments change.

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HPLC and GCMS Analysis of Mint JUUL Pods

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Abstract

E-cigarette liquid samples from JUUL were analyzed by high performance liquid chromatography (HPLC) and gas chromatography mass spectrometry (GCMS) to assess the consistency of their composition. The idea behind this experiment was to find out if the e-liquid in mint JUUL pod cartridges have harmful components in them by analyzing their contents. Many reports of lung illnesses have impacted individuals who have used e-cigarettes. Testing to find out if there are various components within e-cigarette liquid such as vitamin E acetate, or diacetyl, may support the idea that there are harmful ingredients in them causing those who use them to become ill. Analysis of mint JUUL pods purchased from multiple suppliers could also assess the quality control of their manufacture by comparing how closely the e-cigarette liquids match each other in composition. Mint JUUL pods were selected for this study due to their popularity and a recent ban on their sale in the United States. It was hypothesized that a counterfeit product might be purchased, which is more likely to contain non-standard ingredients. The HPLC method separated the components of each mixture, indicating that there were two peaks. One of nicotine and the other being an unknown component. These two peaks were absorbed at 259 nm light. The GCMS method separated the mixtures to reveal that there was propylene glycol, menthol, nicotine, benzoic acid, and glycerin in nearly every mixture. Some mixtures however, did not have all components detected within them depending on which package they came from. Ultimately, there was propylene glycol, nicotine, and menthol detected to be the three main components found within most of the samples. In closing, since these components are all listed as ingredients on each package of the JUUL cartridges, there was no

further indication that there may be ingredients, in our purchased mint Juul pods, that display evidence of vitamin E acetate or diacetyl being present.

INTRODUCTION

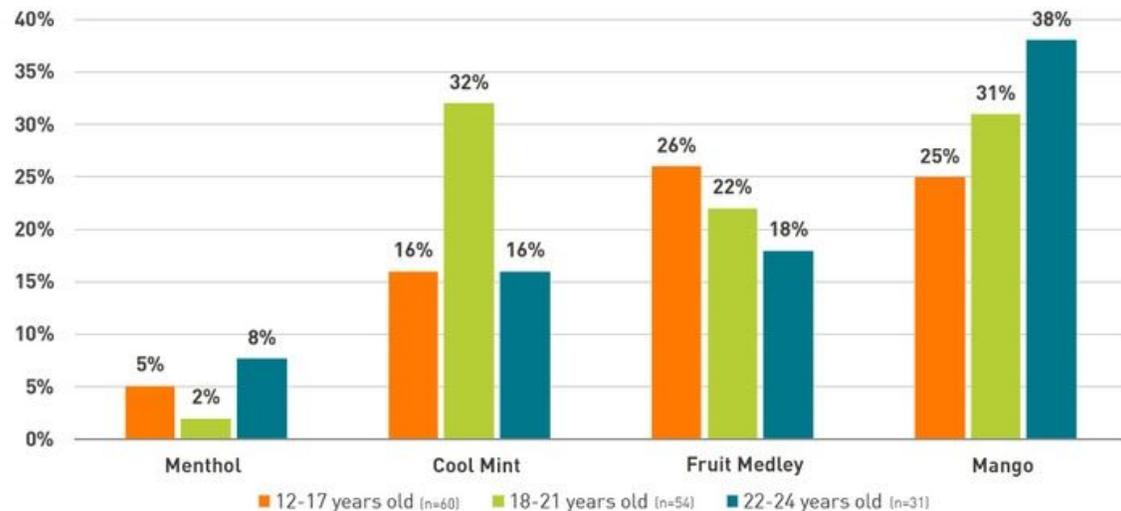
Electronic cigarettes (e-cigarettes or vape pens) are currently a popular alternative to traditional cigarettes, because vaping mimics smoking without exposing the user to tar or other toxic, carcinogenic combustion products (1). Like nicotine patches and nicotine gum, e-cigarettes deliver the addictive nicotine component of traditional cigarettes to people who are trying to quit smoking. Unlike patches and gum, however, e-cigarettes have appealed to non-smokers, as well as those trying to quit a bad habit (2). Although e-cigarettes seem to be the favorable alternative to traditional cigarettes, there are some negative effects of e-cigarettes on the health of those who use them. These effects have been the highlight of many articles and news stories, but even more concerningly, they have caught the attention of the FDA (3). Thus, it appears that e-cigarettes may contain harmful ingredients that need more observation.

Vaping has become mainstream in the past decade, but was invented over half a century ago. In 1963, Herbert A. Gilbert filed a patent for the “smokeless non-tobacco cigarette,” which was modified and commercialized twenty years ago in China (4). Vaping is described as inhaling and exhaling vaporized e-liquid from an e-cigarette device. The device contains a battery-powered coil that has e-liquid inside which is heated up and turns into vapor. When the liquid reaches the heated point of 100-250 celsius, that is when the vapor is released. This works by electrons in an electric current flowing through a conductor (5). Today vape pens are sold by many distributors around the world and are easy to get access to. This increased ease of access and variety of flavors has led to an increase in e-cigarette sales. In fact, the sale of e-cigarettes is expected to surpass traditional cigarettes in the next three years (6).

The popularity of e-cigarettes has increased amongst nonsmokers, particularly the population that are youth and young adults (7). The increase in e-cigarette popularity has stemmed from the ways youth can conceal their existence and the amount of flavors that are available. JUUL vape cartridges have come in flavors such as mint, mango, and fruit, but now only are sold in tobacco and menthol. There was a study that suggests youth and young adults most prefer the flavors mango and cool mint (Figure 1) (8). JUUL vape cartridges have come in flavors such as mint, mango, and fruit, which have appealed to a significant amount of youth. Two-thirds of high schoolers who vape, use flavored e-cigarettes; are one of the top reasons why youth vape (9). Additionally, between 2017 and 2018, the number of students reporting vaping at least once in the past month increased 78% among high school students and 48% for middle schoolers (9). According to the 2019 National Youth Tobacco Survey (NYTS), 27.5% of high school students report using e-cigarettes compared to only 5.8% smoking traditional cigarettes (10). Because of the flavors being popular among youth, the Food and Drug Administration (FDA's) stance on e-cigarettes is to ban the distribution of flavored e-cigarettes except for tobacco and menthol in the U.S (3).

Popularity of JUUL flavors

Most recent flavor used by JUUL users who used the device in the past 30 days



Source: Truth Initiative survey of 1,541 12- to 24-year-olds conducted between April 3-9, 2018

Figure 1. Graph comparing the popularity between different JUUL flavors amongst age groups ranging from 12-24 years of age (8).

The FDA was motivated to enact a ban due to negative effects of vaping, such as EVALI. EVALI is an acronym for an e-cigarette or, vaping related, associated lung injury. Common symptoms facing those who suffer from EVALI are fever, chills, cough, shortness of breath, chest tightness, and loss of appetite (11). This illness has affected many people worldwide who have smoked e-cigarettes (12). Reports of EVALI began in the summer of 2019. “By mid-February 2020, the CDC reported more than 2,800 cases of lung injuries requiring hospitalization across all 50 states, and 68 deaths”(13). As far as youth and young adults, “15% of patients were under 18 years old; 37% of patients were 18 to 24 years old”(11). These lung illness cases are a potential result of what can happen to a person after they vape. This also

indicates that since people are becoming ill, there may be harmful ingredients within vape e-liquid.

There are several hypotheses about harmful ingredients in vape pens that cause those who smoke from them to become ill. The vapor in a vape pen is filled with humectants which are “additives used to produce vapor” (13). These humectants are a key component in respiratory issues by stripping away lung tissue and increasing inflammation (13). While all e-cigarette liquids contain humectants, the most extreme cases of EVALI were connected to THC-containing e-cigarette liquids, often purchased on the black market (14). Counterfeit products are being sold on the streets, at local convenience stores, and online. Researchers found that many THC-containing e-cigarette liquids connected to EVALI cases contained vitamin E acetate (15). Vitamin E acetate is typically found in common products such as lotions and is harmful when inhaled. This substance when inhaled is known to stick to the lungs like that of honey and is seen to be a primary site of lung injury. (15) Another possible culprit is diacetyl, which is a substance that is used to give food a rich buttery flavor. (13) Diacetyl is connected to “popcorn lung” which is another lung associated injury that can be inhabited from the inhalation of a harmful substance. 60% of sweet-flavored vapes have diacetyl in them to add “sweet” flavor to them, thus this is the reason why this substance is a likely culprit for causing lung injury.

Common laboratory methods for identifying components of e-cigarette liquids include high performance liquid chromatography (HPLC) and gas chromatography-mass spectrometry (GCMS) and several research studies have investigated various aspects of e-cigarette liquids. Even before the concern about EVALI, scientists were analyzing e-cigarettes to determine their nicotine content using HPLC. (16) This can be seen through a study done, that was examining

the variation of nicotine and alkaloids, which are nitrogenous organic compounds, found in e-cigarettes. (17) A similar study showing variation was one that looked for the variation among products compared to their labeled concentrations, where, for example, the labeled concentrations were 74% -109% nicotine concentration. (18). Researchers concluded that the nicotine levels were higher than labeled. Researchers have also tested for the presence of diacetyl and vitamin E acetate in e-cigarette liquids. (19) Additionally, forensic investigations have also used HPLC and GCMS analysis to identify illicit drugs in e-cigarette liquids. (20) Ultimately, these experiments are similar to this experiment by using similar techniques to analyze e-liquid samples and finding similar results in the end.

