

University of Washington Bothell

The CROW

Campus Research and Observational Writings

VOLUME FOUR

Spring 2019

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The CROW

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This publication is courtesy of the University of Washington Bothell, the UWB Club Council, and is funded through Student Activity Fees.

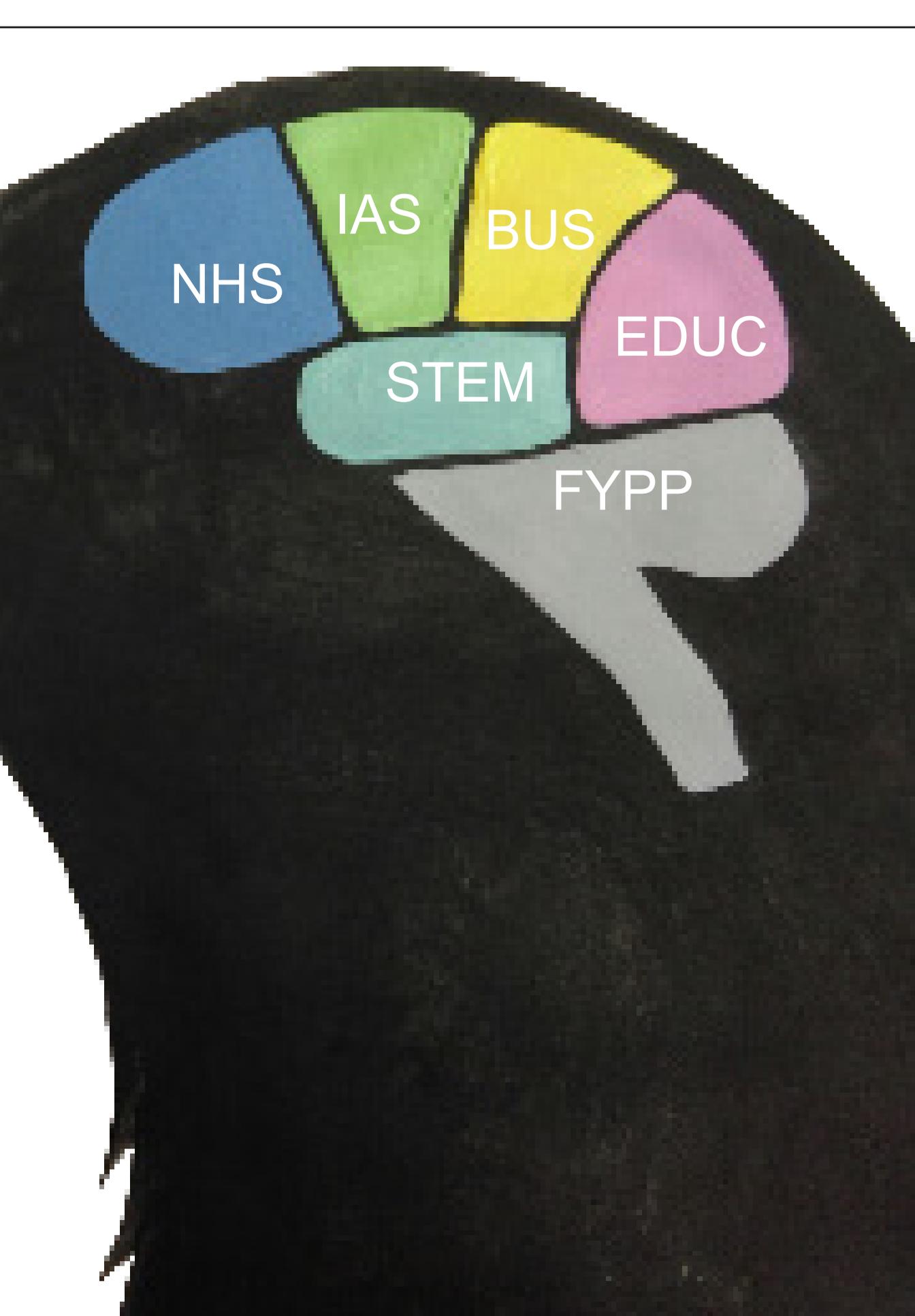
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LETTER FROM THE EDITORS

The CROW showcases the initiative and commitment of students at the University of Washington Bothell to engage in their own research endeavors. As the reader, you will discover a myriad of topics ranging from the biological sciences to interdisciplinary arts and beyond. The multiple submission types and diverse writing styles are likely to capture the interest of any reader. Conducting research is a dynamic, influential learning practice promoted throughout the University. Research solidifies learning outside of the classroom setting by allowing students to think critically about the topics they desire to explore, and to practice producing knowledge for themselves and others. Having their research published will forever preserve their work while also transforming it into a powerful tool to be used by the next generation of academics. By taking the monumental and often daunting step of participating in the peer-review process, the authors featured in this journal have emerged as contributors to the academic discourse of their particular field of study. The Editorial Board was privileged to have the opportunity to review all of the incredible submissions this year. The selection process was undertaken thoughtfully with respect and sensitivity for all of the insightful, articulate submissions we received. We sincerely thank and commend all of the students for the dedication they put into their research and to everyone who submitted their work. We also thank the faculty and staff mentors who foster students' passions and talents. In this volume we proudly present the work of a growing research community.

A stylized graphic of a human brain, rendered in a dark grey/black color. The brain is filled with several colored, irregular shapes representing different regions or sectors. Each shape contains a white acronym. The acronyms are: NHS (blue), IAS (green), BUS (yellow), EDUC (pink), STEM (teal), and FYPP (grey).

NHS

IAS

BUS

EDUC

STEM

FYPP

THE EFFECT OF BPA ON GENE EXPRESSION

Rachel Calder

ABSTRACT: The levels of the plastic chemical bisphenol A (BPA) that leach into food via plastic in packaging have been deemed safe for public consumption in a final report by the FDA (2014). However, scientists have recently begun studying how BPA affects gene methylation. Gene methylation occurs when a methyl group (CH₃) blocks RNA from reading the DNA code which causes the gene to be switched “off.” When genes are not methylated, the gene is not blocked causing the gene to be turned “on.” RNA can then use the DNA as a template to make proteins and other structures in the cell. Therefore, the gene is expressed. Methylation is a way for the body to control when the DNA template is read so that the function of the DNA is only expressed when needed. BPA toxins absorbed in the body are found to cause gene demethylation where genes are then overexpressed. Such a result can be a problem when heavily regulated genes are affected. For example, cancer can occur when genes coding for replication and growth are not controlled by methylation. Many scientists have quantified these effects, but their focus is isolated on one gene where implications are only applicable to that gene. This review compares the percent of methylation change of genes between four studies before and after the treatment of 50 µg/kg of BPA: Sox2 whose protein regulates embryonic development (Prins et al. 2017), β-Casein whose protein is found in milk (Altamirano et al. 2017), PGC-1α whose protein regulates cell metabolism (Jiang et al. 2015), and Dnmt1 whose protein produces methyltransferase (Ma et al. 2013). Sox2, PGC-1α, and β-Casein showed a decrease in methylation percent after treatment (Prins et al. 2017; Jiang et al. 2015; Altamirano et al. 2017). Dnmt1 was found to have increased in methylation. Ma et al. (2013) suggested that since methyltransferase causes methylation, a decrease in methylation could coincide with an initial decrease in methylation of Dnmt1. These findings support that BPA does decrease gene methylation. These findings could persuade the FDA to consider new regulations for standardizing BPA use. This knowledge also informs people’s decisions on whether or not to avoid products containing BPA.

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COSMIC STRINGS: THE CRACKS IN THE UNIVERSE

Hannah Preisinger

ABSTRACT: This research editorial covers the topic of cosmic strings, theoretical one-dimensional faults in space-time formed in the immediate aftermath of the Big Bang. Of particular note are oscillating cosmic string loops, which produce gravitational waves detectable by instruments such as LIGO (Laser Interferometer Gravitational wave Observatory), and gravitational lensing, a visual distortion of distant objects potentially caused by the interference of cosmic strings in the foreground of images. While conclusive data on the phenomenon remains elusive, the potential insights into cosmology, particle physics, and other fields keep the search alive.

Introduction

The inception of the theory of cosmic strings can be traced back to Descartes' model of the cosmos, in which planets swept through space along a great vortex-line that lay perpendicular to the plane of the solar system (Vilenkin & Shellard, 1994). Although this particular theory was quickly shot down by Newton and other scientists of the time, more recent developments in cosmology have revealed that supposedly "empty" space is anything but, prompting inquiries into the nature of the void and the possibility of "topological defects" in its fundamental makeup.

Cosmic strings are one-dimensional faults in space-time, a theoretical result of the Big Bang and its immediate aftermath. In much the same way that water undergoes a "phase transition" from liquid to solid when sufficiently cooled, the universe was fundamentally altered by the immense decrease in temperature which occurred after the initial heat of the Big Bang (Naculich, 2003). The theory goes that this process of phase transition caused three of the four fundamental forces of nature (strong, weak, and electromagnetic) – which once were unified as one force – to split into their current separate states. This phenomenon is known as symmetry breaking, and it is believed to be the cause of

the long, thin fissures in space that have come to be known as cosmic strings (Naculich). Another way to describe the concept of cosmic strings is to think of them as a region of trapped potential energy density, one which can be moved around but never truly spread out or eliminated.

If the recent theories are correct, we would expect cosmic strings to have started off chaotically tangled in the compressed early universe, only stretching out later as space itself expanded. As part of this outward movement, some of the strings would inevitably cross and intermingle with others, creating separate, broken-off loops, like rubber bands. These cosmic string loops and the "cusps" they form are the key to further study of this theory, as the oscillating loops are the aspects of cosmic strings possible to detect from here on Earth (Moskowitz, 2013). Much like the merging of two black holes, cosmic string loops oscillate and produce "ripples" in the fabric of space-time – gravitational waves. Mechanisms such as LIGO (Laser Interferometer Gravitational wave Observatory) can be used to search for these elusive indicators of cosmic string cusps (Aasi et al., 2014). The LIGO-Virgo collaboration has searched through data from 2005 to 2010, seeking evidence of these mysterious loops by collecting signals from the skies and mapping them to models of what the loops' emitted waves

may look like. So far, scientists have been able to estimate a minimum and maximum tension in the cosmic strings sweeping through space, a major step towards pinpointing and studying them more directly (Aasi et al.).

