CABRINI UNIVERSITY

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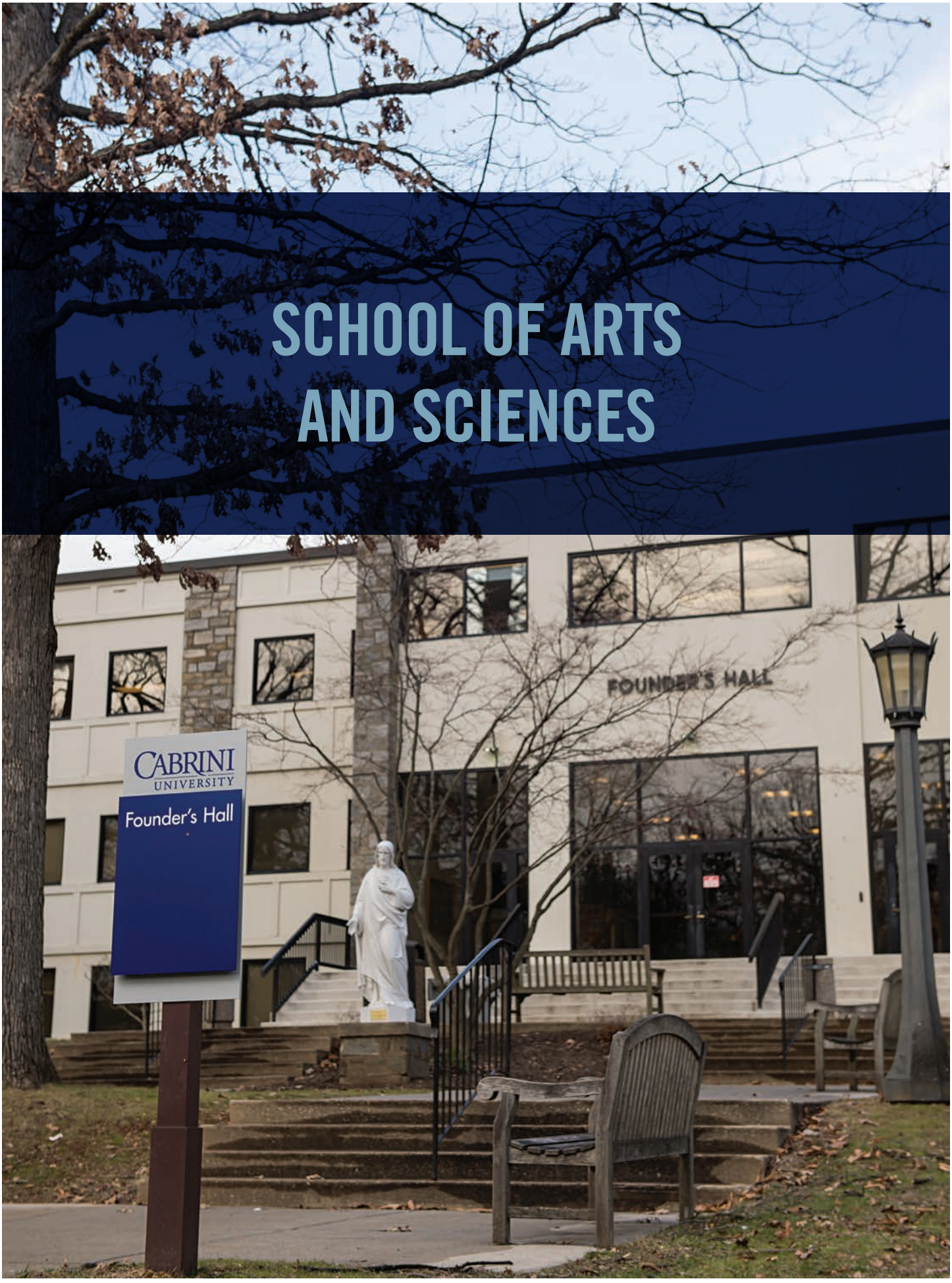

Gabriela Chauca
Arts, Research and Scholarship Symposium
Cabrini University
May 3, 2022
Mentor: Dr. Natacha Bolufer-Laurentie

Mi español

El español es mi hogar, mi lengua natal. Cuando el español me mira y yo lo miro el mundo me hace sentido, Sé que con el inglés no soy la misma que con el español porque con el español me siento fuerte, me da libertad para expresarme, no tengo que disimular si entendí o no. No tengo que leer lentamente para entenderlo, no tengo que quedarme callada mirando como argumentan los demás. También puedo dar mi opinión sin miedo, sin tener que pensar si lo que estoy diciendo hace sentido o no. Aunque el inglés me ha abierto puertas, el español me ha dado la felicidad con la que puedo gritar al mundo que soy una guerrera. Aunque sé que sólo soy otra humana en esta tierra, el español me hace sentir única porque con el español´ puedo mostrar mi personalidad, mis chistes hacen sentido, el ambiente es diferente y el tiempo pasa volando… El español es el puente que me une a mi familia, a mis amigos, a mis raíces y a nuevas oportunidades. Si algún día llego a perder la memoria yo sé que mi corazón no olvidará lo bien que se siente al oír a alguien hablar español.

Victimization and the Effects on Punitiveness

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VICTIMIZATION AND THE EFFECTS ON PUNITIVENESS

Abstract

When examining punitive attitudes, most studies today focus on either victimization or fear of crime, which ultimately fails to explore other areas that could affect an individual's perception. Punitiveness dominates both the criminal justice system and justice considerations because of the absence of reparative options that are accessible as a response to criminal behavior (Gormet, 2011). In today's system, harsh punishment is one common way to deal with issues in society such as violent crime. In addition to victimization, the media has a strong influence on an individual's perception towards punitiveness. The purpose of this study is to examine the relationship between victimization and the effects it has on punitiveness. This study utilized primary quantitative data by the use of surveys that were distributed to Cabrini University students during the spring semester of 2022. It was hypothesized that individuals who experienced victimization are more punitive than those who have not experienced it and the more exposure individuals have to the media, the more punitive attitudes they hold. Results showed that individuals who have experienced victimization own less punitive mindsets.

Introduction

The right to punish must contribute to justification and not just rely on an individual's moral rationality (Alm, 2018). Over the decades, a research study has centered around crime being conceptualized as the personal experience of victimization or fear of crime but abandons the possibility that crime can influence individual's attitudes regarding punishment (Kleck & Baker Jason, 2017). The study of public attitudes concerning crime is important in understanding how harsh punishment is sanctioned. Punitiveness is a legislative reply to the public belief that crime is increasing, rehabilitation has no real impact, and criminals should be punished for their crimes (Langworthy & Whitehead, 1986). In addition to crime, a person's emotions and moral beliefs could affect one's punitive mindset relating to victim concerns or crime (Gormet, 2011).

Punitiveness dominates both the criminal justice system and justice considerations because of the absence of reparative options that are accessible as a response to criminal behavior (Gormet, 2011). This causes society to rely on harsh ideas regarding the decision of punishment. Harsh punishment then becomes a construction of normality as a result. This can be seen in examples such as violent crime. Crime that results in high harm to the victim is more likely to cause others to feel sympathy which creates stereotypes (Hanslmaier & Baier, 2015), resulting in an increased fear of crime. Fear of crime is the perception of both crime rates locally and nationally that is thought not only to be increasing, but at an extreme rate (Pratt, 2015). Fear of crime can come from firsthand experience, political campaigns, and the media (Langworthy & Whitehead, 1986).

In the case of media, cultivation theory (Gerbner, 1969) gives insight on the diverse ways the news can affect an individual's personal judgement on a topic based on what they are being fed through media coverage. Cultivation can take two forms which could either affect one's judgement about facts and/or an individual's expressive attitudes and beliefs. Overall, media

coverage has an impact on the way people view societal issues (Roche et al., 2015). Individuals who are exposed to more media coverage are more likely to favor punishment (Gerbner, 1969; Simmons, 2017).

Literature Review

Perceptions of Punitiveness

Many punitive attitudes originate from racist perceptions that African Americans pose a threat to both a community's safety and socioeconomic status (O'Hear & Wheelock, 2020). African Americans are seen as a threat to a community's socioeconomic status because of their needs for limited public resources, which makes their white counterparts more accepting of social control through punitive measures (O'Hear & Wheelock, 2020). The presence of Black men is progressively identified with crime and the fear of crime in society, especially in America's political culture (Chiricos et al., 1997). Jerome Miller, the executive director of the National Center for Institutions and Alternatives (NCIA), suggests that society's war on crime is an overlay for the mass incarceration of African Americans, particularly Black men (Szkowny, 1994). One common justification of punitive attitudes that is often made by neo conservatives is that rehabilitation does not work so incarceration is the alternative.

Recent research shows that changes in demographic patterns can result in increased perceptions of threats by individuals within society (Baker et al., 2018). This perceived feeling of threat causes more Whites in the community to demand social control and embrace punitive policies (O'Hear & Wheelock, 2020). African Americans may experience individual racism in the form of personal threats or treatment that implies they are less than their White counterparts (Constantine & Lewis-Coles, 2006). To establish control, the dominant groups are determined to

preserve their privileged social standing, as they find minorities to be a disruption to their way of order (King & Wheelock, 2007).

Victimization and Fear of Crime

Victimization occurs when a person is suffering against an attack on themselves or their property, while fear of crime is a feeling of nervousness or worry that is caused by the considered risk of being a victim of a crime (Noble & Jardin, 2020). Early fear of crime research originated from the idea that criminal vulnerability is related to crime levels. It was assumed that in times when there was an increase in crime, fear of crime would also rise (Heart, 2016). Correspondingly, individuals who were more likely to experience crime would be most afraid of victimization (Heart, 2016). People who are afraid of being a victim of crime change their habits. These individuals often stay at home or in surroundings they have made safer, through locks, chains, bars, and alarms (Hale, 1996). Furthermore, criminal victimization has the potential to shape political attitudes.

People who were victimized are more likely to adopt beliefs that support stricter laws and order policies because their victimization has left them feeling vulnerable, fearing revictimization, and a sense of anger because they received insufficient protection from society, which aligns with right-wing political leanings (Unnever et al., 2007). In addition, criminal victimization can cause both intense and persistent feelings of revenge resulting in the support of punitive measures, such as incapacitation and deterrence of the offender to protect not only other potential victims but themselves as well and to reduce fear of repeated victimization (Orth, 2003). Furthermore, victims often demand punishment for their offender for the purpose of public recognition of their victim status.

Ideal Victim

An 'ideal victim' is considered a person or category of individuals who – when impacted by crime – most readily are given the complete and legitimate status of being a victim (Van Wijk, 2013). This group includes those who are perceived as vulnerable, defenseless, innocent and worthy of sympathy and compassion. Elderly women and young children are generally considered the 'ideal victims,' whereas young men, the homeless, drug addicts, and others who lack social power may find it difficult to obtain legitimate victim status (Greer, 2007). In addition, the sick and old are particularly well qualified to be considered ideal victims (Van Wijk, 2013). Women are also considered to be ideal victims because they are seen as weaker, therefore they are examined more than men (Van Wijk, 2013).

Gender

The relationship between gender and fear of crime is one of the most dominant areas of research (Ellis & Renouf, 2017). Women, especially elderly women, are more fearful of crime but have less chance of being victimized than young men; in the contrary young men, who are most likely to be victimized, are not likely to be afraid of crime (Gilchrist, 1998). Researchers suggest that perceived risk of victimization, specifically the likelihood of victimization, is a significant predictor of fear of property crime, violent crime, and gang crime for men (Chataway & Hart, 2018). One explanation for gender differences in fear of crime is that women are more sensitive than men to risk and vulnerability. Moreover, women are perceived to be less able to defend themselves against victimization, making them more likely to believe that the consequences of crime would have a greater impact on them in terms of physical injury and psychological trauma (Chataway & Hart, 2018). Although men are more likely to be victims,

(Gault & Sabini, 2000). Research suggests that because of emotions, political attitudes differ within gender (Gault & Sabini, 2000). For that reason, men are more aggressive and more likely to display punitive support.

Learned Helplessness

Learned helplessness is a theoretical structure for understanding the influence of victimization. (Kilpatrick & Otto, 1987; Tontodonato & Erez, 1994). According to this theory, a crime is an unpredicted and ungovernable event for the victim, who is sent into contact with the criminal justice system which often is inevitable (Tontodonato & Erez, 1994). Victims are greatly impacted by how they are treated by the legal system. They are the subject of a crime, and subsequently develop a form of learned helplessness (Winick, 2008). This theory suggests that when there is no reliable answer to circumstances, individuals can develop "learned helplessness" (Goodstein et al., 1984). This sense of powerlessness, which victims may tend to spread to other aspects of their lives, could advance into what is considered to be the syndrome of learned helplessness (Winick, 2008). In addition, helpless individuals react passively to situations because they have learned that attempts to exert outcome control or choice or to obtain predictability are useless (Goodstein et al., 1984). This is related to punitiveness because when individuals develop this sense of helplessness, which causes them to adopt a more punitive mindset. This is due to individuals feeling as if punishment is their only way to receive justice for the crimes that were committed against them (Goodstein et al., 1984). However, without this perceived justice, victims develop a learned helplessness as they feel as if their experience does not matter.

Power of the Media

Public concern about crime is a result of political initiative, which is the number of given speeches, statements, policy initiatives, or summaries regarding crime that are reported in mass media or discussed by federal officials (Beckett,1997; Pratt, 2009). The evaluation of media effects on public attitudes toward crime and justice is important because the public receives much of its information about societal issues from media narratives, including news stories and television crime programs (Roche et al., 2015). Not to mention, the amount of news about crime can expand even when crime rates are declining (Roche et al., 2015). The crime rate in the United States has decreased while public support for punitive measures has increased; it is argued by many that the reason is due to media outlets portray all of crime as a major social issue and highlight violent crime for entertainment or political gain, giving the public a mistaken view of the reality of crime in society (Waid-Lindberg et al., 2011). The exposure to unlimited news reports about violent crime can create the idea that the world is dangerous, even for people who are not at risk of victimization (Kleck & Baker Jackson, 2017). Media coverage focuses on violent offenses, particularly the uncommon and most extreme types of crime, ignoring the relevant causes of offending (Gilliam & Iyengar, 2000; Roche et al., 2015). To add, the influence of the Internet on attitudes about crime could be particularly important among a population that is more likely to use the Internet as well as other media sources (Waid-Lindberg et al., 2011). Media sources also inaccurately illustrate the demographics of both offenders and victims and irregularly reports on instances where law enforcement authorities do not protect the public or ensure just punishments for offenders (Roche et al., 2015).

Cultivation Theory

Cultivation theory explains how exposure to news can shape its audience members' concerns. This theory suggests that media messages are an indirect source of information. As media consumption increases, audience members' views mirror the norms that are found in the media presentation (Gerbner, 1969; Simmons, 2017). Cultivation theorists argue that media exposure cultivates the view among audience members that reality reflects what the media reports, for example by reporting rising crime and lenient punishments (Roche et al., 2015). An earlier study suggests that exposure to traditional media, such as newspapers and television news, relates to greater support for punitive policies, higher trust in the police, and higher levels of fear about victimization (Roche et al., 2015). Furthermore, cultivation theory states, at its simplest level, that the media cultivates our social reality; what we watch influences how the world is viewed (Roskos-Ewoldsen et al., 2004).

Hypotheses

1. Individuals who experienced victimization are more punitive than those who have not experienced it.
2. The more exposure individuals have to the media, the more punitive they become.

Methodology

Sample and procedure

A nonprobability, convenience sampling method was used to collect the data for this study. Data was collected from N= 100 participants from Cabrini University. Self-administered surveys and electronic surveys were distributed to Cabrini University students in spring 2022 from different classes and majors. These surveys were voluntary, and students were asked if they

wished to complete the questionnaires. This research study is designed to measure the effects that victimization and media have on punitive attitudes.

Demographics

The sample consisted of 67% (n=67) female respondents and 32% (n=32) male respondents. The racial distribution of the sample was composed of 69% (n=69) White, 16% (n=16) Black, 13% (n=13) who identified as other. In addition, 13% (n=13) identified as Hispanic. Of the students surveyed 66% (n=66) were from the school of Arts/Sciences, 17% (n=17) were from Business & Professional Studies, and lastly 7% (n=7) were from the school of education. See table 1 complete breakdown.

Table 1.

Sample Demographics

	Frequency	***Valid Percent***
Gender		
Female	67	67.0
Male	32	32.0
Race		
White	69	70.0
Black	19	16.3
Other	13	13.3
Hispanic		
No	87	87.0
Yes Mexican	4	4.0
Yes Puerta Rican	4	4.0
Yes other	5	5.0
School		
Art/Sciences	66	73.3
Business & Professional studies	17	18.9
Education	7	7.8

Variables of interest

The independent variable for this study is crime victimization which is defined as the action of singling someone out due to the suffering of crime (Noble & Jardin, 2020). Three questions will be used to assess crime victimization. Participants were asked, "Have you ever been attacked or threatened?" (1=Yes, 2=No)(Teplin et al., 2005) 64% (n=64) of the respondents answered no. The next question was "Have you ever been physically assaulted such as: shoved, pushed, choked, grabbed, twisted hair or arm, or kicked*?"* (1=Yes, 2=No) (Kelmendi & Baumgartner, 2017) and 68% (n=68) of the respondents answered no. The last question was "In the last 4 months, have you ever been a victim of violent crime such as robbery, assault, kidnapping or domestic violence?" (1=Yes, 2=No) and 69% (n=69) of the respondents answered no (Teplin et al., 2005). See table 2 for the complete breakdown.

The second independent variable for this study is media consumption which is defined as exposure to television, online news, and social media (Shi, 2021). Three questions will be used to assess media consumption. Participants were asked, "In a typical week, how much time do you spend on social media sites such as Instagram, Snapchat, Twitter and Facebook?" (1=None; 2=60 min or less; 3=61 to 120 min; 4=121 to 180 min; 5=181 to 240 min; 6=241 min or more). Precisely 28% (n=27) of the respondents spend 241 or more minutes on social media (Intravia, 2019), "In a typical week, how much time do you spend watching television?" (1=None; 2=60 min or less; 3=61 to 120 min; 4=121 to 180 min; 5=181 to 240 min; 6=241 min or more). Precisely 26% (n=26) of the respondents spend 61-120 minutes watching TV (Intravia, 2019), "In a typical week, how much time do you spend reading or watching news stories on social media?" (1=None; 2=60 min or less; 3=61 to 120 min; 4=121 to 180 min; 5=181 to 240 min;

6=241 min or more). Precisely 50% (n=50) of the respondents spend 60 minutes or less reading or watching news stories on social media (Intravia, 2019). See table 2 complete breakdown.

Table 2.

Independent Variables

	Frequency	***Valid Percent***
Attack		
Yes	33	33.0
No	64	64.0
Physical Assault		
Yes	31	31.3
No	68	68.7
Violent Crime Victim		
Yes	29	29.6
No	69	70.4
Social Media		
None	1	1.0
60 or less	9	9.2
61-120	18	18.4
121-180	22	22.4
181-240	21	21.4
241 or more	27	27.6
Time Watching TV		
None	1	1.0
60 or less	17	17.3
61-120	26	26.5
121-180	22	22.4
181-240	14	14.3
241 or more	18	18.4
News on Social Media		
None	12	12.1
60 or less	50	50.5
61-120	19	19.2
121-180	11	11.1
181-240	3	3.0
241 or more	4	4.0

The dependent variable for this study is punitiveness which is defined as the attitude toward inflicting punishment (Baker et al., 2018). Four questions will be used to assess punitiveness. Participants were asked, “Do you think an individual who is convicted of murder should receive the death penalty?” (1=Yes, 2=No) “Do you think an individual who is convicted of robbery should receive: (1=1-4 months; 2=5-8 months; 3=9-12 months; 4=1-2 years; 5=2-3 years; 6=4-6 years; 7=7-10 years; 8=11 years or more). “Do you think an individual who is convicted of assault should receive: (1=1-4 months; 2=5-8 months; 3=9-12 months; 4=1-2 years; 5=2-3 years; 6=4-6 years; 7=7-10 years; 8=11 years or more). “Do you think sentences are: (1=Too tough; 2=About right; 3=Too lenient). 53% (n=53) of the respondents think sentences are about right (Jennings et al., 2017). See table 3 complete breakdown.

Table 3.

Dependent Variable

	Frequency	***Valid Percent***
Death Penalty		
Yes	45	45.9
No	53	54.1
Robbery		
1-4 months	9	9.1
5-6 months	17	17.2
9-12 months	16	16.2
1-2 years	25	25.3
2-3 years	19	19.2
4-6 years	10	10.1
7-10 years	3	3.0
Assault		
1-4 months	5	5.1
5-6 months	13	13.1
9-12 months	21	21.2
1-2 years	19	19.2
2-3 years	22	22.2
4-6 years	13	13.1
7-10 years	6	6.1
Sentences		
Too tough	31	31.0
About right	53	53.0
Too lenient	16	16.0

The table below is an overall descriptive statistics table. It provides an overview of all variables of interest. It is important to notice that the majority of variables had a high individual response rate. In addition, the median and mode suggest a normal distribution for the variables. See Table 4 for complete breakdown of Descriptive Statistics.

Table 4.

Variable Descriptive Statistics

Variable	*N*	*Mean*	*Median*	*Mode*	*Range*	*Standard Deviation*
Gender	100	-	-	1	3	-
Race	98	-	-	1	2	-
Hispanic	100	-	-	1	4	-
School	90	-	-	1	2	-
Attack	97	-	2	2	1	-
Physical assault	99	-	2	2	1	-
Violent crime victim	98	-	2	2	1	-
Social media	98	-	4	6	5	-
Time watching TV	98	-	4	3	5	-
News on social media	99	-	2	2	5	-
Death Penalty	98	-	2	2	5	-
Robbery	99	-	4	4	6	-
Sentences	100	-	2	2	2	-

Results

Table 6 shows the results of the spearman correlation that was conducted in order to analyze the relationship between victimization and punitiveness. Throughout the spearman correlation, there were 4 significant relationships found. In table 6, the first relationship was a weak, significant, positive correlation between the variables Attack and Sentences; $r_s(98)=.252$, $p<.05$. Those who reported being attacked were more likely to also say that sentences were too tough. This significant correlation supported the hypothesis that the variables victimization and punitiveness are related but supported the hypothesis in the opposite direction predicted. It was predicted that victimization increases punitiveness, but it was found that victimization results in favoring less punitive measures. Approximately 6.4% of the variance is explained through sentencing leniency.

The second relationship was a weak, significant, positive correlation between the variables Physical assault and Robbery; $r_s(98)=.210$, $p<.05$. Those who reported experiencing physical assault were more likely to say sentencing for robbery should be shorter. This significant correlation supported the hypothesis that the variables victimization and punitiveness are related but supported the hypothesis in the opposite direction predicted. It was predicted that victimization increases punitiveness, but it was found that victimization results in favoring less punitive measures. Approximately 4.4% of the variance is explained through robbery sentencing.

The third relationship was a weak, significant, positive correlation between the variables Physical assault and Sentencing; $r_s(98)=.237$, $p<.05$. Those who reported experiencing physical assaults were more likely to say that sentences were too tough on offenders. This significant correlation supported the hypothesis that the variables victimization and punitiveness are related but supported the hypothesis in the opposite direction predicted. It was predicted that victimization increases punitiveness, but it was found that victimization results in favoring less punitive measures. Approximately 5.6% of the variance is explained through sentencing leniency.

The fourth relationship was weak, significant, positive correlation between the variables Violent crime victim and Assault; $r_s(98)=.241$, $p<.05$. As the report of victims increased more respondents believed that sentencing for assault should be shorter. This significant correlation supported the hypothesis that the variables victimization and punitiveness are related but supported the hypothesis in the opposite direction predicted. It was predicted that victimization increases punitiveness, but it was found that victimization results in favoring less punitive measures. Approximately 5.8% of the variance is explained through assault sentencing.

Table 6.

Spearman Correlation Victimization and Punitiveness

Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
1) Attack	1	-	-	-	-	-	-
2) Physical Assault	.534**	1	-	-	-	-	-
3) Victim	.649**	.528**	1	-	-	-	-
4) Robbery	.189	.210*	.182	1	-	-	-
5) Assault	.152	.091	.241*	.675**	1	-	-
6) Sentencing	.252*	.237*	.119	.230*	.193	1	-
7) Death Penalty	.127	.151	.055	.000	-.026	-.205*	1

*p<.05, **p<.01

Table 7 shows the results of the second spearman correlation that was conducted in order to analyze the relationship between media consumption and punitiveness. Unfortunately, throughout the spearman correlation no significance was found. The independent variables: Social media, Time watching TV, and Social media news was not related to any of the study's dependent variables: Robbery, Assault, Sentencing, and Death Penalty.

Table 7.

Spearman Correlation Media Consumption and Punitiveness

Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
1) Social media	1	-	-	-	-	-	-
2) Time watching TV	.018	1	-	-	-	-	-

3) Social media news	.086	.185	1	-	-	-	-
4) Robbery	.071	.183	.103	1	-	-	-
5) Assault	.006	.128	.009	.675**	1	-	-
6) Sentencing	.047	.051	-.073	.230*	.193	1	-
7) Death Penalty	-.153	-.073	.049	.000	-.026	-.205*	1

*p<.05, **p<.01

Discussion

The purpose of the study was to examine whether victimization affects an individual's perception towards punitive sanctions. The results found in the first spearman correlation support the constructed hypothesis that there is a relationship between the variables of victimization and punitiveness. The first significant relationship within the first spearman correlation between attacks and sentencing showed that individuals who have been attacked are more likely to believe that sentencing is too tough on offenders. The second significant relationship within the first spearman correlation between the variables physical assault and robbery showed that individuals who have been a victim of a physical attack are more likely to believe that sentencing for robbery should be shortened. The third significant relationship within the first spearman correlation between the variables physical assault and sentencing showed that individuals who have been a victim of a physical attack are more likely to believe that sentencing is too tough on offenders. The last significant relationship within the first spearman correlation between the variables victim and assault showed that individuals who have been victims of violent crime such as robbery, assault, kidnapping, or domestic violence are more likely to believe that sentencing for assault should be shortened. All the significant findings within the first spearman correlation suggest that there is a relationship between victimization and punitiveness. However, these

significant findings support the hypothesis in the opposite direction predicted. Instead of the original hypothesis that claimed individuals who experienced victimization are more punitive than those who have not, it was found that individuals who have experienced victimization own less punitive mindsets. One major explanation for these findings that was supported in earlier literature was a concept referred to as victim-offender relationships. Charge reductions are seen often in these cases. For instance, murder could be downgraded to something less serious, such as manslaughter (McQuade, 2014). As a result of victim offender relationship, victims tend to forgive their offenders. This leads to outcomes such as less punitive desires. In contrast to the findings within the first spearman correlation, the second spearman correlation that measured the relationship between media consumption and punitiveness was insignificant. The findings within the second spearman correlation suggest that there is no relation between these two variables of interest.

Some major limitations of this study include sample size and time constraint. This study used a nonprobability convenience sampling method and sample size of 100 participants. The population that was surveyed included college students, which varied from first-year students to seniors. Even though the results that were found in this study are representative of Cabrini University student population, the results could be more compelling and generalizable to a larger population if there was more diversity in age, race, and gender. Moreover, time was a limitation to the study because this research had to be completed by a certain target date which excluded potential research participation and the incorporation of other survey questions that could have been used. Some overall implications for future research include more time to conduct more in-depth research. In addition, to having access to a more diverse population

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Stress and Mental Health in College Students

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Abstract

The research conducted looks at how stress and mental health are related among college students. The development of mental illness can result from the constant worrying and pressures of being a student (Musabig & Karimah, 2020). Individuals ages 18 to 24 are the target range for experiencing the effects of social relevance and academic responsibilities (Musabig & Karimah, 2020). The transition into higher education has been linked to emotional instability and high levels of anxiety, depression, and stress (da Costa Bento et al., 2021). The pressures of being a student include things such as being in a new environment, the constant need to fit in and feel social acceptance, more responsibilities in terms of assignments and time management, etc. (Bhujade, 2017). Primary research was conducted by administering surveys to Cabrini University students. In-depth details will be presented in this paper.

Introduction

Poor mental health is a growing issue amongst college students with anxiety and depression being the common mood problems seen in college students' due to pressure and stress (Barkham et al., 2019). Approximately 3.9% of all college students attending university form some type of mental illness during their stay at university, with anxiety and depression being the leading two (Barkham et al., 2019). The development of mental illness can result from the constant worrying and pressures of being a student (Musabig & Karimah, 2020). The pressures of being a student include things such as being in a new environment, the constant need to fit in and feel social acceptance, more responsibilities in terms of assignments and time management, etc. (Bhujade, 2017). These pressures are strongly connected to the development of poor mental health as it causes feelings of anxiety and depression when there is a struggle to overcome them (Bhujade et al., 2019). There are also students who have experienced mental health issues during

their childhoods in which the reoccurrence may trigger worse mental health issues in life, which commonly is brought on by stress (Doré et al., 2020).

Individuals aged 18 to 24 are the target range for experiencing the effects of social relevance and academic responsibilities, also known as parts of interpersonal and intrapersonal stress, clashing and causing mild to severe side effects of anxiety and depression (Musabig & Karimah 2020). The transition into higher education can result in a time period where young adults cannot handle change and causes students to establish unhealthy behaviors such as drinking, smoking, and poor dietary habits (Jao et al., 2019). These risky behaviors can alter an individual's mental health and become a coping mechanism as well when stressed and further one's stress even more due to the consequences of their actions (Jao et al., 2019). The transition into higher education has been linked to emotional instability and high levels of anxiety, depression, and stress (da Costa Bento et al., 2021). Students are experiencing situations that are causing levels of psychological distress and forcing a subgroup of the student population to have mood issues. The distress they are facing can have a negative impact on the person (e.g., excessive worry, anxiety, panic, depression, isolation) and research show this leads to high levels of resistance in terms of reaching out for help and working towards a solution (Barkham et al., 2019). Research shows that more students do not seek help than the number of those who do (Barkham et al., 2019).