For this study, we were interested in testing e-cigarette liquids for vitamin E acetate, but had no way of legally purchasing THC-containing vape pods in Pennsylvania. Hence, we shifted the focus of our study to assessing the consistency of e-cigarette liquids from the same company purchased from different suppliers. Doing so would offer insight into the quality control of that company. Differences in composition would indicate poor quality control or maybe even suggest a counterfeit product. A counterfeit product may then have a higher likelihood of containing harmful components. We chose to test mint JUUL pods purchased before and after the federal ban on the sale of flavored vapes because this brand in particular is popular among vape users, and is more likely to be duplicated by other distributors. In this study, HPLC and GCMS analysis was performed to further analyze mint JUUL pods purchased both locally and online.

EXPERIMENTAL

Chemicals and Equipment

Reagent grade sodium bicarbonate, reagent grade sodium carbonate, and HPLC-grade acetonitrile were purchased from Flinn Scientific, Fisher Science, and Acros, respectively. HPLC grade methanol was purchased from J.T. Baker. HPLC analysis was performed using a Dionex system comprised of an ASI-100 automated sample injector, P680 HPLC pump, solvent rack SOR-100, and a UVD170U UV detector. The column used was a Hypersil BDS C18. The HPLC was operated using Chromeleon software. GCMS analysis was performed using a GCMS-QP2010 Shimadzu Gas Chromatograph Mass Spectrometer consisting of an AOC-5000 Auto Injector and a SH RXI-5MS column (with parameters of 25mm thickness, 30m length, and 25mm diameter).

Purchase of e-cigarette liquids

Mint Juul pods were purchased from three different retailers between November 2019 and February 2020. The packaging indicated that each pod contained 0.7 mL of e-cigarette liquid with a 5% concentration of nicotine. Two were purchased from local retailers. The first vape pods were from the convenience store, 7-11, and were purchased on November 8, 2019. The next vape pods were purchased from a tobacco/CBD store called Keepin' It Glassy on November 16, 2019. Shortly after these purchases, the FDA proposed a rule to ban all flavored Juul pods except for tobacco and menthol. The ban finally came into effect on February 7, 2020. Now Juul no longer produces these flavors of e-cigarettes, including mint, in the United States. The third pack of Juul pods were purchased from the online retailer, Price Point NY, on February 12, 2020. These pods were purchased after the federal ban was imposed.



Figure 2. Images of all three Juul pod boxes lined up alongside each other, front and back, after being opened. From left to right: 7-11, Keepin’ it Glassy, and Price Point NY.

HPLC Analysis of e-cigarette liquids

Liquids from mint-flavored Juul pods were analyzed according to a procedure adapted from Bansal, et al. (18) Specifically, samples were run at a flow rate of 1 mL/min using a 20:80 (v/v) acetonitrile-NaHCO₃ buffer (0.03 M, pH 9.7) as the mobile phase. The following wavelengths were used for UV detection: 220, 259, 294, and 500 nm. Initial trials were performed using undiluted e-cigarette liquid. Two Juul pods were tested from each package of four, for a total of six samples and data was collected for 20 minutes. Due to detector saturation, additional trials were run using diluted versions of the original HPLC samples. These diluted samples were generated by adding varying volumes of eluent (0.5 mL, 1 mL, or 1.5 mL) to the original HPLC e-cigarette liquid samples. Originally, the period of time it took for these samples to be collected was for 20 minutes in the initial trials, but in the second trials, it took 30 minutes.

GC-MS analysis of e-cigarette liquids

Two Juul pods were tested from each package of four, for a total of six samples. Each sample included 10 µL of e-cigarette liquid dissolved in 2 mL of methanol. The samples were run at a flow rate of 2 mL/min each at a span of 20 minutes with the GCMSsolution Software.

The highest peaks were automatically picked by the software and their mass fragment tables compiled and compared to a database of known substances.

Results & Discussion

The solutions of e-cigarette liquid were analyzed through both HPLC and GCMS procedures. A representative HPLC chromatogram from a mint JUUL pod analyzed in this study is given in Figure 3. The peaks indicate when a component that can be detected by UV or visible light runs off of the column as well as how much of that component there was that was run off. The HPLC data is specific to how each component ran off in liquid form while the GCMS data was specific to how each component ran off in gas form.

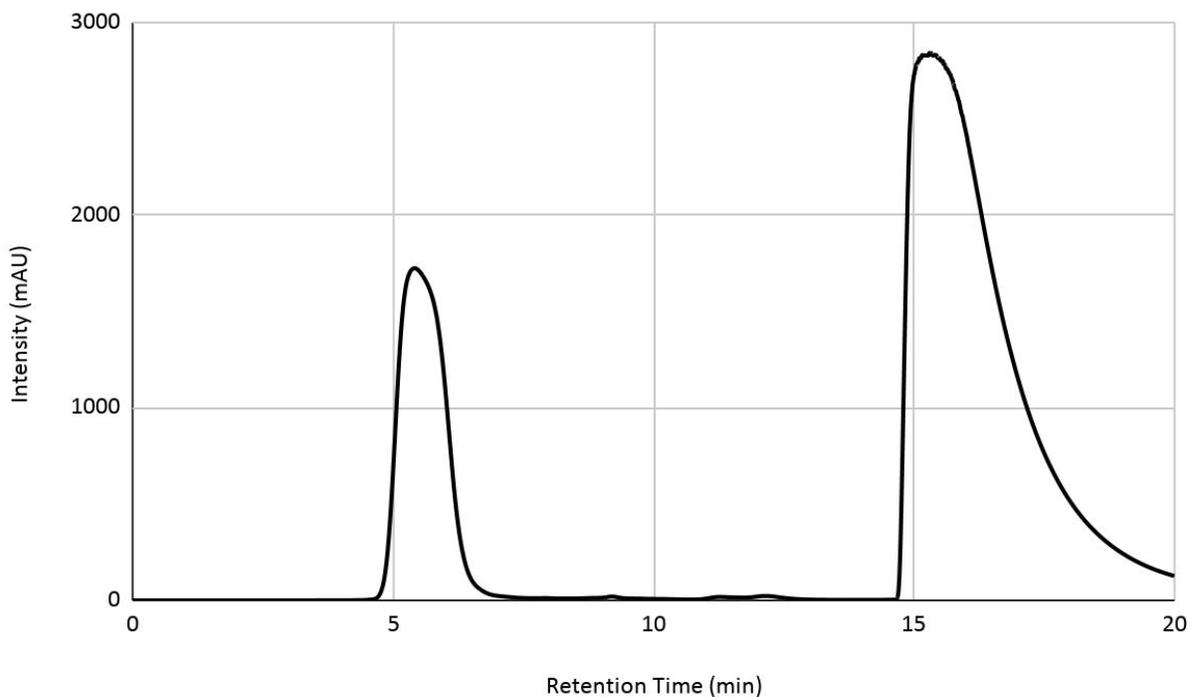


Figure 3. HPLC chromatogram measured at 259 nm of an undiluted JUUL pod liquid showing two components with retention times of 5.4 minutes and 15.4 minutes. The first peak is consistent with the presence of nicotine.

Four different wavelengths were monitored during the HPLC analysis of JUUL pod samples from each distributor, but none yielded more insight into the mixture than 259 nm. For every pod tested, the HPLC chromatogram showed two peaks. The samples were so similar that their chromatograms overlapped precisely when plotted on the same graph, making it clear that there were no differences within each solution. The two retention times were 5.4 minutes for the first peak and 15.4 minutes for the second peak. The chromatographs indicate the presence of nicotine, which is represented by the first peak. Referring to a similar study done to analyze the amount of nicotine content within e-cigarette liquids, the retention time for nicotine was 4.6 minutes in that experiment. (16) In which is approximate to the retention time of our run off time of 5.4 minutes. The component in the second peak can't be identified directly, but future studies could test pure samples of JUUL pod components, such as propylene glycol, benzoic acid, or menthol for comparison.

The data collected by the GC-MS system included both gas chromatograms for each sample tested, as well as mass fragment tables for significant peaks. Figure 2 shows results from one of the samples which represents how most of the components were detected. For each significant peak detected, the mass fragment pattern was also recorded. The fragmentation pattern was then compared to a database of known substances and the software reported closest matches as given in Table 1. Figures 3-5 show the fragmentation patterns for the three main components.