Another potential method of detecting the presence of cosmic strings is to search for gravitational lensing, a visual distortion of distant objects caused by strings curving space-time between the viewer and the object. One example of this phenomenon was observed in the mid-1990s, when the image of a double quasar near Ursa Major behaved strangely; normally, the image is split in two by the gravity of an enormous galaxy located between the quasar and Earth, causing the two images to vary in brightness 417 days out of sync with each other. But during this unusual window of time, the brightness of the two images pulsed in sync with each other several times over the span of a year (Schilling, 2005). A US-Ukrainian team of scientists studying the phenomenon announced in 2004 that according to their calculations, “it is difficult to propose a less exotic model” for the anomaly than gravitational lensing caused by a cosmic string loop close to our galaxy (Schilling). In addition, a Russian-Italian team found an even more compelling object of study in the constellation Corvus – the image of a distant galaxy split into two oddly similar, undistorted copies, a behavior entirely different from normal gravitational lensing (Schilling). This strange duplication is part of a series of similar anomalies littering the surrounding region. It seems very much as though a cosmic string may be stretched out across the foreground of this area, causing the chain of distortions, though the data is still inconclusive (Schilling).

Given their theoretical origins in the early stages of the universe, observing the geometry of a cosmic string network stretched across space-time could lend enormous insight into the topography of the cosmos. Additionally, since they possess a strong gravitational force, cosmic strings could be responsible for everything from black holes to the structure of gigantic galaxy

clusters. And, of course, the proper detection and study of cosmic strings could help establish a solid theory of elementary particles themselves. In short, these enigmatic cracks in space-time may be elusive, but their untold potential makes the search well worth the effort.

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EDUCATION FOR NATIVE AMERICANS – HELP OR HINDRANCE?

Joyce Chester

ABSTRACT: Native American students taught using a Euro-centric educational curriculum/model continue to fail out of the PreK-12 system. We will explore how devaluing Indigenous culture, yet maintaining the expectation that Native American students will thrive and graduate, are harmful and ineffective. How can relationships between teachers and our Native students, with respect for and consideration of Indigenous culture, lead to student success?

Introduction

Native American K-12 and Post-Secondary students who are enrolled in schools across the nation continue to struggle. The number of Native Americans graduating from high school is 69.1% (Adams, 2013). If the percentage of white students was this low, there would likely be a resounding outcry across the nation, trying to ascertain the cause and find a solution. While we strive to have equality in the classrooms, research still supports that our students of color, more particularly our Native American students, are graduating at lower rates. So, one can assume that racism and skin color still matter. What is seen on the outside isn't so important as what is inside. The color of our skin or the percentage of our blood should not be considered, it is what is in our hearts (Bray, 1999). People tend to judge by what they see, such as the color of our skin. There are many factors that will continue to be a problem if they are not addressed. For example, if students are not successful in school, there is a high possibility that they will live in poverty and earn a median annual income of \$33,627 a year (Flynn, 2014). They also will have a higher chance to be involved with criminal activities such as selling illegal drugs (Keith, 2016). Native Americans are more likely to live in inadequate and unhealthy housing, die from motor vehicle incidents, binge drink, smoke, and suffer from

higher suicide rates (Keith, 2016). At the post-secondary level, current estimates indicate Native American students represent 1.1% of the total U.S. college and university enrollment (National Center for Educational Statistics, [NCES], 2008). It is important for this dilemma to be resolved because it is negatively affecting Native American students, their families, and deleting their native cultural values. It is essential to preserve the cultural history of our country that we still do not know much about before the white settlers colonized the country. There needs to be a drastic change in the educational system so that educators are effective in closing the opportunity gap for Native American students. Such changes include, showing acceptance and fairness, helping them adjust to mainstream school, teaching students how to navigate the educational system, how to seek resources available on campus and communicate with their professor, and adjusting from tribal to post-secondary school.

Definitions of Relevant Terms

The terms referred to in this study are defined as follows:

- Assimilated- To take upon oneself the culture or tradition of a given community.
- Bachelor's degree- A degree obtained after successfully completing 120 semester/180 quarter credits that fulfill

program requirements.

- Caribou- A large reindeer that is widely hunted in Alaska.
- Disengagement- A process of withdrawing into a particular group or situation.
- ELL- English Language Learner.
- Native American- Refers to a member of an indigenous people in the United States.
- Pedagogy- A method or practice of teaching an academic subject or theoretical concept.
- Post-secondary- References to any education beyond high school.
- Reservation- Denotes land set aside by the American government on which Native Americans may live.

Acceptance and Fairness

Many Native American children dream of achieving academic success. They begin their educational journey with a sense of hope, adventure, and excitement but they exit twelve long years later treated as second-class citizens, unintelligent, unable to compete or cope, lacking job training or workable skills, unprepared for higher education, leading lives of hopelessness, alienation, joblessness, homelessness, and despair (Bray, 1991). This is not what the parents of these students thought they were signing up for; they had high hopes for their children, and the students had their own dreams to complete high school. The educational system is letting them down. Much of this is due to the lack of equality in the education system. For example, many schools on the reservations do not have school buildings that are fit for learning, up-to-date school books, or credentialed teachers. Teachers on the reservation lack the training to teach students in the way they can learn best (Bray, 1991). The educational system is failing to teach these Native American children the essential skills of reading, writing, math, and thinking for themselves. Prejudice from the local communities has hurt these Native American children while they are in the greater

public. Basic needs for these Native Americans are not being met, so they have a harder time learning what they are being taught. School boards need to hire leaders, not managers (Bray, 1991). Leaders need to encourage those working in education to set policies, and not necessarily worry about the day-to-day operations in education. They need to let the educators educate and let the administration set up a system that encourages the staff and students to work as a team, one that helps the students be active learners who love to learn.

Adjusting to Mainstream Schools

The dropout rate among Native Americans and ELL students in the education system is high across the board (Houseman, 2002). Most Native American students have their native language, so they are also considered ELL students. A higher level of adaptation is necessary for culturally and linguistically diverse students. There needs to be some connectivity between student and teacher relationships that includes their families. This allows more responsive connections, where families feel valued and respected, and are more willing to work with the teacher in educating their child. Family and community engagement helps students foster a greater sense of individual and cultural identity. Curriculum and textbooks are not written to include Native Americans in a favorable light. Bilingual students need to be viewed as assets, not deficits. Teachers' attitudes need to change and not call the white students real students (Houseman, 2002). Anyone who is learning, no matter what level, is a student. An idea of changing high school from a 4-year term to a 5-year term has been proposed (Houseman, 2002). This could help students feel more successful in completing their high school career. Teachers need to be better trained to deal with students and their cultures. Teachers need to portray respect and appreciation of each of their students' cultures in addition to simply teaching them the course material. They also need to be

able to tell the difference between language barriers and cognitive barriers (Houseman, 2002). A language barrier is not being able to understand the rules of English, whether it be writing, or speaking. Cognitive barriers could range from autism, Down Syndrome, or attention disorder. Educators need to be able to decipher if it is a language barrier or cognitive barrier, or both that the student is struggling with, so that they can deal with each issue separately. District leaders need to raise the level of teacher expectations, create additional training days for professional learning, and have teachers who are experienced in working with ELL and Native Americans to assist their peers in developing culturally responsive pedagogy. Another suggestion is to track students even after they leave their school, to track how they can encourage and support these students. All levels K-12 need to be equal, not separate, by not just passing students in the lower grades, then holding them to higher standards in high school level. As educators we need to consider how we can change the curriculum to the level that each student is at. Assistance needs to be offered to teachers in order to show them how to help their students to be able to learn how to learn. Teachers need to be held to a higher standard to help their students to feel more successful in the classroom. For instance, face-to-face connections with Native American communities can show improvements. Schools and families need to work together to make a stronger community. This dangerous trend of high number of drop-outs needs to be reversed.

Unteachable to Understanding

Any teacher that is asked if they let down the Native American students in their school would deny it. Due to the current institution of the education system, the predominance of students who are able to successfully navigate it are white. An illustration of this involves a Native student that was initially labeled by the school faculty as being unteachable. His parents had

moved him from school to school. Eventually, they moved from Canada into the United States. When this Native American student got to the new school, word spread that he was not teachable, so not a single teacher wanted him in their classroom. In the first class where he was placed, the teacher said he was not a good fit for her room. Eventually he was placed in a classroom with a different teacher. That teacher then learned about the student's native culture and wrote a story about a coyote because that is what the student understood (Clifford, 2001). This was a lesson to learn about culture, and the work educators need to investigate diligently, so we can reach all our students in the classroom. Most teachers are not trained in teaching Native American students. They do not know how to respond to them or encourage them because they have not been trained to know their culture, so there is a disconnect between the teachers and Native American students. For example, in native culture, children are taught not to make eye contact with those in authority, yet this could be misconstrued in the classroom as the student being disrespectful to the teacher if the teacher does not understand the student's cultural norms. A teacher could view this as showing disrespect to an adult. If the teacher does not know this, it would probably be followed up with a disciplinary action.

Tribal to White Postsecondary

American Indian acculturation from tribal lands to predominantly white postsecondary settings can be a culture shock. In the article *Whatever Happens to Him Happens to Us: Reading Coyote Reading the World*, Patricia Clifford examined the stress that Native American students experienced at their schools, whether it was just fitting in or understanding how to just get by with passing grades in school (2001). The article details how Native Americans are impacted by racist attitudes and the historical trauma they face while adapting to white culture. The loss of their native culture

has an impact on these students and their families back at home. The students interviewed in this study shared about the presence or lack of support they received from home, such as not responding to a graduation invitation. They also discussed what information they shared with their families, or if they withheld information altogether. Many family members at home felt prideful about their students but also jealous of the opportunity they had (Flynn, 2014). Family members have mixed emotions, making isolating and divisive remarks to the students in the family such as, "Oh, you think you are better than us?" (Clifford, 2001). Students rely on self-motivation to keep up their studies at school as well as encouragement from their families back at home. The families tell students to not come back home until they are done with their studies. Students often lack financial support from home. They shared experiences of how they adjusted to the new opportunities they have and how it helped and/or was a struggle. As Keith (2016) stated, only 1.1% of students enrolled in college are Native American, with only 15% of Native Americans having a bachelor's degree compared to 55% Asian/Pacific Islander, and 33% for whites. Having a bachelor's degree might lead to more stable careers, jobs, and higher income.