Interpersonal and intrapersonal stress, along with performance stress, work together to cause forms of overstimulation on an individual (Bhujade, 2017). These have been found to have a rather larger impact on female students in terms of anxiety mood issues and exhibiting symptoms of depression (Hubbard et al., 2018). The importance of this issue is based on identifying how stress can affect the mental health of college students. Interpersonal stress can be

defined as stressful situations that occur between two or more individuals that involves negative attitudes, behaviors, arguments, etc. whereas intrapersonal stress occurs within one person's emotions, thoughts, behaviors, etc. (Musabig & Karimah 2020). Together, they may increase the risks of developing mental illness.

Literature Review

Mental Health

Mental health among college students is an ongoing issue with a high percentage of students suffering from depression and anxiety (Bhujade, 2017). Mental health is not the absence of mental illness, but rather one's overall well-being and ability to properly enjoy life (Doré et al., 2020). Anxiety can be defined as feeling worried, experiencing tension or even physical changes such as increased blood pressure (Bourdon et al., 2018). Anxiety can include symptoms such as (1) nervousness or shakiness, (2) suddenly scared without reason, (3) feeling fearful, and (4) having sudden spells of terror or panic (Bourdon et al., 2018). Depression can be defined as the lowering of one's mood with symptoms such as (1) feeling down/blue, (2) worrying too much about things, (3) having no interest in things, and (4) having no hope for the future (Bourdon et al., 2018).

Depression is a multifactorial disease, which means it can be caused by a large range of factors, including genetic, biological, hormonal, environment, and impact of family and other socio-cultural factors (Stegenga et al., 2021). After entering higher education, one may experience triggering factors for depression such as significant emotional instability, heavy study load, academic requirements, fears about future instability and change in the individual's daily routine, bad habits and unruly lifestyle, as well as carelessness in performing basic care with their own health (da Costa Bento et al., 2021). Depression has a high prevalence among college

students that can result in the decrease of quality of life, such as social withdrawal, disinterest in curriculars, and even dropping out of the course (da Costa Bento et al., 2021). Students with mental health issues are more likely to face challenges like lower grade point averages, delayed graduation, or even dropping out of school with outside school related issues like poor work performance, unemployment, etc. (Stegenga et al., 2021). Most lifetime mental health issues begin with depression having their onset begin at university age, with an estimated range of depression from 85%-8% among university students (Saeed et al., 2017).

The National College Health Assessment Survey (2017) revealed that 29.2% of undergraduate college students were actively diagnosed with or being treated for mental health issues in the last year (Merianos et al., 2013). The NCHA survey also found that nearly 30% of college students reported that their depression caused difficulties in functioning (Merianos et al., 2013). Data from this survey found that it was mostly reports of anxiety and depression (Hubbard et al., 2019). Anxiety and depression are considered the most commonly recognized disturbances that affect functions such as motivation, concentration, perception of self-worth, and mood (Saeed et al., 2017). The American Psychological Association stated that their findings included a large increase in the amount of college students taking psychological medicines over the last ten years and that the connection was sharing signs of anxiety and depression brought on the by the stress of being a college student (Bhujade, 2017). Individuals are collectively increasing with their mental health in terms of not being able to cope with the stress brought on from being a college student (Bhujade, 2017). Students have shown a history of having low rates of reaching out for clinical help when struggling with symptoms of mental health issues (Barkham et al., 2019). Over 90% of college campus counseling directors have reported an increase in the severity of psychological problems over the years with one third of students

meeting all the criteria for a serious psychiatric problems in which majority of them do not seek help (Lipson et al., 2016). Students may either feel embarrassed for seeking help or may just not know what resources are available to them or where to begin seeking it (Stegenga et al., 2021). Most individuals will seek help from a close person in their lives rather than counseling services due to levels of comfort and feelings of embarrassment (Merianos et al., 2013).

Stress

Although stress can be positive, it is shown to be the main factor in creating poor mental health in individuals (Khan & Shamama-Tus-Sabah, 2020). According to Manap et al., (2019, p.1)

> identifying depression, anxiety and stress levels are considered as important indicators for mental health. These three emotional disorders can lead to negative outcomes, such as impaired normal functioning, burnout, and health problems. Failure to detect and address it will unfortunately lead to increased psychological morbidity with undesirable impacts all through their professions and lives.

Stress can cause students to face social, emotional, physical, and family problems that can alter one's ability to learn and lower their academic performance (Khan & Shamama-Tus-Sabah, 2020). These can lead to even greater amounts of stress and result in the change of one's attitude, behavior, and sometimes interpersonal relationships which can lead to the decrease in the quality of life (Ribiero et al., 2020). Some interpersonal occurrences deal with one's support system and self-esteem as they play a role in how an individual handles their stress (Merianos et al., 2013). In 2016, the American College Health Association survey found that 91% of all participants involved felt "average" to "tremendous" levels of stress within the past year (Yzer & Gilasvitch, 2019).

Stress can be caused by a variety of reasons, but for a college student it comes down to a more specified range of stressors. For example, the main stressors that have been recorded for

influencing poor mental health issues are the fear of failure, greater/harsher academic demands, changes in relationships with family/friends, time pressure, establishing one's identity, and most commonly feeling the social pressure to fit in (Bhujade, 2017). These stressors are a mix between interpersonal and intrapersonal and the way an individual handles them will differentiate between whether a student turns their stress into a negative experience or drive themselves to a positive experience (Bhujade, 2017). More times than not, students will let a stressful situation impact them negatively (Ribiero et al., 2020). Stressors are found to begin as early as admission into a university where it's possible to begin to feel thoughts of separation from their family and friends (Ribiero et al., 2020). In a study conducted by Bin (2011), he found that there is a positive relationship in correlation between stress and poor mental health. A factor that has been recorded to be a popular one for college students is FOMO- the fear of missing out. FOMO has been linked to causing lack of sleep which develops into stress associated with poor mental health (Adams et al., 2020). The fear of missing out can cause insomnia or disrupted sleep patterns that messes with a person's quality of life in terms of increased rates of stress, fatigue, mental health, and signs of depression and anxiety (Adams et al., 2020). FOMO generates such strong feelings of anxiety for students at the mere thought of missing out on something that is deemed part of the college experience (Adams et al., 2020).

Major research has been conducted to try and estimate how likely stress is to affect students' mental health statuses negatively. Between 2009 and 2015, it was reported from college counseling centers that there was a 30% increase in self-referrals with a high 61% of undergraduate students suffering from anxiety like symptoms and 49% suffering from signs of depression with rates continuing to fluctuate (Adams et al., 2020). In a nationally representative survey answered by 600,000 participants, researchers found that there was a rise among United

States adolescents in the late 2010s in terms of psychological distress, major depression, suicidal thoughts, and more attempts of suicide than the early 2000s (Doré et al., 2020). Doré et al., (2020) had found that mental health individuals in the college age range showed higher results of poor mental health due to adapting to new, less-supervised home and school environments, leaving the family home, and trying to keep a work-study-family balance. The newfound responsibility for college students can be a difficult burden for some (Doré et al., 2020).

The goal of this study is to measure how harshly stress, perceived stress (negative), can affect college students and their everyday quality of life/mindset. It is important to try and measure the positive effects of stress as well to cover all aspects of stress incase one's experience with stress isn't negative. Eustress, positive stress, can help push ones towards their goals as a type of motivation to better one's quality of life (Khan & Shamama-Tus-Sabah, 2020). It is important in the study to differentiate between the two and create an equal number of questions to capture the possibilities that stress may not have any effect on a student's mental health. Stress is a concept that can be perceived differently to people unless given a defined definition. Research has shown that stress plays a big part in the development of depression and anxiety. There are two hypotheses for this study: (1) Students who are experiencing stress are more likely to develop anxiety like symptoms (2) Students who are experiencing stress are more likely to develop depression like symptoms.

Methodology

Sample and Procedure

This non-experimental survey design collected information from 96 respondents (N=96). The sample ranged in age from 18 to 24, with 10% (n=9) being 18, 13.3% (n=12) being 19,

(*n*=2) being 24. Of the students surveyed, 18.8% (*n*=18) were Freshman, 12.5% (*n*=12) were Sophomores, 32.2% (*n*=31) were Juniors, 29.2% (*n*=28) were Seniors, and 7.3% (*n*=7) were Graduate students. When asked about Hispanic/Latino background, 90.5% (*n*=86) responded they were not Hispanic or Latino, 8.4% (*n*=8) responded Yes, I am Puerto Rican, and 1.1% (*n*=1) responded Yes, I am Mexican, Mexican American, or Chicano. For racial background, respondents were 2.2% (n=2) Asian, 4.5% (*n*=4) Black or African American, 88.8% (*n*=79) White, 43.4% (*n*=3) Mixed, and 1.1% (*n*=1) Hispanic. Lastly, the sample was 18.8% (*n*=18) Male and 81.3% (*n*=78) Female. See Table 1 for the demographic distribution of the sample.

Table 1. *Sample Demographics*

	Frequency	***Valid Percent***
Age		
18	9	10
19	12	13.3
20	23	25.6
21	25	27.8
22	17	18.9
23	2	2.2
24	2	2.2
Grade		
Freshman	18	18.8
Sophomore	12	12.5
Junior	31	32.3
Senior	28	29.2
Graduate	7	7.3
Are you Hispanic or Latino?		
No	86	90.5
Yes, I am Puerto Rican	8	8.4
Yes, I am Mexican, Mexican American, or Chicano	1	1.1
Race		
Asian	2	2.2
Black or African American	4	4.5
White	79	88.8
Mixed	3	3.4

Gender		
Male	18	18.8
Female	78	81.3

Independent Variable: Stress

The independent variable in this survey was stress. Stress can be defined as a physical or mental toll taken on someone's overall health and can vary in chronic stress and acute stress (Adams et al., 2020). By asking a series of questions regarding both the independent and dependent variable, it was possible to draw a connection between the two. For the independent variable, the question used came from the Prevention of National Stress Survey (1994). The question presented was, "In general, do you think you have more or less stress than the people around you?" Respondents had the response choices of 1=More, 2=Less, 3=About the same.

Table 2. *Frequency Table for Stress Amount.*

	Frequency	***Valid Percent***
Stress Amount		
Less	13	13.5
About the same	36	37.5
More	47	49

Of the respondents who answered about their stress level compared to others, 13.5% (*n*=13) responded that they felt Less, 37.5% (*n*=36) responded About the same, 49% (*n*=47) responded More. See Table 2 for the frequency table for this variable.

Dependent Variable: Mental Health

The dependent variable in this survey was mental health in college students. Mental health has a very broad list of diagnoses, but this survey mainly focused on anxiety and depression. Mental health is defined as not the absence of mental illness, but rather one's overall well-being and ability to properly enjoy life (Doré et al., 2020). For the dependent variable, the statements measuring this variable came from Hathi et al., (2021). These statements were used a

Likert Scale of 1-5. The responses ranged from (1) Strongly Disagree, (2) Disagree, (3) Neutral, (4) Agree, to (5) Strongly Agree. The series of statements that were asked regarding the dependent variable included: (1) I have trouble thinking clearly, (2) I cry more than usual, (3) I have lost interest in things, (4) I find it difficult to enjoy daily activities, and (5) I often feel nervous, tense, or worried.

Table 3. *Frequency Table for Cry More.*

	Frequency	***Valid Percent***
Cry More		
Strongly Disagree	30	31.3
Disagree	23	24
Neutral	21	21.9
Agree	12	12.5
Strongly Agree	10	10.4

Of the respondents who answered whether they cry more than usual, 31.3% (*n*=30) responded that they Strongly Disagree, 24% (*n*=23) responded that they Disagree, 21.9% (*n*=21) responded that they're Neutral, 12.5% (*n*=12) responded that they Agree, and 10.4% (*n*=10) responded that they Strongly Agree. See Table 3 for the frequency table for this variable.

Table 4. *Frequency Table for Lost Interest.*

	Frequency	***Valid Percent***
Lost Interest		
Strongly Disagree	24	25
Disagree	26	27.1
Neutral	20	20.8
Agree	15	15.6
Strongly Agree	11	11.5

Of the respondents who answered whether they have lost interest in things, 25% (*n*=24) responded that they Strongly Disagree, 27.1% (*n*=26) responded that they Disagree, 20.8% (*n*=20 responded that they were Neutral, 15.6% (*n*=15) responded that they Agree, and 11.5% (*n*=11) responded that they Strongly Agree. See Table 4 for the frequency table for this variable.

Table 5. *Frequency Table for Difficult to Enjoy.*

	Frequency	***Valid Percent***
Difficult to Enjoy		
Strongly Disagree	24	25
Disagree	25	26
Neutral	26	27.1
Agree	15	15.6
Strongly Agree	6	6.3

Of the respondents who answered whether they find their daily activities difficult to enjoy, 25% (*n*=24) responded that they Strongly Disagree, 26% (*n*=25) responded that they Disagree, 27.1% (*n*=26) responded that they feel Neutral, 15.6% (*n*=15) responded that they Agree, and 6.3% (*n*=6) responded that they Strongly Agree. See Table 5 for the frequency table for this variable.

Table 6. *Frequency Table for Thinking Clearly.*

	Frequency	***Valid Percent***
Thinking Clearly		
Strongly Disagree	14	14.6
Disagree	32	33.3
Neutral	23	24
Agree	18	18.8
Strongly Agree	9	9.4

Of the respondents who answered whether they find it hard to think clearly, 14.6% (*n*=14) responded that they Strongly Disagree, 33.3% (*n*=32) responded that they Disagree, 24% (*n*=23) responded that they feel Neutral, 18.8% (*n*=18) responded that they Agree, and 9.4% (*n*=9) responded that they Strongly Agree. See Table 6 for the frequency table for this variable.

Table 7. *Frequency Table for Tense.*

	Frequency	***Valid Percent***
Tense		
Strongly Disagree	13	13.5
Disagree	17	17.7
Neutral	20	20.8
Agree	25	26
Strongly Agree	21	21.9

Of the respondents who answered whether they feel nervous, tense, or worried, 25% (*n*=24) responded that they Strongly Disagree, 26% (*n*=25) responded that they Disagree, 27.1% (*n*=26) responded that they feel Neutral, 15.6% (*n*=15) responded that they Agree, and 6.3% (*n*=6) responded that they Strongly Agree. See Table 7 for the frequency table for this variable and Table 8 for variable descriptives.

Table 8. *Variable Descriptives.*

Variable	*N*	*Mean*	*Median*	*Mode*	*Range*	*Standard Deviation*
Stress Amount	96		2.00	1	2	
General Stress Level	95		3.00	3	4	
Cry More	96		2.00	1	4	
Lost Interest	96		2.00	2	4	
Difficult to Enjoy	96		2.00	3	4	
Thinking Clearly	96		3.00	2	4	
Tense	96		3.00	4	4	

Plans for Analysis

To analyze the relationship between stress and mental health, a spearman correlation was ran to test the hypotheses: (1) Students who are experiencing stress are more likely to develop anxiety like symptoms and (2) Students who are experiencing stress are more likely to develop depression like symptoms. A spearman correlation will be ran due to test results being ordinal.

Results

Below, table 9 shows the results of the spearman correlation that was conducted to examine the relationship between stress and mental health in college students. The relation

effective size for this finding is small, as it is .293. The relation between stress and cry more is significant; r_s (94) =.359, p<.01. The effect size for this finding is moderate, as it is .359. The relation between stress and losing interest in daily activities is significant; r_s (94) = .343, p<.01. the effect size for this finding is moderate, as it is .343. The relation between stress and finding their daily activities difficult to enjoy is significant; r_s (94) =.395, p<.01. The effect size for this finding is moderate, as it is .395. The relation between stress and feeling nervous, tense, or worried is significant; r_s (94) =.572, p<.01. The effect size for this finding is large, as it is .572.

Table 9. *Spearman's Correlation Table for Independent and Dependent Variable*

Variables	***(1)***	***(2)***	***(3)***	***(4)***	***(5)***	***(6)***
Stress Amount	1	-	-	-	-	-
Thinking Clearly	.293**	1	-	-	-	-
Cry More	.359**	.491**	1	-	-	-
Lost Interest	.343**	.296**	.274**	1	-	-
Difficult to Enjoy	.395**	.314**	.373**	.747**	1	-
Tense	.572**	.416**	.474**	.477**	.533**	1

**. Correlation is significant at the 0.01 level (2-tailed).

Discussion

The purpose of this study was to examine if stress and mental health were related in college students. Based on the results from the previous literature, the hypotheses were formed that: (1) Students who are experiencing stress are more likely to develop anxiety like symptoms (2) Students who are experiencing stress are more likely to develop depression like symptoms. The results from the study fully supported the hypotheses and the results indicated that the more stressed college students are, the more likely they are to experience depression and anxiety like symptoms that effect one's quality of life. The study supported the claim that mental health

individuals in the college age range showed higher results of poor mental health (Doré et al., 2020).

Although this study did a credible job in supporting the hypotheses, there were a few limitations presented. One of the limitations in this study is the generalizability. With the sample only being *N*=96, 78 of them being female, and all of them being Cabrini University students, it makes generalizability for all university students difficult. Also, with the time period being short, it was very difficult to collect a large number of surveys. If there was more time, more surveys could have been collected in order to have a more representational number of answers. Overall, future research could include a larger sample size with more male and diverse respondents as it could change the research findings. Women may be more open to admitting mental health issues than men, hence the high levels of significance, so incorporating more men into the research may change the results drastically. By incorporating more diversity in the respondent pool, there would be more generalizability in the study for all college students.

Overall, this topic is important to know because students that cannot handle their stress well are more inclined to experience mental health issues. With the transition into higher education, they may not be able to handle change and cause them to establish unhealthy behaviors related to depression and anxiety (Jao et al., 2019). With depression having such a high prevalence, it's important for students to be aware of the behaviors associated with it that could lead to academic struggling like disinterest in curriculars and dropping out of courses Students need to be more aware of the possibilities and the options available to them in terms of resources in order to help prevent these occurrences. With 29.2% of self-referrals over the course of a year, with proper knowledge and caution, the percentage may increase or decrease

depending on the mental health of students or increasing due to more students reaching out for help (Merianos et al., 2013).

For the future, university policies that implement more mental health awareness for both men and women, especially during their freshman year, may make students feel more comfortable with the idea of reaching out to someone for help. Also, if there were more programs or outlets for students on campus to feel more connected or relieve stress, it may create an overall surge of happiness and content throughout the student body as some of the main factors for stress include changes in relationships with family/friends, establishing one's identity, and most commonly feeling the social pressure to fit in (Bhujade, 2017).

In conclusion, stress and mental health are always going to be prevalent as long as proper awareness and resources are not advertised to students. This literature brought awareness to how harmful stress can be for all college students with all of the different factors that can build up to depression and anxiety. The hypotheses were tested using a spearman correlation, which had supported the research question. While it may have had a few limitations, it brings hope that this research study will bring awareness to Cabrini University regarding the mental health of their students, along with other universities.

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Representation of Same-Sex Couples in American and Japanese Animation: A Study of History, Artistic Intent, Culture, and Audience Influence

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PART 1: EXPLANATION OF RESEARCH

I. History of Representation of Same-Sex Couples in Animation

The LGBTQIA+ community has made great strides in media representation since the beginning of movies and television shows. Animated television, which greatly differs in separate countries, has been a very sensitive space for queer representation until recent years. This representation, though it may seem unimportant to those outside of the LGBTQIA+ community, is vitally important to queer youth.

Animation is an art form that is not often discussed in academic contexts. However, it is simply another avenue creators use to tell stories just like books, movies, songs, etc. The United States and Japan are the two countries that create the most animated material (ImperatorSage, 2019). The two countries have different animation styles, and their shows are often focused on different topics. Where Japanese animation (anime) often depicts either realistic or mature situations, American animation often focuses on more fantastical situations (Fernandez, 2020). ImperatorSage writes,

> Those unfamiliar with Japanese anime, especially U.S audiences, will naturally prefer western cartoons due to environmental upbringings, cultural disconnect, anime stereotypes/tropes, the medium's incestuous and homogenous visuals, etc. Meanwhile, anime elitists like to point at U.S animation's saturated history of cartoons made only to sell toys, rarely appealing to demographics outside of young children, lack of risks and innovation in their storytelling, etc. Both sides have some valid criticisms for the other, but both also are often very biased and generalize the other as well. (2019)

The two mediums, though essentially similar in their avenue for storytelling, create a great deal of discourse. Not only are the two created differently, but because of these differences, they are often aimed toward distinctive audiences. While American animation targets children, Japanese anime captures a much wider and more diverse audience. Due to these various audiences, the

mediums differ in what they can show or feel comfortable showing on screen. However, both are highly loved forms of art in pop culture that many audiences greatly enjoy and to which they dedicate a great deal of time.

As Rebecca Sugar, creator of American children's animated show *Steven Universe*, said about representation of same-sex couples in animation, "It was just a matter of not so much busting down these walls, but just very slowly chipping away at them for years and years and years and years" (Snyder et. al., 2021). There was no one event in America that made same-sex couples in animated shows acceptable. Instead, there exists a long history of the slow development of same-sex couples in American animation. In 1934, homosexuality was banned in films according to the Hays Code (Snyder et. al 2021). Many creators found ways around this ban, and it was easier, in some ways, to do this in animation. Homosexuality was strange and other-worldly to many people, so that adapted to old cartoons. In the words of Snyder et. al, "Live-action TV couldn't show two men kissing, but a character like Bugs Bunny could kiss hunter Elmer and pass it off as a joke" (2021). Following this age, creators often had to queer-code characters, meaning they would give hints about their sexuality without explicitly stating it. These characters were often depicted as villains or as jokes, lessening the positive effects that can come from representation. Even in the 2010s, as the representation of same-sex couples in live-action teen and adult movies and television shows, there was still great pushback against the inclusion of same-sex couples in children's animation. Due to parental television guidelines, studio standards, and creators' self-regulation, children's animated shows like *Mysticon* and *The Loud House* have had to remove explicit scenes of representation like kiss scenes or descriptive LGBTQIA+ language (White et. al., 2021). In the past few years, creators have finally been able to fully showcase same-sex couples in their animation. They worked through this pushback for

almost one hundred years and have only recently been able to make explosive progress (Snyder et. al., 2021).

Though Japan does not condemn homosexuality by law, the country also does not outwardly support the LGBTQIA+ community (Corg, 2017). There are supports in place for the community in America, so Japan's lack of supports adds a new layer to queer representation. However, homosexuality was accepted and welcomed in ancient Japan. When the country began to adopt more Western ideals around the late 19th century and early 20th century, citizens started to advise against homosexuality due to Christian influence (Hendricks, 2015). As of today, Japan still does not recognize same-sex marriage as a legal union. Queer people are much more secretive in Japanese society, and the community is tailored mostly to gay men (Hendricks, 2015). All of this context contributes to representation of same-sex couples in anime. Because anime can be intended for a wide variety of audiences, there are different types of representation. When the stories are made for the people they are representing, the romance is often subtle and implied rather than shown. However, there are some anime that are tailored for a different type of audience. In these, the same-sex couples are more sexualized or played for humor (Hendricks 2015). This concept is similar to early ideas of representation in American animation. However, there are absolutely examples of homosexual couples in Japanese media that appear familiar to Americans. Later, we will discuss two explicit couples who act romantically in a way that Americans would recognize: Yuuri and Victor from *Yuri on Ice* and Mafuyu and Ritsuka from *Given*. However, oftentimes, modern representation is either implicit or sexualized.

Many people argue that the fight for representation is nitpicky and unimportant. However, the reality is that it is incredibly important, especially for young people. When these relationships are normalized in their media, heterosexual youth can become more knowledgeable

and sensitive toward their peers, and queer youth can feel more comfortable in themselves. Rebecca Sugar stated about including LGBTQIA+ couples in her show,

> Even the audience members who were excited about it or who liked it would say things like, "I can't believe you're getting these adult themes into your show." It was all treated as if it was very subversive. It's not that we snuck adult ideas into a children's show. I mean, children are flooded with heteronormative content all the time. (Snyder et. al., 2021)

Adults try to hide homosexuality from children, but they allow them constant exposure to heterosexuality. There is nothing "adult" about watching people innocently fall in love, no matter their sexuality. Children need to see queer characters and queer relationships on screen to know that it is okay to be who they are (Whitley-Berry, 2020). Many creators of popular queer animated shows today are queer individuals that wish they had this type of representation while growing up. They wanted to be able to see themselves, so they are finally creating characters for current youth to see and with whom to find comfort. Queer people have trudged through works of poor quality for years in order to see some semblance of themselves. Finding oneself in a work can be such a powerful and personal experience. As Sedgwick states, "The truth-effect I am describing goes beyond questions of the work's coherence and credibility, however. It has to do with the use of the literary work, its expropriability by its readers, its potential for empowering them" (1990, p. 246).

The representation of same-sex couples in animation has gone through a long, arduous journey in both American television and Japanese television. Overall, it is important for queer youth to see themselves represented in the television they consume. Therefore, many queer individuals are very satisfied with how far representation has come, despite it still having room for improvement.

II. Subtext and Implicit Representation

Subtext is a device used in storytelling to imply something that is not being explicitly stated. It is not a concept that is exclusive to LGBTQIA+ couples in television shows, but it is often used for representation because of censorship issues.

According to Davis, "Subtext is the implied, unspoken meaning of something in a story. Then when a reader or viewer discovers that hidden meaning, that makes it subtext. Thus, subtext is a great way for a writer to communicate with their audience" (2021). Subtext adds different layers to stories. There is a great difference between when a concept is explicitly stated and when it is meant to be implicitly understood. Subtext that is meant to be implicitly understood is often utilized for the representation of LGBTQIA+ relationships in animation. However, it is not a new concept. Warwick argues that while Homer does not explicitly define Achilles and Patroclus's relationship in the *Iliad*, the subtext he uses suggests they are in a homoerotic relationship (2019). She argues that Homer repeatedly makes comparisons to a husband-and-wife relationship when discussing the bond between Achilles and Patroclus (Warwick, 2019). Subtextual representation of same-sex couples in animation may come about through symbolism, parallelism, dialogue, and more.

Homosexuality in media is something that has had to be hidden for many years. The censorship of queer relationships on television and silencing of queer voices in general led to many members of the community feeling abnormal, even though the attraction to any gender is completely natural (Rich, 2003). In order to avoid censorship from both American and Japanese studios, creators will often utilize subtext to convey the relationships. This implicit representation, while imperfect, can sometimes be the only way for creators to release their story to the world. To them, it is better to show queer couples implicitly than to be unable to show

them at all. Censorship has been an issue for both American and Japanese media. In the past, American versions of Japanese shows have even removed homosexual couples (Corg, 2017). However, Japanese shows will usually censor kisses or avoid explicit statements when representing homosexual couples. In contrast, explicit representation in this sense refers to anything from characters clearly stating romantic feelings for each other, to showing the characters in solely romantic actions like kissing or sexual intercourse, to characters using queer-specific terms and language (White et. al., 2021).

Due to the nature of society's views on homosexuality in both America and Japan, creators have often had to use subtext to implicitly represent couples. By utilizing different nuanced ways of implying queerness to the audience, creators can bypass censorship issues and produce a story that they wish to create.

III. Cultural Differences in Showing Affection

If one is to discuss representation of couples in media, one must consider that different cultures may perceive romantic affection in different ways. American people display affection much more openly than Japanese people, and they also act more passionately than the latter, revealing more reasoning for the difference of implicit and explicit representation.

The concept of love itself and its depiction in media is often intertwined with sexuality (Sun, 2019). Love is an incredibly popular topic for works of media, but it is difficult to adapt the same rules for the depiction of love across separate cultures. Americans show affection very freely, with public displays of affection being a normal occurrence in their society. Therefore, understandably, couples on American television are often shown to be engaging in a great deal of physical contact. This physical contact is often seen as an indicator of their romantic relationship. In Japan, on the other hand, public displays of affection are generally looked down

upon. In their culture, keeping heavy emotions and relationships private is very important. They encourage people to refrain from "icha-icha," which is a term for any kind of physical showing of affection, in public (Cohn, 2018). It is not that people are not expected to be happy with their relationship in this culture; it is simply an aspect of life that individuals should keep to themselves. In fact, it only became widely acceptable for heterosexual couples to hold hands in public in Japan a mere four years ago (Corg, 2017). These ideals also stem from older generations' attachment to a more traditional type of "wooing," that did not include public displays of affection (Barr 1998). Many teenagers feel more comfortable seeing and experience this affection though, due to the globalization of the idea of love (Barr, 1998). What used to feel inappropriate began to feel normal in moderation.

Yamada et. al conducted a study in which they observed couples in America and Japan, specifically focusing on passion and relational mobility in considering commitment in these relationships (2017). Relational mobility refers to how acceptable it is in society to move from different relationships. It is much more acceptable to change relationships and even change marriages in American society than Japanese society, so one would think Japanese couples are more committed. However, the results of the study showed that the Americans were more committed due to their higher degree of passion (Yamada et. al., 2017). Love is a more passionate concept in America because it is connected to sexuality. In reality, that is not the only type of love, and sexual or physical activities are not the only way to show love. When considering cultural differences, representation becomes even more multifaceted. There may be some representation of Japanese same-sex couples in animation that may not readily come across to American viewers due to the nuance of the couple's relationship. Later in this paper, we will discuss the female couple Ymir and Historia from the anime *Attack on Titan*, the male couple

Reki and Langa from the anime *SK8: the Infinity,* and the way that their subtle representation may slip past American audiences. Langner discusses the implications of performativity when it comes to representation (2015). The concept of performativity refers, in this sense, to a couple or character acting in a way that would traditionally make the audience think they are a couple according to common standards (Langner, 2015). If couples do not "perform," in a sense, their relationship may not translate to every audience member.

Discussing cultural differences in showing affection, especially between a more open America and a more conservative Japan, is vital to understanding what these countries consider representation. This difference adds more explanation to why Japanese representation is more often implicit.

IV. Audience Interpretation and Shipping

When determining representation, audience interpretation can play a large role. Fandom culture, "shipping," and queerbaiting are all aspects that create new layers to the topic of LGBTQIA+ representation in animation. Art is for public consumption after all, so the way audiences receive art has a large role in the art's impact. However, this impact also raises the question of whether "canonicity," or the couple being "official," actually matters in representation.