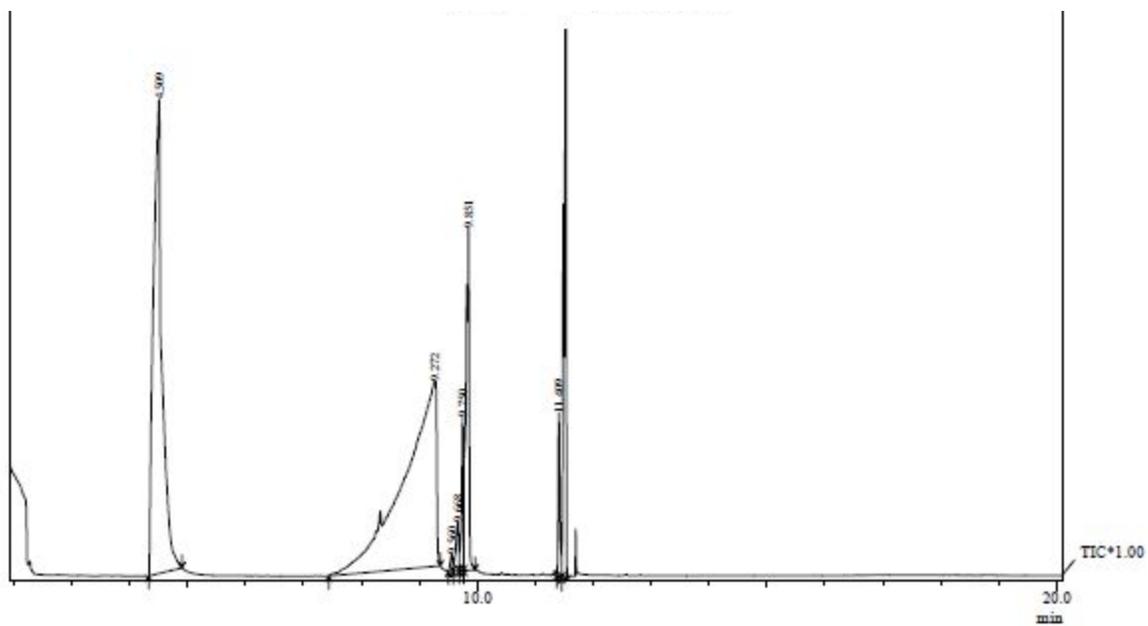


Figure 4. Gas chromatogram of a JUUL pod solution purchased from 7-11. Retention time (min) is the x-axis and intensity of peaks is the y-axis.

Table 1. Table indicating all known peaks and retention times within each sample.

Peak #	Retention time (min)	Chemical Name	JUUL ingredient
1	4.50	Propylene glycol	Propylene glycol
2	9.72	Glycerin	Glycerol
3	9.56	Benzoic acid	Benzoic acid
4	9.66	Benzoic acid	Benzoic acid
5	9.75	Cyclohexanol, 5-methyl-2-(1-methylethyl)-	Menthol
6	9.85	Cyclohexanol, 5-methyl-2-(1-methylethyl)-	Menthol
7	11.40	Pyridine, 3-(1-methyl-2-pyrrolidinyl)-, (S)-	Nicotine
8	11.52	Pyridine, 3-(1-methyl-2-pyrrolidinyl)-, (S)-	Nicotine

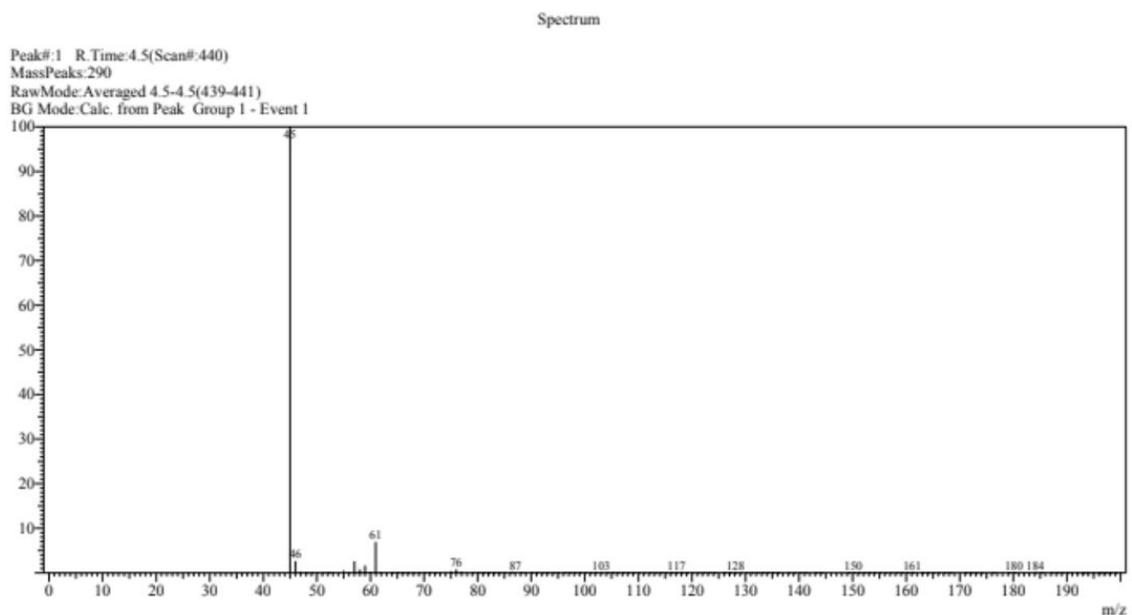


Figure 5. Fragmentation pattern that indicates peaks consistent with that of propylene glycol.

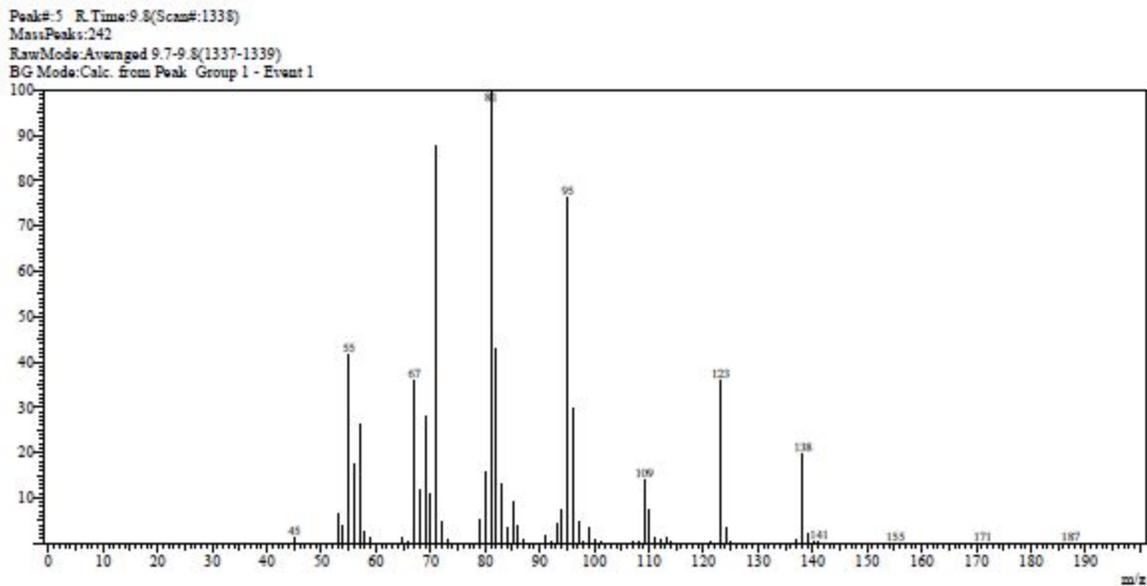


Figure 6. Mass spectrum fragmentation pattern for menthol. Mass to charge ratio is the x-axis and the amount of abundance is the y-axis.

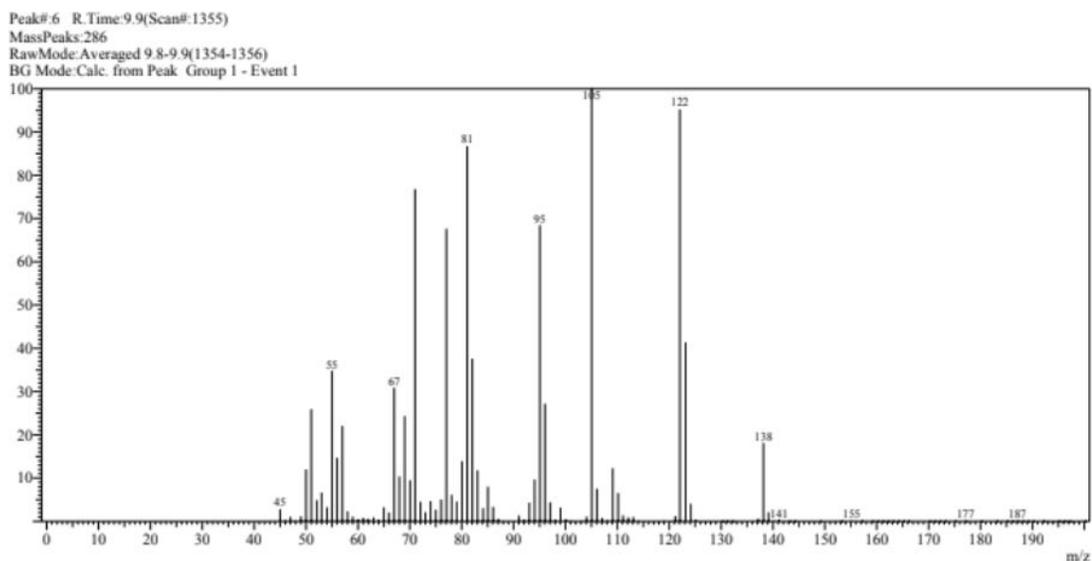


Figure 7. Fragmentation pattern matches that of nicotine.