There are many factors that lead to Native Americans being unprepared for the education system. For instance, they often have a hard time adjusting to the academic community, frequently have problems with self and family, cultural differences, isolation, and money issues (Keith, 2016). One huge factor can be the inability of a Native American student to be able to communicate fully with the advisor, counselor or teacher. In these situations, the staff should set up one key person on staff that can help the student navigate the educational system who is more aware of their needs, wants, and struggles. Also, Native Americans need to know their strengths and use those to help themselves be successful academically. We need to realize many of these students' parents have not gone

to college and either do not encourage or do not know how to support a student going to college. The parents who were sent away to boarding schools were often taught things that tainted their view of their education as well as their children's education due to the quality and methodology of their instruction. Some of the rules these parents were often told: 1) Let Jesus save you, 2) Come out of your blanket, cut your hair, and dress like a white man, 3) Have a Christian family and have one wife, 4) Do not go to Indian dances or to the medicine men (Adams, 2013). For the parents who were forcibly taught these rules, it is often difficult to encourage their children to go and be taught these same rules; they fear that this education will also strip them of their Native identity and culture. In order to allay these concerns, students should be put in touch with another student that was successful and hear their story. Additionally, some Native American students who refuse to assimilate have a harder time adjusting in college. Some Native Americans tap into their strengths and engage in both cultures. If a college does not make Native American students feel like they belong, they will sense that. We need to improve the availability and accessibility of clubs or groups that help students feel more comfortable and provide them with support and resources to set and achieve their goals. Teachers need to check to see how Native American students are dealing with the following: racism, discrimination, isolation, separation, and not adjusting to their environment. For example, it is important to set up an early intervention team if a Native American student is having trouble with attendance or failing grades. Staff, such as advisors, should ask ahead of time what it looks like for a Native Americans student when someone is encouraging them in order to be able to set up support systems that will be effective for each student. Reading material and analyzing data are important but having a personal connection can speak louder than the studies we have heard about.

Personal Experience

My personal experience and that of my family members falls closely in line with the research and other students' experiences detailed above. Two of my older siblings were sent away to a boarding school when they entered high school, because the reservation we lived on only had a school for K-8th grade. At first, my parents thought this would be a good thing, yet when my siblings came home for Christmas break, they had changed in ways that were a complete shock to the family. My brother had to cut his shoulder length hair, they both had specific clothes they had to wear, and the school had gotten rid of the clothes they brought with them. They would not indulge in the caribou that my mom had cooked for their homecoming dinner. My siblings said at the boarding school they were told that they could not eat meat that was caught by a family member. They also wanted to go to church much more often than we normally would go as a family because they were told they could lose their salvation and be condemned to hell if they did not. When they had to go back to the boarding school, they brought nothing that would label them as Natives because it would be taken away and others would make fun of them. Decades later, my brother has totally embraced the native culture and is not ashamed, whereas my sister vehemently rejects anything that has to do with our native upbringing.

I witnessed all this unfolding, so when we moved to the city where there was a high school, I was very withdrawn from other students. I did not want others to make fun of my culture. My older sister taught me what to share or not share with my peers so that I would not be ridiculed. I lived my life in two entirely disparate worlds. At home, we lived like we had on the reservation, but at school we assimilated to fit in culturally with the majority of the students in our school. The school staff and my parents did not see the change in me, but I knew that I had to change or else I would be made fun of. As Sheets states, students from non-dominant cultures may feel

pressured to disavow themselves of their cultural beliefs and norms in order to assimilate into the majority culture. This, however, can interfere with their emotional and cognitive development and result in school failure (Sheets, 1999).

The remnants of those experiences continue to have an effect on me to this day. At times, I tend to hold back and not let people know I am a Native American, although on other days, I couldn't care less if people know I am a Native American. I struggled in school because I lived in fear. I did not want to be made fun of because of the color of my skin, therefore learning was a struggle. Many times, the teachers would just give us a passing grade, so we would be passed on to the next teacher and the next grade. When I was 34 years old, I decided I would go to college. I had to take an entrance test, which showed all my levels were below the 7th grade level. I had to put in a great deal of extra work for three quarters in order to get every subject up to college level.

After all of the struggles and changes, my grandma, if she were alive today, would disown me if she knew I married a white man. She would say that it shows clearly that I am ashamed of my heritage. Growing up with this thought in the back of my mind, I continually lived with this strong need to hide my culture. I then passed this desire to cover up my identity down to my children. After coming to grips with the need to not live in shame and to be proud of who I am and where I am from, I now embrace my culture and encourage my children to do the same. As U.S. American educators, we should embrace all cultures and help all students realize the importance of being accepting and educating all cultures. To be educated and to be able to accept each other's differences would prove we are truly the land of the free.

Concluding Remarks

As shown by numerous studies, Native Americans have a record of not being successful in K-12 grade and in post-secondary schooling.

There needs to be a change in the educational system. Teachers need to be trained appropriately so they can reach their Native American students. If this trend does not come to a halt, we will continue to hurt future generations of the Native American tribes who seek success and achievement in the current educational system. Forcing Native Americans to assimilate to white culture does not make it right. We must accept Native Americans and other cultures as equally important parts of our educational system. When we do this, it will show the unquestionable benefits of standing as an educational system that truly embraces all cultures, learns to reach them, and shows educators care about supporting all students regardless of any differences they might have.

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USING SCI-FI TO OBSERVE THE EFFECTS OF SOCIAL MEDIA AND REALITY TV

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ABSTRACT: Science-fiction has a reputation for doing two things remarkably well. The first is creating commentary on present-day societies, and the second is being eerily good at predicting possible technologies and societies. This paper utilizes pieces of science-fiction from various mediums in order to establish an observable pattern amongst writers in the genre today, and what these pieces say about the current state of two media forms: reality television and social media. As well as questioning whether the ubiquitous presence of reality television and social media are perpetuating the normalization of using others as our own personal entertainment.

Introduction

There is a large group of people that aren't afraid to voice just how much they loathe reality television for being trashy or stupid, while it may at times be those things, it's also practically a human tradition. We've been on the edges of our seats watching the successes and failures of others for ages. Reality entertainment is nothing new. No matter how many actors, stand-up comedians, and other performers offer to provide us with entertainment there is a strong collective desire for real people. The perfect historical example is the Roman Colosseum; even if the events that took place in that stadium are far more gruesome than what can be found on today's televisions.

In all fairness, the Colosseum wasn't all that dissimilar to the sporting events of today, where we flock in droves to stadiums or gather around a television to watch athletes prove their physical abilities in competitive and at times aggressive formats. The viewing of real people in perilous activities hasn't ended, they have merely been transformed to meet modern society's ideas of what is acceptable. Most often with the addition of a little padding and an official to enforce a few rules.

However, television isn't the only place to go for reality entertainment these days. The internet and social media by extension have created a place where we don't have to wait once a week for episodes to view the latest installment of "real

people." Social media has created a place for any ordinary person to display their talents and abilities for the world to see without the need for permission from producers, casting agents, and the like. Powerhouse social media sites like YouTube and Twitch have more or less built their platforms around the idea of average people presenting their lives online for others to see.

This proliferation of content both online and on television that observes, judges, and analyzes everyone from top celebrities to random people on the street continues to normalize the age-old habit of viewing others for entertainment. The internet practically surrounds us. It is not an easy task to find yourself more than a few feet away from some kind of screened device whether it be a computer, phone, or tablet. It's these ideas that science-fiction writers in many mediums appear to be contemplating lately. Are the ubiquitous presence of reality television and social media increasingly perpetuating the normalization of using others as our own personal entertainment?

Literature Review

The Netflix series *Black Mirror* is a show that contemplates possible bleak technological futures based on the more regrettable facets of human nature. In fact, Charlie Brooker and Annabel Jones the original creators of *Black Mirror* originally pitched the show as, "Modern parable stories around the theme of social media, technology, and AI advances," (Inside, 2018).

The series includes two vastly different episodes “Nosedive” and “White Bear” that respectively tackle social media and the idea of using others for entertainment through social media.

In the episode “Nosedive” people appear to be even more dependent on their phones than society today is. All characters appear to be on the same social media site (Whether by choice or by force is unclear). On this site, not only are you able to post images and statuses for people to rate on a 1-5 star scale, but the users can be rated by others based on real-life encounters. Phones appear to detect one another allowing users to easily rate anyone they’ve come into contact with, without the need to search for others or even know their name. All of these ratings are compiled into an average user score. Those below a certain ranking in the episode find it difficult to receive service in most business establishments, and when the characters are able the service is sub-par. On the other hand, those with higher ratings often see perks and rewards coming their way. Throughout the episode characters are seen using various behaviors in an attempt to receive better ratings from the people around them. Behaviors range from giving hollow compliments, to trying to discretely align themselves with people of desirable rankings. Others are a little more blatant about their intentions are seen offering food items such as smoothies and cookies to one another for a little boost to their social media statistics (Nosedive, 2016).

Meanwhile, the episode titled “White Bear” portrays a woman named Victoria (Lenora Crichlow) seemingly waking up with amnesia (White, 2013). She fumbles about in confusion only to quickly find herself being chased by homicidal mask-wearers. She sees dozens of other people throughout the episode and frequently asks for their help, only to be met by silent gawking and picture taking. As the day unfolds, a mystery woman offers aid and brief explanations to Victoria. Despite the woman’s aid later on Victoria is caught by the frightening mask-wearers and tied up anyway, where she begs for mercy declaring her humanity over and over

again. It is then revealed to her that the entire day was orchestrated. Anyone who spoke to her was an actor, and the people taking pictures on their phones were paying audience members. This is her daily punishment for having taken part in the murder of her own child. Victoria is then paraded past all the paying tourists in one last shameful act before being injected with a drug that not only puts her to sleep but wipes her memory of the day (White, 2013).

The Fox Network show *The Orville* aired an episode in their first season titled “Majority Rules” with a rather similar premise to that of “Nosedive.” Although “Majority Rules” takes the idea of user ratings a step further. Space travelers from Earth (a few hundred years in the future) visit a world that is described as quite similar to 21st century Earth. In this world up-votes and down-votes are not displayed on a social media profile, but on a badge that every person is required to wear by law. The people of this episode, as in “Nosedive,” find it difficult to receive business if they have too many down-votes. But worse yet, if at some point they have more than 1 million down-votes they’re arrested. Instead of going to court anyone arrested must go on an “apology tour,” wherein the defendant must appear on a number of television talk shows and discuss what happened with the host(s), and of course, apologize. Viewers will then give the person an up-vote if they believe the given apology was sincere or the person to be likable. If they do not believe this, then they give the person a down-vote. If at the end of the tour, the defendant has gotten 10 million or more down-votes, they are given “social correction” to “pacify” them. (Which is really just an electric shock to the brain substantial enough to make a toddler seems more cognizant.) If the defendant has less than 10-million down-votes then they are free to go home. This is the method of all governmental decisions in this world. One character goes as far as to call the judicial system, “Government by *American Idol*” (MacFarlane, 2017).