Fandom culture involves a group of people with at least one shared interest coming together, usually virtually in modern times, to talk about the topic of the fandom, create content based on it, and find comfort with similar people. Though these groups have a great love for the subject of their fandom, they often do not find it perfect and would like to change some aspects. The concept that often emerges from fandoms wanting to rewrite parts is called "fanon." Busse and Hellekson define fanon as, "the events created by the fan community in a particular fandom

and repeated pervasively throughout the fantext" and canon as, "the events presented in the media sources that provide the universe, setting, and characters," (2006, p. 9). This process of creating fanon in addition to canon allows people to enjoy their favorite form of media more fully in more dynamic ways. Fans gain some sense of ownership over the material or deeper connection with it, "and in doing so, fans avoid being simply passive consumers of commercial goods" (Lyden, 2012, p. 777). It is often the subtext and implicit representation of relationships that creators include that initiates the fans' desire to produce more content and fully believe aspects of the media that may be fanon instead of canon.

Fanon often leads to "shipping," which happens when members of a fandom either enjoy a fictional couple that is already officially together or wish for an unofficial couple to become official, or canon (Valdez, 2020). These "ships" often make a show more popular because people become invested in watching their story and waiting to see if they actually end up together. Especially when a couple is not officially together, fans find great joy in imagining the couple in scenarios that the writers are not providing as well as overanalyzing everything the members of the couple do. An article written by Angelina Karpovich in *Fan Fiction and Fan Communities in the Age of the Internet* introduces the idea of the audience as an editor (Busse et. al., 2001). Once a piece of media reaches the audience, it can, in many ways, be out of the original creator's hands. Busse writes, "the creator of meaning, the person we like to call the author, is not a single person but rather is a collective entity" (2001). Fans may connect to a certain aspect of this piece of media and create much more content based on it that changes aspects that they want to change. Therefore, the source material often becomes skewed from its "authorial intent" (Busse et. al., 2001). When an artist releases their work into the world, they

are signing up for this process. Everyone interprets pieces of art differently, so the entire audience may not always listen to exactly what the creator says.

One of the main reasons fans often find comfort in couples that are fanon comes about when these fans are part of a suppressed community that has been underrepresented in media for years. These fans will search for characters to which they can relate, yearning for a feeling of being seen and heard. Fandom content often begins with someone comforting themselves or comforting a friend with a piece of media that they created within the fandom (Busse et. al., 2001). From here, a community is created in which people can feel connected even if they feel outcasted by society. However, because these communities often make pieces of media more popular, certain creators will try to use them to their advantage. Queerbaiting is the process by which creators intentionally add homoerotic subtext to their piece of media to entice the queer community into watching their piece. However, these creators do not actually deliver on open homosexual relationships in the work (Nordin, 2015). Nordin writes,

> The anger people express when accusing a show of queerbaiting seems to originate with the experience that representation of queer characters (often with biggest focus on homosexual and bisexual characters) is scarce, which makes those who wish to see such representation easy to lure with queerbaiting. Another source of anger is that queerbaiting is considered to be a widespread and commonly used phenomenon, used as an intentional tactic. (2015, p. 51)

Because of the complicated emotions involved within fans feeling like they finally found representation that relates to them, members of fandoms can get into passionate, heated, and dangerous arguments over the "couple."

With fandom culture included in the conversation, the question arises of whether canonicity, the confirmed content of the media, really matters if people find comfort in their own

interpretations. Many people have said in the past that certain characters that may not have been canonically queer made them feel more comfortable with themselves anyway. "RuPaul, for one, has said that Bugs Bunny was his 'first introduction to drag.'" (Snyder et. al., 2021). Queer adults have said the same sentiment about many old characters, but the idea for 2021 and beyond is to give the LGBTQIA+ community enough representation that they do not have to search for it. It should be as easily accessible to them as heterosexual representation is to straight individuals. Queer people should also not have to guess whether they can see themselves on screen or not. Being gay is common and normal, so it should be reflected in art.

Fandom culture, shipping, and queerbaiting are all complex aspects that come into play when considering audience's interpretations of same-sex relationships. At the end of the day, though people can find comfort in characters and couples that are fanon instead of canon, queer people deserve to see themselves explicitly and openly represented.

V. Transition

The representation of same-sex couples in animated television can be examined through multiple avenues. The research portion of this Capstone provided background information about the following: (1) the history surrounding representation of same-sex couples in both American animation and Japanese anime, (2) the concept of subtext and how it contributes to implicit representation as opposed to explicit representation, (3) cultural affection differences and how they may affect how audiences define representation, and (4) the role of the audience and fandom culture in representation. The second part will examine the representation of queer couples in the American shows *Legend of Korra* and *She-Ra and the Princesses of Power*, and the Japanese shows *SK8 the Infinity*, *Attack on Titan*, *Yuri on Ice*, and *Given* through these different lenses and contexts.

PART 2: ANALYSIS OF SHOWS

I. *Legend of Korra*

The Nickelodeon show *Legend of Korra* acts as an example of implicit representation of a same-sex couple in an American children's animated show. It was one of the frontrunners of lesbian representation in this medium, but the aspects of its representation are very subtle. Though Nickelodeon was hesitant about openly indicating this lesbian relationship, the creators tried their hardest to break boundaries.

Legend of Korra was a 2012-2014 show that acted as a sequel to the explosively popular show Avatar: The Last Airbender. It is a children's show set in a fantastical universe. The series centered around Korra, the Avatar, master of the four elements of earth, air, fire, and water, as well as her friends that also had control of some of these elements. *Legend of Korra* originally aired on the American children's channel Nickelodeon, until it was moved to only Nick.com for possible controversies (Langner, 2015). The creators were under regulations to keep the show acceptable for children's television. After they were moved online, they received more freedom. Thus, they decided to include a lesbian relationship, albeit implicit and subtle. This situation connects to the criticisms of people wishing to keep "mature themes" out of children's shows, so Nickelodeon subtly pushed down the creators' desires to kill characters on screen or include queer characters. Ironically, there was an episode of the show *Spongebob Squarepants* that included the characters secretly raiding a woman's underwear drawer. The episode with this inappropriate content aired in 2003, and it was not removed until 2018 (Panchal, 2021). This situation creates a double standard for what "adult content" truly means to people. Six years after *Legend of Korra*, in 2020, the Nickelodeon twitter account tweeted pictures of three canonically queer characters, and Korra was included. Nickelodeon also released a video to

celebrate Pride Month in 2021 (V 2021). They seem to have grown more comfortable with openly addressing the queer community, and that could be due to Internet culture's increasing prevalence in everyday life.

The creators of *Legend of Korra* included a great deal of subtext in order to convey Korra and Asami's lesbian relationship to the audience. The series began with Korra having a crush on the male character Mako. The two were flirting, but then Mako and Asami started dating. This connection was the way that Korra and Asami met. The three were in a love triangle until season three, when the group agreed to remain friends. However, as time went on, Korra and Asami began to exchange longing glances and appear closer than the rest of the group. When Korra was away, the only person member of her friends and family with whom she exchanged letters was Asami. When Korra returns, the two are much closer. Their relationship is never defined, but in the final scene, the two discuss going on a trip together, walk hand-in-hand, and gaze lovingly at each other in a nuptial pose as the final, romantic music swells (Konietzko, 2014).

At the time of *Legend of Korra*'s release, it was still not acceptable for children's television to depict same-sex couples. Homosexuality was still considered an adult topic by many people, so it could not be openly shown, especially on a network like Nickelodeon. Though the early 2010s do not seem that far from 2021, there have been great changes in the past ten years. *Legend of Korra* creator Bryan Konietzko stated after the show's finale that while Nickelodeon was supportive of Korra and Asami as a concept, they made sure to let them know they had limits in what they could portray (Konietzko, 2014). For the creators, it had to be palpable enough that audiences looking for it could find it, but for the network, it had to be subtle enough to slip past those against it. This forced combination created a very specific formula for

implicit representation. The creators know they did not perfect it, but they also know that the couple pushed some representation barriers (Langner, 2015).

Three days after the finale of *Legend of Korra*, Konietzko posted on his Tumblr confirming the canonicity of Korra and Asami's relationship, titling the post "Korrasami is canon" (2014). Fans had been wishing for the two women to become official for years, making their own fan creations based on the pairing. On November 21, 2014, before the finale hinting at Korrasami had even aired, Tumblr user Ansdrela created a gif of Korra and Asami kissing, and it received over 51,000 notes. Six years later, on July 15, 2020, an enhanced version of the gif interposed into the finale was uploaded on YouTube. It has received about 541,000 views (Sanche). Judging by this data, a large audience had a great interest in the relationship between Korra and Asami.

Korra and Asami of *Legend of Korra*, though implicitly represented and coming into being under a limited network, became a beloved couple for the show's audience. The efforts of the creators seem to have been worth it.

II. *She-Ra and the Princesses of Power*

Creators of *She-Ra and the Princesses of Power* sought to revamp the She-Ra character and lore for a more diverse audience. The show is an example of explicit representation of a same-sex couple in children's animated television. This representation is shown very openly, which could not have been done in the past. Nevertheless, it garnered a large following.

The 1985 show *She-Ra: Princess of Power* was a *He-Man* spin-off that was mainly aimed to sell toys. In April 2016, production for a reboot began with the plan to make the cast much more diverse and relatable for a more modern audience. 2018's *She-Ra and the Princesses of Power* came into being at a different point in history than *Legend of Korra*. After 2015, same-

sex marriage was legalized in the United States. Moreover, children's shows featuring explicitly queer characters like *Adventure Time* and *Steven Universe* were produced by the time *She-Ra* was in production (Snyder et. al., 2021). Moreover, as the last season of *She-Ra* was being aired in 2020, animated children's shows like *The Owl House* and *Harley Quinn* were also depicting open lesbian couples (Monteil, 2020). Therefore, it is clear that *She-Ra and the Princesses of Power* was released amongst a much different context than *Legend of Korra*, which allowed it much more freedom in a slightly more open America. However, the context in which it was released does not take away from its impact. Every show involving queer characters has had a place in the timeline, and just because *She-Ra* falls later in the line does not inherently make it less influential.

Noelle Stevenson, creator of *She-Ra and the Princesses of Power*, has stated that there is not a single straight character in the show. Therefore, there are multiple open queer couples throughout the show. However, the main couple is Adora and Catra, two teenage girls. They start the show as friends under the villains, but Adora leaves to join the "good side." The two are rivals for most of the show, with Catra always trying to get Adora's attention. In the last season, Catra and Adora begin to reveal their romantic love for each other. They both struggle with confidence in their feelings, with Catra angrily, tearily exclaiming, "Adora doesn't want me! Not like I want her" (Stevenson et al., 2021, s05, ep. 12). Their feelings culminate, and they end up dramatically confessing to each other and sharing a kiss. In the finale, they share the following exchange: "Catra: Don't you get it? I love you. I always have. So please, just this once. Stay! Stay.; Adora: You... love me?; Catra: You're such an idiot.; Adora: I love you too." (Stevenson et al., 2021, s05, ep. 13). They end the show in a romantic relationship. The creator also released

an official piece of artwork as a sort of epilogue of the whole group of friends together at a ball after the events of the show. Catra and Adora are shown hugging and smiling (Stevenson, 2021).

Though it is more acceptable in general to show same-sex couples on television, more nuances also arise with the fact that *She-Ra and the Princesses of Power* is a Netflix show rather than on a network. With streaming services, parents can more easily regulate what their children are seeing. They can avoid the controversies that may arise from coincidental or accidental viewing, as Nickelodeon was trying to prevent with moving *Legend of Korra* to Nick.com (Langner, 2015). Moreover, the show comes from DreamWorks, which has historically been a bit more open than Disney or Nickelodeon in terms of their creations. Also, as mentioned, *She-Ra* was released at a time when Americans were more accepting of queer culture.

Due not only to its diverse characters but also to its messages of female empowerment and self-love, *She-Ra and the Princesses of Power* has performed very well in the American market. According to Parrot Analytics, in October 2021, over a year and a half since the last episode of the show was released, *She-Ra* has a 9.8x difference in demand from market average. Only 2.7% of all shows in this market have that much demand. It has more demand than around 95% of all American children's shows (Parrot Analytics, 2020). When a couple is explicitly canon in a show, the audience does not have as much of an effect on the couple itself. However, it is evident that this show has garnered an enormous audience in the United States. Young queer girls, queer boys, and non-binary children have been able to see versions of themselves on screen doing fantastical acts. It has sparked thousands of pieces of fanart, fan videos, and fanfiction. As it is on Netflix, the streaming aspect of this show allows for it to have strong lasting effects years after its finale.

As She-ra and the Princesses of Power was created for a more diverse audience than its predecessor, it included a great deal of explicit representation of same-sex couples. The creators included characters that queer youth would love, and they were able to create a very comforting show for the LGBTQIA+ community.

III. *SK8 the Infinity* & *Attack on Titan*

Implicit representation of same-sex couples is much more prevalent in anime than American animation. Creators used subtext to create subtle representation as it was easier to imitate subdued heterosexual anime couples. These implicitly represented couples can cause fans to push for more and more content and create theories and fanon.

Homosexuality has been represented in some way in anime since the 1980s. There has been a mixture of positive and negative representation, with many factors like censorship and oversexualization coming into play. Wildly popular 90s anime Sailor Moon had a lesbian couple, but, in the English dub, the relationship was changed to cousins (Corg 2017). Therefore, in order to avoid this type of censorship or oversexualization taking away from the story, creators began to make their same-sex couples more subtle and understated. With this method, representation could slip past people that were against it. The show *SK8 the Infinity* is an anime centered around competitive skateboarders in Okinawa, Japan. *Attack on Titan* is an action/horror anime about a horrendous race of giants terrorizing humanity. *SK8 the Infinity* was released in 2021, and the episode of *Attack on Titan* containing LGBTQIA+ content is from 2019. Because Japan still does not openly protect the queer community, it is understandable that creators still must use implicit representation in very recent years.

Reki and Langa of *SK8 the Infinity* are often implicitly represented through the show's dialogue. The male couple never kisses, but they hug. Langa tells his mom that Reki is someone

he "likes." This word, "like," can either be interpreted platonically or romantically. However, based on Langa's demeanor when he says it, the audience can easily assume that it is romantic, especially because his mom assumes he is talking about a girl (Miyake et al., 2021, ep. 8). The two meet and bond through skateboarding, and Langa later discovers that his whole reason for loving skateboarding is Reki. In the last episode, Langa tells Reki that he had not been feeling anything while skateboarding without him, and Reki says he feels the same way. They continue, "Reki: I want to skate together with you a lot more! Tomorrow, the day after that, and long after that!; Langa: Me, too! I want to infinitely skate together with you!; Reki: [laughing] Infinitely? Isn't that a bit much?; Langa: You're the one that said it first, Reki, that skating was infinite!; Reki: Come to think of it, I did!" (Miyake et al., 2021, ep. 10). Considering these pieces of dialogue and the shy blushes exchanged between the two, one can interpret their relationship as romantic. The nature of the two boys only feeling emotions while skating if they are together is a tactic often used in romantic stories. Ymir and Historia, the lesbian couple of *Attack on Titan,* similarly never openly share traditionally romantic exchanges. However, after Ymir dies, Historia receives a letter from her. It reads, "To my dear Historia…I'm going to die soon. But I'll die without regrets. Or that's what I'd like to say, truth is I do have one thing: It's that I never got to marry you. With love, Ymir" (Wada et al., 2019, ep. 58).

Cultural differences in showing affection are most prominent with Japanese implicit representation of same-sex couples. Actions seen as platonic in America may be romantic in Japan, and actions seen as romantic in America may be kept private in Japan (Cohn, 2018). Reki and Langa as well as Ymir and Historia never kiss, but that does not necessarily mean they are just friends. It is also important to consider the culture of romantic anime and anime couples. In two of the most popular romantic anime, *From Me to You* and *Ouran High School Host Club*, the

main couples also never kiss. In action anime, where the couple is not the focus, the couples physically do even less, such as the couples in *Fullmetal Alchemist: Brotherhood*, who never kiss or engage in any type of "icha-icha" (Cohn, 2018). Where American audiences require a kiss or some sort of physical contact to consider a couple canon, Japanese audiences do not find that aspect important to the development of a fictional relationship.

An implicitly represented queer anime couple can create enough excitement and basis for fan content for a fandom for decades. With Reki and Langa from *SK8 the Infinity*, there are thousands of pieces of fanfiction on websites like Archive of Our Own, Wattpad, and more. There are also constantly new pieces of fanart and fan videos being produced. When the audience is given characters and a world, they can often feel inspired enough to create years' worth of more content. Moreover, as *Attack on Titan* is one of the most popular and well-known anime of all time, the inclusion of a lesbian couple exposes the two to a large audience that will find solace and comfort in them. Fans of *SK8 the Infinity* are split as to whether they believe they were queerbaited or not. However, the fanon that the online fandom generally accepts and builds upon is that Reki and Langa are in a romantic relationship. At the very least, they accept that Langa says he likes Reki, indicating at least one queer character within the couple (Miyake et al., 2021, ep. 8).

The implicit representation that arises in Japanese anime comes about through subtext, and it can be easier in this culture to subtly represent couples due to their lack of PDA. Whether they are canonically together or not, thousands of fans still find comfort in them.

IV. *Yuri on Ice* & *Given*

Explicit representation of same-sex couples in Japanese anime does not necessarily require the inclusion of endless scenes of intimate physical connection. Often, the show includes

a few scenes of intimate connection and explicit dialogue. Overall, the inclusion of open queer couples in Japanese media allows for individuals in Japan and internationally to feel seen.

The most popular anime in history are often action anime or ones centered around heterosexual romance. That is where the incredible popularity of *Yuri on Ice* becomes so surprising. When it aired in 2016, people within the anime sphere as well as outside of it were all talking about *Yuri on Ice.* As it is about competitive figure skating, big names in figure skating from all over the world were praising the show. (Chao, 2021). It has become one of the most well-known anime of all time, crushing the stereotype that anime with explicit same-sex representation must be a niche for those looking at it sexually. Moreover, when *Given* was released in 2019, it was heavily praised for its relatability, characters, dialogue, cinematography, and romance (Creamer, 2019). The anime caught the attention of fans that did not usually gravitate toward LGBTQIA+ anime due to its high quality.

The explicit representation of *Yuri on Ice* comes through the dialogue mostly, as the kiss between the characters Yuuri and Victor is censored (Yamamoto et al., 2016, ep. 7). However, they confirm their relationship publicly and get engaged by the end of the anime (Yamamoto et al., 2016, ep. 10). They also receive the overwhelming support of their friends and family. There are two explicit same-sex couples in *Given*. Mafuyu and Ritsuka are the younger couple, and Akihiko and Haruki are the older couple. The four men are in a band, and they are trying to perfect their sound. Mafuyu and Ritsuka have many romantic moments akin to how heterosexual couples are shown in anime. It is revealed about halfway through the series that Mafuyu has an ex-boyfriend that killed himself, and Ritsuka suddenly feels jealous that Mafuyu had a love in his life. In a moment of great emotion, after their first performance, Ritsuka kisses Mafuyu. Not only is their kiss uncensored, but a flashback also shows a sex scene between Mafuyu and his

deceased boyfriend Yuki (Yamaguchi et al., 2019, ep. 10). In Episode 11, in contrast to Mafuyu's dark backstory, the process of Ritsuka and Mafuyu sharing their feelings with each other and deciding to date is portrayed in a very lighthearted manner (Yamaguchi et al., 2019). Akihiko and Haruki have a more complicated relationship, but uncensored scenes of their relationship are shown as well.

Because, according to Cohn, Japanese culture stresses the importance of keeping intimate acts private, couples in anime will usually show their affection while they are alone (2018). All the kisses and intimate touching in *Given* occur while the couple is alone. If a stranger were to see them on the street, it would not be evident that they were together. Victor and Yuuri of *Yuri on Ice* express their relationship a bit more openly. The anime takes place in a certain subculture: figure-skating. This setting creates a different situation because, to the public, male figure-skaters are often assumed to be gay due to the effeminate nature of the performances (Chao, 2021). Though the actual world of figure skating is still homophobic, the creators of *Yuri on Ice* developed a very "gay-friendly" background, providing more comfort for the characters and audience members (Chao, 2021). Yuuri and Victor do not engage in excessive PDA, but they kiss in front of an audience. It is a bit hidden, though, as the audience is not entirely sure if they kissed or not. However, with their words, they are much more open. Victor never hesitates to inform others of his feelings for Yuuri, even if they do not physically show it often. Though the representation in these two anime was explicit, it was not gratuitous. The couples express their love for each other in accordance with Japanese ideals of PDA.

In terms of audience interpretation, explicit Japanese representation is where it can often grow closer to fetishization. There are absolutely examples of this inappropriate representation, but the two anime discussed in this context are two examples of genuine representation, without

making it a joke or an overtly sexual manner. This is evident in the way both couples have understated, serious, loving moments together and in the way their physical scenes are not gratuitous. Both anime have gained popularity amongst Japanese and American audiences, but the success of *Yuri on Ice* was explosive. It received immense recognition in Japan, but it is also one of the most well-known anime around the world. LGBTQIA+ individuals in Japan, America, and more were able to connect to these characters and see themselves openly represented on screen, which is endlessly important for their confidence, comfort, and self-esteem.

The anime that include explicit, positive representation of same-sex couples are very important in their contribution to media. The open dialogue as well as the quiet, intimate scenes create a beautiful combination that can comfort thousands of people.

V. Final Conclusion

When considering the representation of same-sex couples in American and Japanese animated television, one must consider the history of LGBTQIA+ ideals in both countries, the meaning of creators using text and subtext, cultural differences, and the role of the audience. Examining the American shows *Legend of Korra* and *She-Ra and the Princesses of Power* as well as the Japanese shows *SK8 the Infinity*, *Attack on Titan*, *Yuri on Ice*, and *Given* through these four different lenses reveals the different ways same-sex fictional couples come about as well as their different effects on global media and audiences. Overall, each show included in this paper has a place on the timeline of LGBTQIA+ representation in animation. Though explicitly represented couples like those in *She-Ra and the Princesses of Power, Yuri on Ice,* and *Given* have been revolutionary in their power and effects, the implicitly represented couples in *Legend of Korra, SK8 the Infinity,* and *Attack on Titan* have broken barriers as well. In reality, shows

like *She-Ra and the Princesses of Power* could not exist in 2020 without shows like *Legend of Korra* proceeding them. Therefore, it is not a debate of which is "better:" implicit representation or explicit representation. All have their place in media, their reasons for existence, and their own audience that has found deep comfort in them. The consensus is that, while there is still much work to do in terms of LGBTQIA+ representation in animated media, it has absolutely made progress. Now, queer children and queer audiences in general can see themselves on screen, whether it be subtly or openly.

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Flow cytometric and microscopic analysis of antimicrobial properties exhibited by protein extracts purified from *Eisenia hortensis* on the bacterium *Bacillus megaterium*

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Abstract

Antimicrobial resistance has become a major issue in recent years due to the liberal and improper use of antibiotics leading to antibiotic and antimicrobial resistance. Alternative antimicrobial therapies are thus in need of discovery and development to combat this issue including, but not limited to, invertebrate sources. Earthworms lack adaptive immunity, but have been able to survive and mount efficient non-specific defense responses against pathogens due to elements of their robust innate immune system including cellular responses such as phagocytosis by coelomocytes, and chemical responses mediated by lysozyme, antimicrobial peptides, and agglutinating components found in the coelomic fluid. This study used flow cytometry and microscopic methodologies to investigate the antimicrobial effects of a crude protein extract isolated from the earthworm *Eisenia hortensis.* Both cell morphology and viability of the bacterium *Bacillus megaterium* were examined. Using the cell viability dye propidium iodide (PI), flow cytometry results obtained from duplicate experiments showed significant cell killing ($p < 0.05$) occurred when *B. megaterium* was treated with either a high (2.5 mg/ml) or a low (1.25 mg/ml) concentration of extract for 2 hr. The high concentration correlated with cytotoxicity between 26-37%, whereas the low concentration induced killing between 19-38% in assays A and B, respectively. Fluorescence and phase contrast microscopy revealed that following exposure to the extract for 4.5 hr, bacterial cells exhibited noticeable differences in light refraction, substantive clumping, and high levels of PI uptake compared to untreated controls. Future studies aim to focus on purification of the specific protein(s) responsible for the observed cytotoxic effects in the antimicrobial earthworm extract.

Introduction

High morbidity and mortality associated with human infections are some of the few issues that are associated with antimicrobial resistance in bacterial pathogens. Gram positive and Gram negative bacteria that are multidrug resistant have led to hard-to-treat and even untreatable infections with standard antimicrobials. Broad spectrum antibiotics are liberally and predominantly unnecessarily used according to Frieri et al. (2017) because early identification of causative microorganisms, along with their antimicrobial susceptibility patterns, in patients experiencing bacteremia is underdeveloped or absent in many healthcare settings. Drastic increases in resistance occur because of this practice, especially when paired with poor infection control. New findings of multidrug-resistant bacteria, and resistance to common antimicrobial therapies by important bacterial pathogens are increasing at a frightening rate. Thus, alternative antimicrobial therapies need to be developed and used in order to combat antimicrobial resistance (Frieri et al., 2017).

Earthworms, which are invertebrates, lack adaptive immunity that includes important antimicrobial defense components such as antibodies, T and B lymphocytes, and recombination-activating genes (RAGs). Despite these limitations, earthworms and other invertebrates mount efficient defense responses against pathogens using well-developed innate immunity mechanisms. One of the many important aspects of an invertebrate's innate immunity include pattern recognition receptors (PRRs), such as Toll-like receptors (TLRs) and peptidoglycan recognition proteins (PGRPs). These PRRs detect specific components of bacteria such as lipopolysaccharide (LPS), peptidoglycan (PGN), outer-membrane proteins (Omps) and flagellins. Once a PRR detects a bacterial component, a downstream signaling pathway is triggered leading to production and activation of antimicrobial peptides (AMPs), and reactive

oxygen species (ROS) (Nyholm & Graf, 2012). Several groups of antimicrobial peptides exist, classified according to structural motifs such as linear peptides that form hydrophobic and amphipathic helices. Lysozymes, fetidins, and several AMPs have been reported as defense molecules in earthworms. In the earthworm *Pheretima gillelmi*, a study discovered a novel lumbricin-like AMP, named lumbricin-PG. This molecule was isolated from the earthworm's skin secretions. The study also found that lumbricin-PG had potential antimicrobial activity that was most sensitive for *Pseudomonas aeruginosa* and *Staphylococcus aureus* and weakest against *Escherichia coli*. Lumbricin-PG's hemolytic capabilities were tested on human and rabbit red blood cells since some AMPs have been known to destroy membranes and express hemolytic activity but was found to have little hemolytic activity on both cell types (Li et al., 2011).

Lysozyme and AMPs can be found in an earthworm's coelomic fluid (CF), thus contributing to their innate immunity as explained by Ghosh (2019). Bacteriostatic, antibacterial, and strong hemolytic properties have been exhibited in earthworm coelomic fluid (ECF) against pathogenic bacteria found in soil. *Eisenia fetida andrei, E. f. andrei* (EFAF) factors include two glycoproteins (fetedin and lysenin) which are secreted by cells such as coelomocytes and exhibit agglutination of red blood cells (RBC), hemolytic, and cytotoxic properties. ECF's opsonization, clotting of CF, and antibacterial activity has been expressed against both Gram positive and Gram negative pathogenic bacteria (Ghosh, 2019). Earthworms also have a coelomic cytolytic factor (CCF) that aids in their innate immune response and protection since it functions as a pattern-recognition molecule (PRM). When interacting with membrane lipids and molecules in the cytoplasm of bacteria, AMPs display high selectivity and specificity thus adversely affecting cellular metabolism of bacterial pathogens. When interacting with multiple targets, AMPs have been known to undergo conformation changes as well. The AMP lumbricin was reported from

the earthworm *Lumbricus terrestris* and has been reported to perform many functions including, but not limited to, neuroinflammation and dopaminergic neurodegeneration, neuronal proliferation, and microglia mediated acute or chronic inflammation. Another related AMP, lumbricin-PG, was isolated from the skin secretions of earthworm *Pheretima guillelmi* which also contains antimicrobial activities against bacteria and fungi. OEP3121 is another AMP that has been reported in *E. fetida,* as well as the AMP PP-1, similar to lumbricin I, which was identified in *Metaphire tschiliensis*. Lumbricin I has also been identified in *Lumbricus rubellus* and has no hemolytic activity but has broad spectrum antimicrobial activity (Ghosh, 2019).

According to Lange (et al., 1999), coelomic fluid found in earthworms, such as *E. fetida*, contains antibacterial, cytolytic, and agglutinating components to aid in destruction of foreign cell membranes. The study looked at eiseniapore, the cytolysin from the coelomic fluid that is found in *E. fetida*, that deals with the humoral component of the immune system. Eiseniapore was isolated from *E. fetida's* coelomic fluid via negative PAGE and the purity of the isolated protein was confirmed with the use of SDS/PAGE. Eiseniapore's activity was observed to be dependent on temperature and declined upon longer incubation periods at higher temperatures. Vitronectin, heparin, Eiseniapore-regulating factor, and lysophosphatidylcholine were all recorded to inhibit Eiseniapore's hemolytic activity, while copper ions seemed to cause an increased binding capacity. Eiseniapore also induces hemolysis of mammalian erythrocytes to varying degree since it differs in effectiveness per species, such as sheep, human, or cat erythrocytes (Lange et al., 1999). If earthworm antimicrobial components are to be used in humans to treat bacterial infections, any hemolytic properties of such components would need to be carefully screened to ensure patient safety.

Previous research conducted in the Fuller-Espie lab includes work by Alyssa Rothman, Anna Bauer, Sophia Scarpone, and Heaven Daye (**Figure 1**). Rothman's work (2018) included testing 14 bacterial strains for susceptibility to a crude protein/peptide extract derived from *Eisenia hortensis*. Rothman (2018) used the crude protein extract to conduct disk diffusion assays to test the antimicrobial activities of the extract. Of the 14 bacterial strains tested, only *Micrococcus luteus* and *Bacillus megaterium* exhibited susceptibility to the extract, and hence only these two bacterial species were pursued in subsequent analyses. Bauer, Rothman, and Scarpone's (2019) work expanded the disk diffusion assays to include a tube dilution method to determine bacterial susceptibility to the crude protein extract. Duplicate tubes containing diluted *M. luteus* and *B. megaterium* were treated with varying concentrations of earthworm extract demonstrating that *M. luteus* exhibited more sensitivity to the earthworm extract than *B. megaterium* (Bauer et al., 2019). Daye's findings (2020) included the development of a flow cytometry assay to test the susceptibility of *M. luteus to the crude protein extracts*. This work provided the foundation for the research presented in this paper.