There was some variation among samples with respect to the number of components detected by GCMS. Propylene glycol, menthol, and nicotine were all reported to be in each

solution according to the graphs. Glycerin and benzoic acid were only detected by the software program to have been in two out of the six solutions, both from different distributors.

Prior research regarding e-cigarettes has investigated nicotine content. To compare concentrations of nicotine in our samples, the GCMS data was analyzed by calculating the ratio of nicotine to propylene glycol. This was done by comparing the total area under the peak for any nicotine peaks to the total area under the peak of propylene glycol for a given trial. To approximate a measure of consistency within each concentration. The average ratio of nicotine to propylene glycol is 0.60 whereas these values remain quite consistent ranging from 0.54 to 0.63. Comparably, the peak area between each sample is close in number, along with each retention time being close in series.

Analyzing each peak from the GCMS graphs, the peaks were similar in size, but differed in exactly how many peaks there were and when they showed up. Between the two graphs from each of the three places where the Juul pods were purchased, the graphs reveal how alike each of the peaks are. The peaks from the 7-11, PricePoint NY, and Keepin It Glassy, seem to be quite similar. It seems as though the larger peaks resemble when the propylene glycol, nicotine, and menthol have run off of the column, since they were all present in each solution.

Conclusion

In conclusion, the data from the HPLC analysis shows how consistent each sample was, as each chromatogram gave identical peaks. The GCMS data highlighted how there were three main components consistent within each sample (i.e. propylene glycol, nicotine, and menthol). Flavored vape devices are currently banned in the United States. The use of other vape flavors such as tobacco and menthol however, are still allowed. The latest edition of mint Juul pods were

banned due to an FDA regulation on all flavored e-cigarettes. Nicotine was seen to be consistent throughout every pod, meaning that the FDA regulation on JUUL pods seems to be quite effective. Therefore, JUUL pods appear to have good quality control and due to this there wasn't any evidence of there being a counterfeit product in this study. Overall, there were no unexpected components identified from the results that weren't already labeled to be there.

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The Effects of Video Game Play on Academic Achievement at The Neighborhood Academy

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Mathematics Senior Seminar

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Abstract

Previous research is divided on there being a positive or negative relationship in games and grades. The purpose of the current study was to determine whether or not video games had an effect on GPA in a small homogeneous high school community in regards to total game play, weekday and weekend play, study time, and gender and GPA. The study was carried out by creating a survey and asking 67 students about the time they played games and their grades. First we confirmed that self-reported grades are accurate by comparing self reports and school records. Second, our most important finding was that there is a small but negative relationship for weekend gameplay but there is no other clear association for anything else we looked at. Because of this we can conclude that video games are unlikely to harm grades, when in moderation.

Introduction

Currently there has been plenty of debate in both research and popular culture on video games and if they are harming kids and influencing them in negative ways. This is such an important point for some adults that in places like China there have been government restrictions put into place to keep kids under a certain amount of video game play (1). While no such policy is under consideration in America, schools and families are concerned about children playing video games. The main group of kids thought to be affected the most are high school students who play large amounts of video games. This may be because high school students are vulnerable mentally and emotionally (2). This is important because of the amount of adolescents that play games; 91 percent of children between 2 and 17 play video games (3). The study investigated whether games are negatively associated with high school academic achievement (GPA), in grades 9-12 at a college preparatory high school. Four main factors under consideration that relate to academic achievement and video game play are total playing time, weekday vs. weekend play, study time and gender.

Gameplay has been shown to have various effects on grades but the most prevalent is there being a negative effect (4-9). In most studies, there has been a significant relationship between low academic achievement and video game (VG) usage. One study of college students investigated gameplay, time spent studying, and self-reported GPA (4). It was found that students who played more than 13.4 hours a week had lower GPAs, but no effect on time spent studying. It's possible students were not honest about study habits, or possibly their sleep was affected by the gameplay (5). Another study of college students investigated time management and how video games and academic performance were affected by it. It was found that there was a negative correlation between both total SAT and GPA and VG play (6). A small negative correlation was found between GPA and VG usage, along with that they saw that college students who played more than 14 hours had worse grades compared to people who played under 14 hours.

Research says that gender matters when it comes to the negative effects of VG play, but it is actually gender norms and how much one gender plays compared to the other that matters. In a study conducted on 621 college students, it was found that students who played more VGs did worse and people who played less VGs did better. Males played 7.1 hours per week on average, while females played 1.7 hours. Therefore the better academic performance of females might be due to the gameplay, and not biological differences between the genders. Another study found that women played an average of 5 hours a week compared to the men who played 13 hours (9).

The next study included 152 high school students from three different cities (8). The students had an average age of 16.1, two of the cities were small while one was big and the students' grades were not

self reported. What they found was a negative correlation between time and money spent on games and English grades. Another study of 607 eighth and ninth graders investigated violent video games (9). Students who played more violent video games tended to have worse grades, however both violent and nonviolent video games were found to have a similar negative effect on grades.

There have also been cases in which VG have seen a positive or no effect on academic achievement at all. The problem with those studies though were they are frequently either not specific with the data they are collecting or they had small sample sizes. For example, one study that reported no negative effect had self reports of grades from students with deviant behavior (10). These kids self reported grades and because of their past deviant behavior they have a higher chance of lying about their grades in the study. For academic achievement, there was no significant difference from a source that used a standardized test called the PISA. This source has one major flaw in being too broad and only measuring gameplay for daily, weekly and monthly video game play (11). Not only does how much someone plays matter but also when they play, one other study reported a small positive correlation between weekend video gameplay and academic achievement (12). Video game play during the week on the other hand had a strong negative correlation with academic achievement, a possible reason for this is that there is a stark contrast in amount of time to play games on the weekend versus on a weekday.

In addition to when a game is played, the genre of the game may affect the relationship as well. A study displayed a small negative correlation between multiplayer games and standardised test scores, while there was no correlation between single player games and standardised test scores (11). The content of the game mattered as well. For academic achievement there was a small negative correlation between both violent and non violent games for another source (9). Although another important factor came when there were parental limits set, because there was a positive correlation with limits and grades (9).

In previous studies, when more video games were played, grades tended to be worse for college students, this could be because one of two things- either lack of sleep caused grades to be worse or lack of study time because of more gameplay (4). That is an example of time displacement hypothesis, which is the idea that the more time someone uses doing one thing the less they have doing another. Participants reported their study was not harmed by playing, therefore suggesting they may have lost sleep, which could also harm grades. Other research suggests that those who play a lot of games tend to study less and do worse on tests like the SAT (5).

In the current study, we investigated academic achievement and how it is affected by video games through, total playing time, weekend versus weekday, study time and gender. Previous research suggests that there is a little consensus that VG have a positive, negative or neutral impact, although the most common answer is that there are negative effects. However what we will have different from

previous studies is the amount of variables compared to video game play. We will also have the opportunity to study in a small homogeneous college prep community who all share the same teachers and classes. Also by comparing self reported and grades from the grade book to see if self reported grades are actually worth collecting.

We hypothesize that players who play more time per week, will have lower GPAs. This is consistent with previous sources (4-9). Second, there will be a stronger negative relationship between weekend play and grades versus weekday is what we hypothesize because of the amount of time played. Third, the more students play video games, the less time they will report studying and we hypothesize this because there is only a finite amount of time. This claim is backed because of past similar studies (4, 5). We hypothesize that VG playing and grades will have a negative correlation more for males than females because they play less overall. This is backed up by previous studies (5, 7, 9)

Methods

The participants were students 9th through 11th grade from The Neighborhood Academy, a college preparatory private high school. There were 68 students invited to participate in total, 74% female and 26% male. All participants are black or biracial. One student decided not to participate in the study so we had a total of 67 participants in our study.

We used a self-created survey, with questions that asked about students' GPA. It also asked how much VG per hour for both weekdays and weekends they played in the past week. Also, we asked how much students study per hour for both weekdays and weekends in the past week. Lastly, we asked how much time the student sleeps on a typical weekday. The survey also asked students permission on obtaining their school records for their GPA. The survey was given during class with permission from the teacher, in groups of 8 to 12 students. The survey was about 5 minutes long and it consisted of two sets of questions from two different video game related projects, both primary researchers collected data and entered it into a shared spreadsheet.

Results

The purpose of the experiment is to figure out if a person's grades have an effect on their GPA. In particular, we investigated total playing time, weekday and weekend playing time affected grades and if so if they did it any differently. Another thing was also the fact that plenty of other studies that were similar to ours allowed students to self report grades and because of the complications that we thought this could bring we decided that we wanted to check if students were truthful when asked about their grades.

Other studies tended to use self reported grades (2-4,6,9,10 & 11). So, we decided to determine if self reported grades were accurate; we asked students for their GPA and also looked up students' GPA and ran a Pearson correlation coefficient test. The results we found were that there was a positive and significant relation with students self reported and real GPAs ($r(49)=.90$, $p=0.0001$). A total of 16 respondents were unable to report their grades so they were not included in the test. In general, it appears as those students' self-reports are accurate.