The Orville is meant to take a more optimistic view of possible futures than shows such as

Black Mirror. Even the episode “Majority Rules” provides an ending that leaves the audience hopeful that perhaps change will happen for the better on the planet where the episode takes place. The creator, Seth MacFarlane, says that most science-fiction written these days is dystopian, bleak, and defends his own show by saying, “There is some space for aspirational” (Moraes, 2017). Yet, despite the show’s more hopeful viewpoint we still see it providing similar lenses and claims that the darker and bleaker science-fiction have when it comes to social media and reality entertainment.

While *Black Mirror* and *The Orville* both take place in the future, the novel *An Absolutely Remarkable Thing* takes place in a modern-day United States. The novel was released in October of 2018 and uses science-fiction to provide thought-provoking commentary on social media use today (As well as a number of other things). The book is written by Hank Green, a social media influencer who made a name for himself on the platform of YouTube. This, of course, gives an interesting weight to the scathing self-reflection the main character April has on her own usage of social media. Especially when the author admitted online via Twitter that April was quite similar to himself by saying, “People who think April May is a deeply unlikeable character, I have bad news about.....me,” (hankgreen, 2018). In the story, April finds herself suddenly and unexpectedly catapulted into online fame after going viral. This occurs because she and a friend happen to be one of the first people to post about seeing an other-worldly-statue. As engrossing as this alien statue should be a large portion of April’s focus (and therefore the story’s focus) is on her desire to maintain an online presence. The story shows just how quickly she becomes consumed with updating her Twitter and YouTube pages, even though, far larger events are taking place in her life.

Discussion

Gamification in Social Media

“Nosedive” looks closely at the gamification of

social media and how intrinsically we’ve allowed these sites to become woven into our lives. Gamification is defined as “The process of game-thinking and game mechanics to engage users and solve problems” (Zichermann & Cunningham, 2011). Users find themselves being engaged with gamification on most, if not all, social media sites these days. Their success on the site being measured in statistics, gaining credibility, digital rewards for passing certain milestones, etc. are all forms of gamification.

In the story of *An Absolutely Remarkable Thing*, April is a prime example of someone who becomes addicted to social media through gamification. She pushes important people in her life away from her to focus on cultivating her online presence. At one point shortly after creating her first social media account the main character says this: “I had also been building my Twitter following... I had also developed a new and voracious interest in growing my number of Twitter followers, which had become a fun game. My brain liked seeing the numbers go up,” (Green, 2018 P. 42). Whether intentionally or not author Hank Green points to the exact quality that makes these gamified websites work. Later on in the book April is seen cultivating her online presence so carefully that she hires an agent to provide her with advice on creating her online brand. The agent goes as far as to tell April that it isn’t in her best interest to admit publicly that she’s bisexual, but should instead identify herself as a lesbian. April who is more concerned about her numbers than her truth puts aside the qualms she has with the request and does as she is told. April’s behaviors are not unlike those seen in the real world or even those seen in “Nosedive.” In fact, “Nosedive” also features a character who pays for advice and assistance on how to raise her own social media statistics despite alienating people around her with her new behaviors.

There are app developers that have already tried to create a social media site such as the one in “Nosedive” that allows users to rate one another based on personal experiences. The app not-so-creatively titled *People* includes user

profiles that have ratings and reviews, (Peeples, 2016). Much like an Amazon product page. The creators of this app seem to have been banking on potential users being curious and then quickly becoming addicted to raising their profile statistics; ultimately proving to those around them that they are a good person, or perhaps even worthy of spending time with. The app advertises itself as being good for hiring employees and even deciding on whether you should go on a date with someone (Peeples, 2016). Peeples never did manage to take off, but this app isn't the only attempt made at a human rating system, nor is it likely to be the last. Many people already do their best to associate only with people they believe are worthy of their social circle. An app with human ratings would only make that easier.

Peeples was likely hoping to use the addictiveness of social media to build their business. It's common knowledge that social media is often referred to as being addictive. Many frequent users have admitted to realizing they have in some way attached their perceived self-worth to their profiles and the numbers displayed on them. This gamified system encourages addictive behavior. With every like and comment comes a small surge of dopamine. However, Peeples's advertising appears to have been a bit too transparent, and many people realized exactly what they were doing. Ultimately preventing the growth of the company. Individuals want to have control over what their own profiles say. They want to paint themselves in the best light possible. Peeples made it obvious that the power to tell your story was given to everyone except for you.

Social Media Today

The problem is that despite your best efforts you don't always get to be the author of your own story- even with today's social media. The word of others almost always carries greater weight than your own on the topic of yourself, which is something that both "Nosedive" and "Majority Rules" exemplify clearly. Moreover, "Majority Rules" sheds light on how much enjoyment

people can derive from wielding that type of power.

There are numerous real-life examples of this occurring as well. For example, the boy who is known as Alex from Target. In 2014, a teenager in Texas was working a normal shift bagging purchases at his local Target when a teenaged girl decided that he was cute. Rather than smiling at the boy and walking away as most would do, she snuck a picture of him on her cell phone. However, she didn't just stop there, she posted the image to Twitter. This secret picture almost instantaneously went viral with over 100,000 likes and retweets. Before Alex's shift had even ended the line at his register had become oddly long with a blatant demographic skew of young women. It wasn't until Alex went to the backroom to check his phone on a break that he realized he was now internet famous. In the following days, he would be offered everything from modeling contracts to movie deals, all because the internet deemed this 16 years-old worthy. The only offer he ever accepted was an appearance on the *Ellen Show* (Bilton, 2014).

In Alex's case having a profile and existing on the internet didn't matter, he had about a hundred followers that probably didn't think much of his posts. However, because somebody else made a point to inform the online sphere of his (apparently) wonderful existence he became a sensation. Alex's story is one of the rarer positive stories, though he didn't really seem to enjoy the sudden catapult to fame, nor was the internet entirely kind to him. Other people such as Plane Bae haven't fared as well, and more clearly exemplifies the warnings that science-fiction entertainment appears to be issuing.

The story of Plane Bae took place in the beginning of July 2018. A woman named Rosey asked another woman to trade seats with her on an airline flight so that she could sit with her boyfriend. Rosey joked that if the woman made the switch she may end up sitting next to the love of her life. The second woman complied and moved to the row in front of the couple. Much to Rosey's excitement the passenger

that took the seat beside the second woman was a rather attractive man. What proceeded to happen throughout the flight was Rosey and her boyfriend avidly watching and live-tweeting the actions of the two strangers in front of them. She reported that they both appeared to have similar interests saying “They’re both personal trainers. They have touched arms a few times. “They are both vegetarians” (Hater, 2018). These updates were also accompanied by candid pictures of the two people and went as far as to inform the general internet that the two strangers went to the bathroom at approximately the same time. Rosey also admits in one of her tweets that she paid for in-flight internet specifically to keep posting about the two personal trainers (Moye, 2018).

Nobody can know what motivated Rosey’s actions. Was she hoping that the thread would go viral? (It did.) Was she hoping to gain some form of internet fame through the attention her thread may receive? Or was it just the fact that she was so intensely curious about the lives of others that she felt the need to share the goings-on? No matter the motive Rosey is not the first of this kind, and she won’t be the last either. Perhaps we’re so used to seeing “regular” people on display through social media and reality television that we don’t even consider the oddity of taking someone’s picture and using it without their knowledge. Perhaps the fact that we are nearly constantly surrounded by cameras for security and monitoring continues to erode the boundary of discretion in our minds.

Understandably the woman whose pictures were taken on Rosey’s airplane was rather upset. She felt as if her privacy had been invaded. In response, the posts were all taken down, but other people had already used the images in articles and shared them online. They’re on the internet forever now. They’re even cited in the very reference section of this research.

Digital Mobs

The episode “Majority Rules” contemplates the real-world repercussions that can come of actions taken online. Even further it reflects the sheer amount of entertainment people receive

from watching and participating in digital mob scenes. Constantly throughout the episode, people are watching talk shows that are part of the apology tour. There are live feeds on screens in every direction that show exactly what people are saying about the latest person to be put to trial. These down-voted people are what everyone is talking about. They are the daily news in this world.

The episode contains some rather on the nose comments from the outsiders observing this world. Since the world in this story is driven by social media anyone and everyone can have an opinion on any topic, knowledge or experience is unnecessary. One character points out the flaw in this system by describing it as, “Confusing opinion with knowledge,” (MacFarlane & Gates, 2017). Another character asks a native of this social media and reality entertainment driven world, “With so many voices how do you filter out the truth?” To which the woman responds with a succinct phrase, “The majority are the truth,” (MacFarlane & Gates, 2017). Which, as far as Twitter is concerned, seems to be about right.

Twitter has increasingly become the place to go to for finding out what the verdict is in the court of public opinion. “Majority Rules” has merely taken this statement and applied it in a more literal sense. These opinions on Twitter may be innocent ones such as whether or not a movie is any good, but all too frequently they’re about people. It can be celebrities, but it can also be an average everyday user. Anyone is fair game and you never know when the internet’s attention may be turned towards you. There are dozens of accounts where people have been fired or harassed due to a mob on Twitter. Users will sometimes discover a single piece of information about a person or read a single tweet from them and collectively decide that this person needs punishment. Often this results in Twitter trending topics, personal information of this user being sought out and shared online, and screenshots of the questionable tweet sent to the user’s boss or company of employment. Sometimes it seems

fair and necessary, such as when food servers admit to and even post pictures of contaminating customers' food (11 Tweets). Other times the situation appears to be far less black and white.