The focus of this investigation was to establish the effectiveness of the crude protein extracts from *E. hortensis* in decreasing cellular viability in *B. megaterium* using flow cytometry. The flow cytometry assays were conducted in order to collect data related to multiple cellular parameters including forward scatter (FSC) based on size, side scatter (SSC) based on internal cellular complexity, and fluorescent properties. The viability dye propidium iodide (PI), which only enters cells with a compromised cell membrane, was used to measure cell death. The flow cytometer detects PI if this dye is bound to double stranded DNA using the FL2-photodetector in the instrument. The goals of the experiment included finding an adequate dosage of earthworm extract and time of treatment required to kill *B. megaterium*, as well as the use of phase contrast

and fluorescence microscopy methods. This study furthers our knowledge of the cytotoxic properties of the crude protein extracts beyond the disk diffusion and tube dilution assays conducted previously (Rothman, 2018; Bauer et al., 2019).

Methods

Crude protein extract preparation (Rothman, 2018)

The crude protein extract was prepared by first blending and liquefying 200 earthworms, lysing cells with the Sonifier Cell Disruptor, followed by multiple rounds of centrifutation to eliminate insoluble materials. After filtration, 85% ammonium sulfate was added to precipitate proteins/peptides, and then the sample was centrifuged to form a pellet of desired proteins/peptides. The pellet was then suspended in phosphate buffer saline (PBS) and then dialysis, filtration, and ultrafiltration methods were carried out. The concentration of the crude protein extract was determined to be 250 mg/ml using a Nanodrop at 280 nm. Sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS PAGE) was performed to observe protein integrity and heterogeneity. It is important to note that all assays described in this paper used this crude protein extract that was divided into small aliquots and stored at -20ºC.

Flow cytometry procedure

A fresh tryptic soy agar (TSA) streak plate culture of *B. megaterium* was prepared aseptically two days in advance and left in the incubator at 37ºC. The next day an isolated colony from the TSA streak plate was transferred aseptically into 5ml of tryptic soy broth (TSB) in a conical 50 ml conical, plastic test tube. The test tube of broth was then secured in an aerating orbital shaker overnight at 25ºC. To prepare the flow cytometry tubes, first a 1:50 dilution of the overnight TSB culture was prepared using fresh TSB, and then each of the 10 tubes received 250

µl of the diluted cells. Next, as shown in **Figure 2**, the tubes were filled with either phosphate-buffered saline (PBS) or crude protein extract treatment (High = 2.5 mg/ml, Low = 1.25 mg/ml). All flow tubes, excluding the "heat shock control" duplicates, were shaken vigorously on the Red Rocker Shaker for 120 min at room temperature. The "heat shock control" duplicates were treated at 72ºC for 30 min in a dry heat block, and then put on ice until the other eight tubes were ready. After 120 min of continuous shaking, flow cytometry tubes, except for the "untreated no dye", received 25 µl PI (10 µg/ml final concentration), and were incubated 5 min at room temperature before immediate analysis on the flow cytometer. The "untreated no dye" samples were used to adjust three instrument settings on the flow cytometer including the side scatter photomultiplier tube (SSC – cell granularity and complexity detection), the forward scatter photodiode (FSC - size detection), and the FL-2 photomultiplier tube (PI fluorescence detection). The "untreated no dye" sample permitted determination of autofluorescence, whereas the "untreated with PI" established the baseline of PI uptake and also served as an indicator of the viability status of the bacteria prior to treatment and for statistical comparison.

Acquisition and analysis methods

BD Cell Quest Pro software was used for acquisition of the flow cytometry listmode data thus allowing for the addition of counters and other instrument settings/parameters to be manipulated for the data collection process. To run the samples on the flow cytometer, the tubes were first aligned in a test tube rack in order of duplicate pairs listed in **Figure 2,** and then vortexed briefly prior to attaching them to the sample injection port (SIP). Once attached to the SIP, 25,000 ungated events were collected per sample for each listmode file. The listmode data was analyzed further using Verity - WinList 3D 9.0.1 software to create multigraphs displaying FSC vs SSC dot plots, and FL-2 histograms. A region (R1) was generated to capture relevant

cells while excluding aggregated material (cell clumps) and cell debris. The FL-2 histogram was gated on R1 to ensure that PI-uptake was restricted to the selected population of cells in R1. A second region, R2, was generated to capture PI-positive cells using the "untreated no dye" control sample to establish the placement of R2. Any cells in R2 were counted as PI-positive, and any cells residing to the left of R2 were counted as PI-negative.

Microscopy procedure

The *B. megaterium* cells were prepared the same way as described for the flow cytometry procedure (**Figure 2**). Using a duplicate approach, 50 µl was placed in the first well of 96 well flat bottom plate and subjected to a two-fold dilution series by adding PBS (**Figure 3**). The cells were left to settle for 10 min and then the relative cell densities were observed under the phase contrast microscope to select the appropriate density (i.e., an even dispersion of cells still enabling identification of single cells in isolation with space between cells). Once a particular density in the serial dilution array was deemed fit, the duplicate wells received either 25 µl PBS (untreated control) or 25 µl of earthworm extract (1.25 mg/ml final concentration). Phase contrast microscopy coupled with a fluorescence microscopy overlay and photography was conducted after 4.5 hr incubation at room temperature.

Results

Flow Cytometry

Two assays (A and B) were conducted to determine the killing effect of the crude protein extract on *B. megaterium* using flow cytometry (Assay A = **Figures 4-5**; Assay B = **Figures 6-7**). The "Untreated + PI" sample was used as the baseline control for comparison to treated samples using the student t-test paired two sample for means. Data from the samples were

compiled into multigraphs (**Figure 4** and **Figure 6**) comparing forward scatter (FSC) vs side scatter (SSC) with R1 generated to avoid cellular aggregates and debris in final histogram analyses. The viability dye PI allowed for detection and differentiation of dead cells (PI positive) from live cells (PI negative). The intensity of fluorescence displayed by R1-gated cells was then measured using the FL-2 photodetector which detects fluorescence emitted from PI. On the FL-2 histograms (middle column of **Figure 4** and **Figure 6**), R2 represents PI positive cells which is indicative of cell death because PI only enters cells with a compromised cell membrane and binds to double-stranded DNA by intercalating between the bases. It is important to note that PI emits fluorescent light only if it is bound to DNA and after excitation of the dye with the argon laser (408nm) in the flow cytometer.

When comparing FSC (cell size) vs SSC (cell complexity/granularity) in Assay A, the percentage of cells in R1 decreases between the "Untreated + PI" versus crude extract-treated samples as shown in **Figure 4**. Morphologically, the cells appear to be reducing in size and complexity when comparing the FSC and SSC axes of "Untreated + PI" compared to "High" and "Low" samples. Note the changes in R1 values, and how the cells shifted leftward and downward out of R1 to decreased FSC and SSC values. The contour map shading provides a visible means of tracking the shift in FSC and SSC values after treatment with the crude protein extract. Assay A also exhibited a very high percentage of cell death in R2 in the FL-2 histogram for "Heat Shock" (98.65%) as predicted for this positive control when compared to that of the "Untreated + PI" (4.15%). The value observed for "Untreated + PI" indicates that the cell culture used was very healthy and that very few cells (less than 5%) had entered the death phase of the growth curve under the closed batch culture conditions used, thus providing an appropriate baseline for comparison. "High 2.5 mg/ml" and "Low 1.25 mg/ml" also exhibited demonstrable

cell death with 25.51% and 19.17% of the cells residing in R2 (PI positive), respectively. From this data a bar graph (**Figure 5**) was created comparing percentage of cell death in each of the samples to the baseline control (Untreated + PI). Statistically significant cell death was observed for "Heat Shock" ($p < 0.0005$), "High (2.5 mg/ml)" ($p < 0.005$), and "Low (1.25 mg/ml)" ($p < 0.005$) samples compared to baseline control (student t-test).

In Assay B, the cells again appeared to be morphologically smaller as the samples progressed from "Untreated + PI" to "High" and "Low" treatments (**Figure 6**). When comparing FSC vs SSC, percentage of cells in R1 decreased following treatment with the crude protein extract. In R2 on the FL-2 histogram, Assay B exhibited even higher percentages of cell death compared to Assay A. As anticipated, the positive control "Heat Shock" exhibited the highest percent of cell death (99.44%) compared to the other samples. The data from Assay B is shown in **Figure 7**. Statistically significant cell death compared to baseline was again observed for "Heat Shock" ($p < 0.0005$), "High (2.5 mg/ml)" ($p < 0.05$), and "Low (1.25 mg/ml)" ($p < 0.05$) samples, providing evidence of inter-assay reliability.

Microscopy

After exposure of *B. megaterium* to the crude protein extract for 4.5 hr, phase contrast microscopy showed that the cells appeared to swell and refract light differently, as well as exhibit multiple zones of cell clumping compared to the negative control (**Figure 8, left side**). Under fluorescence microscopy overlay of the same cellular zones used for phase contrast, the untreated cells appeared to be evenly dispersed, without notable bright patches indicating low levels of PI uptake. In contrast, treated cells exhibited multiple very bright patches of cellular clumping indicative of PI uptake and cell death (**Figure 8, right side**).

Discussion

This goal of this study was to investigate the antimicrobial effects of a crude protein/peptide extract purified from the earthworm *E. hortensis* using the bacterium *B. megaterium*. The crude protein extract used in this study was made and tested previously by students in the Fuller-Espie lab for its antimicrobial properties using disk diffusion, tube dilution, and flow cytometry techniques. Out of 14 bacterial species originally tested by Rothman (2018), only 2 Gram positive bacteria exhibited susceptibility to the extract, namely *M. luteus* and *B. megaterium*. The results presented in this paper showed for the first time that flow cytometry and microscopic methods are useful for studying bactericidal effects in *B. megaterium*.

The flow cytometry results showed that a statistically significant amount of cell killing occurred, as measured by PI uptake, using 1.25 mg/ml of crude protein extract in only 2 hr. Although lower concentrations of the extract and a wider range of exposure times were not tested, it would be interesting to establish the minimum inhibitory concentration and time required to achieve 100% cell death by the crude protein extract in future experiments. The flow cytometry data revealed that not only was the integrity of the bacterial cell compromised, thus permitting entry and binding of PI to DNA in the affected cells, but morphological and physical changes could also be detected based on forward and side scatter properties of the cell population. Fluorescence microscopy results complemented the flow cytometry data by showing increased PI fluorescence in treated cells. Phase contrast microscopy results provided a closer look at the morphology and light refraction properties of the treated cells, characteristics that flow cytometry is unable to reveal. The aggregation of cells may be attributed to cell death of the bacterial cells; as the cells die, nucleic acid is released from the cells making the extracellular environment more viscous and cell surfaces more sticky and prone to cellular aggregation. In the

flow cytometer, this effect is not obvious because the cells are moving in a flow stream provided in the flow cell of the instrument that would have the effect of decreasing extracellular viscosity.

Continuation of this research and further investigation could include the use of gel filtration and/or ion-exchange chromatography to separate the relevant proteins responsible for the cell killing effect by size and net charge fractionation, respectively. Purification of the specific protein(s) responsible for the observed cytotoxic effects in the extract is the obvious next step in this research since the crude extract is extremely heterogeneous and contains hundreds, if not thousands, of different proteins (as noted by Rothman, 2018, based on SDS PAGE analysis).

Reverse genetics could ultimately be used to help identify the gene(s) encoding the antimicrobial proteins/peptides exhibiting inhibitory effects; one the protein responsible for bacterial cell killing is identified, the amino acid sequence could be determined from which degenerate nucleic acid probes could be used to probe a gene library of *E. hortensis* to isolate the full gene and determine its sequence. Electron microscopy post-treatment could help observe in more detail what is occurring on the surface of the cells and provide more information that correlates with the phase contrast and flow cytometry findings of this study, i.e., changes in cell refraction and shape/size. Finally, determining the minimum extract concentration and treatment time needed to cause cell death is another viable option. It is the ultimate goal of studies such as the one described in this paper to identify alternative sources of antimicrobial reagents to treat bacterial infections that are becoming increasingly more resistant to the arsenal of antibiotics currently available for human treatment.

Acknowledgements

I would like to take a moment to thank Alyssa Rothman, Anna Bauer, Sophia Scarpone, and Heaven Daye for laying the foundation needed to continue building upon this research. I

would also like to thank Dr. Fuller-Espie for allowing me to have this amazing opportunity where I was able to strengthen my knowledge and further develop my interest in microbiology. I would also like to thank her for her enthusiasm and encouragement in my understanding as well as presenting this information especially at an adjudicated conference. I would also like to thank and acknowledge my parents, family, and friends for all their support as well. Finally, I would like to thank Cabrini University Science Department for providing the supplies and materials as well as laboratory space needed to conduct this research.

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Figures

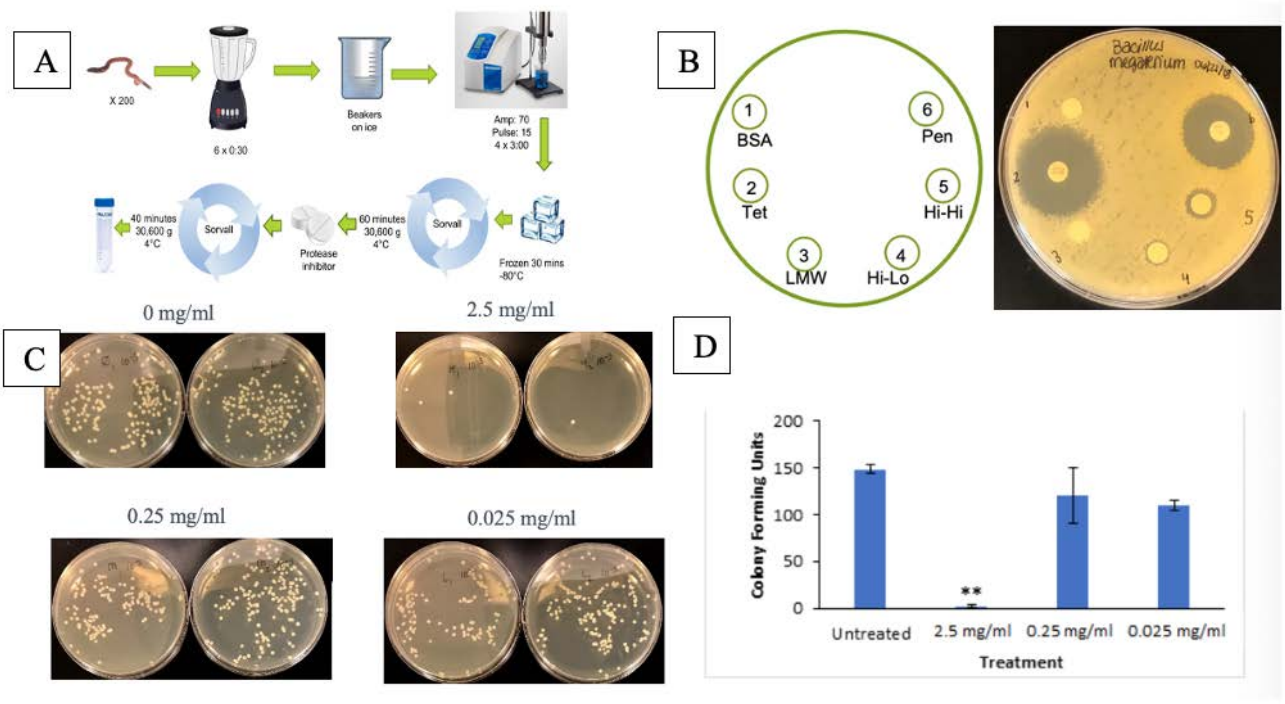

Figure 1- (A) Preparation of the crude protein extract from the earthworm *E. hortensis*. Two hundred earthworms were liquefied in 6 pulses of 30 seconds at 4°C. The samples were sonicated and frozen to disrupt cellular membranes. The samples were centrifuged, then a protease inhibitor was added. Samples were centrifuged again, and the samples' pellets were placed into PBS. Then ammonium sulfate was added (85%) to precipitate proteins. Following centrifugation and resuspension of pellet in PBS, dialysis was conducted followed by filtration to concentrate proteins. Nanodrop was performed to determine protein concentration (247.4 mg/ml) (Rothman, 2018). (B) Disk diffusion of *B. megaterium*. Disk 1 is a BSA control (2000 µg), disk 2 is tetracycline, disk 3 is a low molecular weight protein fraction (< 2 Kdal) from *E. hortensis*, disk 4 is 500 µg of crude protein extract, disk 5 is 2,000 µg of crude protein extract, and disk 6 is penicillin. Results show earthworm extract inhibited growth of *B. megaterium* (Rothman, 2018). (C and D) Protein extract inhibits the growth of *B. megaterium* at high concentration. The experiment was carried out at three different concentrations using tube dilution methodology (10^{-5} dilution). No significant differences were observed at low or medium concentrations. Very significant differences (**$p < 0.005$, student's t-test) were observed at high concentration of the crude protein extract with *B. megaterium* showing significant decreases in colony forming units (CFUs) (Bauer, et al., 2019).

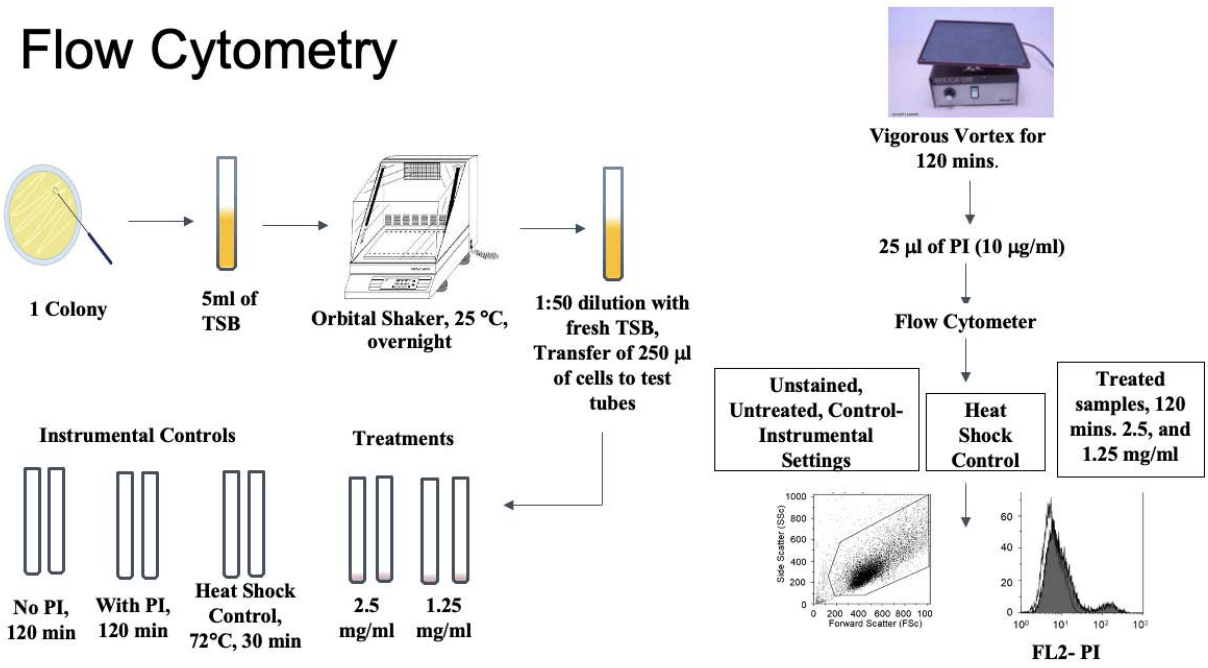

Figure 2 - Flow cytometry procedure. One colony of *B. megaterium* was transferred to a 5 ml conical tube of tryptic soy broth (TSB). The conical tube was put on an orbital shaker at 25°C overnight. A 1:50 dilution was made using 0.1 ml cells plus 4.9 ml of TSB. Each flow cytometry test tube was filled with 250 µl of bacterial cells. Next, the controls, heat shock and no treatment controls (instrumental controls as indicated), received 25 µl of phosphate buffered saline. The treated tubes (treatments as indicated) received 25 µl of protein extract at 1.25 mg/ml (low) or 2.5 mg/ml (high) final concentration. All tubes (except heat shock samples) were then placed on a Red Rocker for the designated time. Heat shock samples were incubated separately at 72ºC for 30 min. Instrumental controls and treatment tubes receiving PI received 25 µl of PI (10 µg/ml final) and data was acquired using a BD FACSCalibur flow cytometer using FSC, SSC, and FL-2.

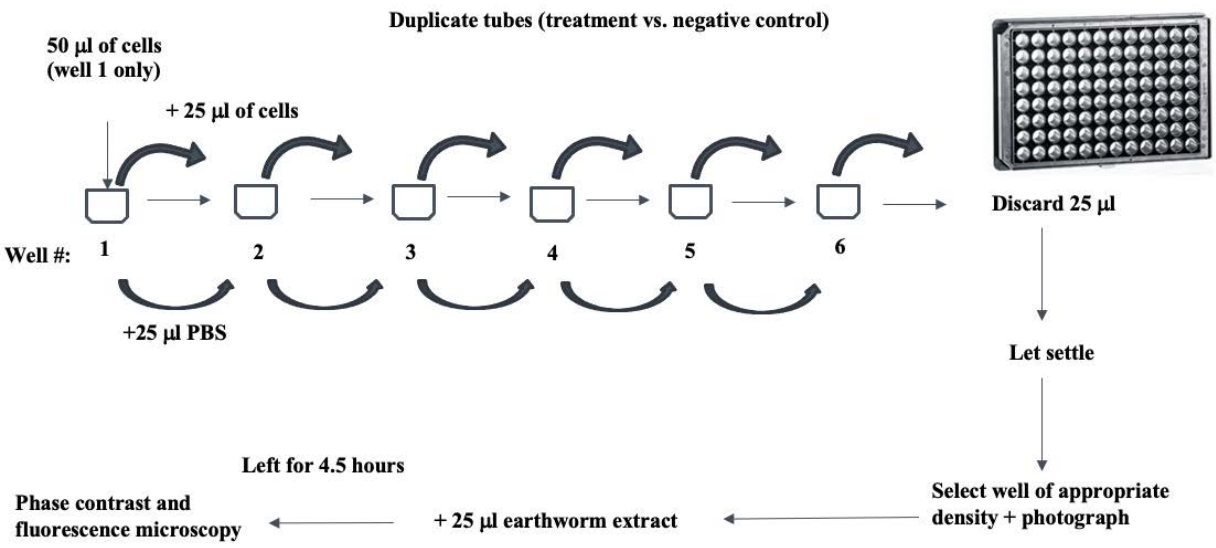

Figure 3 - Microscopy procedure. The experiment was conducted in duplicates with a negative untreated control. Cells prepared as previously stated, and 50 µl were added to the first well in the row of a 96 well-flat-bottom plate. 25 µl of PBS was added to subsequent wells and 25 µl of cells from the previous well were added to the following well (working left to right) with the final 25 µl discarded, and the wells were left to settle. The wells of appropriate density were selected, 25 µl of earthworm extract was added to achieve 1.25 mg/ml final concentration, and incubated for 4.5 hr followed by photography.

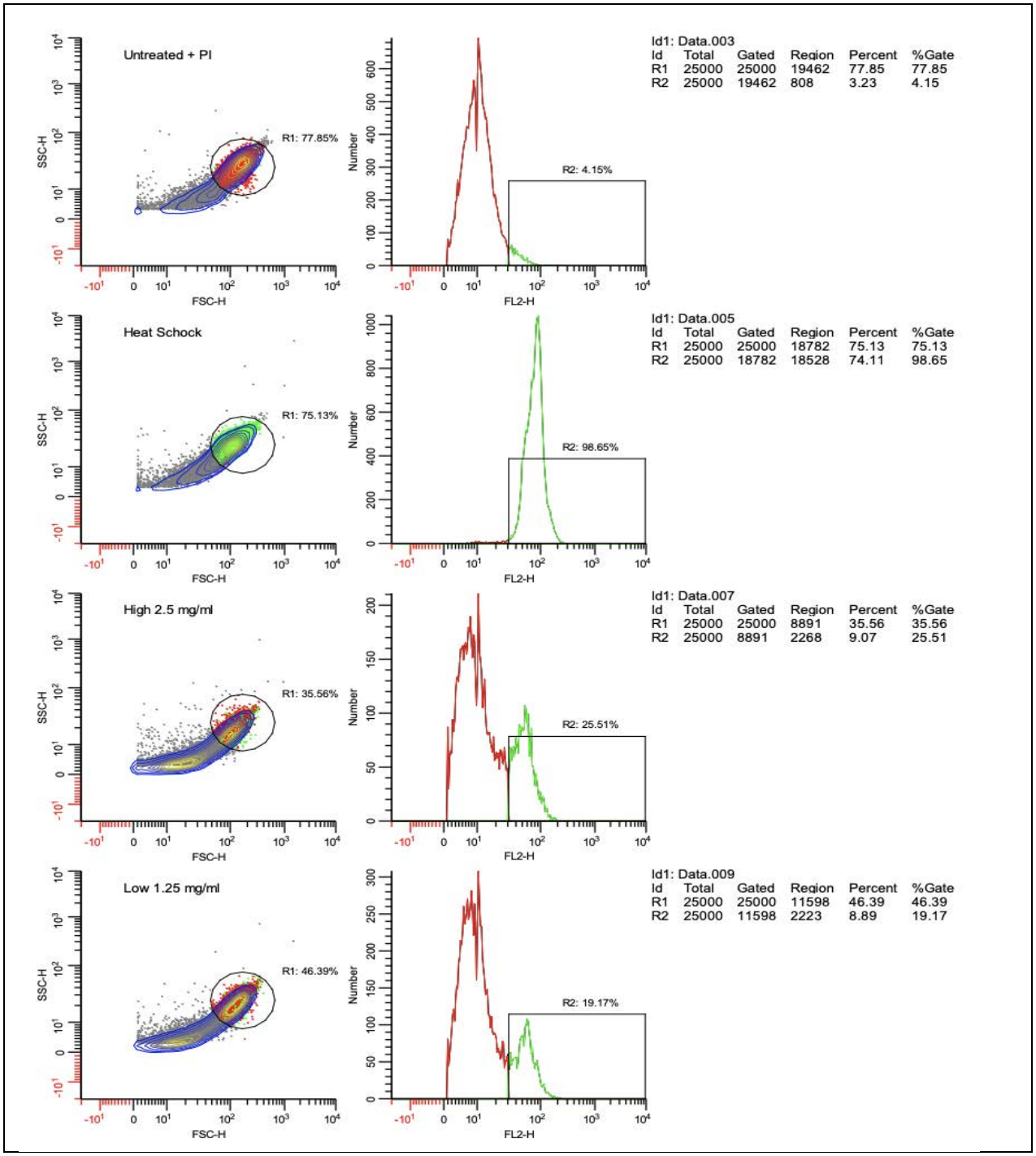

Figure 4. The multigraph above shows the results from Assay A for "Untreated +PI", "Heat Shock", "High 2.5 mg/ml", and "low 1.25 mg/ml". The left column shows FSC vs SSC, the middle column shows FL-2 (gated on R1 from the left column), and the right column shows the data files, total number of cells collected, percent, and percent gated. "Untreated +PI" (row 1) had a percent gate of 77.85% in R1 and 4.15% in R2, "Heat Shock" (row 2) had 75.13% in R1 and 98.65% in R2, "High 2.5 mg/ml" (row 3) had 35.56% in R1 and 25.51% in R2, and "Low 1.25 mg/ml" (row 4) had 46.39% in R1 and 19.17% in R2.