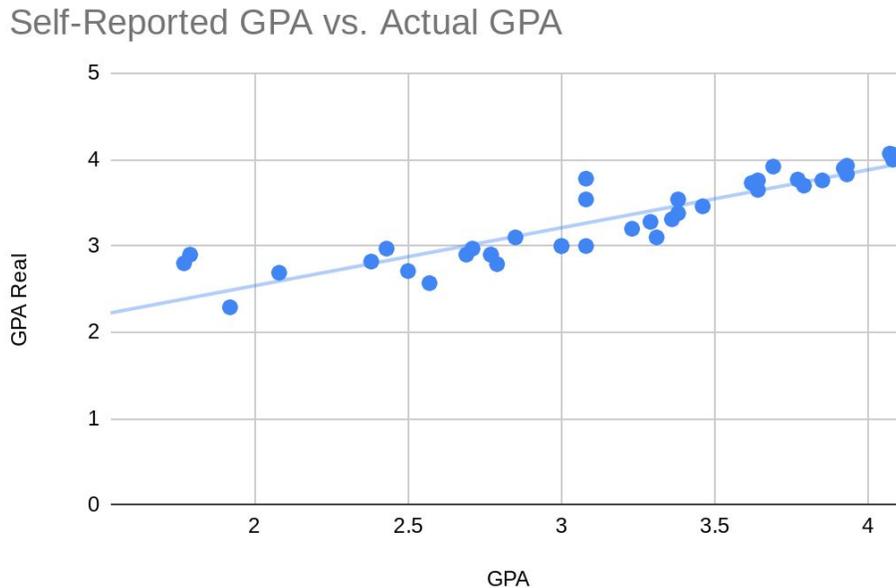


Figure 1. Self Reported GPA vs. Real GPA. *The figure above shows that there is a positive, significant, and strong correlation between a student's self reported grade and the grades from the grade book ($r(49)=.90$, $p=0.0001$). Based on the sample from participants who knew their grades it showed that when people wrote what their grades were it was accurate.*

In order to measure the effect of total play time, we summed the respondents weekend and weekday playtimes. Including players who did not play at all, a Pearson correlation coefficient test found no significant relationship with GPA ($r(65)= -0.15$, $p= 0.12$). This suggests that there is no real connection between playing time and GPA. The same results were found when the test was run without the zero-hour players ($r(33)= -0.24$, $p = 0.08$). However, the negative relationship was stronger without the non-players.

We measured the time of weekday play and we did this with both a mixture of respondents who did and did not play during the weekday and also only players who played during the week. Including players who did not play there was no significant relationship between weekday gameplay and

GPA($r(65) = .036$, $p = 0.39$). The results were similar when there was a test without the zero hour players ($r(27) = .15$, $p = .22$) and this also suggests that there is not a significant relationship between the two.

In order to measure the effect of weekend gameplay we did two tests, one with players who played zero hours included and a second one where they were not. We found using the Pearson correlation coefficient test that for the weekend, and players who played zero hours included there was a small but significant negative correlation ($r(65) = -.24$, $p = .024$). We found the same thing but with a stronger correlation whenever players who played zero hours were taken out ($r(31) = -.40$, $p = .011$) and with that it shows that there is a negative correlation that was stronger than the test that included players with zero hours of VG during the weekend. In Figure 1, there are some extreme gamers who could disrupt the relationship, to investigate this we used the convention that an outlier is three standard deviations beyond the mean, or more than 35.4 hours in this sample. We ran the test again with outlying students removed and there was still a significant relationship ($r(30) = -.32$, $p = .03$).

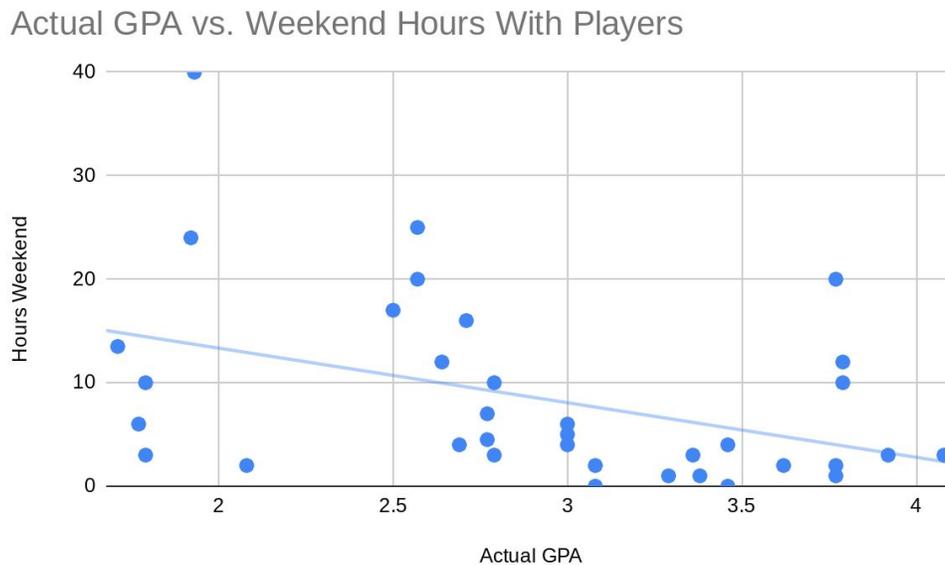


Figure 2. Total Weekend Play vs. GPA. The figure above displays the fact that there is a statistically negative but moderate correlation between total weekend gameplay without zeros and GPA ($r(31) = -.40$, $p = .011$). Based on the sample from the participants it shows that there is a small correlation between playing games on the weekend and GPA. The relationship remained when an outlier was removed.

To determine the effect of VG on study time we did two tests, one with zero hour VG players and another without them. Using the Pearson correlation coefficient test we found that players with zero hours included had no significant relationship between play time and study time ($r(65) = .053$ $p = .33$). We found that there was a similar connection when non video game players were removed ($r(63) = .04$ $p = .38$).

We wanted to see if there was a significant relationship between gender and GPA, based on VG. To figure this out we did three tests, one for males and two for females one with all players and another with all zero hour players taken out. First for males there was no significant relationship between their GPA and VG play ($r(17) = .06$ $p = .40$). We found similar things for both of the other tests as well. We found that females with zero hour players did not have any significant enough data ($r(46) = .06$ $p = .35$) and for females without zero hour players we found the same thing ($r(15) = -.28$ $p = .13$).

Discussion

We have five hypotheses and between there there are only two with a significant relationship. First, we did confirm that students in this sample were able to report their GPA's correctly (Figure 1). Second, there was a negative relationship for weekend video game play and grades (Figure 2). All hypotheses were not supported by our data. Total time was not related to GPA, nor was weekday time, and weekend time was in the opposite direction as expected. Study time was also unrelated to game play, and we found no difference in the strengths of relationships between genders and game play.

Our research was not consistent with prior research (5). The prior research found that any player over 13.4 hours would have worse grades and in our research that could not be proven. This was because there was high variability to it that showed some participants with high grades and high hours along with people with low grades and high hours. This was true even when omitting 0 hour players. There are only eight people who play a high level of videogames and therefore it is hard to know if there is a large effect on GPA from them. There can also be the fact that even if people do not play games, they can be filling their time with other things such as social media use on their phone. Therefore, we could not conclude that games distract people from studying. It is more likely people do not want to study and use games or other activities to fill their time.

The research on weekday and weekend play that we conducted was not consistent with prior research (12). Prior research saw that there was a small positive relationship between weekend gameplay and GPA, but for the weekdays there was a strong negative correlation. What we found was the opposite: we found that there was a small negative relationship with weekend games but, we had no significant relationship between weekday games. Although at TNA students play a lot more on the weekend on average: 9 hours during the weekend and 4.7 hours during the weekdays. Our school has significantly

more work and activities one needs to do, compared to a typical school, so the results may differ due to school expectations. Therefore, students might be unable to play as much, so it impacts them less during the week. However, on weekends, they may overcompensate for this and play more. And since TNA often gives weekend homework, players who play a lot of weekends, would be affected in a negative way.

The research we found on study time vs. total play time was consistent with a previous source (5). What was found was that when people played more they did not study less. This does not go with our time displacement hypothesis. We think this happened because games are not replacing study time. If people do not want to study they may not study and if they want to study they may study and video games may just be a distraction. We also hypothesize that this happens not only with games but today this can also be done with smartphones, and that would further prove that people studying is a notion of if they want to study or do not want to study.

A previous source (9) was not consistent with our research. In our previous source they found that men who played games had worse grades than women who played games. They concluded this was because women played a lower average of games with 5 hours while men played an average of 13. With our research we found that there was not a significant relationship between male and female grades and GPA. While females played an average of 1.9 hours and males played an average of 19.0, there was still a close GPA between the two with females having an average of a 3.0 GPA and males having an average of a 2.6 GPA. We concluded this was because there is not a true pattern and this means there are good students who play a lot and bad students who do not play at all. This suggests that it is highly unlikely that VG causes bad grades and it is more of how good or how focused a student is on their school work.

There were three main limitations to our study, which could have affected the results. First of all there were a lot more females than males in our community, this can make the results inconsistent with other studies. Second, there are a lot of people who do not play video games at all and this would make it harder to get more data on whether or not video games are harmful. Lastly there is a smaller amount of people at this school than there are at regular schools and this makes it so there is less data and therefore less for us to be able to figure out.