For instance, there have been a number of people fired for actions and comments made entirely unrelated to their work. Instead of attempting to educate this person on why their remark may be hurtful, ignorant, or offensive the internet screams. They scream loudly. Both in the direction of the user and anyone that may be associated with them, especially if they're in a position of power. One girl in 2013 who wore an admittedly cold-hearted and offensive Halloween costume (that of an injured Boston Marathon runner) ended up having to beg on Twitter for people to stop sending death threats to her parents through the postal system (11 Tweets). This mob demonstrated not only a disturbing mal intent towards people who weren't part of the situation, but those sending the mail were making it obvious they were perfectly capable of following through with their threats by utilizing their possession of the parents' home address.

A far more recent example would be that of director James Gunn, a man most famous for working on both *Guardians of the Galaxy* and its sequel. Up until the summer of 2018 fans adored him, the cast and crew praised him, and Disney was clearly a happy employer. That is until a determined user combed through Gunn's Twitter profile. Once they were almost a decade deep into the profile they found jokes posted by the director that were less tasteful than what Gunn is known for today (Bishop, 2018). The user then took screen-shots and re-posted these jokes for all the world to see. Now that James Gunn is far more well-known than he was when the jokes were originally penned, the content mattered to people. Disney almost instantaneously fired him.

James Gunn is not the same person he was ten years ago. Most people aren't the same as they were ten years ago. But that didn't matter either. Sean Gunn, James' brother even went to Twitter in order to tell people that working on the *Guardians* franchise is in large part what helped

James realize the changes he needed to make in his own life (seangunn, 2018). The court of public opinion does not accept character testimony.

It didn't matter that the tweets were from as far back as 2009. It didn't matter that they were made years before he was ever hired. It didn't even matter that James Gunn had made the Marvel franchise millions upon millions of dollars. The court of public opinion had spoken their verdict, and punishment must follow. Lest the company itself be the next target.

The absolutism of "Majority Rules" and even "Nosedive" echoes perfectly the unwavering decisiveness that can on any given day be witnessed on sites such as Facebook and Twitter.

White Bear

"White Bear" is a prime example of precisely the type of horrifying punishments that could be wrought if social media were given the kind of power demonstrated in "Majority Rules." It's also an excellent example of dehumanization of others for the purposes of pleasing audiences. People revel in seeing the bad punished. Those we deem immoral are dehumanized. They're called animals and savages. It isn't uncommon online to see statuses wishing crimes to be committed against people who have been convicted. Most often people will say whatever crime the person committed should be inflicted upon them to see how they like it. "White Bear" is only holding up a mirror to these base instincts. Asking if this technology creates an echo chamber of similar ideas, and preventing us from critically analyzing these desires.

Victoria, the woman who is being punished in "White Bear," seems to have been singled out for this cruel and unusual sentence. If every criminal was given this disturbing eye-for-an-eye style punishments, there would be criminal theme parks everywhere. The novelty would wear off for audiences. This attraction seems to be unique in this world. But this begs questions. What made Victoria different? Why did she get chosen? The way she is spoken about in the episode makes it sound as if she's widely known.

Social media likely vilified her long before her jury ever came to a decision. This would also explain the eagerness of the audience members to snag a picture- one little girl going as far as to sneak off away from where she's supposed to be in order to attempt grabbing a close up shot of Victoria (Brooker, 2013). Getting a picture of a well-known person/attraction for bragging rights is highly desirable for anyone who wants to get a boost on their social media account. The use of audience members recording her on their phones suggests that her court case was extremely public. People want to add to the narrative. Or perhaps become a small part of it. Becoming a part of someone's torture sounds to be of horribly bad taste to most viewers of the episode. Surely nobody in their right mind, would do that. However, this is clearly the writer's modern adaptation of public executions. Everyone knows that for centuries executions, and even trials were used as public entertainment. A small solace in "White Bear" is that Victoria is not killed.

The Hunger Games and Big Brother

The Hunger Games, a movie released in 2012 based on a book of the same name by Suzanne Collins, provided audiences with another shocking futuristic story of forcing people to be entertainment for the masses. This story follows the character Katniss Everdeen (Jennifer Lawrence) as she is forced by a dystopian government to play in an annual fight to the death (Ross, 2012). The most jarring and horrifying part of this event is the fact that all 24 participants must be children. Once the participants are let loose in what is called "the arena" the children must find ways to survive against the weather, the animals, the traps, and each other. Some resort to making temporary alliances, while others prefer to go it alone. No weapons or provisions are not guaranteed, but if a participant is lucky they may find some (Ross, 2012).

More startling than perhaps anything else is the fact that *The Hunger Games* feels eerily familiar to anyone who has ever watched the real-life television show *Big Brother*. *Big Brother* is a

long-running reality television show that has, in the United States alone, run for 20 seasons. Additionally, this show has many iterations in varying countries. The premise of the show is not unlike that of *The Hunger Games*. Approximately 16 people (referred to as house guests), who don't know each other, are all placed inside of a house. In this house, they are isolated from the outside world, and constantly monitored with video cameras and microphones 24 hours a day for over 100 days. That is if you make it to the end. Over the course of the season house guests are given challenges to test various abilities. These competitions will test players' agility, physicality, intelligence, endurance, and sometimes a combination thereof. Winning different competitions allows the house guests different perks, sometimes it's safety from being evicted from the house for a week, other times it's just the ability to sleep in a soft bed and take warm showers. At the end of each week, the house guests vote to have someone removed from the house (Mol & Roden, 2000).

The Hunger Games stories may use many types of futuristic technology with scenes involving hybrid animal species created for the torment of players, or commonplace holograms. Yet, interestingly, this world isn't all that different from ours today. Television still appears to be a largely important segment of the entertainment industry. People flock to their TVs to view the annual games, the interviews, the fashion, and other periphery events. Much like U.S. citizens gather to watch the Super Bowl with its the pre-game analysis, and post-game press conferences.

The house guests on *Big Brother* may all be more than willing volunteers, but they really do suffer. Being cut-off completely from the outside world stuck in a single building filled with lying and backstabbing is a recipe for disaster. In fact, the penultimate episode in a number of the show's seasons include a Cry Montage. Instead of providing a light-hearted reel of out-takes like most movies and shows *Big Brother* opts to highlight the sheer number of times house-guests burst into tears that they didn't have time to air in

earlier episodes.

Fans of the show *Big Brother* refer to themselves as “super fans.” And these fans adore the ability to change the game through use of social media. Multiple times throughout each season viewers are given the opportunity to vote for what will happen. This can be anything from an advantage, a rule change, or a punishment. Sometimes these changes will affect the entire house, and other times a specific house guest. The end of every season allows viewers to vote for whomever they want to receive the third place cash prize (Mol & Roden, 2000). This mechanic is quite similar to one in *The Hunger Games*, where viewers have the ability to intervene on behalf of players they like by paying money for something useful to be sent to a player’s way (Ross, 2012).

Big Brother may not be governmentally run nor is it as watched as the Super Bowl, but the community around it and the basis of the rules are unnervingly similar to that of *The Hunger Games*. Many people view the dystopian event as ludicrously improbable in the real world, but the creator of the fictional story, Suzanne Collins, doesn’t necessarily seem to agree. Her story seems quite grounded in realities that either have existed in the past or currently exist now. We’ve already completely normalized the idea of socially isolating over a dozen humans every year and watching them fight one another- even if it isn’t to the death.

Conclusion

Science-fiction has always served two functions very well: providing social commentary on current societies and predicting possible futures. The writers of this genre, no matter the medium they use, are aware of this and choose this medium in order to do these very things. Therefore, it is important to consider the fact that there are such similar stories being written about social media and reality entertainment over and over again. Additionally, they appear to be increasing in volume. These writers are noticing trends. They’re applying their knowledge of

human history, human nature, and the world as it is today. The conclusions they’re coming to are all disconcertingly similar.

The addictive nature of social media has made it pervasive. This makes it not only hard to avoid playing the “game” that is social media, but it has also almost made it a requirement to participate in certain aspects of society. This has allowed the problematic aspects of these sites to fester. If you want to succeed in this realm you are encouraged to participate in sensationalism- even if it’s the sensationalism of yourself or the people around you. It encourages constant use, which ultimately allows for the types of behaviors on these sites to quickly and easily become normalized. People who are more susceptible towards these types of behaviors can become so engrossed in improving the statistics of their own accounts that the “real world” suddenly seems to fade away. All that matters is, what lies behind the screens. Because of this fact it’s unsurprising that we’ve begun to see personalities such as Lil Tay and Jake Paul begin to emerge online.

Reality entertainment, though far more ancient in nature, has become even more common than it once was thanks to television, and has in many ways intertwined itself with the ideals of social media. Though reality television seems almost more sinister. It allows for audience members to not only view other people in situations that are uncomfortable or emotionally vulnerable, but it also encourages audiences to enjoy these scenes. It also provides audiences with a narrative that may or may not be true; with editors striving to give viewers someone to love and someone to hate, which ultimately gives viewers even more pleasure when seeing the villainized in positions of distress.

One could say that science-fiction writers are attempting to issue warnings, while this sounds dramatic it doesn’t have to be. The futures depicted in these various pieces of entertainment are all just possibilities. Though it isn’t easy to become self-aware of one’s bad habits and weaknesses, especially collectively as a society, it isn’t impossible. The writers of *The Orville*

even make an effort to create their stories to encourage that kind of optimism. The start may even be simply asking yourself why you watch certain shows and interact with certain online posts. What is to gain personally? What does the person on the other side of the screen have to gain? And what might they be losing?

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THE EFFECTS OF MASS INCARCERATION ON INDIVIDUALS AND COMMUNITIES

Ashley Forsyth

ABSTRACT: Over two million individuals are incarcerated in the United States. This paper examines the negative impacts of incarceration on individuals and their communities. Since most of the individuals affected by high rates of incarceration are people of color, this produces harmful effects in communities of color. The negative impacts of removing individuals from communities and imprisoning them include decreased social control within those communities, higher rates of medical problems, decreased well-being, and relationship problems. Minimizing these impacts is a goal that doesn't address the systemic racism and poverty perpetuated by incarceration. A widespread change in mass incarceration can be achieved through a change in attitude toward race, crime and punishment

In the 1980s and 90s, American lawmakers combined the tough on crime philosophy of punishment with the war on drugs to make prisons a first resort for people who broke the law (Wildeman, 2017). Being tough on crime became an essential platform to running a political campaign, which meant that elected officials competed with each other on how brutally they would be willing to punish people who broke the law. Meanwhile, legislators enacted policies that led to more people being imprisoned over smaller offenses for longer amounts of time. This combination helped to exponentially grow the prison population. Over two million individuals are now incarcerated in the United States, a number that is quadruple the prison population of the 1980s (Blankenship, 2018). This increased rate of incarceration has disproportionately affected people of color and has, in turn, produced more harmful effects on communities of color (Wildeman, 2017). However, incarceration has negative effects on everyone imprisoned and increased incarceration means more people experience those negative effects. Such negative impacts include decreased social control and support in communities, higher rates of medical problems for inmates and their

families, decreased mental and physical well-being, and the disruption of relationships.