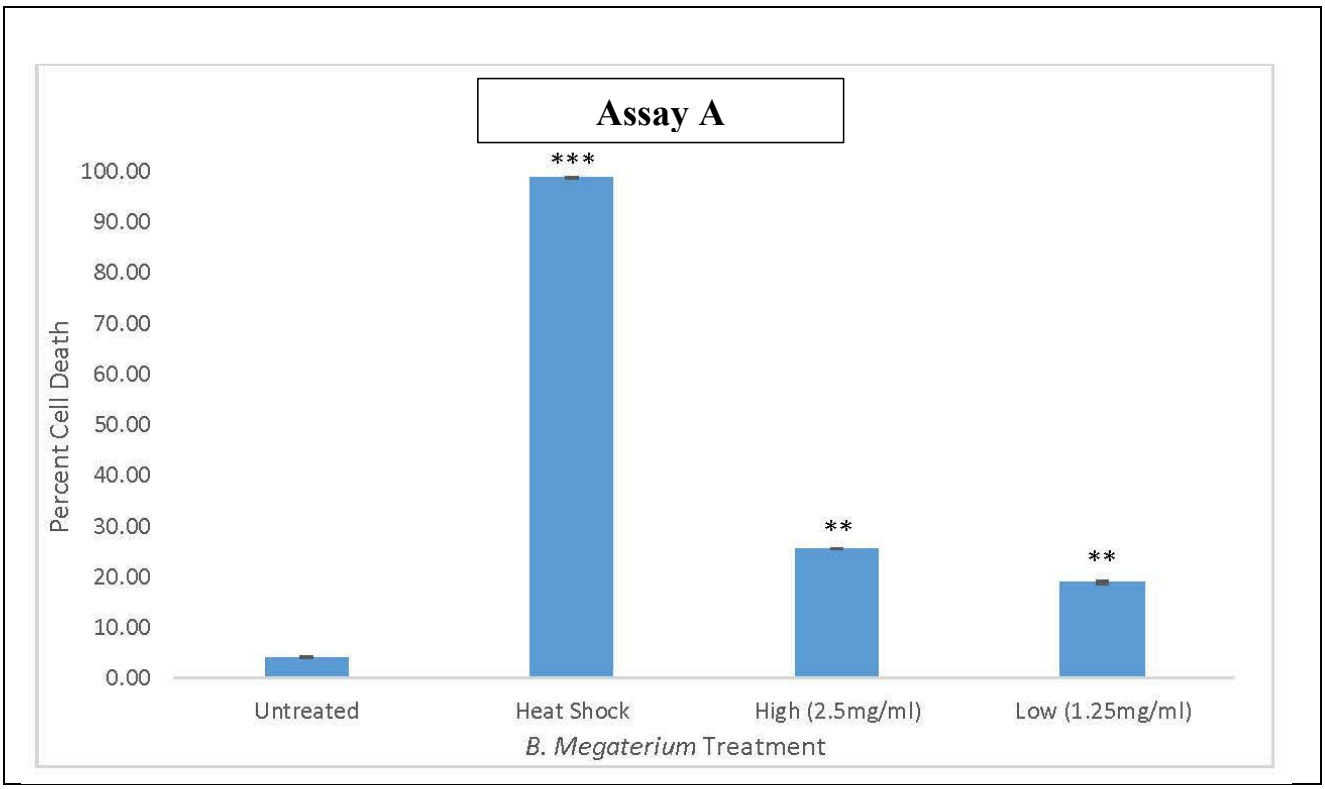

Figure 5. The data above shows Assay A and the percent cell death that occurred in "Untreated + PI", "Heat Shock", "High (2.5 mg/ml)", and "Low (1.25 mg/ml)". A t-test was conducted on the data comparing the other samples to the untreated sample as a standard. "Heat Shock" had the highest percentage of cell death and most statistical significance ($p < 0.0005$), followed by "High (2.5 mg/ml)" ($p < 0.005$), and lastly "Low (1.25 mg/ml)" ($p < 0.005$). (** = $p < 0.005$; and *** = $p < 0.0005$)

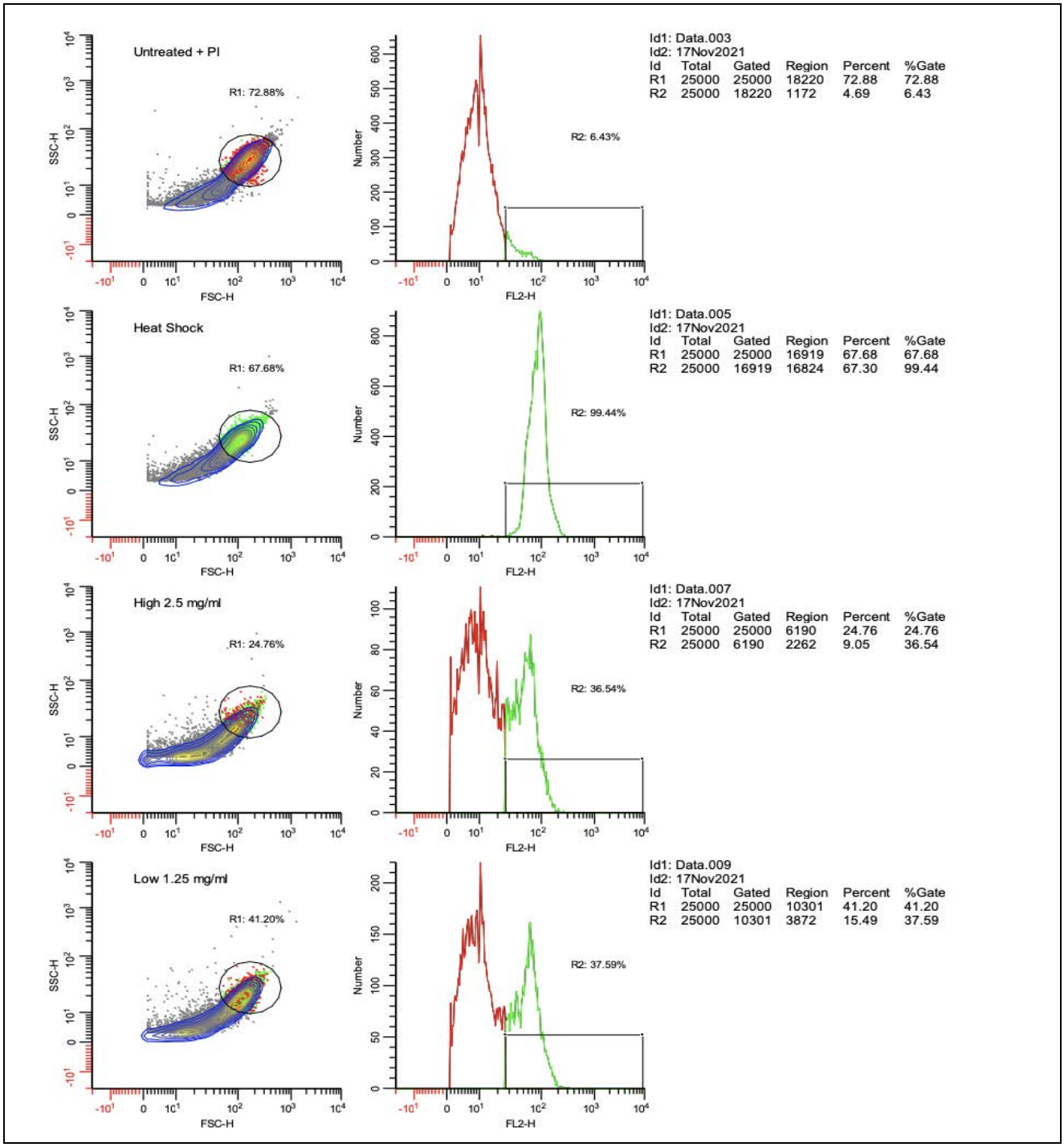

Figure 6. The multigraph of Assay B above, shows the results for samples "Untreated +PI", "Heat Shock", "High 2.5 mg/ml", and "low 1.25 mg/ml". The left column shows FSC vs SSC, the middle column shows FL-2 (gated on R1 from the left column), and the right column shows the data files, total number of cells collected, percent, and percent gated. "Untreated +PI" (row 1) had a percent gate of 72.88% in R1 and 6.43% in R2, "Heat Shock" (row 2) had 67.68% in R1 and 99.44% in R2, "High 2.5 mg/ml" (row 3) had 24.76% in R1 and 36.54% in R2, and "Low 1.25 mg/ml" (row 4) had 41.20% in R1 and 37.59% in R2.

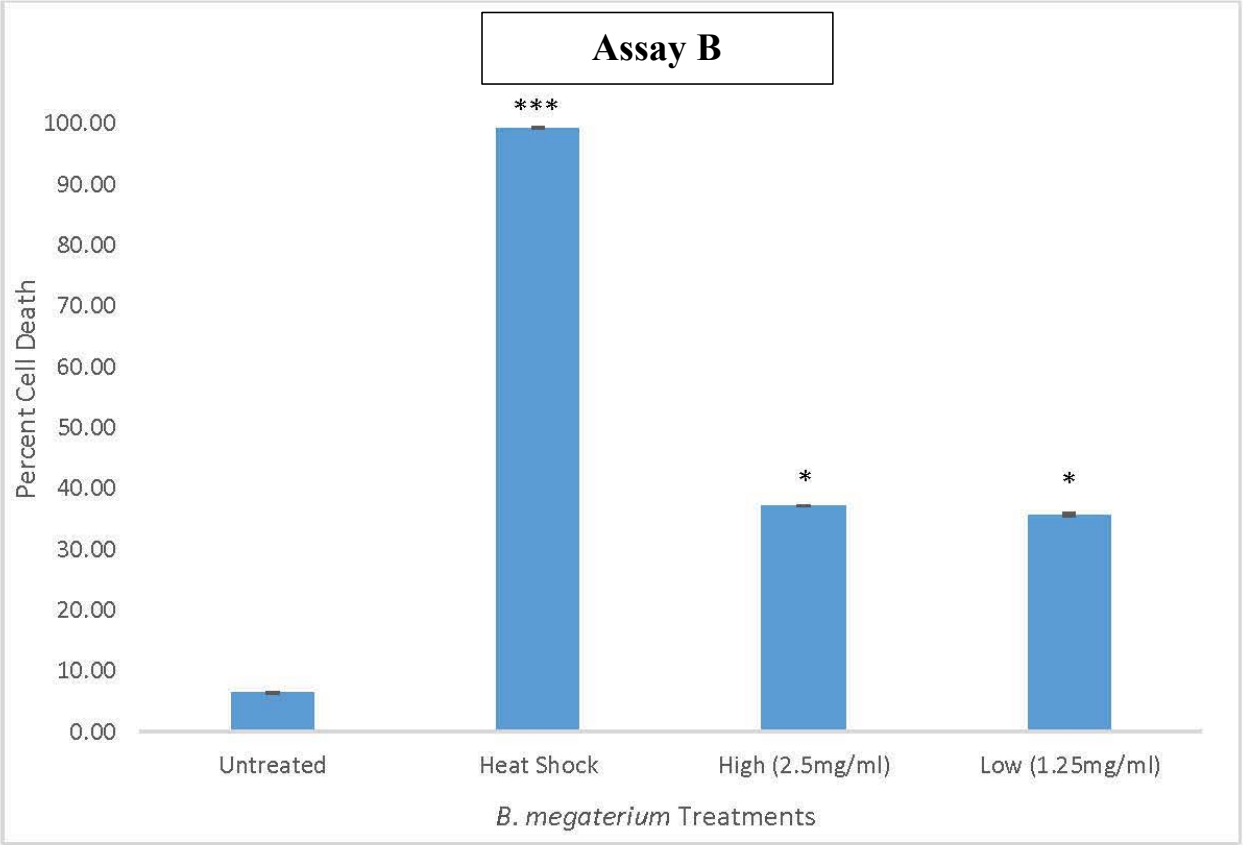

Figure 7. The data above shows Assay B and the percent cell death that occurred in "Untreated + PI", "Heat Shock", "High (2.5 mg/ml)", and "Low (1.25 mg/ml)". A t-test was conducted on the data comparing the other samples to the untreated sample as a standard. Again, "Heat Shock" had the highest percentage of cell death and most statistical significance ($p < 0.0005$). This time "High (2.5 mg/ml)" increased a bit but was less statistically significant as well as "Low (1.25 mg/ml)" ($p < 0.05$). (* = $p < 0.05$ and *** = $p < 0.0005$)

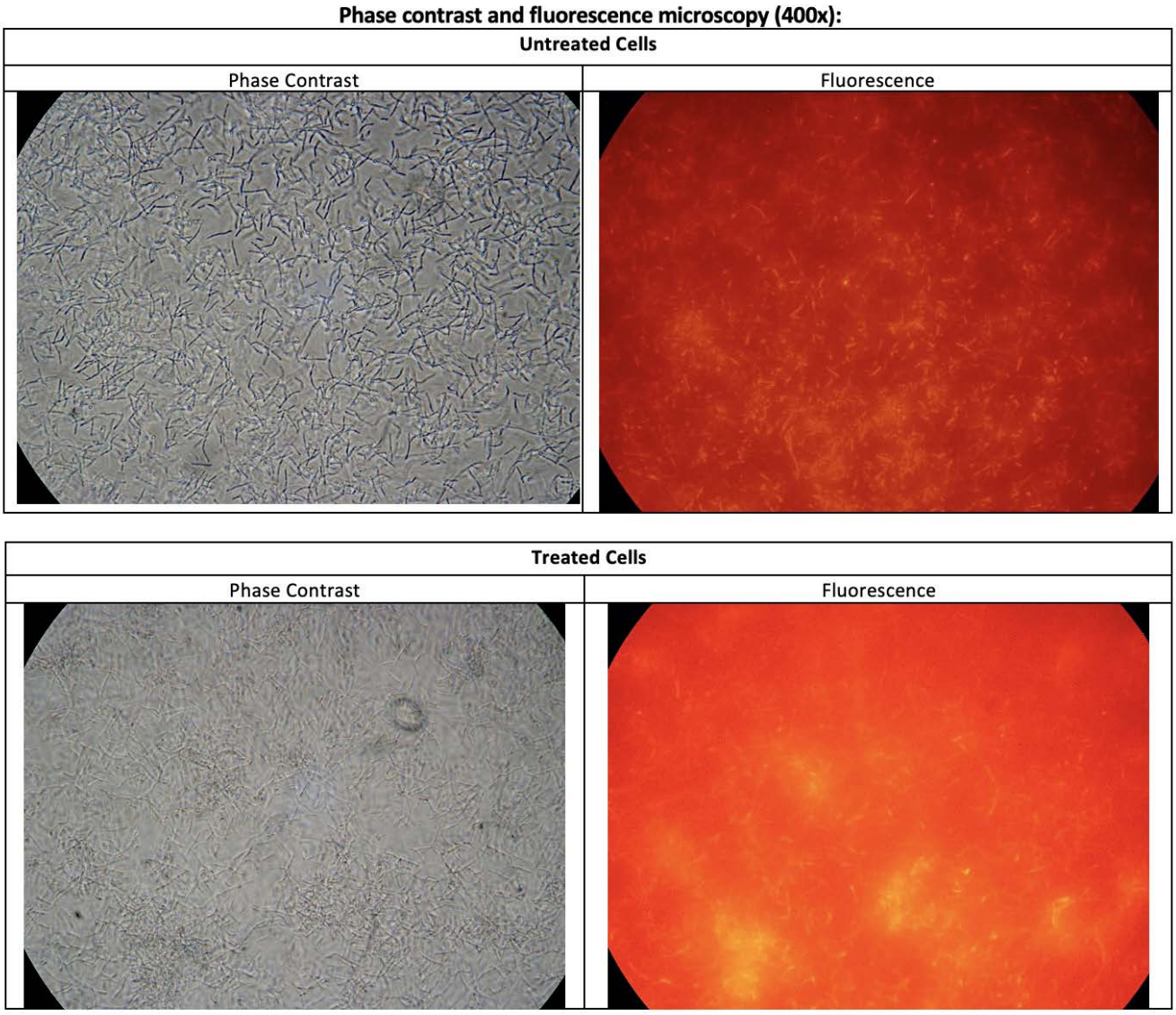

Figure 8 – Phase contrast and fluorescence microscopy (400x). The figure shows the differences between the untreated cells and treated cells, 4.5 hr after treatment, when viewed under two different types of microscopes at 400x magnification. Starting at the top left, the phase contrast image of the untreated cells shows how the rods looked dark in color (based on light refraction), narrow/thin, and were evenly dispersed. When compared to the phase contrast image of the treated cells (bottom left), there were notable morphological and physical differences such as notable translucence, swelling, and significant clumping/overlapping. The fluorescence image of the untreated cells (top right) shows some uptake of the PI indicated by the brighter areas with only slight clumping visible. The fluorescence image of the treated cells (bottom right) shows much higher levels of fluorescence indicating more cell death, as well as prominent areas of cell clumping.

Television and Perceptions of Criminal Justice

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Research Mentor: Dr. Katie Farina

Abstract

Television shows, movies, and documentaries demonstrate a large number of contents related to crime and the criminal justice system. With the growing number of crime-related media, the validity of the portrayal of forensic science and the criminal justice system has come into question. The subsequent portrayal can shape public attitude towards the criminal justice system and can lead to false perceptions (Werner, 2015). To investigate whether this is the case among college students, a survey using non-probability availability sampling was administered to 100 Cabrini University students. The researcher hypothesized that students that watched more crime-related television, regardless the genre, were more likely to have fear of crime as well as a negative perception of forensic science and the criminal justice system. Results conclude that there is a significant relationship between crime-related television, forensic science and the criminal justice system but not a significant relationship between consumption of crime-related television and fear of crime.

Introduction

Television shows, movies, and documentaries that relate to a crime composition have drastically increased in popularity over the past few years (Fedorek, 2013). Crime composition incorporates the aspect of committing, solving, and investigating crimes. *The Rookie*, *FBI*, *Law & Order*, *Blue Bloods* and *Forensic Files* are some of the popular crime-related shows that are on air and continue to contribute to a false perception of crime and the criminal justice system. Crime-related television shows represent 19.6% of all scripted shows in the 2019-2020 season (Porter, 2020). Of the top ten most watched television shows, five are crime related with viewers

ranging from 10.16 million to 12.73 million views (Stoll, 2021). These shows illuminate various agencies that are involved in the criminal justice system.

The criminal justice system is a network of government and private agencies intended to manage accused and convicted criminals; included in the criminal justice system are multiple interrelated pillars, consisting of academia, law enforcement, forensic services, the judiciary, and corrections (Crowder & Turvey, 2013). The criminal justice system has been portrayed in the media for centuries. Between 1550 and 1700, there were an exceptional number of publications that reported on capital crimes (Burger, 2016); however, Kania and Walsh (2010) found that media portrayal of the criminal justice system has transformed in many different ways over the last century. False portrayals of criminal justice professions can damage the professionals as well as to the individuals they are serving. Also, whether the criminal justice system or an official is portrayed positively or negatively depends on the events occurring in society (Werner, 2015). Television portrayal of the criminal justice system is important because it can shape public attitude towards the criminal justice system and inaccurate portrayals can lead to stereotyping and false perceptions (Werner, 2015). Further, the portrayal of evidence, such as forensics can also lead to various misconceptions.

Forensic evidence ranges from molecular biology and fingerprints to trace evidence and toxicology (Forensic Science, 2021). In the criminal justice system, forensic scientists examine evidence collected from a crime scene and analyze it in order to aid in an investigation as well as prosecute perpetrators or liberate an innocent person from suspicion (Forensic Science, 2021). Forensic science is portrayed in many crime-related television shows, however, in some cases, it skews the viewers' perceptions of the truth behind forensic science and how it is truly used within the system (Werner, 2015). The criminal justice system that is portrayed in television

shows often are susceptible to myths and misconceptions. The *CSI (Crime Scene Investigation)* effect is the impact television shows such as *CSI* and *Law & Order* have on jurors, specifically involving forensic evidence (CSI effect, 2021). This is significant due to the fact that jurors aid in maintaining law and order and misconceptions of forensic evidence can alter the result of a case. Moreover, this is significant because it may create a fear of crime amongst viewer.

Often levels of crime and the fear of becoming a victim of crime concur with each other, but they are generally mismatched (Curiel & Bishop, 2018). Perceptions of crime rates as well as fear of crime are important because the emotional distress caused by them can result in a reduced quality of life, particularly as some people are affected by these concepts more than others (Kohm et al., 2012). As individuals continue to watch crime related television shows, especially those based on true stories and events, perceptions of crime rate and fear of crime may increase due to an overwhelming feeling of relation (Kohm et al., 2012).

Literature Review

The criminal justice system has been portrayed in the media for many years; the genre has spiked in popularity due to the industry innovations developed in the 1950s and 1960s (Pioneers of Television, 2014). Mass media, fictional storylines, and the news cover crime as a public threat and defines how the police, courts, prosecutors, and many other properties of the criminal justice system are perceived (Kania & Walsh, 2010). Levan and Stevenson (2019) and Graziano et al. (2009) found that the media shapes how the public views societal issues.

The CSI Effect & Forensic Evidence

The *CSI Effect* posits that exposure to television shows such as *CSI: Crime Scene Investigation* impact jurors and how they view forensic science (Chin & Workewych, 2016).

Holmgren and Fordham (2011) found that 85.6 percent of jurors believed that expert evidence was important to their decision in the case. This was consistent with additional research that watching crime television was frequently related to a guilty verdict in a case involving DNA evidence and that individuals who viewed crime television as more realistic had a positive attitude towards the presence of DNA evidence in a trial (Maeder & Corbett, 2015). Weaver et al. (2012) found that almost 80 percent of forensic science students believed that the image of forensic science in television shows provided an unrealistic representation of what is the true science. This finding explains that more than half of individuals attaining a forensic science degree believe that television shows are not accurately depicting forensic science and what it means for a criminal case.

Television shows typically depict forensic evidence such as blood spatter, bite marks, handwriting analysis, firearm and ballistics and fiber identification (Forensic evidence: TV shows vs. real life, 2021). Stephens (2007) concluded that blood is only found in five percent of crime scenes. In addition, Peterson's 1984 study, *Forensic Evidence and the Police*, found that only about 20-30% of collected forensic evidence is analyzed in all serious crimes (Peterson et al., 2010). Forensic science is seen as a means to an end to many members of the legal community (Pyrek, 2007). This means that individuals see forensic science as a concept to produce a desired result. Pyrek (2007) found that to jurors, forensic science is a critical tool for decision making. For example, data from Denver and San Diego concluded that most defendants charged with homicides and sexual assaults had forensic evidence involved in their cases, and the largest majority of these defendants had guilty dispositions (McEwen, 2011). In turn, the CSI Effect can negatively affect how an individual understands the true impact of forensic evidence. Researchers at Purdue University found that individuals that regularly watch shows like *CSI*,

Law & Order, and *Cold Case* overestimate the frequency of crime and misperceive important facts about crime (Patterson Neubert, 2010). The impact television has on viewers is significant because a perceived "CSI Effect" is negatively impacting the criminal justice system (Hayes-Smith & Levett, 2012).

The Criminal Justice System

The criminal justice system is a plethora of individual systems working in concert (Global, 2021). The field is typically broken into three areas: law enforcement, the court system, and corrections (Global, 2021). Gerbner and Gross (1976) described cultivation theory "as the notion that television cultivates the public's perception of reality. Therefore, people's perceptions of how things work in the real world are heavily influenced by depictions of television" (Gerbner & Gross, 1976, p. 76). Gerbner was the university professor who developed cultivation theory, a concept created in order to examine the influence of television on viewers (Corbett & Maeder, 2015; Gerbner, 1969). It was found that long-term exposure to media shapes how the consumers perceive the world (Nabi & Riddle, 2008). The viewing of television programming significantly shapes attitudes and opinions of reality. For example, regular viewers of violent content are likely to experience more fear, pessimism, increased anxiety and a greater alertness to imaginary threats; in turn those who watched a small amount of television were more likely to view the world as less dangerous (Perera, 2021; Callanan, 2012). Various research studies were conducted in order to test and understand cultivation theory. Gerbner and Gross (1976) believed that TV is a medium of socialization of most people into standard roles and behaviors. Their study concluded that the amount of individuals who watch a good amount of violent television shows, were more likely to provide a "television answer" in response to crime and criminal justice system questions compared to answering based on true reality (Gerbner &

Gross, 1976). This is in contingency to Fedorek's (2013) study of whether crime-related television viewing impacts an individuals attitudes/perceptions of police, perceptions of forensic evidence, perceptions of clearance rates, perceptions of crime, and fear of victimization. His study concluded that individuals who consume a large amount of crime-related television believe what they see on TV is a real depiction of the outside world (Fedorek, 2013).

The impact television has on the public's perception of the criminal justice system derives from a domino effect starting from forensic evidence. The misinterpretation of forensic evidence is a problem for all aspects of the criminal justice system (Alldredge, 2015). Of a split study in 2011, the results indicated that regular viewing of crime-related television shows negatively influence the population's opinions of the criminal justice process (Holmgren & Fordham, 2011). This is concurring with Dirikx et al. (2013) where results showed that exposure to the news negatively predicted an individual's perceptions of the distributive fairness of the police. Gerbner and Gross (1976) found that individuals who heavily watch television have biased and unrealistic perceptions of the criminal justice system. According to Color of Change, a progressive not-for-profit civil right organization, the distorted reality television portrays promotes dangerous tropes about criminal justice (Evelyn, 2020). Criminal justice shows often present police misconduct in a normalized manner (Evelyn, 2020). This along with the heavy depiction of crime may create a feeling of fear of crime in individuals.

Fear of Crime

Fear of crime is a social phenomenon that impacts an individual's quality of life due to several psychological issues, such as paranoia or anxiety (Austin et al., 2002; Jackson & Gray, 2010; Ruijsbroek et al., 2015). Further, fear of crime is the worry people feel over the possibility of victimization (Fisher et al., 1995). There are many different predictors of fear of crime,

including sex, age, race/ethnicity, social class, marital status, parenting status, educational attainment, and previous victimization (Rader, 2017). Women are less likely to be the victim of a crime and yet are more likely to say they are afraid of crime (Rader, 2017). This means that despite statistics indicating that the likeliness of a women becoming a victim in any criminal activity, women fear crime more compared to their male counterparts. There are mixed findings in regard to age and fear of crime; some say that younger individuals fear crime more and others believe older individuals fear crime more (Rader, 2017).

There have been few studies that address race and ethnicity and fear of crime; the results are not consistent, however, generally speaking the results suggest that nonwhites are more afraid of crime than whites (Rader, 2017). In a study completed by Boateng and Adjekum (2017), researchers found that non-White students expressed the greatest level of fear on campus compared to White students. The victimization model of fear, a model that suggests that fear responses are cognitively mediated, concludes that levels of fear of crime are impacted by the level of criminal activity in a community (Farrall et al. 2006). This finding is important since local television news programs overrepresent Blacks as criminal suspects especially in Chicago, Philadelphia, Los Angeles and Florida (Dixon, 2008). Dixon (2008) found that there was a positive correlation between attention to crime news and fear about crime. In addition, Kort-Butler & Sittner Hartshorn (2011) concluded that the most notable results stem from the positive correlation between crime dramas and nonfictional crime shows and an increased fear of crime. In addition to race, those who are married are often less afraid of crime than their single counterparts (Scarborough et al., 2010; Schafer et al., 2006). However, married men are more afraid for a spouse than for other people, and sometimes more fearful for spouses than they are for themselves (Rader, 2010; Warr & Ellison, 2000). Parents are more fearful than nonparents,

especially when considering fear of crime for their children (Rader, 2017). In terms of education, although little research has been conducted on this topic, research has found that those who are more educated are less fearful of crime (Rader, 2017). The fear of crime may have potential psychological consequences. These mental consequences, such as anxiety or depression, can be very burdensome on the individual. (Rader, 2017). For individuals who might already be vulnerable to the system, this kind of psychological effect could put people at a greater disadvantage for increased fear of crime.

Hypotheses

Based on the research behind the relationship between crime related television shows and perceptions of forensic evidence and the criminal justice system, the researcher has three hypotheses. First, individuals who watch more crime-related television shows, regardless the genre, will have more fear of crime. Second, individuals who watch more crime-related television shows, regardless the genre, will have a negative perception of forensic science. Finally, individuals who watch more crime-related television shows, regardless the genre, will have a negative view of the criminal justice system.

Methodology

This study used a non-probability, availability sampling design. The data was collected from 100 undergraduate students who attend Cabrini University. Paper surveys were distributed in the spring semester of 2022 to consenting participants following approval from the institutional review board (IRB). Professors of various courses were contacted by the researchers ensure availability of class time to administer the surveys. Researchers contacted both criminology and psychology classes as well as non-criminology and non-psychology classes in an attempt to evenly survey different majors. In classes, researchers invited students to

participate while informing them of their right to abstain from participation and ensure voluntary participation. Prior to administering each survey, researchers provided the respondents with a form of consent for research which included the purpose, risks, benefits, participants' rights and the researchers' contact information. In addition to the physical form of consent, researchers verbally informed respondents of the information on the form, including the risks, benefits, voluntary nature of the study, and that all information would be kept confidential.

One hundred surveys were administered (*N*=100) and no missing data emerged. Within the sample, 67% (*n*=67) of the respondents were female, 32% (*n*=32) were male, and 1% (*n*=1) responded with "Cisgender." The samples racial demographics comprised of 16.3% (*n*=16) Black or African American, 70.4% (*n*=69) White, and 13.3% (*n*=12) students identified as "Other." Only 13% (*n*=13) of the respondents indicated that they were Hispanic or Latino, such as Mexican, Puerta Rican, or another Hispanic/Latino. See Table 1 for the demographic distribution of the sample.

Table 1.

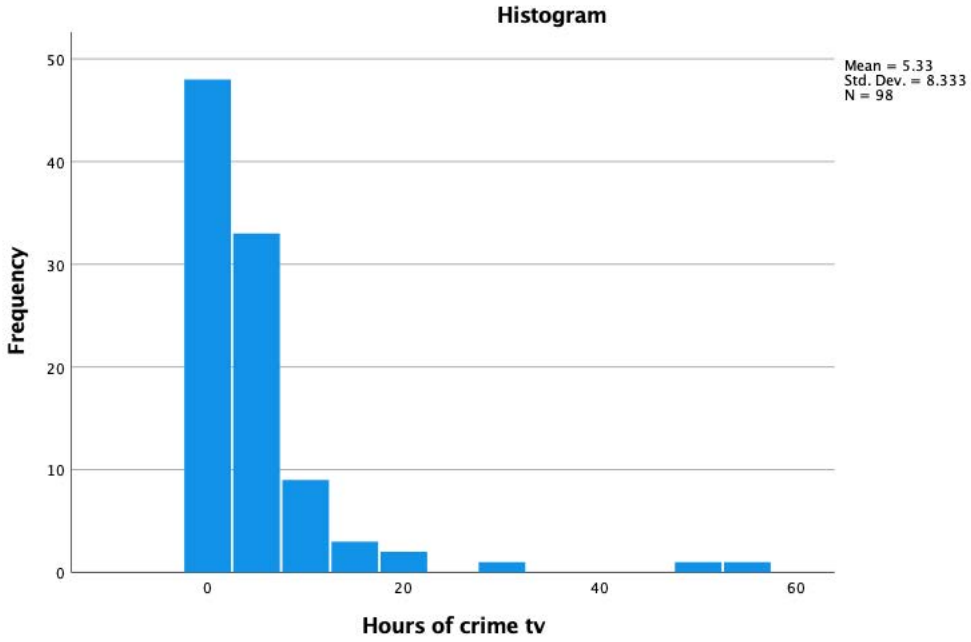
Sample Demographics

	Frequency	***Valid Percent***
Gender		
Male	32	32.0
Female	67	67.0
Cisgender	1	1.0
Race		
White	69	69.0
Black	16	16.0
Other	13	13.0
Ethnicity		
Hispanic/Latinx	13	13.0
Non-Hispanic/Latinx	87	87.0

Variables of Interest

This study consisted of one independent variable and three dependent variables. The first independent variable will be the amount of crime-related television shows observed. Crime-related television shows was conceptualized as television shows, fiction or nonfiction that relate to the composition of crime. The amount of crime-television consumed each week ranged from 0 to 56, with 25% (*n*=25) indicating that on average they watch an hour of crime related TV, movies, documentaries, streaming services, etc. The average number of crime-related TV that the sample watches is 5.33 (SD=8.33). See Figure 1 for the distribution.