For future research we recommend looking at how people are affected by games day to day. So that you can see if video games played the night before affect a test tomorrow or whether it affects the homework you did and in the sense your video games affect your grades. You can also look at the type of games of how these affect your assignments, homework tests, etc.

In conclusion, video games are not likely to be harmful to grades, but only in moderation, if someone plays more there is a chance that your grades will be worse. We also found that games on the weekend are harmful but not by much and that it is likely worse for students if they play the whole entire

weekend. There is also a common notion that males' addictions to video games cause poor grades and this is unlikely because they still have similar GPA to females even while playing over 10 more hours than them. Our data suggests video games are not harmful except in extreme cases of high video game play.

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Overparenting and Adolescent Development

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Abstract

Many studies have shown the negative impacts of overparenting in white families. The purpose of our study was to see whether overparenting had similar negative impacts on black children as white children. The population used in our study were black, 9th-11th grade students at a college preparatory school in Pittsburgh, Pennsylvania with extended school hours. Our study utilized two surveys, The Helicopter Parenting Index and The Parental Authority Questionnaire, to categorize if the 64 students in our study were overparented and what the parenting and family communication styles were of all students. Based on students' survey scores, we chose eight critical cases to interview to see whether overparenting was tied to low self-efficacy or entitlement. We found that overparenting had no correlation to self-entitlement or self-efficacy. We did find that authoritarian parenting styles were correlated to conformity communication styles, however, neither were correlated to overparenting. Future research needs to expand to include more diverse subjects because overparenting may look different and have dissimilar results based on their population's demographics.

Introduction

Overparenting is characterized by parent's overinvolvement in their child's life, especially by solving their children's problems for them. Overparenting can lead to negative impacts such as entitlement, low self-efficacy, neuroticism, and a continuation of dependency in later adult life (A,D,E,H). Overparenting may be influenced by the general parenting style in the family. There are three categorizations of parenting styles. Permissive, authoritative and authoritarian are the most commonly studied parenting styles. Authoritarian parenting seems to have a correlation to overparenting (H). Families also are separated into either having a communication or conformity style communication patterns. Studies have shown that conformity communication styles are correlated to overparenting (H).

However, despite many studies on the causes and outcomes of overparenting, the literature largely ignores black communities. The aim of our study was to see whether overparenting is related to parenting and communication styles in black families and whether overparenting had negative impacts such as low self-efficacy and sense of entitlement for teens. To do this, we surveyed 9th-11th grade students at The Neighborhood Academy in Pittsburgh, Pennsylvania, with questions to get an understanding of how they were parented. We then conducted critical case sampling interviews to find out if our three hypotheses can be proven true based on their responses.

Literature Review

Overparenting

Overparenting occurs when parents continually intervene to solve their children's problems and conflicts that should be handled by their child. There is no single cause of overparenting, but there are many cases it can stem from. Overparenting can come from the marital status of the parents, whether or not one's parents are single, married, remarried and or divorced can determine whether or not they choose to overparent. The personal relationship parents have had with their own parents, those with poor relationships may overparent to avoid repeating history. The number of siblings a child has, and the child and parent's gender dyads can play a role in overparenting. Over-parenting comes with many consequences that parents are not even aware that they are instilling into their children. Entitlement, low self-efficacy, interpersonal dependency, neuroticism, and a continuation of over-parenting in a child's life are negating effects of overparenting (A, D, E, H).

Entitlement usually comes into play when parents spoon-feed their children, leaving their children to feel like all others and adults should do things for them. This means that when kids run into a problem, they will retreat rather than facing the problem themselves. Studies have shown instances where parents are still overly involved by calling college professors to dispute a grade (A). Many parents want their children to succeed, so they try to control situations to prevent their children from failure. Though the parents have good intentions, children might be vulnerable to negative experiences and failure later on in life (E). When parents solve all of their kids' problems, it often lowers their self-efficacy.

Self-efficacy is the confidence and belief that you can do something. Overparenting can break or lower someone's self-efficacy. The consequences of low self-efficacy include dependency, poor coping strategies, or failure to take accountability in the workplace (D). Interpersonal dependency can also stem from low self-efficacy. When a person depends on a relationship with another person to feel adequate, it can be described as an interpersonal dependency. People who are dependent may feel rejection and failure more often, suffer from a borderline personality disorder, and experience social anxiety in close relationships (J).

On the other hand, there is involved parenting, which is different compared to overparenting. Involved parents typically try to help their children brainstorm solutions to problems or challenges, but allow their children to handle situations on their own rather than doing it for them. People who have well-educated parents, biological parents, are female or are young children are more likely to have involved parents (A). Both overparenting and involved parenting seem to be correlated with specific parenting styles.

Parenting styles can be broken down into three groups: authoritarian, permissive or authoritative parents. An authoritarian parent is known to instill fear into their children to gain structure. This can lead children to feel less independent and mature and more likely to challenge rules. Permissive parents allow children to figure out behaviors for themselves rather through authority. Permissive parenting can leave children less likely to set goals or be self-sufficient. Finally, an authoritative parent sets boundaries but gives autonomy to their child (H,I), which is more likely to allow children to be assertive, mature, and self-reliant.

Parents also have different communication styles, which include either conformity or conversation patterns. In a conformity household, the parents value family hierarchy, meaning the youngest would follow by the example of the oldest. Parents who use conformity communication patterns also tend to emphasize traditional values and beliefs (H, E). Negative outcomes of conformity communication are higher levels of stress, low self-esteem, and poor

mental health instilled into children (E, H). While some parents communicate with conformity, some communicate through conversation. Those who have conversation styles believe all voices in the family should be included in decisions. There can be positive and negative outcomes for families that communicate with a conversation. Positives for children include knowing how to deal with problems, believing that they can overcome challenges, building communication skills, and setting foundations for good romantic relationships (D, E, J). However, fostering conversational patterns at home can be challenging for children, too, if they are expected to use conformity patterns with authority figures such as teachers outside of the home.

There are some mitigating factors that seem to help children no matter what parenting style they have, such as parental warmth. Parental warmth is when a parent is actively involved in the child's mental and emotional well-being by actively showing affection. Nelson et al. measured this by surveying adolescents' responses to statements like, "My parent finds time to talk with me" (D). It was found that when mothers did not exhibit warmth, the children had significantly lower levels of self-worth and higher levels of risk behavior. An interesting result was that the mother's warmth seemed to have a significant impact on children's sense of self-worth, however, the father's warmth did not. This could be because fathers were absent from the study or they were not as involved in the child's emotional upbringing.

Study Hypotheses

Research says that overparenting has negative effects on a child's development, leading to entitlement, low levels of self-efficacy, interpersonal dependency, neuroticism and more. The research though has gaps including diversity in their participant pool, therefore we investigated whether overparenting would look different in a black family and if those parenting styles would fall under the textbook definition of overparenting.

We hypothesized first that students who are overparented are more likely to express traits tied to entitlement, which means they would believe they have rights to certain things or are deserving of special treatment. Our next hypothesis is that students who are overparented will have lower levels of self-efficacy. The last hypothesis is that students with authoritarian parents are more likely to have conformity style communication patterns.

Methods

Participants

61 9-11th grade students gave their consent to participate in this study. All of the students who participated attend a predominantly black, college preparatory school in Pittsburgh, Pennsylvania.

Surveys

Each participant consented to take two surveys: the parental Authority Questionnaire and the Helicopter Parenting Instrument. The Parental Authority Questionnaire was scored on a 5 point Likert scale (1= strongly disagree, 5= strongly agree). The questionnaire identified which parenting style best describes the students' guardians: authoritarian, authoritative, or permissive. We compared this score to the scores that students receive on The Helicopter Parenting Instrument. The Helicopter Parenting Instrument is a survey that utilizes a 7 point Likert Scale (1 = strongly disagree, 7 = strongly agree). Two of the statements on the survey were reverse scored. This survey identified the students who could be said to have been overparented more than their average peer within the population. Based on these surveys we were able to select our case samples for the interviews.

Interviews

Critical case sampling is the process of selecting a small number of important cases that are most likely to yield the most information and have the greatest impact on the development of knowledge. We selected our critical cases by identifying students who scored over one standard deviation above the average on the Helicopter Parenting Instrument. We selected two boys and two girls from the case sample. We also selected two students who scored within the average range, and two who scored one standard deviation below the average. The interviews aimed to shed light on the families' communication styles as well as students' senses of entitlement and self-efficacy.

Results

61 students, comprised of 46 girls and 15 boys in grades 9-11, took the Helicopter Parenting Instrument survey. The highest a student could score was 105, and the mean score was 58.7. The standard deviation of the results was 9.4, so any student that scored above a 68.1, which was rounded to 68, was classified as overparented. Students who scored below 49.3, rounded to 49, were classified as below average, and any student that scored between 49 and 68 was classified as being averagely parented. Of the 61 students who took the survey, 9

scored below average, 11 scored as being overparented, and 41 students were in the normal range (See Figure 1).