While it's true that legislators have passed a lot of new, tougher sentencing laws over the past 30 or 40 years, and it's true that more people have been imprisoned for nonviolent drug offenses, there are other things that play a role in explaining prison growth. The deinstitutionalization of people with mental illnesses, mandatory minimum sentences (long sentences for specific offenses, even for some first-time offenders), and policies such as three-strike laws (life imprisonment for third offenses of even relatively minor felonies) have also contributed to the growth of mass incarceration (Wildeman, 2017). Most people would expect that removing criminals - those who have or would victimize others - from a community would be welcomed by that community, and that residents and their property would be better off as a result (Wildeman, 2017). However, there are consequences that imprisoned people accrue during and after their time in prison, and those consequences come back with individuals to their communities. The United States remains substantially racially segregated in terms of where people live, and it's economically

segregated as well. It's not surprising that poor people of color have been disproportionately incarcerated since the 1980s; it is from these communities that large numbers of felons are removed, and where they return when they are released (Clear, 2008). This constant turnover has a number of negative effects on individuals and communities, as Robert DeFina (2009) has noted:

Excessive incarceration disrupts a neighborhood's informal mechanisms of social control and social support by, for instance, breaking up families, removing purchasing power from the neighborhood, increasing reliance on government support programs, and generally erecting even higher barriers to legitimate development and financial well-being (p. 565).

On the individual level, incarceration might actually decrease mortality and physical morbidity for some groups in the short-term, as prisons and jails are some of the only places in the United States where healthcare is guaranteed by law (Wildeman, 2017). However, the quality of medical care varies from one correctional facility to another, and the protective effects of imprisonment only appear to hold true for black male prisoners (Wildeman, 2017). Compared with the non-incarcerated population, incarcerated individuals experience higher rates of infectious disease, chronic medical conditions, substance use disorders, and mental health disorders (Wildeman, 2017). While mortality declines for black inmates, overall physical and psychological wellbeing is worse for the imprisoned population. It doesn't improve much when an individual is released; past incarceration affects the average prisoner for around six times as long as they were incarcerated, which has potential lifelong impacts (Wildeman, 2017).

These potential impacts can be felt in the lives of people who may never go to prison themselves. Todd Clear (2008) writes that the most commonly expected community-level consequence of incarceration is the control

of crime; that is, communities expect crime to be reduced or prevented when individuals are arrested. However, the crime rate today is around the same as it was in the 1970s, when the expansion of the prison system started (Clear, 2008). This would suggest that higher rates of incarceration haven't resulted in a significant reduction of crime (Clear, 2008). Instead it has had an effect on the children of people who are locked up and their families; it affects community infrastructure. It also affects how safe a community is to live in. Incarceration of a loved one has been shown to decrease socioeconomic status, compromise family functioning, and negatively impact stress levels and mental health (Cox, 2018).

Incarceration also affects social networks, which "are the building blocks of human and social capital" (Clear, 2008). Social networks provide the foundation for informal social control in two ways: parochial and private. Clear (2008) writes that parochial controls are provided by contact with adults in the community whose living circumstances put them in a child's life, while private controls are provided mainly by family members. Theories of social control also propose that communities are made safe when people share an expectation of collective efficacy, or "the degree of social cohesion among neighbors combined with their willingness to intervene on behalf of the common good" (Clear, 2008, p. 107). Community-level processes can bolster social control and potentially reduce crime, but when incarceration removes members of the community, people tend to respond by isolating themselves in ways that undermine the expectations of cooperation and mutual support (Clear, 2008). So, by incarcerating a member of someone's network and community, there is less social support, diminished access to resources for the imprisoned individual and their communities, and reduced informal social control and collective efficacy in the neighborhood from which they were removed.

People living in neighborhoods with high

prison admission rates tend to experience increased mental health problems as they are more likely to meet criteria for current Major Depressive Disorder (MDD), current Generalized Anxiety Disorder (GAD), and lifetime GAD than individuals living in neighborhoods with low prison admission rates (Hatzenbuehler, 2015). Even after adjusting for demographic and neighborhood variables, a higher concentration of neighborhood incarceration is significantly associated with lifetime MDD and has similar effects on mental health for residents with and without a history of incarceration (Hatzenbuehler, 2015).

Poor neighborhoods in which there is a large ratio of adult women to men tend to be places where single-parent, female-headed families are common. Within families where a parent, usually the father, is in prison, incarceration “disrupts marital relationships, separates children and parents, and may contribute to the permanent legal dissolution of these relationships” (Clear, 2008, p. 111). The removal of black males from their neighborhoods and families produces the above ratio, which increases the rate of female-headed households. Such removal also restricts the number of male partners available in the neighborhood, which means more competition among mothers for partners that can support a family and serve as parents. Going to prison also substantially reduces the likelihood of the incarcerated individual getting married (Clear, 2008). While the effects hold across all racial and ethnic groups, they are strongest for black males over the age of 23; their likelihood of getting married drops by 50 percent after being incarcerated (Clear, 2008).

Many men maintain contact with their partners and children while in prison, but the rate at which mothers dissolve their relationships with their children’s father during his imprisonment is very high (Wildeman, 2017). Parental incarceration in particular can be linked to a host of negative health outcomes among children, including depression, anxiety, asthma and obesity (Wildeman, 2017). Studies

examining how incarceration affects children have found strong evidence that parental incarceration exacerbates certain problems and creates risk factors for later delinquency (Clear, 2008). Having a parent incarcerated makes a child three to four times more likely to develop a juvenile delinquency record, makes a child two and a half times more likely to develop a serious mental disorder, and puts the child at higher risk for school failure, unemployment, and illegal drug use (Clear, 2008).

Most of the people who end up in prison were engaged in behavior that created strains on their families. While arrest and imprisonment reduce some of that strain, they tend to create new problems for families, such as financial difficulties that emerge from a loss of income, court costs and a later need to support the individual in prison (Clear, 2008). Other financial and legal difficulties arise from an individual having a criminal record when released, such as problems finding housing, employment, or being unable to attend school because they don’t qualify for financial aid. People who get in trouble with the law are already characterized by poor work records before they get arrested; only half of parents who are incarcerated were working full-time when they were arrested, and a third were unemployed (Clear, 2008). Going to prison further deteriorates unemployment prospects, and suffering a conviction and imprisonment has a permanent negative impact on earning potential (Clear, 2008). So, neighborhoods with high rates of incarceration not only experience the removal of social support and potential wage-earners, but the stigma of incarceration means that men tend to get stuck in low-wage or unstable jobs. This can make single mothers reluctant to marry or live with them, further degrading their work and marriage prospects.

High rates of incarceration can actually increase crime in impoverished places. The removal of young residents from a community reduces the capacity of that community to link to resources outside the neighborhood, which weakens attachment to

the neighborhood and erodes collective efficacy (Clear, 2008). Social stresses that occur when a partner or parent is incarcerated can lead to changes in the home and increased stress on the home, in neighborhoods with low social support and high economic stress. Parental incarceration often leads to juvenile delinquency (Clear, 2008). Crime also tends to increase in poor neighborhoods because those communities not only absorb large numbers of people returning from prison, but also because they are residents who tie up the limited interpersonal and social resources of their families and networks (Clear, 2008). Those families and networks are then unable to perform other functions of informal social control and collect resources from outside the community. In short, high rates of incarceration in poor communities creates a series of effects that destabilize mechanisms of informal social control.

These problems are places where community psychology can intervene, though it's important that interventions recognize the racially distinct experiences of mass incarceration, so they don't continue to maintain or exacerbate race-based inequalities. However, working to minimize the negative effects of incarceration is treating the symptoms rather than the cause. Interventions such as programs for successful reintegration into the community aren't addressing the systemic racism and poverty that incarceration perpetuates.

A shift away from punishment to treatment could be an improvement, but releasing drug offenders won't reduce the prison population as much as people think (Clear, 2008). Cutting back sentence lengths could weaken bargaining power at plea bargaining, but most people who are arrested don't serve the maximum length of time in prison, so that wouldn't have much of an effect on the prison population either (Clear, 2008). Most of the prison population consists of people arrested for violent crimes (Clear, 2008), and even that could be reduced with the development of rehabilitative and other non-prison approaches to justice. "Incarceration has consequences at the individual, family, and community levels; and these are disproportionately borne by communities of color. Society can no longer address issues of poverty and racial

inequality without also addressing the deleterious effects of incarceration" (Cox, 2018, p. 49). What would effectively reduce mass incarceration is arresting fewer people and sending fewer of them to prison, which would require a change in attitude toward race, crime and punishment.

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GIVING UP THE GHOST: THE PARALLEL DEMOTION OF SPIRITS AND SPIRITUALITY

Hannah Preisinger

ABSTRACT: This paper aims to examine the progression of Western attitudes towards ghosts and related concepts from ancient times through Europe's age of Enlightenment. Through a study of folklore, literature, and religious beliefs, a gradual shift becomes evident: from the sincere respect of ancestor veneration, to demonic paranoia in the Middle Ages, to public scorn and private curiosity as Western scientific traditions gained dominance (with this final stage largely persisting to the present day). The author also proposes a parallel between this demotion of spirits and a diminishment in the societal importance of spirituality itself.

Introduction

Human society has vastly altered its opinions on the matter of ghosts over time. They began as a core facet of many (if not most) ancient religions, forming the basis of integral cultural lore and prompting the creation of vast and complicated rituals to appease, dispel, and summon them. In other words, they were – forgive the pun – a deadly serious matter. Fast forward a few thousand years and we find an enormously different scene: most “civilized” populations enjoy ghost stories as an entirely fictitious source of thrills, while those who continue to see them as a very pertinent reality are openly mocked. My opinions on their existence aside, what caused the ghost’s abrupt shift from intensely respected reality to pseudoscientific campfire story, and when did this demotion take place? Further investigation reveals an intriguing parallel: as a civilization distances itself from the notion of ghosts or spirits as a reality, it also becomes distanced from spirituality in general. A society’s popular opinion on the matter of ghosts directly reflects its relationship with noetic, spiritual, and metaphysical matters. Western society specifically has gone from shamanistic respect for the dead, to the Dark Ages’ paranoid fear, to the Enlightenment era’s open scorn and lack of any acknowledgement whatsoever. This journey traces a parallel path to the Western

world’s declining relationship with its own contemplative and spiritual life.