Figure 1. Histogram of the distribution of average consumption of crime-related TV



The dependent variable was the alteration of an individual's view of crime and the criminal justice system. This was conceptualized as perceptions of what crime entails including frequency and how the criminal justice handles crime (Fear of crime – Perceptions of risk, 2021; Birzer & Tannehill, 2003). The second dependent variable was fear of crime, which was conceptualized as

2002; Fisher et al., 1995). The third dependent variable was perceptions of forensic evidence, which was conceptualized as scientific data analyzed and used in criminal proceedings (Forensic Science, 2021).

In order to measure the consumption of crime-related television shows, participants will be asked to identify if they have watched any of the following television shows. The show options were CSI, Law and Order, Dexter, The Rookie, FBI, Mindhunter, Criminal Minds, NCIS, Rookie Blue, Blue Bloods, True Detective, Forensic Files, etc. There were questions for the general genre composition of crime television shows adapted from Holmgren and Fordham's study from 2011. The crime program questions asked were yes or no questions, open ended numerical, multiple choice and open-ended questions. The following questions were included:

1. Have or have not watched the following tv shows CSI, Law and Order, Dexter, The Rookie, FBI, Mindhunter, Criminal Minds, NCIS, Rookie Blue, Blue Bloods, True Detective, Forensic Files, etc.

Of the respondents, 94.9% (*n*=94) of individuals indicated that they have watched any of the following shows and 5.1% (*n*=5) indicated that they did not watch any of the shows.

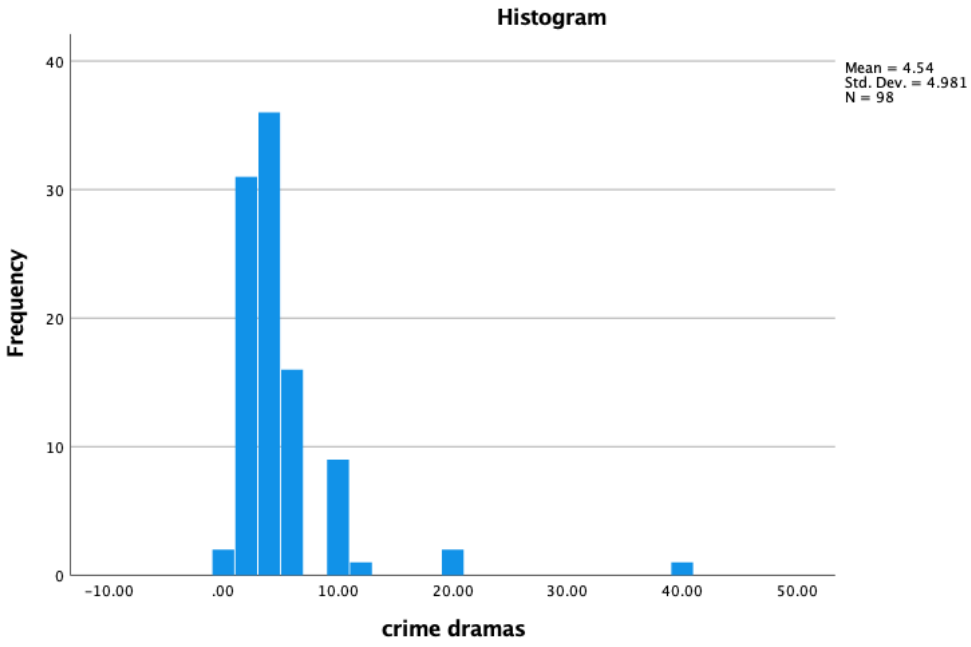
2. Do you watch crime-related television shows on a regular basis?

Of the respondents, 53.0% (*n*=53) of individuals indicated that they do watch crime-related television shows on a regular basis and 47.0% (*n*=47) indicated that they do not.

3. How many different crime dramas have you/do you watch?

The amount of different crime dramas watched ranged from 0 to 40, with 22.4% (*n*=22) indicating that they watch approximately 2 different crime drama. The average amount of different crime dramas watched is 4.54 (SD=4.98). See Figure 2 for the distribution.

Figure 2. Histogram of the different crime dramas watched/currently watching



The dependent variables of the comprehension if an individual's view of crime, the criminal justice system, and forensic evidence was altered, Likert scale questions will be used and range from *1=completely disagree* to *7=completely agree* and *1=strongly no* to *7=strong yes*. These questions will be asked to find the participants opinion on crime, fear of crime, law enforcement officers and their roles as well as forensic evidence. Questions for the dependent variables were adapted from Holmgren and Fordham's study from 2011, as well as Hogan's study from 2019. The following questions were included:

1. I have learned about DNA evidence mostly from the media.

Of the respondents, 29.3% (*n*=29) of individuals disagree the DNA evidence was learned mostly from the media (M = 2.93, SD = 1.18).

2. Forensic science is capable of solving any criminal case.

Of the respondents, 35.4% (*n*=35) of individuals do not agree nor disagree with the statement that forensic science is capable of solving any criminal case (M = 2.85, SD = 1.15).

3. Based on television shows such as CSI, you think time of death is easily determined.

The results show that 34.3% (*n*=34) of participant's do not agree nor disagree that time of death is easily determined (M = 2.54, SD = 1.01).

4. Do you believe our criminal justice system is fair and unbiased?

Of the respondents, 46.5% (*n*=46) of participant's strongly disagree that the criminal justice system is fair and unbiased (M = 1.99, SD = 1.19).

5. How afraid are you of having crime done against you?

Of the respondents, 33.3% (*n*=33) of participant's responded as not very afraid or very afraid of crime being done against them (M = 3.26, SD = 1.13).

6. Do you believe we have efficient police departments in Philadelphia?

The results show that 33.7% (*n*=33) of participant's disagree that we have efficient police departments in Philadelphia (M = 2.37, SD = 1.04).

See Table 2 for the distribution of the dependent variables.

Table 2.

Dependent Variables

	Frequency	***Valid Percent***
DNA Evidence		
Strongly Disagree	11	11.1
Disagree	29	29.3
Neutral	25	25.3
Agree	24	24.2
Strongly Agree	10	10.1
Forensic Science		
Strongly Disagree	18	18.2
Disagree	15	15.2
Neutral	35	35.4
Agree	26	26.3
Strongly Agree	5	5.1
Time of Death		
Strongly Disagree	17	17.2
Disagree	31	31.3
Neutral	34	34.3
Agree	15	15.2
Strongly Agree	2	2.0
CJS		
Strongly Disagree	46	46.5
Disagree	27	27.3
Neutral	12	12.1
Agree	9	9.1
Strongly Agree	5	5.1
Afraid		
Not Very Afraid	6	6.1
Not Afraid	19	19.2
Neutral	33	33.3
Afraid	25	25.3
Very Afraid	16	16.2
Philly Police		
Strongly Disagree	22	22.4
Disagree	33	33.7
Neutral	32	32.7
Agree	7	7.1
Strongly Agree	4	4.1

See Table 3 for overall descriptive of the variables.

Table 3.

Descriptives of Variables

Variable	*N*	*Mean*	*Median*	*Mode*	*Standard Deviation*	*Range*
Have You Watched	99	1.05	1.00	1.00	1.00	.22
Crime TV on Regular Basis	100	1.47	1.00	1.00	.50	1.00
Hours Per Week	98		3.00	1		56
Different crime Dramas	98		3.00	2.00		40.00
Police Philly	98	2.37	2.00	2.00	1.04	4.00
Afraid	99	3.26	3.00	3.00	1.13	4.00
CJS	99	1.99	2.00	1.00	1.19	4.00
Forensic Science	99	2.85	3.00	3.00	1.15	4.00
DNA Evidence	99	2.93	3.00	2.00	1.18	4.00
Time of death	99	2.54	3.00	3.00	1.01	4.00

Plan for Analysis

In order to analyze crime-related television consumption and alteration of an individual's view of crime and the criminal justice system, fear of crime and perceptions of forensic evidence, an influential statistical test will be conducted.

Results

Perceptions of Fear of Crime

There were mixed results between crime television viewing and being afraid of crime. There is no relationship between have you watched crime related TV shows (examples were provided on the survey) and being afraid, r(96)=.153, p=.132. There is no relationship between watched crime TV on a regular basis and being afraid, r(97)=.952, p=-.006. There is an inverse negative relationship between hours of crime TV watched per week and being afraid, r(95)=-

.210, p<0.05. The more hours of television watched the less afraid individuals report. This is a weak correlation. There is no relationship between how many different crime dramas have you watched and being afraid, r(96)=-.076, p=.459. See Table 4.

Table 4.

Pearson Correlation of Hours of TV Watched Per Week and Being Afraid

Variable	(1)	(2)	(3)	(4)	(5)
1) Have You Watched	1				
2) Crime TV on Regular Basis	.243*	1			
3) Hours Per Week	0.095	-.397**	1		
4) Dif. Crime Dramas	-.096	-.193	.250*	1	
5) Afraid	.153	-.006	-.210*	-.076	1

*. p<0.05
**. p<0.01

Perceptions of Forensic Evidence

There were mixed results between hours of TV watched and perceptions of forensic evidence. There is a significant relationship between watched crime TV on a regular basis and time of death determined, r(97)=.-.204, p<0.05. The more hours of television watched the less individuals report that time of death is easily determined. The other relationships were not significant. See Table 5.

Table 5.

Pearson Correlation of Hours of TV Watched Per Week and Perceptions of Forensic Science

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1) Have You Watched	1						
2) Crime TV on Regular Basis	.243*	1					
3) Hours Per Week	-.095	-.397**	1				
4) Dif. Crime Dramas	-.096	-.193	.250*	1			
5) Time of Death	-.078	-.204*	.033	.104	1		
6) DNA Evidence	.012	-.184	.054	.30	-.028	1	
7) Forensic Science	-.170	-.174	.146	.186	.166	.359**	1

*. P<0.05
**. P<0.01

Perceptions of the Criminal Justice System

There were mixed results between hours of TV watched and perceptions of the criminal justice system. There is a significant relationship between have you watched crime related TV shows (examples were provided on the survey) and Philadelphia police efficiency, r(95)=.-.265, p<0.05. The more crime related television watched the less individuals report Philadelphia has an efficient police department. There is a significant relationship between watched crime TV on a regular basis and Philadelphia police efficiency, r(96)=.-.223, p<0.05. The more crime television

watched on a regular basis the less individuals report Philadelphia has an efficient police department. The other relationships were not significant. See Table 6.

Table 6.

Pearson Correlation of Hours of TV Watched Per Week and Perceptions of the Criminal Justice System

Variable	(1)	(2)	(3)	(4)	(5)	(6)
1) Have You Watched	1					
2) Crime TV on Regular Basis	.243*	1				
3) Hours Per Week	0.095	-.397*	1			
4) Dif. Crime Dramas	-.096	-.193	.250*	1		
5) CJS	-.152	-.043	.083	-.170	1	
6) Police Philly	-.265**	-.223*	.045	.049	.297**	1

*. p<0.05
**. p<0.01

Discussion

This study at hand evaluated the relationship between consumption of crime related television and the perceptions of forensic evidence, fear of crime and the criminal justice system among college students. Perceptions of fear of crime produced mixed results. There was no relationship between have you watched crime related television shows and being afraid, watched crime television on a regular basis and being afraid as well as how many different crime dramas watched and being afraid. An inverse negative relationship between hours of crime television watched per week and being afraid was found. These findings do not support the hypothesis that

individuals who watch more crime-related television shows, regardless the genre, will have more fear of crime.

Additionally, college students' who watched crime television on a regular basis was found to have a significant effect on perceptions of forensic evidence, specifically time of death. In specific, the more hours of television that was watched the less that individuals believed that time of death is determined easily. These findings do support the hypothesis that individuals who watch more crime-related television shows, regardless the genre, will have a negative perception of forensic science. Individuals who watch more crime television on a regular basis strongly believe that time of death is easily determined. This finding is concurrent with previous literature that majority of forensic science students believed that how forensic science is portrayed in television shows delivered an impractical depiction of what is the true science (Weaver, 2012). The other relationships of learned DNA evidence through the media and forensic science being capable of solving any criminal case were not significant.

Finally, perceptions of the criminal justice system produced mixed results. There was a significant relationship between have you watched crime-related television shows and the statement that we have efficient police departments in Philadelphia. The more crime related television watched the less individuals report Philadelphia has an efficient police department. This was consistent with the hypothesis that individuals who watch more crime-related television shows, regardless the genre, will have a negative view of the criminal justice system. There was also a significant relationship between watched crime TV on a regular basis and Philadelphia police efficiency. The more crime television watched on a regular basis the less individuals report Philadelphia has an efficient police department. These findings do support the hypothesis

that individuals who watch more crime-related television shows, regardless the genre, will have a negative view of the criminal justice system. The other relationships were not significant.

The results of the study produced two inverse negative relationships. A possible explanation could be deduced from the assumption that the School of Arts and Sciences include smarter individuals. The School of Arts and Sciences at Cabrini University is comprised of majors of nursing, psychology, science, sociology and criminology, social work and more. Of the individuals who completed the survey, 73.3% of those students are from the School of Arts and Sciences. Almost half (45.5%), of participants indicated that they were a criminology major. See Table 7 for the frequency demographic of schools and Table 8 for the frequency demographic of majors. This suggests the that these students better understand the implications that television shows do not impact their preexisting knowledge due to the education they are receiving. The liberal arts education that Cabrini produces, teaches students from a less traditional perspective. Previous research indicates that college students who major in physical and social sciences tend to be smarter than those who do not based on the Scholastic Assessment Test, also known as SAT, scores (Lubin, 2013).

Table 7.

Frequency Demographic of Schools

	Frequency	***Valid Percent***
Arts/Sciences	66	73.3
Business & Professional Studies	17	18.9
Education	7	7.8

Table 8.

Frequency Demographic of Majors

	Frequency	***Valid Percent***
No	54	54.5
Yes	45	45.5

Various limitations of the study were evident affecting the generalizability. The design of the study, a non-probability availability design, poses an issue because it prevents the ability to generalize the results to a larger population. The inability to use a probability sampling methodology and the sample size of the study, prevents a true representative population. Also, students within the School of Arts and Science were overrepresented in the sample. Lastly, the number of questions as well as the phrasing of the questions potentially could have had a negative impact on how participants answered on the survey. While numerous limitations are prevalent in the study, the need for further research would expand on the relationship between the consumption of crime-related television and perceptions of forensic science, fear of crime, and the criminal justice system.

Future research seeking to expand on the factors that influence perceptions of forensic science and the criminal justice system should be evaluated. It would be interesting to deeply look into an individual's demographics as well as an individual's major to assess a relationship to their perceptions of concepts within the criminal justice system and forensic science. It is thought that where an individual's lives can impact their perceptions of crime within that area. An expansion of the criminal justice system, beyond Philadelphia police efficiency, would be noteworthy to gage. Addressing the type of forensic science more deeply can provide would potentially provide additional insight into the topic. Finally, it would be interesting to see if the

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Una Exploración del Sexismo en las Obras del Guardián Invisible y Legado en los Huesos

El guardián invisible de Dolores Redondo es la primera novela de suspenso y crimen en su trilogía. La novela se adaptó a una película con el mismo título que fue dirigida por Fernando González Molina. La trama trata sobre una inspectora de policía llamada Amaia Salazar que tiene que regresar a su pueblo natal de Elizondo para investigar una serie de asesinatos de niñas. Las obras siguen la misma trama, aunque algunos detalles se cambian o eliminan para encajar el ritmo de una película de terror. Por ejemplo, Amaia experimenta sexismo en la novela, pero no en la película.

Amaia es una mujer en un trabajo que está dominado por hombres. De hecho, a lo largo de ambas obras, Amaia es la única mujer en su trabajo. En la novela Amaia lucha contra el sexismo varias veces. Primero, Amaia sufre sexismo por los guardas forestales, "Los dos hombres uniformados les miraron venir desde lejos y Amaia adivinó que hacían algún comentario chistoso, porque les vio reír desviando la vista" (Redondo 2013, 88). Amaia no les respondió y en cambio, los miró en silencio, una táctica de intimidación para obtener respeto. Más tarde en la interacción, uno de los guardas forestales llama a Amaia "señora" y Amaia le corrige para que la llame "inspectora." El lector puede ver que Amaia no es tomada en serio y no se le da el debido respeto por ser mujer. Al faltarle el respeto llamándola "señora" le niegan el esfuerzo que requiere el título de inspectora. En la película, Amaia no experimenta tanto sexismo. En una escena similar con los guardas forestales, los hombres son muy respetuosos, ~~e~~ y llaman a Amaia "inspectora." Amaia no tiene que utilizar ninguna táctica para ser tratada como

un igual. Hay otro caso de sexismo en la novela cuando Amaia y dos oficiales están en el hospital para hablar con un doctor. Cuando el doctor entró en la sala, miró a todos los que estaban presentes y luego solo habló con los dos oficiales masculinos. El doctor ignora la existencia de Amaia, aunque Amaia está a cargo de la investigación. Para ganar respeto, Amaia tiene que acercarse al doctor y leer su nombre en la placa identificativa. En la película, Amaia está sola en el hospital y el doctor habla directamente con ella. La escena es muy corta, pero la audiencia puede ver que el doctor tiene respeto. Con el tema del sexismo, las obras retratan una historia muy diferente. En la película, los hombres no dudan de las habilidades ni de la inteligencia de Amaia. La película no tiene un gran enfoque en el sexismo mientras que la novela es una descripción más precisa de las dificultades que experimentan las mujeres en la sociedad.

En la segunda novela y película llamada *Legado en los huesos*, Amaia necesita trabajar con el juez Markina mientras está investigando una serie de misteriosos suicidios y vandalizaciones. La novela muestra cómo Markina usa su influencia y posición de poder para cruzar los límites del espacio personal de Amaia. Sin embargo, la película no muestra completamente la dinámica de poder entre Markina y Amaia.

En la novela, cuando Amaia necesita reunirse con Markina para hablar sobre el caso, Markina decide hablar con ella en un restaurante de lujo. Allí, insiste en que Amaia lo llame "Javier" y que ella beba vino. Esto fue muy informal ya que Amaia pensó que iban a tener una reunión profesional. Es obvio que Amaia está incómoda y cuando quiere irse, Markina insiste en que debe ayudarla con su chaqueta y seguirla a su carro, a pesar de que Amaia le dijo que no a sus peticiones. Después de esta interacción, Amaia tiene miedo de que Markina destruirá su investigación porque ella trató de rechazarlo. Ella piensa que, "…su aviso hubiese servido para establecer los parámetros de la relación…y los problemas podían dificultarle la

investigación…Esperaba que no se sintiese ofendido," (Redondo 2013, 134). Esta cita muestra la injusta dinámica de poder entre ellos y cómo los acciones de Markina son inapropiados. En la película cuando Amaia se reúne con Markina, insiste en que Amaia lo llame "Javier". Llama a Amaia "señorita", y Amaia lo corrige diciéndole "señora". Cuando Amaia le dice que va a irse, Markina no protesta ni intenta seguirla como lo hizo en la novela. Para el lector, es innegable que Markina está utilizando su poder e influencia para ignorar los límites del espacio personal de Amaia, pero en la película, sus acciones no son tan explícitas ni evidentes. Por ejemplo, al final de la película, Markina le dice a Amaia, "Te estaré esperando." Esto Puede ser visto como un comentario inocente o que puede implicar un significado más profundo. La película retrata sus comentarios de manera más sugerente, pero en la novela, usó su posición como juez y hombre para cruzar repetidamente los límites del espacio personal de Amaia.

En resumen, mi gran pregunta es, ¿una película de terror no tiene tiempo suficiente para mostrar temas de sexismo y dinámicas de poder o es una elección deliberada del director para excluir estos temas?

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Gendered Perceptions of STEM/Mathematics

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Abstract

Throughout the course of history, mathematics has typically been seen as a field for men. This separation of genders in science, technology, engineering, and mathematics has led many women to not pursue the fields and leaves women at a disadvantage if they do decide to pursue a career. Understanding the views that females have of mathematics is vital to introduce more women into the field and give them the same opportunities as men. Prior research has shown that while younger children do not hold strong gendered perceptions of mathematics, older high school and college age men and women have strong gendered perceptions of mathematics (Bloodhart et al., 2020; Brandell & Staberg, 2008; Ehrlinger et al., 2018; Kombe et al., 2019). In addition, Stearns et al. (2016) found that the number of female STEM teachers a female student had in high school is positively correlated with STEM interest. This study analyzed quantitative data through a survey conducted at Cabrini University during the Fall 2021 semester. The researcher had three hypotheses: females would have lower perceptions of mathematics, females with more female STEM teachers would have stronger perceptions of mathematics than those with fewer female STEM teachers, and that the sample would show gendered differences in perceptions of mathematics. Results from several independent t-tests and ANOVAs show that females had significantly lower personal math interest than males. There were no other significant differences between males and females with math self-efficacy, the number of female STEM teachers was not significant to one's math self-efficacy, and there was no significant difference between men and women on views of gendered differences in mathematics.

Introduction

The history of women in science, technology, engineering, and mathematics (STEM) dates back over hundreds of years to when these subjects were being founded and discovered

with prominent figures such as Katherine Johnson, one of the most influential women in STEM. Johnson was one of the first few Black women to work with large companies like the National Aeronautics and Space Administration (NASA). She and her team analyzed data and solved complex equations about several spacecraft flight patterns and landing positions (Shetterly, n.d.). While Johnson's work is known by many and held in high regard, many other women in STEM go unrecognized due to both the disproportionately small number of women in this field as well as the many stereotypes and prejudices associated with women in STEM. Sexism in the sciences goes back as far as the 4th century when Hypatia of Alexandria was considered a heretic by men of the higher class for her views on mathematics and philosophy (Schiebinger, 1992). For several centuries after, women have been barred from entering colleges and were deemed unfit to be in the sciences since individuals believed women were only good for childbearing (Schiebinger, 1992).

At the college level, women are more likely to obtain bachelor's degrees than men, yet there are fewer women obtaining STEM degrees than men (The National Girls Collaborative Project, n.d.). While this might not be shocking based on the history of sexism in STEM education and the STEM workforce, the difference in STEM bachelor's degrees between men and women does not match the skill levels of men and women. Even though there are more men in STEM programs, a 2020 study of over 2000 undergraduate students showed that women outperform men in their classes (Bloodhart et al., 2020). If women are just as competent in STEM as males, if not better, the gender discrepancy in STEM degrees should be non-existent. This phenomenon is attributed to the gendered stereotypes of women in STEM and how outsider men and women see these stereotypes (Bloodhart et al., 2020).

Much of the research on women and STEM focuses on math aptitude such as test scores and perceptions of mathematics (Ajai & Imoko, 2015; Bloodhart et al., 2020; Scafadi & Bui, 2010). This paper attempts to understand the latter half of this research and how individual and societal perceptions can impact one's view on mathematics. Regardless of major, maleand female college students who are not STEM majors believe negative stereotypes of women in STEM (Smeding, 2012). These include beliefs such as STEM being a male field and labeling math courses such as algebra and geometry as male courses (Smeding, 2012). These stereotypes could impact a woman's decision to pursue a STEM degree.

By understanding these stereotypes, many women are in a predicament known as stereotype threat. This is where women in STEM do not want to fall into the negative stereotypes set by our society on how women should perform in STEM subjects (National Institutes of Health, n.d.). Many individuals who address stereotype threat advocate for informing women of the stereotypes and biases that follow them through their lives, but there is conflicting evidence whether understanding stereotype threat improves a woman's chance of success in STEM (Boysen, 2013; Tomasetto & Appoloni, 2012). This conflicting data has led researchers to find the best way to demonstrate what stereotype threat is to women without it becoming a hindrance to their math ability (O'Brien et al., 2020; Vallée et al., 2020).

Stereotype threat is one of the largest barriers keeping women out of STEM. Science, technology, engineering, and mathematical professions are some of the highest paying professions and with the current state of STEM, women are not able to reap the benefits of these careers. There are thousands of careers in STEM that women are excluded from because they are not pursuing these careers at the same rate as men. By addressing stereotype threat to everyone and understanding how women are being excluded from STEM degrees and jobs, the gap

between men and women can be broken allowing more women to be successful and confident in STEM careers.

Literature Review

Perceptions of STEM

The individual perceptions of STEM vary, but trends show the greatest differences in perceptions of STEM are between men and women. Studies on gendered math perspectives are usually divided between differences in younger students during the foundational stages of learning and differences in adults (Bloodhart et al., 2020; Gouwe et al., 2017; Kombe et al. 2019). In the foundational phases, girls believe that they care more about mathematics and work harder than boys and that boys do worse in mathematics and are more distracting in the classroom (Brandell & Staberg, 2008; Kombe et al., 2019). On the other hand, many teachers believe that females have less self-confidence in mathematics which demoralizes them in the subject (Gouwe et al., 2017). Since many individuals see mathematics and STEM as male-dominated, there is less interest from the start on the students' part, and it takes a very skilled educator to re-spark that interest (Bloodhart et al., 2020; Gouwe et al., 2017).

While this information was taken from the foundational stages of mathematics and women, a similar dichotomy was found in the perceptions in older women. Unlike younger girls in STEM who tend to ignore or not understand the stereotypes surrounding women in those fields, older women tend to understand and accept the stereotypes (Ehrlinger et al., 2018). In the time between primary school and secondary school, girls' perceptions of mathematics change from being a neutral or female oriented domain to a strictly male domain (Brandell & Staberg, 2008). In one research study, when college students were asked to write down the smartest person in their class, the students who identified as women were more likely to choose another

woman. They also said they would reach out to this woman if they were struggling with the course (Bloodhart et al., 2020). It is important to note, however, that while more women are chosen as being the smartest, their peers do not recognize their rate of success proportionally to the number of women in the class (Bloodhart et al., 2020). Women tend to hold stronger stereotypes of people in STEM including intellectual ability and higher skill levels but did not relate to these characteristics (Ehrlinger et al., 2018). This disconnect between the perceptions of individuals in STEM and the perceptions of one's skills is one of many theories as to why women are not represented in STEM.

Men in STEM also hold beliefs that undermine the success of women in the field. In the foundation stages, boys tend to hold similar beliefs to girls. Boys believe that other boys like harder math problems more than girls and that mathematics will be more important to boys than girls when they reach adulthood (Brandell & Staberg, 2008; Kombe et al., 2019). Most boys have similar opinions to girls with statements such as, "girls work harder in their math classes" and "girls care and worry more about mathematics than boys" (Kombe et al., 2019). In regards to age, adult men pick a higher proportion of other men they believe are the smartest in their class even though women outperform the men in their class (Bloodhart et al., 2020). Additionally, men have weaker perceptions of individuals in STEM than women which results in men relating to individuals in STEM (Ehrlinger et al., 2018). These studies only break the surface of how men and women differ in their perceptions of STEM.

While gender is the largest factor in understanding perceptions of STEM, it is also important to note how college majors play a role in these findings. Bloodhart, et al. (2020) found that individuals in life science courses (biology, zoology, physiology, etc.) were more likely to receive help and deem women as smarter than those in physical science courses (physics,

chemistry, earth science, etc.). Individuals in life science courses on average selected an equal number of men and women as being the smartest where individuals in physical science courses identified more men (Bloodhart et al., 2020). The gendered differences between men and women might be related to the different duties and attributes associated with life sciences and physical sciences.

As stated previously, STEM courses are seen as male-dominated with the belief that men are better in those subjects than women. This contributes to more men choosing STEM majors and careers. However, recent studies have shown that women perform just as well as men or even better than men in STEM (Ajai & Imoko, 2015; Bloodhart et al. 2020). At the primary stages, researchers found that primary age students have no difference in test scores between boys and girls (Yadava & Yadava, 2018). In another study, females in both life science and physical science college courses performed slightly better than males on their tests and were more likely to receive A's and A+'s on tests (Bloodhart et al., 2020). Ajai and Imoko (2015) suggest that women performed slightly better than men in STEM courses, but not enough to be statistically significant. Similar information was found in high school students where females performed just as well on standardized math tests as men did and these findings were not moderated by other factors like race and socioeconomic status (Scafadi & Bui, 2010). Another study of individuals in STEM courses found men had higher grade point averages (GPAs) their freshman year while women had higher GPAs in their sophomore and junior years (Bloodhart et al., 2020). These studies show that women perform equally if not better than men in STEM courses. The grades and GPAs of women differ from the perceptions of women in STEM courses. Instead of seeing their own skills, women are undervaluing their abilities in STEM. If

women perform equally to men, there should be an equal number of women in these majors and careers.

Stereotype Threat

One theory used to explain much of the gendered perceptions of mathematics is stereotype threat. Stereotype threat is an issue that arises when an individual understands a stereotype associated with one of their characteristics and feels threatened or worried that they will conform to that stereotype (Smeding, 2012). In this research, an example of stereotype threat would be a woman worrying about doing poorly on a math test because if she does do poorly, it will confirm the negative stereotype that women are not as good at math as men. When classifying gendered stereotypes, they are typically divided into implicit and explicit stereotypes and biases. Explicit biases, also known as conscious biases, are when the individual is aware of the biases they have and acts upon them consciously (Papillion, n.d.). On the other side, implicit biases deal with an individual's thoughts and beliefs that are then reflected in their actions unconsciously (Papillion, n.d.). In general, women who are in STEM majors hold weaker implicit biases (Smeding, 2012). Smeding (2012) also found that implicit gender stereotypes had no relation to female STEM majors but had a large negative correlation to female non-STEM majors. This means that non-STEM women believed in the gendered stereotypes associated with women on an implicit level. Generally, implicit biases affect individuals more than explicit biases (Ramsey & Sekaquaptewa, 2010). The implicit biases associated with mathematics and gender relate to stereotype threat by creating a continuous cycle of believing in the stereotype implicitly, doing poorly on tests, and actively engaging in the stereotype threat associated with STEM (Ramsey & Sekaquaptewa, 2010). This cycle keeps many women from participating and enjoying classes within STEM.