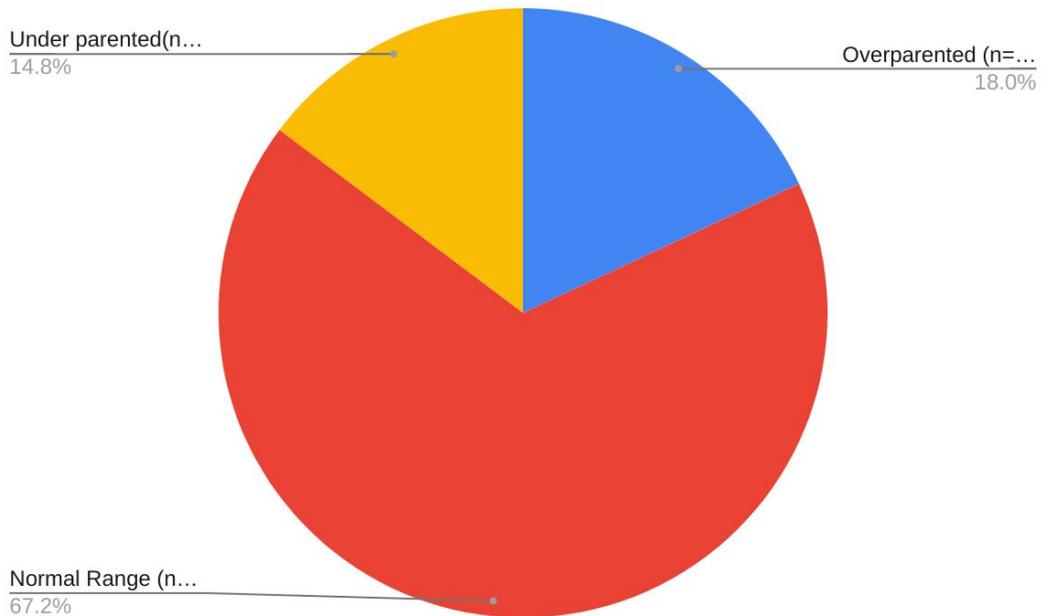


Figure 1. Parenting Classifications at The Neighborhood Academy. The Helicopter Parenting Instrument was used to classify students as over, under, or normally parented. The mean score at TNA was 58.7, with a standard deviation of 9.4. Forty-one students fell within one standard deviation of the mean, classifying them in the “normal range.” Nine students scored under a 49 on the survey, classifying them as, “under parented,” while eleven students scored above 68, classifying them as “overparented.”

The first hypothesis, that students who are overparented are more likely to express traits tied to entitlement, was not supported by critical case interviews. Out of the four critical cases who identified as being overparented, only one showed traits of entitlement. When asked if children should receive an allowance from their parents, she responded, “Yes, because we are taking the time out of our day to do stuff, and most of the time I don’t even make the mess.” The remaining three students who scored high on the helicopter index did not show traits of entitlement. For example, when one critical case interviewee was asked whether or not parents should complete household duties she said, “I feel as though if they’re keeping a roof over my head, money in my pockets for things, food, shoes, clothes, I feel like I should be the one cleaning.”

Additionally, the first hypothesis is not supported because there seems to be no relationship between parenting styles and traits of entitlement among the eight critical case interviewees. Out of the eight interviewees, only two students showed traits of entitlement. One of those students, who scored below average on the Helicopter Parenting Index, was asked about her reaction when she is not given attention by her teacher. She responded, "In class when I raise my hand and the teacher calls on someone else, and they get the answer wrong and then they try to come back to me as a second opinion. No, I'm like yea, no, I'm not answering." This response, which highlights the belief that the interviewee felt she was entitled to be called on first, was uncommon when the same question was asked of all other critical case interviewees.

The second hypothesis, that students who are overparented will have lower levels of self-efficacy, was not supported by the critical case interviews. Of the four students who scored as overparented in the helicopter parenting index, none showed poor traits of self-efficacy. This was shown when students were asked if they had ever felt that because a peer had exceeded or completed a task before them that they were not good enough to do the same or better. One of the four overparented students responded, "I know I can do whatever, I might fail sometimes but I know if I work hard enough then I'll eventually get it." Of the eight critical case interviewees, only one student expressed minor traits of having low self-efficacy. This interviewee was asked the same question but he answered, "Sometimes I feel like if one person does it then they're the best." The second hypothesis is furthermore not supported because of the eight students interviewed, interestingly, almost all of our critical case studies seemed to have high self-efficacy. For example, a student who scored below average on the helicopter parent index responded to this question by saying, "When I see other people do good it makes me feel like if they can do it I can do it, it pushes me harder to do better if I'm not doing what I already want to do." Results for the eight critical case interviewees showed that parenting styles have no correlation to a child's self-efficacy.

The third hypothesis, that students with authoritarian parents are more likely to have conformity style communication patterns, was supported by the Parental Authority Questionnaire. Of the 61 students, 50 students' households had conformity style communication patterns. 36 of the 61 students who took the questionnaire were classified as having an authoritarian parent. Of the 36 students with authoritarian parents, 33 students had conformity communication patterns while only 3 had conversation patterns supporting the third hypothesis.

Students who took the Parental Authority Questionnaire answered questions to measure parental authority in the household. Based on their scores students were to have what is described as either a permissive, authoritarian, or authoritative parent. For each type of parent, there was a set group of questions that would direct towards having that styled parenting. For

example, questions 1, 6, 10, 13, 14, 17, 19, 21, 24 and 28 would indicate permissive. Each subscale ranged from a score of 10 to 50, so to get a complete score the questions from each subscale were added together. There were three students that scored under permissive, 25 students under authoritative and 36 students that had authoritarian style parents (See Figure 2).

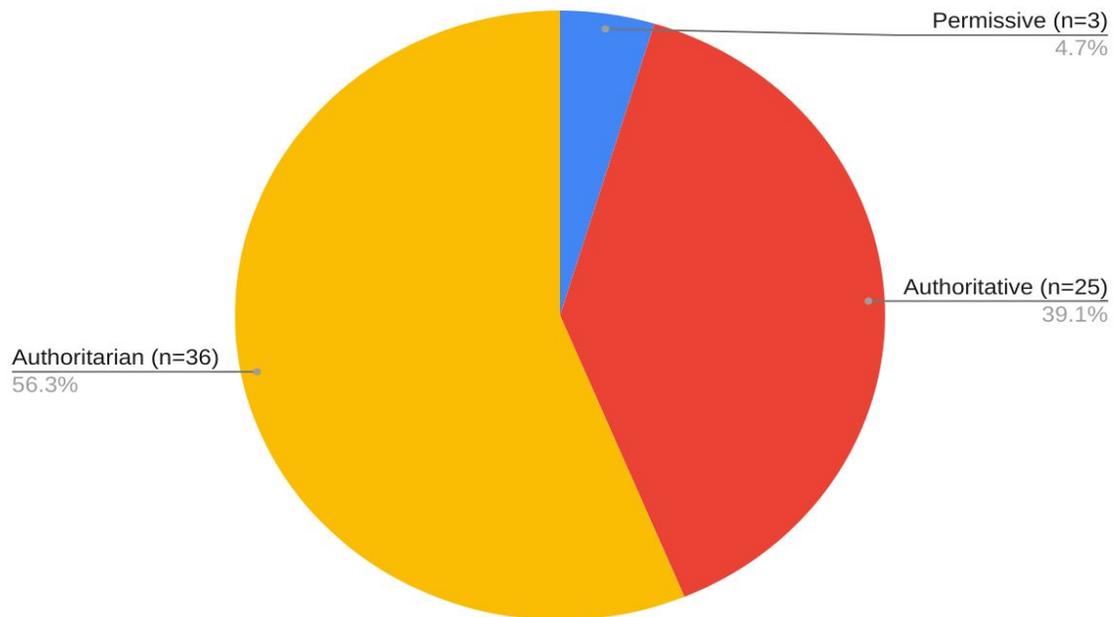


Figure 2. Parenting Styles at The Neighborhood Academy. The Parental Authority Questionnaire was used to classify students as having an authoritative, authoritarian or permissive parent. Of the 61 students, 3 students had permissive parents, 25 had an authoritative parent and 36 of the students had an authoritarian parent.

In order to figure out which students' families had either conversation or conformity communication patterns, utilized the Parental Authority Survey. From that survey, there were seven questions that could insinuate some form of the communication pattern. Students were given statements that they may or may not have related to such as, "As I was growing up my caregiver took the children's opinions into consideration when making family decisions, but they would not decide for something simply because the children wanted it." A question like that would indicate a conversational style communication pattern in the household. Each question was on a 5-point scale, so in terms of the communication patterns, if a student were to circle 1 that would highlight a conformity pattern, but if they were to circle 5 that would signal conversational patterns at home. Several questions were reverse scored. The questionnaire showed that of the 61 students 50 had conformity communication patterns while the other 11 had conversation patterns (See Figure 3). We also found out from the questionnaire that of the

students with authoritarian parents 33 of those students had conformity patterns and only three had conversation patterns (See Figure 4).