Before properly examining this change through the centuries, it should be clarified that this essay deals with the opinions of Western society at large, rather than attempting to account for the varied beliefs of the myriad sub-cultures within that wider scope. There are always individuals and entire movements that go against the grain of popular opinion, and this subject matter in particular retains a strong following throughout history and into the present day. That, however, is a subject for another essay.

Looking back to the beginnings of human culture and philosophy, the critical role of ghosts is immediately evident around the globe, particularly in the form of shamanistic and tribal ancestor worship. Ancestor worship (or veneration) refers to “a set of religious beliefs and ritual practices that commemorates the continued existence of the deceased ancestor beyond death,” and it involves far more than ritual mournings or burial rites; the practice of venerating the lingering spirits of one’s ancestors is a significant commitment of “cater[ing] to the needs of the deceased” (Zhao, 2006). While this may at first sound like a servile-type situation, this beyond-the-veil relationship is generally a symbiotic one, focused on “the ability of the dead to protect kinsmen in return for worship from them. Reciprocity between the living and

the dead is the key to ancestor worship” (Zhao, 2006). Evidence of this type of respect and harmony between a society and its ghosts can be found all across the early Western world, ranging from ancient North America to the halls of the Roman Empire. Native American religion was (and in some cases is) focused heavily on “contact with the spirit world [and] psychic and paranormal activity” (Chryssides, 2012), while the ancient Romans paid regular honor to their city’s Lares, or ancestral spirits, in the form of “small sacrifices ... at every official Roman banquet,” as well as “festivals dedicated to all of the spirits and ancestors at several different times each year” (Susina, 2011). Ghosts were not just real to these people – they were important, and they were respected.

Earlier cultures’ attitudes towards spirituality as a whole were similarly harmonious. To them, “health” meant more than just bodily wellness; their definition included “a subjective quality of life... the peace and coherence that flows from meaning,” and because of this “the functions of healing were placed in the community’s spiritual leaders” (Marcus, 2004). This more peaceful and cooperative acknowledgement of both ghosts and spirituality began to dissolve, however, as the Dark Ages arrived and started to twist existing traditions into a new atmosphere of suspicion. Take Samhain, for instance; this Celtic ancestor of today’s Halloween was based on the reality of ghosts and spirits walking the night as the darker half of the year began. Kind, ancestral spirits were welcomed, while those that might do harm were kept away by specific rituals and protections. But early Christian missionaries, uncomfortable with this emphasis on the supernatural, began to convince people that these spirits of the dead were agents of the devil, and as a result of these efforts, “the Celtic underworld eventually became associated with the Christian hell, and the concept of honoring the benevolent spirits of the dead gradually gave way to fears about evil spirits and witchcraft” (“Samhain,” 2015). This was the beginning of Western society’s new relationship with both ghosts and its own

spirituality: a relationship based in fear.

As the Dark Ages settled over Western culture, the ghost made its first lurching shift in status. These are no longer ancestral spirits to be respected and cooperated with; “now when they confront the living, ghosts are more tangible, and often feared. They may demand, even threaten. They can be dangerous [and] malevolent” (Finucane, 1996). A well-read piece of literature from this era, *The Awntyrs of Arthure*, features the disgusting and horrifying spirit of Guinevere’s mother; one scholar describes this apparition as looking as though “a candle in a hollow skull were glowing balefully through the eye-sockets,” pointing out that “the suggestion is that it is an infernal or subterranean fire from ... the habitat of the ghost ... that is burning in those hollow eyes” (Speirs, 1971). It is undeniable that the popular opinion of ghosts shifted to a vastly different tone in this darker age of Western society.

Turning to the medieval world’s attitudes on spirituality, we find that a similar shift in perspective has once again shoved common consensus from a place of respect to a place of fear. People grew more and more concerned with their own ghosts – their souls – as “the spiritual atmosphere grew thick, cloyed with anxiety, fear, and uncertainty” (Finucane, 1996). This attitude is hardly surprising – they were called the “Dark” Ages for a reason. Plague, famine, and constant warfare left many individuals relying on the doctrines of Christianity for some glimmer of hope, but hellfire and original sin are hardly comforting concepts. Judging by the literature of that time, “among the images which haunted the medieval mind,” one of the “most persistent” was the bleak and alarming view of “human life in its earthly state as a castle besieged” (Speirs, 1971); likewise, views of the afterlife and metaphysical matters in general became similarly terrifying. As the medieval era drew to a close and the Enlightenment swelled, one of the primary concerns of the general populace was shaking off the pallid mantle of fear that a religion-dominated society had thrown over much of the Western world. In doing so, however, the entire realm of

spirituality was thrown out with the bathwater, and ghosts – our unfortunate indicator species – suffered mightily as a result.

In the Middle Ages, ghosts had been feared, but they were at least still acknowledged and treated with a great deal of respect. This all changed in the time of the Enlightenment and into the Scientific Revolution, when a new religion took hold of the reins of Western culture: science. The imminent Immanuel Kant dismissively referred to spirituality and metaphysics as a “magic lantern of brain phantoms” (Kant, 1788), while Oscar Wilde published a scathing parody of a ghost story called “The Canterville Ghost.” In this disparaging tale, an American family takes up residence in a haunted house and, “with the sturdy rationalism of the New World, turn[s] the tables on the ghost” by mocking and dismissing it until it becomes “exhausted by its impotence” and “agrees to its own exorcism,” leaving the smug family “in possession of a stately home now without its supernatural tenant” (Robbins, 2016). This popular piece of literature is a perfect example of Western society’s attitude towards ghosts during this period in history, and the unfortunate phantoms were not the only victims of rationality’s merciless takeover; spirituality at large suffered heavily in the public eye as well.

The Enlightenment has been well-established as “the prototypical era in which scientific and instrumental reason became a defining characteristic of modern culture,” leaving little to no room for such silly and irrational things as the human soul and other metaphysical notions (Reill, 2003). The new paradigm of science was determined to shake off all the old trappings of religion and spirituality in general: “the daunting ‘fully satisfactory’ penances of the early Middle Ages (designed to expunge entirely the stain of sin) were seen as increasingly impractical by men and women who lacked the capacity to perform them” (Watkins, 2002). There is no real room for spirituality in a public mind determined to shrug off what was once overwhelmingly significant as something too “impractical” to be of worth – and in many ways, our culture’s opinion has not

changed since then.

Nowadays, this mocking, short-sighted skepticism towards all things “unscientific” leaves precious little room for new discoveries from those who still take seriously the reality of a spiritual world – and its spiritual residents. A society that ignores its ghosts ignores its nature as something beyond the purely material, and this compulsive blindness can only lead to decline. On this matter, Western popular culture can perhaps take a cue from the academic Franco Ferrarotti, who describes in the abstract of his publication “The Paradox of the Sacred” his vision for the future: “a rational but also reasonable human being, driven by logic but also checked by wisdom... who accepts himself as a spirit but also as flesh and blood: this is the post-Enlightenment and post-Christian individual, the human type, who most closely resembles the ideal of a complete human being” (Ferrarotti, 1984).

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THE OPIOID EPIDEMIC: SHIFTING FROM WAR TO PEACE

AJ True

ABSTRACT: The misleading and unethical marketing practices of pharmaceutical companies during the late 90s led to a health crisis referred to as the opioid epidemic. As the rates of opioid usage skyrocketed along with the rates of bloodborne illnesses due to needle sharing, the United States government's policy of extreme criminalization served to worsen the problem. Faced with a growing crisis, research into alternative policies in efforts to reduce rates of death related to opioids yielded positive results. Separately, programs such as needle exchanges, rehabilitation, and decriminalization were effective in remedying the different consequences of the opioid epidemic. However, because of the complexity of this issue, the United States must implement most or all of these policies together with the shift from a private healthcare system to a public healthcare system.

Introduction

The National Institute on Drug Abuse attributes the beginning of the opioid epidemic to the promises of pharmaceutical companies in the late 90s. These companies assured healthcare providers that their opioid drugs weren't addictive, causing doctors to prescribe them at a highly increased rate. Soon, patients began misusing these prescription drugs, leading to what many today call the opioid epidemic. This epidemic is a many-headed beast; not only do those suffering from use disorders run the risk of overdosing, but the current way the epidemic is treated perpetuates the spreading and sharing of used needles. Since injection is the most common form of opioid use, used needle sharing spreads bloodborne diseases such as HIV/AIDS and hepatitis. A combination of doctor negligence, Big Pharma cover-ups, as well as waging the War on Drugs and the stigma that comes with it has greatly exacerbated the issue. Opioid use disorder rates are continuing to rise and in order to combat this great threat to public health, the United States must revolutionize its healthcare system, shift its policies on drug use to one of decriminalization rather than war, and hold pharmaceutical companies accountable.

To begin with, the United States government's heavy-handed "War on Drugs" approach has left many who suffer from opioid use disorder imprisoned with no access to addiction treatment. This tactic has cost the country over \$50 billion annually according to the Drug Policy Alliance. Despite the billions of dollars spent on the issue, drug-related deaths continue to rise. The Center for Prisoner Health and Human Rights reports that in 1980, the population of drug users in prison was 40,000. Since then, that population has increased by 450,000. Despite the idea that imprisonment fixes the issue, opioid-related deaths have risen steadily since the 90's with sharp increases in recent years, according to the Center for Disease Control. It is revealed in a *The New York Times* article by Timothy Williams that less than 30 of the over 5,000 jails and prisons in the United States provide treatment for opioid use disorder. He attributes this to a widespread view held by corrections officials that opioid use disorder medication, which itself is an opioid, is simply just another drug for people to become addicted to. This is a false belief, however. In two studies published in the medical journals *Addiction* and *The Biomedical Journal*, opioid use disorder medications such as methadone and buprenorphine, when used

simultaneously with counseling and support groups, were found to be effective in reducing opioid-related deaths by over 50 percent. A 2018 study published in the *American Journal of Public Health* found that, “in the first two weeks after being released from prison, former inmates were 40 times more likely to die of an opioid overdose than someone in the general population.” Not only does imprisonment not heal substance abuse disorder, but the stigma and prejudice surrounding opioids by officials puts those suffering from use disorders at an increased risk of danger. The war on drugs has not worked and has caused a dangerous cycle of imprisonment and neglect by the government. Studies have shown opioid treatment to be effective and criminalization has been proven to increase drug-related deaths. With opioid deaths on the rise, the escalation of the War on Drugs by politicians such as former Attorney General Jeff Sessions is a dangerous repeat of history, a tactic that has been used many times and hasn’t worked.