Stereotype threat can directly impact a woman's success in STEM education and career. When comparing women in STEM majors and non-STEM majors, the impacts of stereotype threat indeed affect non-STEM majors more (Smeding, 2012). On average, non-STEM majors tend to hold stronger stereotype biases and were more at risk to believe in the threat (Smeding, 2012). In addition, Tomasetto and Appoloni (2013) found that simply telling women about this threat could significantly impact their performance on math exams. They assert that if a woman was able to accurately understand the gendered stereotype, they performed worse on exams. Other studies show that with the proper technique, understanding and discussing stereotype threat can improve a woman's test score (McGlone & Aronson, 2007; Vallée et al., 2020). With just the acknowledgment of stereotype threat leading to lower test scores in women, it is important to understand the adverse impacts it can have on students in classrooms around the world. As mentioned earlier, stereotype threat is tied closely to implicit biases. As implicit biases change over time, they have negative impacts on women's self-concepts. Overall, these changes can be used as significant predictions for a woman's final grade in a STEM course, with negative changes in implicit biases resulting in lower test scores (Ramsey & Sekaquaptewa, 2010). Stereotype threat is a major issue surrounding women's involvement in STEM and to address this, it is necessary to start with changing implicit biases.

Other Factors

There are also other factors to consider when understanding the gendered differences in perceptions of mathematics. Stearns et al. (2016) found that there was a positive significant correlation between the ratio of female STEM teachers and a girl's probability of entering a STEM-related field, even more so when the student was White. This shows how early involvement with other women in STEM might be a factor in a woman's perception of STEM

subjects and courses. Interactions with individuals other than teachers may also play a role in the perceptions of individuals when it comes to STEM (Leaper & Starr, 2018).

Men are characterized to be more confident in their abilities and are known to have hubris, an over-exaggeration of these abilities (Szymanowicz & Furnham, 2013). Females tend to be less confident in their abilities and often undervalue their skills, also known as humility (Szymanowicz & Furnham, 2013). The hubris versus humility paradigm studied by Szymanowicz and Furnham (2013) tries to explain the lack of representation of women in STEM not as an issue of women's humility but as an issue of male hubris. While these may be learned traits, they have an impact on how women see themselves in STEM and should be considered when looking at the gendered perceptions of STEM. Also, some findings show that self-concept and the hubris humility effect are related to domain-masculine intelligence scores (DIMQ), a test where participants are asked to guess their IQ and the IQ of the other gender in several subjects (Storek & Furnham, 2016). Storek and Furnham (2016) found that men consistently rated their IQ scores higher than their female counterparts did. They also found that the correlation between masculinity and the DIMQ was the strongest in women meaning that women hold stronger gender stereotypes in subjects dealing with math ability and logic. Another study showed that even in young boys, boys are more likely to rate their intelligence higher than girls regardless of if they are more intelligent or not (Steinmayr & Spinath, 2009). While there is no exact answer as to why boys feel this way, it could be linked to the hubris (Steinmayr & Spinath, 2009; Storek & Furnham, 2016).

Hypotheses

The first hypothesis of this study is that female students at Cabrini University hold lower self-concepts of their math ability than male students at Cabrini. This hypothesis follows the

previous research that the perceptions of mathematics from college females are negative or less positive than the actual success rates of women (Bloodhart et al., 2020; Ehrlinger et al., 2018;Storek & Furnham,2016).

The second hypothesis states that female students with more female STEM teachers in their high school education have a more positive perception of mathematics than female students who did not have female STEM teachers. This hypothesis is based on the findings from Stearns et al. (2016).

The third hypothesis states that individuals at Cabrini will believe there are gendered difference in mathematics between men and women. This hypothesis is based on the findings from Brandell and Staberg (2008), Kombe et al. (2019), and Ehrlinger et al. (2018).

Methodology

Sample and Procedure

This quantitative study used non-probability, availability sampling. The data was collected from students at Cabrini University in several different undergraduate and graduate classes during the Fall 2021 semester. Data was collected by using electronic surveys passed out to students in different courses. The researcher had IRB (Institutional Review Board) approval for this study.

Professors in both the social sciences and the natural sciences were contacted to allow the researcher to come in and administer the surveys. The researcher let potential participants know that the surveys were voluntary, and any participant could stop the survey at any time. When the survey links were administered, the participants were first provided a consent form that listed the purpose of the study, the potential risks and benefits, the anonymity of the study, and contact

information that they could use to contact the researcher. At that time, the researcher also provided this information verbally to all potential participants.

A total of 78 (*N*=78) participants took the survey and there was no missing data. Demographically, 67.9% (*n*=53) participants identified as female, 28.2% (*n*=22) identified as male, and 3.8% (*n*=3) identified as another gender. The ages of participants ranged from 18-22+ years old with 16.7% (*n*=13) being 18, 19.2% (*n*=15) being 19, 26.9% (*n*=21) being 20, 24.4% (*n*=19) being 21, and 12.8% (*n*=10) being 22 years old or older. The racial breakdown of participants showed that 6.4% (*n*=5) participants identified as Asian, 14.1% (*n*=11) identified as Black or African American, 67.9% (*n*=53) identified as White, and 11.5% (*n*=9) identified as other. 10.5% (*n*=8) participants said they were Hispanic or Latinx while 89.5% (*n*=68) identified as Non-Hispanic or Non-Latinx. Table 1 describes the demographics of the sample in this study.

Independent Variables: Gender Identity and High School Demographics

In this study, the first independent variable is gender identity. Gender is a socially constructed belief that humans are different based on their sexual characteristics ("11.1 Understanding Sex and Gender," n.d.). As gender is socially constructed, there are many different interpretations of it from person to person. Some sources describe gender on a binary scale between masculine and feminine, but others also describe gender as being a triad with masculinity, femininity, and gender-neutrality ("11.2C Gender Identity in Everyday Life," 2021). To account for the various perceptions of gender and individual gender identity, the participants were asked the question: What is your gender identity? 0 = Female, 1 = Male, 2 = non-Binary/third gender, 3 = Transgender, 4 = Prefer not to say, and 5 = Other. The category "Other" will be an open-ended response so everyone can express their gender identity in the way they want. In this sample, 67.9% (*n*=53) answered female, 28.2% (*n*=22) identified as male, and 3.8%

(*n*=3) identified as either transgender, non-binary, or other. Since there was a small percentage of the sample that did not identify as male or female, they were omitted from analysis.

The second independent variable is linked to the second hypothesis. The gender demographics of high school teachers have been shown to have an impact on a female student's interest in mathematics (Stearns et al., 2016). To understand the demographics of a participant's high school, participants were asked the question: How many female science, technology, engineering, or mathematics teachers did you have in high school? 0 = 0, 1 = 1-2, 2= 3-4, 3 = 5-6, and 4= 7+. Due to uneven groups, the data was then recoded to be 0= 0-2 female STEM teachers, 1 = 3-4 female STEM teachers, and 2 = 5+ female STEM teachers. 20.5% (*n*=16) of the sample had 0-2 female STEM teachers in high school, 44.9% (*n*=35) had 3-4 female STEM teachers, and 34.6% (*n*=27) had 5+ female STEM teachers.

Dependent Variable: Gendered Perceptions of STEM/Mathematics

While the literature review for this study takes research from all categories of STEM, this research seeks to target mathematics because of its widespread use in all STEM courses and the mathematics requirements at Cabrini University. There are many different components of perceptions of mathematics including self-efficacy, universal math importance, personal math interest and the gendered aspects of perceptions of mathematics. Self-efficacy in mathematics is how an individual sees their skills in problem-solving (Betz & Hackett, 1993). Questions about self-efficacy were rated by participants on a Likert-type scale described by Chen et al. (2013) ranging from 1 = "strongly disagree" to 5 = "strongly agree" on how participants saw their skills in mathematics covered a variety of different topics including how the participants feel about exams, homework, their learning ability, and how they feel about their math ability (Chen et al., 2013; Ito & McPherson, 2018).

A scale was created from the questions of self-efficacy to analyze the several questions on self-efficacy. A higher score from a participant shows that they have higher self-efficacy while a lower score shows that the participant has lower self-efficacy. Cronbach's Alpha was conducted on the questions to determine if the scale would be reliable. The Cronbach's Alpha was .876 (11 items) which is higher than the required .7 Cronbach's Alpha. This means the scale for self-efficacy is an appropriate measure. The scale ranged from 12, which corresponds to low self-efficacy, to 44, which corresponds to high self-efficacy. The median score of this scale was 27 with a mean of 27.6234 (M = 27.6234; SD = 7.65032).

Universal math importance and ability is the next section of perceptions of mathematics. Universal math importance is how important an individual feels math will be to their future and universal math ability is how individuals feel math abilities are received or taught (Kombe et al., 2019). Questions for universal math ability were rated on the same Likert-type scale and were taken from Ito & McPherson's STEM Interest Questionnaire (2018) and include statements such as "Being a top scholar of this field requires a special aptitude that just can't be taught," "If you want to succeed in this field, hard work alone just won't cut it; you need to have an innate gift or talent," and "With the right amount of effort and dedication, anyone can become a top scholar in this field." A scale was also created for universal math ability; however, the Cronbach's Alpha was .596 (4 items), which is less than the required .7. Since the variable was not shown as reliable, the questions were not used in analysis.

In regards to universal math importance, participants were asked a series of questions on the same Likert-type scale to ask participants how much they agreed with statements such as "I need mathematics to maximize future employment opportunities" and "It is important to understand the work in mathematics" (Kombe et al., 2019). A scale was created for universal

math importance. The Cronbach's Alpha was .858 (6 items), which exceeds the required Cronbach's Alpha score of .7, and shows that this is a reliable scale to use for analysis. The scale ranged from 0 to 24 with a score of 0 corresponding to low math importance and 24 corresponding to high math importance. The mean score of math importance was 13.5128 (M = 13.5128, SD = 5.06771).

Personal math interest describes how individuals feel about math. Rather than assessing how participants feel about their math ability, this section seeks to understand if participants enjoy the subject. This variable was also analyzed using a Likert-type scale with 1 = "strongly disagree" to 5 = "strongly agree" on questions such as "I enjoy my math classes" and "I am interested in learning math" (Kombe et al., 2019). A scale was created after a Cronbach's Alpha score of .909 (6 items), which is greater than the required .7 score, was found. The scale ranged from 0 to 24 where a score of 0 corresponded to no personal math interest and a score of 24 corresponded to high personal math interest. The mean score for personal math interest was 10.4675 (M= 10.4675, SD= 5.92405).

The final section of this dependent variable is gendered perceptions of mathematics. This section focuses on the different stereotypes surrounding mathematics mentioned previously in the literature review. Research participants will be asked to rate statements on a scale used by Kombe et al. (2019) from 1 = "women definitely more likely than men" to 5= "men definitely more likely than women." The questions all start with the phrase "Do you think men or women are/are more likely to…." and detail different gendered concepts including future employment opportunities, math interest, and math self-efficacy. To test if individuals believed in gender differences in mathematics, the questions were recoded in a binary fashion where responses 1, 2, 4, and 5 were labeled as some gender difference and 3 was labeled no gender differences. Once

the questions were recoded, the Cronbach's Alpha was found to determine the reliability of the questions together. The Cronbach's Alpha was .902 (15 items) which is higher than the required score of .7. Therefore, a scale was created for gendered differences of mathematics and had a mode of 0 and a mean of .2941 (M=.2941, SD= .29317).

Table 1.

Frequencies of Survey Participants

Variable	***Percent***	***N***
Gender	-	78
Female	67.9%	53
Male	28.2%	22
Other	3.8%	3
Age	-	78
18 Years Old	16.7%	13
19 Years Old	19.2%	15
20 Years Old	26.9%	21
21 Years Old	24.4%	19
22+ Years Old	12.8%	10
Race	-	78
Asian	6.4%	5
Black of African American	14.1%	11
White	67.9%	53
Other	11.5%	9
Ethnicity	-	76
Hispanic or Latinx	10.5%	8
Non-Hispanic or Non-Latinx	89.5%	68
High School Female STEM Teachers	-	78
0-2 Female STEM Teachers	20.5%	16
3-4 Female STEM Teachers	44.9%	35
5+ Female STEM Teachers	34.6%	27

Plan for Analysis

Three independent t-tests were conducted to compare gender with three categories of the dependent variable: self-efficacy, universal math importance, and personal math interest the test the first hypothesis. Independent t-tests were used because the independent variable is nominal and has two independent groups. In these t-tests, the independent variable was gender with the categories being female and male. The two categories of the independent variable were analyzed with each part of the dependent variable separately. Each dependent variable was continuous.

To test the second hypothesis, two one-way analyses of variance (ANOVAs) were conducted to determine if the number of STEM teachers a female participant had in high school had an impact on math self-efficacy or universal math importance. An ANOVA was appropriate to test these variables because the independent variable was in three exclusive categories (0-2 female STEM teachers, 3-4 female STEM teachers, and 5+ female STEM teachers) and the dependent variable is a continuous scale. The ANOVAs compare the mean scores of each group to each other as well as the internal mean differences. The first ANOVA was conducted to see if the number of female STEM teachers a female participant had would have an impact on their self-efficacy while the second ANOVA was conducted to see if the number of female STEM teachers a female participant had would have an impact on math importance.

The final test aimed to assess the third hypothesis that the sample believes there are gendered differences in mathematics. An independent t-test was conducted to see if male and female students had differing beliefs in gendered math concepts. An independent t-test was appropriate for to test this hypothesis because the independent variable was nominal and had two categories (female and male) and the dependent variable was a continuous scale. After this, the

frequency of female participants' answers was also conducted to see how many female participants in the sample believed in gendered differences in mathematics.

Results

Perceptions of Mathematics Based on Gender

The first independent t-test describing the connection between gender and personal math interest was significant; t(72) = -2.073, $p<.05$. Levene's Test for the Equality of Variances was not significant ($F= .179$, $p=.673$) so equal variances were assumed. Female students were shown to have less personal math interest ($M=9.5283$, $SD= 5.68$) than male students ($M= 12.6667$, $SD= 6.35$). This partially supports the first hypothesis that females will hold lower views on their personal math self-efficacy and interest. See Table 2 for the results of personal math interest.

The independent t-test comparing gender and math importance was not significant; $t(73)= -1.461$, $p= .148$. Levene's test was not significant ($F=.000$, $p= .998$) meaning equal variances are assumed. While females still had lower scores on math importance ($M=13.0189$, $SD= 5.09$) than males ($M=14.9091$, $SD= 5.14$), the difference was not large enough to be significant and does not support the hypothesis that females have lower views on math importance and self-efficacy. Table 3 details the results of the t-test describing the connection between gender and math importance.

The final independent t-test for the first hypothesis which compared gender to math self-efficacy was also not significant; t(72)= -.072, $p=.943$. Levene's test was not significant ($F=2.602$, $p=.111$) so equal variances were assumed. Females and males had similar means ($M= 27.6226$, $SD= 7.89$ and $M=27.7619$, $SD= 6.28$ respectively). This data shows that there is no difference between female and male perceptions on self-efficacy and does not support the

hypothesis that females have less self-efficacy than males. The results of this t-test are shown in Table 4.

Table 2.

Independent Sample t-Test for Personal Math Interest Based on Gender

	F	***Significance (Levene's)***	***t***	***df***	***Significance***
Equal Variances Assumed	.179	.673	-2.073	72	.042*

*p<.05

Table 3.

Independent Sample t-Test for Math Importance Based on Gender

	F	***Significance (Levene's)***	***t***	***df***	***Significance***
Equal Variances Assumed	.000	.998	-1.461	73	.148

*p<.05

Table 4.

Independent Sample t-Test for Math Self-Efficacy Based on Gender

	F	***Significance (Levene's)***	***t***	***df***	***Significance***
Equal Variances Assumed	2.602	.111	-.072	72	.943

*p<.05

Perceptions of Mathematics Based on the Number of Female STEM Teachers

The first ANOVA describing the connection between the number of female STEM teachers in high school and self-efficacy of female participants was not significant; $F(2,50)= .133$, $p= .876$. This means that between the three groups assessed in this ANOVA, there was little to no difference in their scores on math self-efficacy. Those with 0-2 female STEM teachers (M=27.2308, SD=9.60), 3-4 female STEM teachers (M=27.3333, SD=7.63) and 5+ female STEM teachers (M=28.6154, SD=7.05) did not have any significant differences in their

math self-efficacy. This does not support the second hypothesis that female students with more female STEM teachers will have more self-efficacy than those who had less female STEM teachers. The results of this ANOVA are shown in Table 5.

The other ANOVA describing the connection between the number of female STEM teachers in high school and female participants' personal math interest was also not significant; $F(2,50)=1.486$, $p=.236$. Female students with 3-4 female STEM teachers had a lower mean score of math importance ($M=11.8519$, $SD= 5.30$) while female students with 0-2 female STEM teachers and 5+ female STEM teachers had similar higher mean scores ($M=14.0769$, $SD= 5.14$ and $M= 14.38$, $SD= 4.31$ respectively). This does not support the hypothesis that female students with more female STEM teachers in high school will have more positive perceptions of mathematics than those with fewer female STEM teachers. The results of this ANOVA are found in Table 6.

Table 5.

One way Analysis of Variance of Math Self-Efficacy in Females by the Number of Female STEM Teachers One had in High School

Source	***Sum of Squares***	***df***	***Mean Square***	***F***	***p***
Between Groups	17.068	2	8.534	.133	.876
Within Groups	3218.385	50	64.348		
Total	3234.453	52			

Table 6.

Math Importance in Females by the Number of Female STEM Teachers One had in High School

Source	*Sum of Squares*	*df*	*Mean Square*	*F*	*p*
Between Groups	75.574	2	37.787	1.486	.236
Within Groups	1271.407	50	25.428		
Total	1346	52			

Gendered Differences in Mathematics

An independent t-test was conducted to see if there was any difference between men and women on if there are gendered differences in mathematics. The t-test was not significant; t(73)=1.194, *p*=.236. Levene's test for Equality of Variance was not significant (*F*=.018, *p*=.893) so equal variances were assumed. This test shows that there is no difference between women (*M*=.3172, *SD*= .29) and men (*M*=.2273, *SD*= .32) on their gendered views of mathematics. This does not support the hypothesis that there would be gendered differences between men and women. Because this was not significant, the researcher wanted to see the breakdown of female gendered perceptions of mathematics. While the independent t-test was not significant, 75.5% (*n*=40) of females believed there were gendered differences in mathematics while only 24.5% (*n*=13) of females believed there were no gendered differences in mathematics. Table 7 details the independent t-test of gendered differences in mathematics.

Table 7.

Independent Sample t-Test for Gender Differences in Mathematics Based on Gender

	F	*Significance (Levene's)*	*t*	*df*	*Significance*
Equal Variances Assumed	.018	.893	1.194	73	.236

*p<.05

Discussion

The purpose of this study was to determine if students at Cabrini University held different views on mathematics based on their gender. To do this, participants were given surveys to describe their views of self-efficacy, personal math interest, math importance, and gendered perceptions of mathematics. Based on previous literature, three hypotheses were created to see these differences. Throughout the study, only one hypothesis was partially supported in which females have significantly less interest in mathematics than males. While this may not be the only reason there are less females in STEM careers than males, it can be a start to understanding the disproportionate representation of women in STEM. The first hypothesis was not supported by the results of comparing gender to both math self-efficacy and math importance. However, the relationship between gender and math importance, while not significant, is different between men and women. Females believe that math is less important than their male counterparts. This could be a result of the socialization of mathematics throughout a woman's life as described by Brandell & Staberg (2008). It is unknown as to if this connection is a repercussion of previous interactions with gendered differences in mathematics or if it is the start to why women are not as involved in STEM.

The second hypothesis stated that women who had more female STEM teachers in high school would have higher math self-concepts than women who had fewer STEM teachers. The relationship between the number of female STEM teachers and math self-efficacy was not significant. In addition, there was no significance when the number of female STEM teachers was compared to math importance. The self-efficacy scale mean of participants was even, while there was some difference between groups regarding math importance. Since the comparisons

were not significant, it is unknown as to whether this difference is a result of the number of female STEM teachers, or some other factor not tested in this study.

Gendered differences in mathematics were not found to be significant in this study. While most individuals who took the survey believed there was some difference between men and women and their skills in mathematics, the relationship was not different between men and women. Even though this test was not significant, it still says a lot about how students at Cabrini view mathematics and gender. The test could not be significant because both men and women have gendered perceptions of mathematics, and they are just similar in size. This is shown with over 75% (n=40) of women believing there is some gendered difference in mathematics. This finding is not surprising and follows prior research which states men and women both believe that there are gendered differences in mathematics (Bloodhart et al., 2020; Brandell & Staberg, 2008). It is important to note that there is an overwhelming majority of females in this sample which could impact the significance of this test.

Limitations

There are several aspects of this study that limit the scope of this research. To start, the sample size of this study is small. With only 78 participants, it is only a small portion of the Cabrini University population. In this sample, there was an overrepresentation of women with almost 70% (n=53) identifying as female which is more than the actual proportion of females at Cabrini, around 63% ("Cabrini University Diversity," n.d.). A non-probability, availability sampling method was used to collect the data for this study, making it not generalizable to the larger population of Cabrini Students. While the variables were not tested, there was also a disproportionate majority of White, Non-Hispanic, and Non-Latinx individuals. It is possible that with a more diverse sample, differences between the groups could emerge. Finally, this study

was a cross-sectional design meaning that the data for this survey was collected at one point in time. Since it is only collected at one time, it cannot be said whether gender is a causal factor in the perceptions of mathematics. Using a fixed-sample panel design could potentially change the outcome of this study.

Implications

This study shows that Cabrini students to see gendered differences in mathematics. In addition, female students have less interest in mathematics than male studentsThis research helps to show how vital female education is to create more diversity in STEM. Previous research shows that in the primary stages of learning, boy and girl students alike see no gendered differences in mathematics, yet this changes as these children grow up as is shown in this research (Brandell & Staberg, 2008; Ehrlinger et al., 2018; Kombe et al., 2019). Education is a vital resource for all individuals, and proper education in STEM could show an increase of women in the field. Educators should be made aware of the gendered differences in mathematics and actively inspire young females to partake in the fields of science, technology, engineering, and mathematics. Future research could consider differences in a fixed-sample panel design with a larger sample size to see if gender plays a role in changes of gendered perceptions of mathematics.

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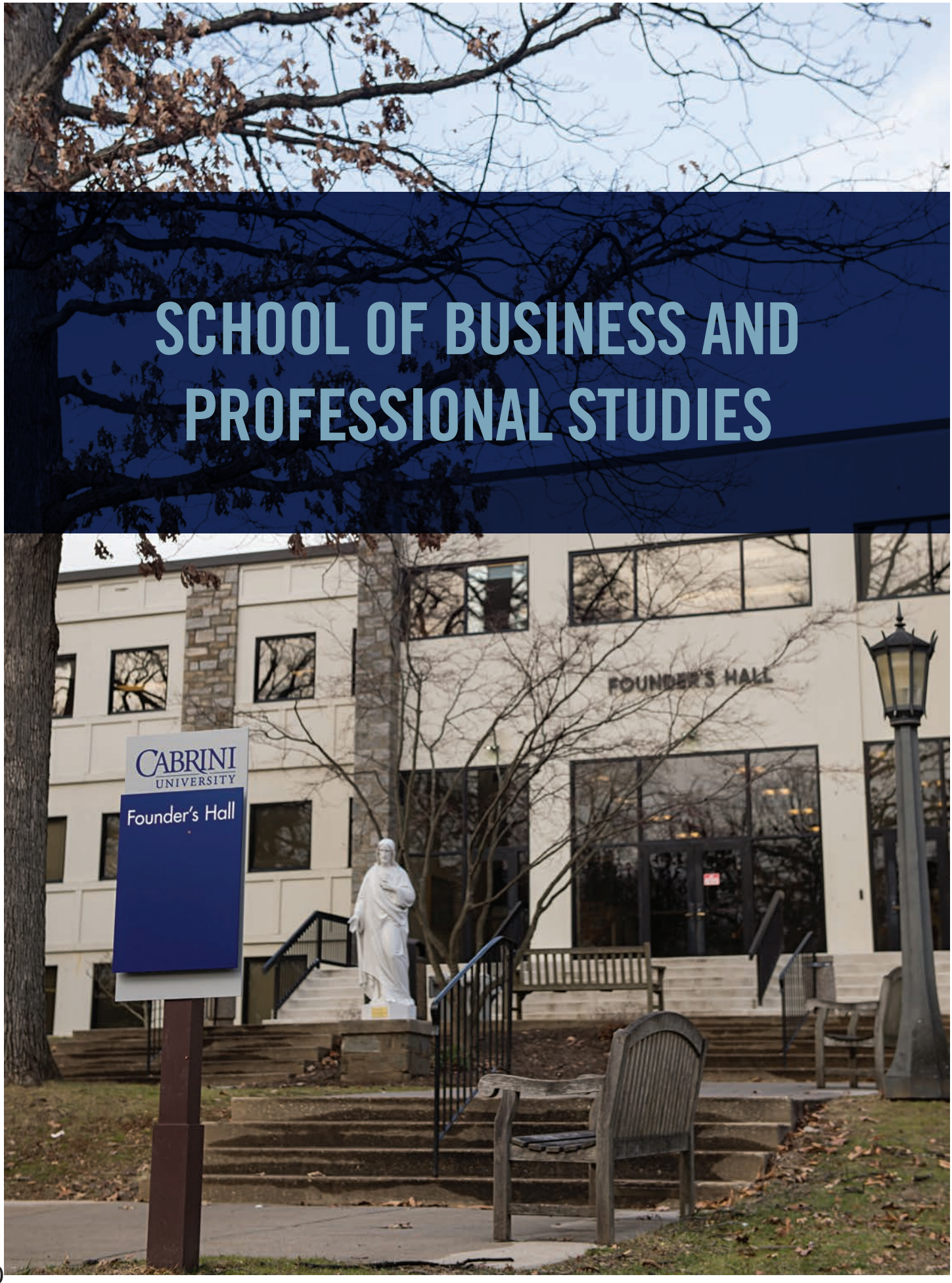

The Effect of Income Levels on Consumer Behavior of Residents in Pennsylvania

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Abstract

In this study, I conducted a regression analysis that analyzed the relationship between the overall level of income, since 1997, and its effect on the consumer behavior of residents in Pennsylvania. The purpose of this study was to determine whether income levels could predict consumer spending exclusively over the past 23 years in PA. I used personal consumption expenditures for goods and services in accordance with the real median household income to investigate the relationship between these economic indicators. I conducted this analysis without consideration of the economic conditions between the years of 1997 and 2020, so the influence of other economic factors will not be analyzed in this particular study. The results concluded statistical significance of the interaction between these two variables since the year 1997 at level, $\alpha = 0.05$.

Keywords: household income, consumption, goods, services, Pennsylvania, 1997, 2020, relationship, regression analysis, statistical significance

Introduction

Economists have emphasized the importance of income in understanding consumer behavior, especially in relation to understanding consumption preferences and consumption patterns. Economic theories support the idea that current consumption patterns are largely dependent on current earnings and vary with changes in them (Mishra, Mishra, & Nayakankuppam, 2010). In this study, I investigated the relationship between the dependent variable, the consumer behavior, and the independent variable, the real median household income, over the years 1997 to 2020 using time series data from the Federal Reserve Economic Database. It is important to note that the consumer behavior variable was investigated by using two price consumption expenditures, goods and services. All data was calculated in millions of dollars, annually, for the state of Pennsylvania. Moreover, it is important to understand the impact that income levels can have on consumer behavior in order to properly acknowledge the economic conditions and economic stimuli that result from the interaction between these two indicators.

Literature Review

In this section, a review of relevant literature will further discuss the basis for this research. It is essential to reflect on previous research as it is conducive to the reliability and validity of the current study. The literature review supports the current research question by dissecting the knowledge of previous scholars that supports the individual variables and furthers their efficacy in this study. Reviewing earlier income and consumer behavior applications will allow for a more adequate analysis of the present results.

Income

In the United States, the variation in household income has increased most notably since the 1970s. Rising income levels over this time period are largely a result of the rapid growth at the top of the income distribution. For example, in 1975, the average income of households at the top of the income distribution was 10.3 times as large as those at the bottom, and in 2019, average top incomes were 16.6 times as large as those at the bottom (Donovan et al., 2021). In addition, reports from 2013 suggest that the median wealth of the nation's upper-income households was about seven times larger than the median wealth of middle-income households and nearly 70 times larger than the median wealth of low-income households (Olsen et al., 2016). Evidently, median household income levels have been greatly affected and continue to be influenced by economic factors today.

Through the acknowledgement of these statistical facts relating to income levels, a discussion of other pertinent income topics can now be discussed in greater detail. On a more domestic level, in 2018, 39% of Pennsylvania's 5,067,682 households lacked the income to cover the costs of necessities, including housing, food, transportation, childcare, health care, and technology. Additionally, 12% of households lived below the Federal Poverty Level (FPL), and another 27% were defined as ALICE households: Asset, Limited, Income Constrained, Employed. By definition, ALICE households earn above the FPL, but not enough to afford basic household necessities for their families (United Way of Northern New Jersey, 2020). Considering these income level statistics, it can be concluded that a household's income may not be enough to support even a modest lifestyle with today's costs and inflation; thus, suggesting that income has a direct correlation to consumer behavior. The ability to earn one's own income drives positive results and grants one the right to spend as one desires. However, consumption

cannot take place at its optimum level for a strong economy if income levels, earned or not, cannot support proper or even necessary expenditures (Roach et al., 2019). Furthermore, the changing demographic makeup of households has also contributed to the pattern of income level distribution. Donovan, Labonte, Dalaker, and Romero (2021) stated that there has been an increase in two earner households, female single-headed households, and marriages of couples with more similar earnings or educational attainment. Income levels are affected as a result of additional members who have the ability to contribute income to a household, and, in turn, households that do not have this additional financial support will likely see a lower level of income.