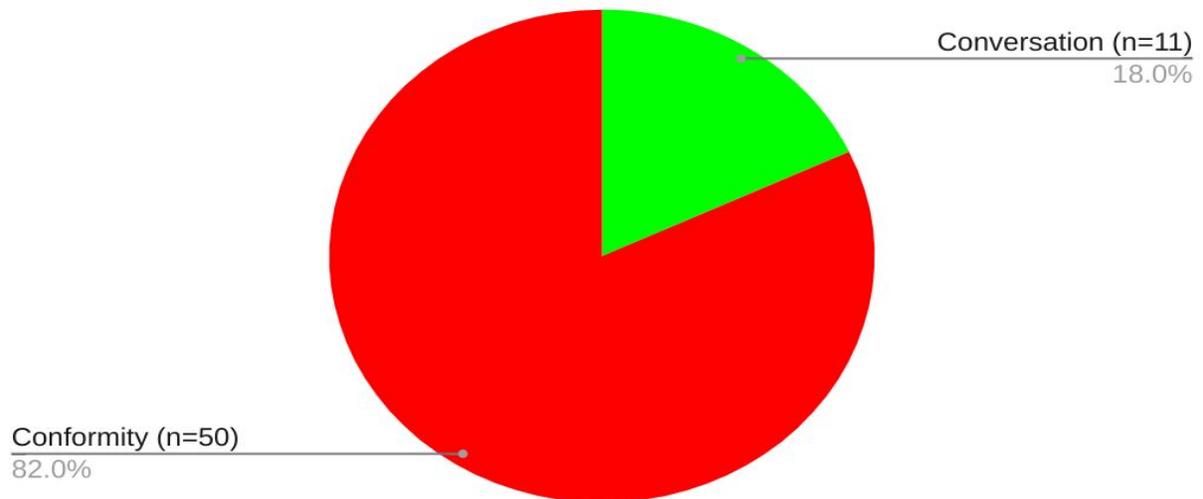


Figure 3. Communication Patterns at The Neighborhood Academy. There were seven questions from the Parental Authority Questionnaire that were used to classify students as having either conformity or conversation communication patterns at home. Of the 61 students, 11 had conversation communication patterns while 50 students had conformity communication patterns.

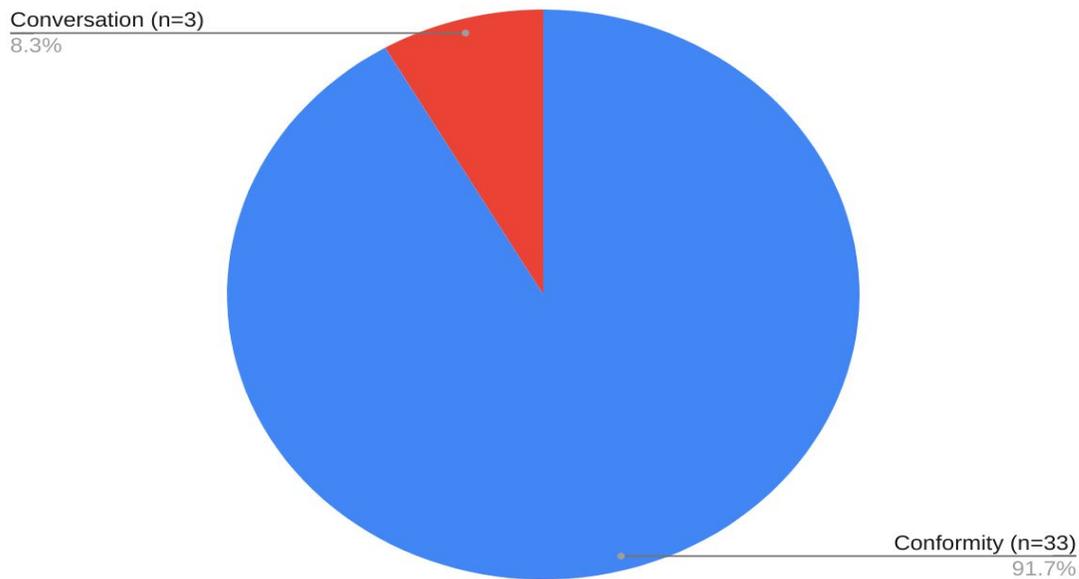


Figure 4. Communication Patterns of Students with Authoritarian Parents. Of the 36 students who scored as having authoritarian parents, 33 students had conformity communication patterns while only 3 had conversation patterns.

Discussion

The first hypothesis, which states that students who are overparented are more likely to express traits tied to entitlement, was not supported. The second hypothesis, that students who are overparented will have lower levels of self-efficacy, was also not supported. These results were a surprise. Multiple researchers agreed that entitlement and low self-efficacy levels were two of the many consequences of overparenting in their studies. For example, Sergin et al. argued that when parents spoon-feed their children, it leaves children expecting that others will continue to do things for them, even when they themselves become adults. Sergin et al., also stated that when parents solve all of the kids' problems, it lowers the kid's self-efficacy. Our results show that overparenting did not seem to impact self-efficacy or entitlement.

This study may be different compared to others because of the pool of participants. For most articles and studies, white families were surveyed for results. In our study, we surveyed only a group of African American students. The backgrounds of a white family compared to a black family may result in different parenting forms. For example, the common definition of overparenting states that parents solve children's problems for them and intervene when children should handle conflict themselves. However, this can be differently defined when talking about how a black family would over parent their child. This could be because

“overparenting” may not actually be overparenting, it may actually just be involved parenting, or what is defined as overparenting would be the norm for a black family so it would not be seen as overparenting. The results could also have shown to be different because generally, overparenters would want to be over-involved or controlling in their child’s life, but the group of students in our survey attend The Neighborhood Academy, a school with extensive school hours. With the school hours, a typical overparenter may not have chosen to send their child to a school where they may not be able to be as involved due to the hours taken away that are mandated by The Neighborhood Academy.

In this study, we found that overparenting may have a different definition for our case samples. The students scored in this study were a part of a very small community, so those classified as being “overparented”, may not, in the larger society, actually be overparented. Sergin et al. gave an example of the tactics of an overparenter, like handling disputes with college professors and negotiating their child’s salaries in their later life. In our study, the population of students who were overparented seemed to just have parents with strict rules rather than an over-involved parent. Future researchers should explore whether overparenting is impacted by race or class.

Odenweller et al., states that authoritative parenting is the best and that many parents fall into that category but that is not the case for the students at The Neighborhood Academy. Results show that most parents found that being an authoritarian parent was the most effective way to raise their children. It is essential that in psychological research there are studies that are diverse. Within the literature read, the case samples were very similar in race and it was hard to find good resources that touched on child development and parenting styles of people that were not white.

Interestingly, Odenweller et al. noted that there is a connection between authoritarian parenting and overparenting, but in our specific study, there was no correlation. Our third hypothesis was that students with authoritarian parents are more likely to have conformity style communication patterns. Though this hypothesis was supported, our study shows again overparenting has no connection to either authoritarian parenting or conformity style communication.

In this study, we came across a few limitations, including the availability of a racially homogenous population. Similar to psychological researchers, our study was not diverse in racial backgrounds. Many studies have used usually exclusively white participants, while our

study was focused on black students only. For future research, a diverse group should be used, so that overparenting can be measured across different racial groups.

The Neighborhood Academy is a school with extended school hours, so the students who attend will more than likely have limited interactions with their parents, which is another limitation of this study. An adult who leans towards overparenting may choose not to send their child to a school that does not have regular school hours because of the decreased interaction between parent and child. To conduct a similar study like this but in a school with more traditional hours may be more helpful in getting better results to accommodate the hypothesis.

There was also a limitation on perspectives in terms of the sample case. To get a better understanding, it might be helpful to interview parents themselves. Our study was limited to the perspective of an adolescent. Another interesting perspective could be one of a young adult that is also a parent. This would give us the opportunity to compare their own parenting styles to the way they were parented themselves to see how it may have shaped them.

Future research can include broadening what is thought to be the best type of parent. For our study, the most prominent style of parenting was authoritarian, but for previous studies authoritative is the ideal parenting style. This difference in results can be due to the difference in race, class or age of the participants. Because we used a population of black students compared to white students, the “best” type of parenting style could have varied; is one parenting style actually better for all children? Future research can examine further into this idea to see if it is actually the case.

Gender dyads could also be interesting to look into in correlation to overparenting. Parent and child gender dyads can affect how a parent chooses to parent. Potentially, the way a mother treats her son compared to her daughter will show different parenting traits. The same may be assumed for the relationship between a father to daughter and father to son. The parent with the same gender of the child may have harsher expectations of them compared to the child of the opposite gender. For further research, it may be necessary to see if the gender dyads of parent and child can lead to overparenting.

Conclusion

Overparenting can lead to negative impacts such as entitlement, low levels of self-efficacy, and continued dependency in adulthood. Previous studies have shown that overparenting is correlated with authoritarian parenting and conformity communication styles. However, our study shows different results. We found that overparenting does not necessarily result in entitlement or low self-efficacy. Additionally, our results showed that while authoritarian

parenting and conformity communication styles were correlated, neither was correlated with overparenting. This could be due to the population that we surveyed and interviewed. Unlike previous research, which used primarily white individuals, our study surveyed and interviewed black individuals who attend a school with extended school hours. Future researchers should conduct studies among more diverse populations and at schools with regular hours. Additionally, researchers should consider that authoritarian parenting and conformity communication styles are not inherently bad or connected to overparenting.

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