Continuing with lower income households, Olsen et al. (2016) put forth that low income households tend to be viewed differently than those with more resources, even when executing identical consumption patterns. Another scholar, Sereikhuoch Eng (2011), affirmed that low income households often spend more time searching for lower prices because they have more restrictive budget constraints. However, insufficient consumption is not solely a matter of having a low income household. Roach et al. (2019) suggested that even people with a higher income level sometimes find themselves lacking basic necessities; for example, the authors cited that those who tend to the elderly, the sick, and children often feel that the United States has an inadequate system of care. Although previous research has implied that income dictates the majority of consumer behaviors, it is important to consider these other factors in order to get the whole picture of economic influences on consumption.

Consumer Behavior

The analysis, interpretation, and reflection of consumer behavior in an economy can prove to be difficult as a result of many influencing factors. Olsen et al. (2016) realized that

consumption choices do not exist in a vacuum, rather they actually identify information about the person making those choices. Both large and small consumer choices depend heavily on household income since income directly influences a household's budget constraints. Roach et al. (2019) supported this fact by noting that consumer spending is restricted by the amount of a household's total budget. Consumers can only behave in the economy in ways that their income allows them to, which is why consumption has a strong correlation to income. In today's world, consumers experience financial constraints on a daily basis. Undoubtedly, these financial constraints certainly impose limitations and restrictions on any one consumer's desired consumption, and, subsequently, on their behavior in the economy.

The different behaviors between high income consumers and low income consumers also imply that one's salary profoundly impacts consumption patterns. Sereikhuoch Eng (2011) reported that high income consumers are less price sensitive and less likely to partake in any sort of price searching, which makes them indifferent across all conditions. Additionally, high income consumers are likely to spend less time deciding what products and services to spend their money on, whereas low income consumers have to think about how to distribute their income. High income consumers are also more likely to invest in high ticket items, whether that be one time or several times a year, but low income consumers typically do not have the same luxury. Ultimately, consumers with different incomes can only satisfy their needs and wants as far as their current budget will allow them.

Finally, consumer behavior cannot be studied without discussing the economic theory of opportunity cost. Over the years, this theory has been used by many economists to explain why some consumers engage in certain activities and others do not (Eng, 2011). Eng (2011) outlines opportunity cost by saying that "the basis lies in the fact that an individual chooses to engage in

an activity if he/she derives positive gain from such activity; that is the gain from engaging in such activity outweighs the cost of foregoing another competing activity." When linking opportunity cost to household income, it is generally acknowledged that high income consumers have higher opportunity cost than low income consumers; thus, these high income consumers are less price sensitive, as well (Eng, 2011). Although they may be unaware of it, every consumer utilizes the opportunity cost theory in every decision, which impacts the outcome of their overall behaviors in the economy as a result.

Theoretical Framework

Permanent Income Hypothesis

Milton Friedman, an esteemed economist, developed the Permanent Income Hypothesis (PIH) in 1957. Friedman's hypothesis explains that consumer spending is a result of estimated future income as opposed to consumption that is based on current after-tax income (Kagan, 2020). Friedman's theory argues that if economic policies result in increased income, then consumer spending will not necessarily increase as well. Kagan (2020) highlights that this is because consumer behaviors are a result of the individual consumer's expectations about their future income, according to Friedman. Julia Kagan (2020) further clarifies that the PIH is a theory of consumer spending that people will spend money at a level consistent with their expected average income. Moreover, Kagan (2020) explains that an individual will save only if their current income is at a higher level than the anticipated level of permanent income, which is done as a way to support the household in the event of a possible decline in income. Furthermore, Neng Wang (2003) states a revised definition of the PIH as the theory that an individual will save money in anticipation of potential future declines in income. This definition is much more pertinent in relation to today's economic environment, including that of higher

inflation and greater unemployment. Evidently, The Permanent Income Hypothesis is crucial when considering income levels in relation to consumer behavior.

Consumer Behavior Theory

Consumer Behavior Theory has been cited and researched by economists for many years. Daniel Liberto (2020) defines this theory as the study of how individuals chose to spend their income based on their preferences and budget constraints. Deaton and Muellbauer (1980) pointed out that consumer behavior is often presented in terms of preferences on one hand and possibilities on the other. This theory develops the understanding between preferences and possibilities, which is that it is only possible to consume one's preferences based on how much available income one has to spend in the economy. Liberto (2020) notes that each individual consumer has a variety of bundles to choose from, and Consumer Behavior Theory seeks to predict these consumption choices. It is important to apply the Consumer Behavior Theory because it helps economists develop a better understanding of individuals' tastes relative to their incomes; thus, giving these economists a better picture of the shape of the overall economy. Overall, the Consumer Behavior Theory is pivotal for the recognition of consumption patterns in the economy.

Research Question

Is there a relationship between real median household income and consumer behavior of goods and services in Pennsylvania between the years 1997 and 2020?

Hypothesis

H_0: $r = 0$, meaning that household income is not useful in predicting consumer behavior. The acceptance of this hypothesis, the null hypothesis, would indicate that there is no relationship between real median household income and consumer behavior in PA.

H_1: $r \neq 0$, meaning that household income is useful in predicting consumer behavior. The acceptance of this hypothesis, the alternate hypothesis, would indicate that there is a relationship between real median household income and consumer behavior in PA.

Research Data and Statistical Approach

For this study, all of my data came from the Federal Reserve Economic Database (FRED). I utilized the following data sets, all of which included information from 1997 to 2020: Personal Consumption Expenditures: Goods for Pennsylvania, Personal Consumption Expenditures: Services for Pennsylvania, and Real Median Household Income in Pennsylvania. MegaStat was the statistical software used to analyze and interpret the results. The statistical approach that I took for this study was to run descriptive statistics, a correlation matrix, and most importantly, a regression analysis on this data. Furthermore, I converted this data into log data, that is natural logs and log returns, in order to evaluate the elasticity between the variables. For the log data, I performed a regression analysis. I felt that this approach was best suited for this study so that I would be able to see the whole picture and get the most beneficial results.

Results

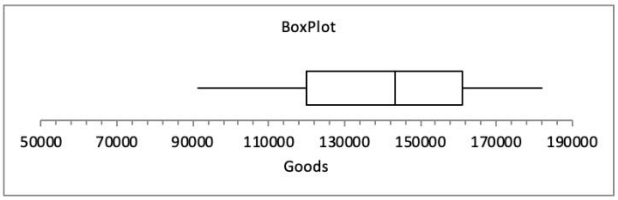
Descriptive Statistics

As seen in Table 1, I ran a set of descriptive statistics on the PCE data for goods in Pennsylvania. Results showed a mean of $140,563.563 over all years, a minimum of $91,494.6 in 1997, and a maximum of $182,162.3 in 2020. In this data set, there are also no low or high extremes or outliers, which increases the data's reliability. When looking at the box plot and the quartile figures, it is proven that this data falls into a normal, symmetrical distribution, meaning that the mean and the median are relatively close in nature. Here, the mean of $140,563.563 is indeed close to the median of $143,367.250.

Table 1: Descriptive Statistics for Personal Consumption Expenditures: Goods for PA

Descriptive statistics

	Goods
count	24
mean	140,563.563
minimum	91494.6
maximum	182162.3
range	90667.7
1st quartile	119,844.450
median	143,367.250
3rd quartile	161,194.150
interquartile range	41,349.700
mode	#N/A
low extremes	0
low outliers	0
high outliers	0
high extremes	0



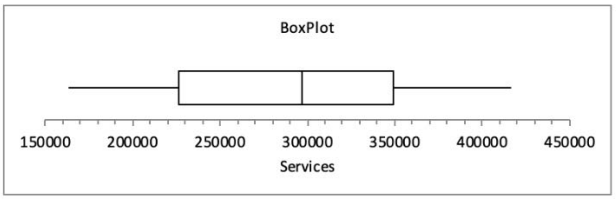
Note: all monetary values mentioned are in millions of dollars

As seen in Table 2, I ran a set of descriptive statistics on the PCE data for services in Pennsylvania. Results showed a mean of $290,683.663 over all years, a minimum of $164,054.8 in 1997, and a maximum of $415,967 in 2019. When comparing services to goods, one can infer that the average consumer spends more money on services in all years. It is also notable that spending on both goods and services was lowest in 1997, which is reasonable since prices and income levels were lower back then. In this data set, there are also no low or high extremes or outliers, which increases the data's reliability. When looking at the box plot and the quartile figures, it is proven that this data is mostly symmetrically distributed but pushing a slightly negatively skewed distribution. In this case, the mean and the median show a greater variation than that shown in the goods data set. The median of $296,805 is slightly larger than the mean of $290,683.663, which is what causes the slight negative skew in the data.

Table 2: Descriptive Statistics for Personal Consumption Expenditures: Services for PA

Descriptive statistics

	Services
count	24
mean	290,683.663
minimum	164054.8
maximum	415967
range	251912.2
1st quartile	226,713.650
median	296,805.000
3rd quartile	348,797.200
interquartile range	122,083.550
mode	#N/A
low extremes	0
low outliers	0
high outliers	0
high extremes	0



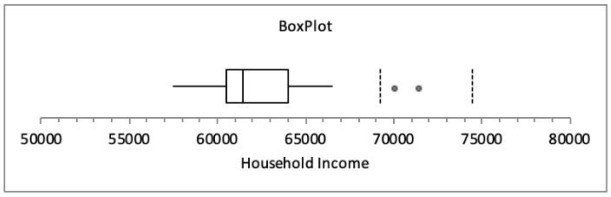
Note: all monetary values mentioned are in millions of dollars

As seen in Table 3, I ran a set of descriptive statistics on the Real Median Household Income in Pennsylvania. Results showed a mean of $62,333.63 over all years, a minimum of $57,482 in 2010, and a maximum of $71,463 in 2019. In this data set, there are no low extremes or outliers, but there are two high outliers, which are values that are inconsistent with the rest of the data. When looking at the box plot and quartile figures, it is proven that this data is positively distributed because of its skewness to the right. This means that the median is less than the mean and that there are extremely high values pulling up the mean. The median of $61,453 is indeed less than the mean of $62,333.63, which is being inflated by the two high outliers.

Table 3: Descriptive Statistics for Real Median Household Income in PA

Descriptive statistics

	Household Income
count	24
mean	62,333.63
minimum	57482
maximum	71463
range	13981
1st quartile	60,488.50
median	61,453.00
3rd quartile	63,992.50
interquartile range	3,504.00
mode	#N/A
low extremes	0
low outliers	0
high outliers	2
high extremes	0



Note: all monetary values mentioned are in 2020 CPI-U-RS adjusted dollars

Correlation Matrix

For the correlation between Household Income and Goods, the coefficient of correlation, *r*, is equal to .476. This indicates that there is a positive, moderate correlation between Household Income and the money spent on Goods by consumers. Since this value is positive, there is a direct relationship between the two variables. Two hypotheses can be put forth: the null hypothesis, H_0: $r = 0$, and the alternate hypothesis, H_1: $r \neq 0$. At the 5% significance level, the decision is to reject the null hypothesis in favor of the alternate hypothesis that the correlation in the broad population is not equal to zero. This means that there is enough evidence to suggest that there is a relationship between Household Income and the money spent on Goods by consumers.

For the correlation between Household Income and Services, the coefficient of correlation, *r*, is equal to .513. This indicates that there is a positive, moderate correlation

between Household Income and the money spent on Services by consumers. Since this value is positive, there is a direct relationship between the two variables. Two hypotheses can be put forth: the null hypothesis, H_0: $r = 0$, and the alternate hypothesis, H_1: $r \neq 0$. At the 5% significance level, the decision is to reject the null hypothesis in favor of the alternate hypothesis that the correlation in the broad population is not equal to zero. This means that there is enough evidence to suggest that there is a relationship between Household Income and the money spent on Services by consumers.

Altogether, the correlation matrix provides further support for this study's regression analysis by showing that there is a direct, positive, moderate correlation between a consumer's household income and the money that the household spends on goods and services.

Table 4: Correlation Matrix on Goods, Services, and Household Income

Correlation Matrix

	Goods	*Services*	*Household Income*
Goods	1.000		
Services	.990	1.000	
Household Income	.476	.513	1.000

24 sample size

±.404	critical value of r .05 (two-tail)
±.515	critical value of r .01 (two-tail)

Regression: Household Income and Goods

Regression Equation: $\hat{Y} = -77{,}559.8083 + 3.4993X_1$

In the regression analysis on household income and goods, the coefficient of determination, R^2, is equal to 0.227. This means that 22.7% of the variation in the money spent on goods by consumers can be explained by the variation in household income. The coefficient of correlation, *r,* is equal to 0.476. This indicates a moderate, positive correlation between the

money spent on goods by consumers and their household income. From the regression output, the regression line can be determined as $\hat{Y} = -77{,}559.8083 + 3.4993X_1$. The slope of this regression equation indicates that for every additional dollar of household income, the money spent on goods by consumers will increase by $3.50. However, we must also test to determine whether the regression line is useful in predicting Y, which is money spent on goods by consumers. Two hypotheses can be put forth: the null hypothesis, H_0: $\beta = 0$, and the alternate hypothesis, H_1: $\beta \neq 0$. Based on the 5% significance level, the *p*-value of .0187 indicates that the decision is to reject the null hypothesis in favor of the alternate hypothesis that the regression coefficient is not equal to zero. This means that the slope is not zero, and the regression equation is useful in predicting the money spent on goods by consumers based on household income. See Table 6, a scatter plot of this data, for a visual.

Table 5: Regression Analysis: Household Income and Goods

Regression Analysis

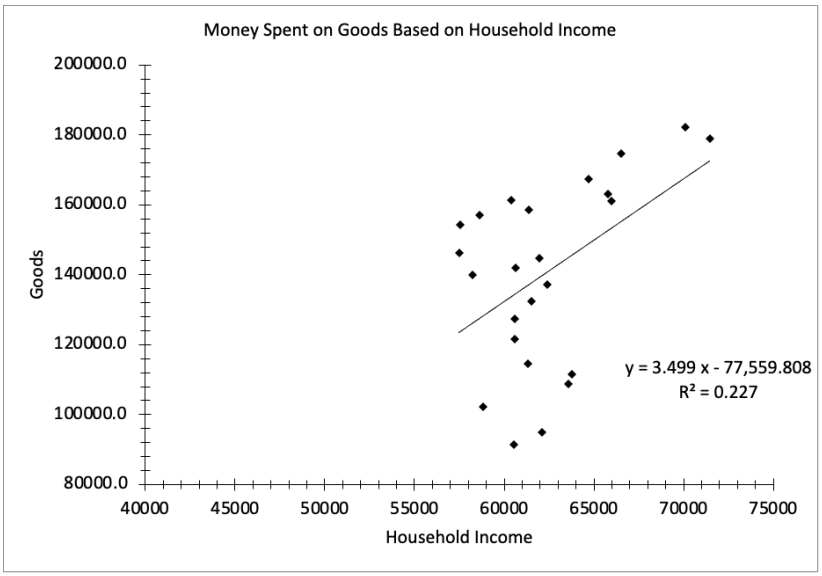
r^2	0.227	n	24
r	0.476	k	1
Std. Error	24004.277	Dep. Var.	**Goods**

ANOVA table

Source	*SS*	*df*	*MS*	*F*	*p-value*
Regression	3,716,730,620.6546	1	3,716,730,620.6546	6.45	.0187
Residual	12,676,516,972.1816	22	576,205,316.9173		
Total	16,393,247,592.8362	23			

Regression output					*confidence interval*	
variables	*coefficients*	*std. error*	*t (df=22)*	*p-value*	*95% lower*	*95% upper*
Intercept	-77,559.8083					
usehold Income	3.4993	1.3778	2.540	.0187	0.6419	6.3567

Table 6: Scatter Plot: Money Spent on Goods Based on Household Income



Regression: Household Income and Services

Regression Equation: $\hat{Y} = -380{,}162.6560 + 10.7622X_1$

In the regression analysis on household income and services, the coefficient of determination, R^2, is equal to 0.263. This means that 26.3% of the variation in the money spent on services by consumers can be explained by the variation in household income. The coefficient of correlation, *r*, is equal to 0.513. This indicates a moderate, positive correlation between the money spent on services by consumers and their household income. From the regression output, the regression line can be determined as $\hat{Y} = -380{,}162.6560 + 10.7622X_1$. The slope of this regression equation indicates that for every additional dollar of household income, the money spent on services by consumers will increase by $10.76. However, we must also test to determine whether the regression line is useful in predicting a Y, which is money spent on services by consumers. Two hypotheses can be put forth: the null hypothesis, H_0: $\beta = 0$, and the alternate hypothesis, H_1: $\beta \neq 0$. Based on the 5% significance level, the *p*-value of .0103 indicates that the decision is to reject the null hypothesis in favor of the alternate hypothesis that the regression

coefficient is not equal to zero. This means that the slope is not zero, and the regression equation is useful in predicting the money spent on services by consumers based on household income. See Table 8, a scatter plot of this data, for a visual.

Table 7: Regression Analysis: Household Income and Services

r^2	0.263		n	24	
r	0.513		k	1	
Std. Error	66839.953		Dep. Var.	**Services**	

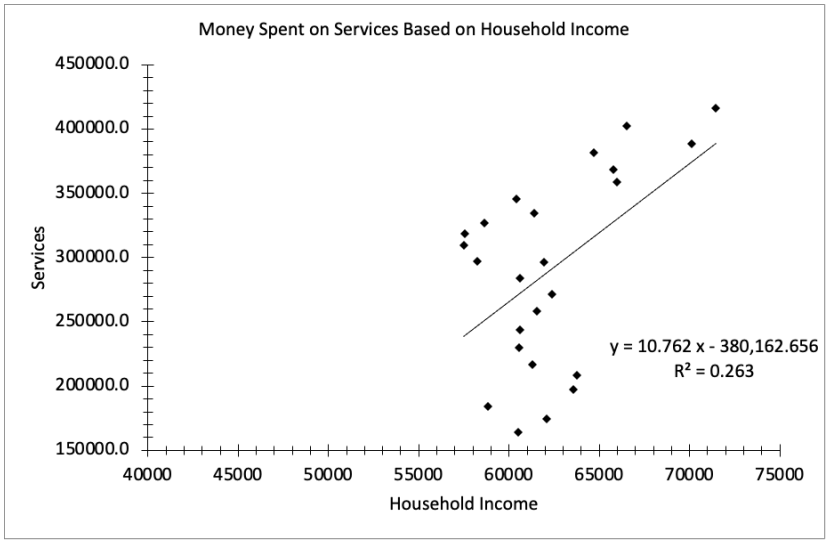
ANOVA table

Source	*SS*	*df*	*MS*	*F*	*p-value*
Regression	35,156,267,975.4987	1	35,156,267,975.4987	7.87	.0103
Residual	98,286,744,758.7176	22	4,467,579,307.2144		
Total	133,443,012,734.2160	23			

Regression output

					confidence interval	
variables	*coefficients*	*std. error*	*t (df=22)*	*p-value*	*95% lower*	*95% upper*
Intercept	-380,162.6560					
usehold Income	10.7622	3.8365	2.805	.0103	2.8058	18.7186

Table 8: Scatter Plot: Money Spent on Services Based on Household Income



With the established direct, positive, moderate relationship between a consumer's household income and the money that the household spends on goods and services, economists can imply corresponding outcomes as a result of this relationship. By understanding that, generally, consumers will spend less on goods and services if their household income is lower,

economists can use this knowledge to analyze the implications of this relationship on the overall economy. Households with lower incomes tend to spend the majority of their money on paying bills and funding necessities, while households with higher incomes have the luxury of saving and investing their money. The Congressional Research Service (CRS) reports that the saving rate presents a tradeoff between current and future consumption. A relatively low saving rate implies higher current consumption, but lower future consumption. Greater present consumption boosts individuals' living standards now, but it leaves little to be invested in future living standards (2020). For instance, if a household saves a generous portion of their income, then less money will be spent on consumer goods and services. According to the CRS, "Because consumer spending makes up about 70% of the U.S. economy, even a small decrease in consumer spending can reduce aggregate demand and economic activity" (2020). Evidently, the relationship between household income and consumer behavior has a significant impact on analysis of economic conditions.

The data used in this paper included both the 2008 recession and the COVID-19 pandemic recession; thus, economic recession is another area in which this relationship is substantial when determining economic activity. An increase in savings by households during an economic recession can be problematic. Typically, households increase their savings per paycheck during a recession in order to provide a buffer against reduced income or possible job loss in the near future. CRS explains that an economic downturn is further exacerbated due to the additional decrease in consumer spending. By contrast, in the midst of a healthy economy, a rising saving rate may result in a more sustainable level of consumer spending, thus preventing the economy from overheating (2020). An overheated economy, that is one in which demand for goods and services exceeds supply, can alone lead to a recession. When an economy does not

have the ability or resources to supply all households with the demanded goods and services, then inflation becomes a problem, causing an increase in the potential for a recession in the near future. The acknowledgement of the relationship between household income and consumer behavior allows economists to predict future changes and conditions in the economy during different periods of economic growth or decline.

Elasticity Perspective

Through the use of a log-log linear regression equation, $\ln y = \beta_0 + \ln x\beta_1 + \varepsilon_i$, the elasticity between the two variables can be identified with the coefficient β. The coefficient β indicates the percent change in Y for a one-unit change in X. Elasticity is measured as follows: Elastic, $\beta < -1$; Inelastic, $\beta > -1$; Unit Elastic, $\beta = -1$. By performing a regression analysis on the log return data, the elasticity between household income and money spent on goods and the elasticity between household income and money spent on services can be determined using the beta coefficients.

Log Regression: Household Income and Goods and Household Income and Services

In the regression analysis on the log return data of household income and goods, the beta coefficient is equal to 0.0054. Since this number is greater than -1 (0.0054 > -1), the relationship between household income and the money spent on goods can be considered inelastic. In the regression analysis on the log return data of household income and services, the beta coefficient is equal to 0.1776. Since this number is greater than -1 (0.1776 > -1), the relationship between household income and the money spent on services can also be considered inelastic.

Hayes (2021) defines income elasticity of demand as “an economic measure of how responsive the quantity demand for a good or service is to a change in income.” Inelastic goods should see the same quantity demanded even as income changes. In this study, it can be

concluded that as household income increases, so does the money spent on goods, and the same can be concluded for the money spent on services. However, this relationship would be described as elastic, which contrasts the results found from the log return regression analyses. This can potentially be explained by the fact that the data for goods and services was representative of goods and services on the whole, rather than as individual items. For example, if the data was broken down and representative of only one specific good, such as gas, then more accurate results might have been produced that better align with the inelastic relationship. The impact of readily available substitutes also plays a part in any elasticity relationship. Continuing with the gas example, there are basically no other substitutes for this specific good, which contributes to its inelastic relationship between income and the money spent on gas. If this exact study was done with specific data for each good or service, then the results would most likely better align with the current log return regression analysis results that show an inelastic relationship between the two economic variables.

Table 9: Log Regression Analysis: Household Income and Goods

Regression Analysis

r^2	0.000	n	23
r	0.009	k	1
Std. Error	2.330	Dep. Var.	**LRGoods**

ANOVA table

Source	*SS*	*df*	*MS*	*F*	*p-value*
Regression	0.0096	1	0.0096	0.00	.9669
Residual	113.9671	21	5.4270		
Total	113.9767	22			

Regression output					*confidence interval*	
variables	*coefficients*	*std. error*	*t (df=21)*	*p-value*	*95% lower*	*95% upper*
Intercept	2.9905					
LRHHI	0.0054	0.1281	0.042	.9669	-0.2610	0.2718

Table 10: Log Regression Analysis: Household Income and Services

Regression Analysis

r^2	0.062	n	23
r	0.249	k	1
Std. Error	2.747	Dep. Var.	**LRServices**

ANOVA table

Source	*SS*	*df*	*MS*	*F*	*p-value*
Regression	10.4322	1	10.4322	1.38	.2528
Residual	158.4200	21	7.5438		
Total	168.8523	22			

Regression output					*confidence interval*	
variables	*coefficients*	*std. error*	*t (df=21)*	*p-value*	*95% lower*	*95% upper*
Intercept	3.6358					
LRHHI	0.1776	0.1510	1.176	.2528	-0.1365	0.4917

Validity

There is constant interaction between consumers, households, and other institutions within the economy. An ethical problem occurs when any one of these parties considers a plan that benefits their own cause or that reduces the benefits available to someone else. While some ethical dilemmas occur knowingly, others could occur unknowingly if the parties involved are unaware of various economic policies. However, any economist concerned with evaluating institutions and policies cannot avoid thinking about ethics (Hausman, 2005). After all, the economy serves to benefit the individual, so ethics should be upheld in any and all circumstances for positive results. With this in mind, it is important to consider the validity of the data sets and of the results presented in this paper.

Internal Validity

Internal validity is important in any study because it is essential to make sure that the conclusions accurately reflect the relationship being studied. When looking at the current statistics for consumer behavior, the personal consumption expenditures for goods and services demonstrate reliability as there are no low or high extremes or outliers in the data set. However,

statistical regression can be a threat to internal validity because the dependent variable may be subject to measurement errors. When the scores of the dependent variable are particularly high or low (i.e., they are extreme scores), there is a tendency for these scores to move towards the mean (Lund Research Ltd., 2012). When looking at the current statistics for income, there are two high outliers that are inflating the mean of the household income data set. As a result, these outliers could influence the accuracy measures of the linear regression model; thus, affecting the internal validity of this data. As aforementioned in the results, this has been addressed and considered throughout the completion of this study.

External Validity

Professor William M.K. Trochim (2022) defines external validity as "the degree to which the conclusions in your study would hold for other persons in other places and at other times." This study was conducted on a microeconomic level, hence why the data was pulled solely for the state of Pennsylvania. In the event that this study is done for a different state, the results would most likely not be the same because of different economic, social, and demographic factors. As a result, it would be hard to generalize this study and its results to the broader population; thus, affecting the external validity of this data.

Possible Future Direction

To further this research objective, one could take a greater amount of data into consideration as a way to achieve more direct results. For example, the FRED database has data available for particular consumer goods, such as clothing and footwear and recreational goods and vehicles for Pennsylvania. It also has data available for particular services, such as financial services, food services, and transportation services for Pennsylvania. This data could be used to analyze the relationship more meticulously between household income and consumer behavior in

Pennsylvania since 1997. There is a possibility that this data could produce different results from those outlined in this paper, as the more precise, exhaustive data could show different trends in the specific categories of goods and services. Another way to further this research would be to investigate data for a longer period of time in Pennsylvania. While the FRED database was unable to provide more years of data, it is possible to explore different database sites that could contribute to evaluating this relationship. Also, this same research objective could be tested in different states in order to see if the established relationship holds true across other geographies. With more in depth and extensive data, this research objective could develop a greater prominence in this field of study.

Study Limitations

As with the majority of research studies, the current study is subject to limitations. One limitation was the lack of available data. While data was accessible on FRED from the years 1997 to 2020, it was only viewable as annual statistics. If this data was available in monthly statistics, for example, then there would have been a larger data set; thus, producing more precise results. Another limitation can be seen in the data profile. Even though this study was conducted specifically on households in Pennsylvania, other important and influential factors of those households, such as the number of income providing adults or the number of children, were not taken into consideration. These factors could either positively or negatively impact consumer behavior for various reasons, and, as a result, influence the identified relationship of this study. An additional limitation could be the fact that all of the data was collected from only one database. While the data was exactly what was needed for this study, it might have been more beneficial to get data from a variety of accredited databases. A final limitation to this study was time. With more time, this study could have been taken further and done in more depth, which

potentially could have addressed some of the aforementioned future directions. Ultimately, the limitations of this study can be resolved and applied in future research to facilitate a deeper understanding of the relationship between household income and consumer behavior.

Conclusion

The basis of this research was to determine the effect of household income levels on the consumer behavior of residents in Pennsylvania using annual data from 1997 to 2020. After performing statistical analyses, it can be concluded that real median household income does, in fact, have a direct effect on consumer behavior in PA. This relationship resulted in rejecting the null hypotheses for all correlation matrices and regression analyses that were run in this study. All data tests indicated statistical significance between the variables. It was made evident that an increase in household income would result in an increase in consumer spending on both goods and services. The log return regression analysis produced beta coefficients that indicated an inelastic relationship between the variables, which conflicted with the results of the other data. This trend was clear throughout all analysis, reflection, and discussion of the variables and their relationship; thus, it can be confirmed that household income has a direct, positive, moderate effect on consumer behavior at the 95% confidence level.

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KILSARY ABREU

CHRISTINA DIGIOVANNI

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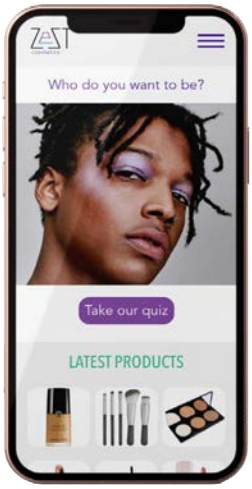
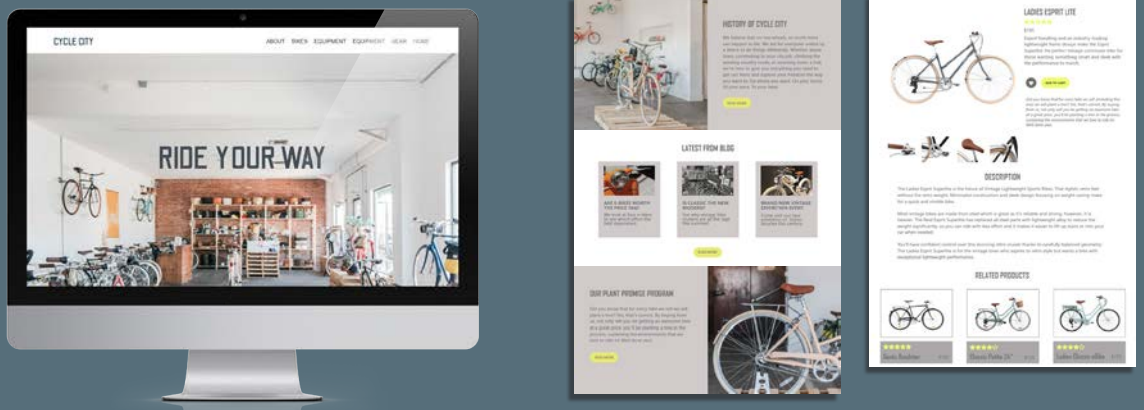
cosmetics



SOPHIA GOUSSETIS



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