The first step in addressing this issue is decriminalization. In 2001, Portugal made a radical decision to combat its own drug crisis. Instead of extreme criminalization like the United States, Portugal became the first and only country to decriminalize the possession and use of all drugs. “Decriminalization” does not mean “legalization.” By decriminalizing drugs, Portugal removed criminal offense for the possession and consumption of illicit substances. Instead, Portugal now deals with illicit substance infractions outside of criminal justice (e.g. rehabilitation and counseling). Glenn Greenwald, an award-winning journalist who has written extensively on drugs and criminal justice reform, in a report about Portugal’s drug policies provides data that shows that drug-related deaths and drug-related diseases have decreased since Portugal changed its policies in 2001 (17-18).

He also states that an important reason for decriminalization was to destigmatize drug use disorder: “A related rationale for

decriminalization was that removal of the stigma attached to criminal prosecution for drug usage would eliminate a key barrier for those wishing to seek treatment. Even in those nations where drug users are not typically punished with prison—such as Spain—the stigma and burden of being convicted of a criminal offense remain” (9). Many conservative leaders in Portugal had fears that their country would see an increase in drug use and drug-related tourism due to decriminalization (6). These fears were unfounded. Portugal’s framework for drug treatment has been a resounding success. The United States has failed in its mission to fight the drug epidemic. It is clear when compared with Portugal that the war on drugs and heavy criminalization has not succeeded in its goal.

Another vital step in combating the opioid epidemic is for the United States to transition from a private health care system to a publicly-funded universal health care system. According to the World Health Organization, universal health care consists of three objectives:

- Equity in access to health services - everyone who needs services should get them, not only those who can pay for them;
- The quality of health services should be good enough to improve the health of those receiving services; and
- People should be protected against financial-risk, ensuring that the cost of using services does not put people at risk of financial harm.

Many politicians want to repeal the Affordable Care Act, America’s closest policy to universal health care, which would be a mistake and a blow to the fight against the opioid crisis. According to Chapter 6 of *The Surgeon General’s Report on Alcohol, Drugs, and Health* (2016), substance abuse has been treated separately from general health care despite a direct correlation between the two: “... the presence of a substance use disorder often doubles the odds that a person will develop another chronic and costly medical illness, such as arthritis, chronic pain, heart disease, stroke,

hypertension, diabetes, or asthma” (6). The report points to this as a major contributing factor to the cost and fatality of drug abuse treatment, or lack thereof. The report also states that the fact that substance abuse is treated completely separately from general healthcare hindered greatly the ability of the healthcare systems to efficiently treat opioid overdose cases that were brought into places like emergency rooms (6). Streamlining healthcare and treating substance abuse together with standard healthcare would likely reduce the cost of our healthcare system, provide equity of access to overdosing patients, and create an environment where substance abuse can be treated much more efficiently and safely in hospitals.

Drug companies, doctors, and insurance companies, fueled by the private healthcare system, have also been feeding the growing opioid epidemic. According to an article by *The New York Times* by *ProPublica* journalist Charles Ornstein and *The New York Times* journalist Katie Thomson, drug companies sell less addictive pain killing medication at much higher prices than more addictive painkillers. Less addictive alternatives are hundreds of dollars a month, where morphine, a highly addictive drug, only costs 29 dollars a month. Insurance companies also make access to these more addictive drugs easier by removing barriers and requirements from obtaining them while often denying coverage of more expensive, less addictive non-opioid alternatives. In an article by Jamie Ducharme for *TIME*, it is shown that, ...members of the Sackler family and other Purdue executives purposefully downplayed the addictive properties of OxyContin, and promoted sales tactics meant to encourage doctors to prescribe as much OxyContin, in the highest doses and longest durations, as possible — despite the potential risks for abuse, and despite the terms of Purdue’s prior settlement with the federal government. The suit also details Purdue’s plans to sell addiction treatments, helping them dominate “the pain and addiction spectrum.”

The article also quotes Joseph Khan, a Philadelphia attorney who is bringing lawsuits against corporations involved in the opioid epidemic. Khan says, “One theme that clearly emerges from this deposition, brick by brick, is the foundation that is laid, that shows how even after this guilty plea there was a shocking lack of care for people that were at risk of abusing this drug and instead a singular focus on profit...” Purdue Pharma’s awareness of the dangers of their drug and the complete abuse of it for profit illustrates a dangerous precedent amongst large pharmaceutical companies. In a country with no drug price control and little accountability on the side of corporations, government regulation and oversight in the form of a publicly funded health care system is necessary to halt the abuses carried out by the manufacturers of our most addictive prescription drugs. According to Emily Miller, an editor for *DrugWatch*, the United States pays three times as much for prescription drugs compared to the rest of the world. In an article by PBS producer Jason Kane entitled “Health Costs: How the U.S. Compares with Other Countries,” he reports that the US pays two and a half times more for its healthcare than other countries such as the UK, France, and Germany while providing less quality. This exacerbates the opioid crisis because, according to the Surgeon General’s report, the majority of those suffering from substance abuse disorders are below 138 percent of the poverty line (7). Therefore, the Affordable Care Act is so important and a step in the right direction. In *The Opioid Epidemic and Medicaid’s Role in Facilitating Access to Treatment*, a report published by the Kaiser Family Foundation, adults who suffered from opioid abuse disorders and were covered under Medicaid were twice as likely to get treatment for their addiction as those with private or no insurance. Medicaid also disproportionately covered low-income individuals with substance abuse disorders compared to private insurance, while those without insurance would most likely be covered if Medicaid were to be expanded in their state.

Yet, the Affordable Care Act is not enough. The fact that the ACA is a state-by-state decision, that universal healthcare is not a constitutional right, and that drug prices are not regulated means that many Americans still go untreated and the possibility of ACA repeal looms. The United States must take power out of the hands of private companies who perpetuate the opioid crisis and revamp its healthcare infrastructure to provide accessible healthcare to the most vulnerable populations.

Increasing the availability of needle exchange sites as well as implementing a public healthcare system is necessary for preventative healthcare in stopping the spread of bloodborne illnesses like HIV/AIDS and Hepatitis C in relation to opioid usage and needle-sharing. In the report “The Role of Needle Exchange Programs in HIV Prevention” published in the public health journal *Public Health Reports*, a joint study done by the Center for Disease Control and the state of Connecticut after the state deregulated the possession of needles is referenced. In the study, the researchers discovered that when pharmacies were allowed to sell needles that the reported rate of needle sharing dropped from 52% before the law changed to 31% after the law changed (79). The report concluded that, “Access to sterile needles and syringes is an important, even vital, component of a comprehensive HIV prevention program for [injection drug users]. The data on needle exchange in the United States are consistent with the conclusion that these programs do not encourage drug use and that needle exchanges can be effective in reducing HIV incidence” (79). Another report done by the Panel on Needle Exchange and Bleach Distribution Programs concluded that in the absence of easily accessible treatment, needle exchange programs are effective in reducing the spread of HIV without increasing drug use, stating: “Reducing drug use would serve to reduce HIV transmission as well as to achieve other important social and public health goals... Based on a comprehensive review of the research literature, the panel concludes that

well-implemented needle exchange programs can be effective in preventing the spread of HIV and do not increase the use of illegal drugs” (253). The report also mentions that communities that especially suffer from issues related to drug abuse, such as AIDS and poverty, may view needle exchange programs as a lackluster and ineffective approach to the problems that ravage their communities (252). In response, the panel suggests that needle exchange programs should be capitalized on for public health promotion and disease prevention to assist with future efforts to combat these epidemics rather than the solution itself (252). Despite the data supporting the effectiveness of needle exchange programs, during Mike Pence’s governorship he refused to institute needle exchanges amidst the country’s worst HIV outbreak in his home state of Indiana. According to a *The New York Times* article written by Megan Twohey, officials and politicians struggled to change Pence’s mind for two months as the epidemic grew. Finally, Pence allowed clean needles to be distributed in a single county, which drastically reduced HIV rates there. As this demonstrates, a massive barrier towards effectively combating bloodborne illnesses amongst intravenous drug users are the morals and beliefs held by important politicians who have the power to implement these needle programs. In order to combat all facets of the opioid epidemic, the United States must engage in public outreach, education and prevention to curtail the spread of opioid-related bloodborne illnesses with needle exchange programs and the stigma that is attached to them.

It is evident that the costly war on drugs has failed to combat the opioid crisis in the United States. If anything, the war on drugs has served to exacerbate the current issues while making access to proper treatment more difficult. It is time for the United States to revolutionize its view on drugs and drug treatment, end the war on drugs, and begin providing universal access to health care in order to address this epidemic

and fight to save the lives of our most vulnerable citizens.

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INFALLIBILITY THROUGH DUALITY

Jakob Johnson

*Abstract: This paper examines the puzzling interplay of Christianity and paganism in the English epic, *Bēowulf*, adopting a new psychoanalytical approach to explain the blending of two (seemingly) mutually exclusive faiths. Applying Saunder L. Gilman's theory of stereotyping, an extension of Lacanian psychology, this essay analyzes the *Bēowulf*-poet's motives for including such opposing religions, taking into consideration the time period's rocky transition from Saxon paganism to Christianity. This a crucial step for scholars, since so few primary documents address the practicalities of Christianity's adoption into Britain, and any inkling into how the common people (such as the *Bēowulf*-poet) responded to this shift would be greatly insightful to this virtually undocumented period of Western history. *Bēowulf* may in fact be the unique window into the battle between the faiths, a singular moment in history captured in the person of its stalwart protagonist.*

Bēowulf is the beginning of the English Literary Canon, one of the oldest surviving examples of Anglo-Saxon, and yet scholars know embarrassingly little about its origins and creation. The *Nowell Codex*, the earliest manuscript of the epic, tentatively dates from around 1000 AD, and yet the first iteration could have been written any time after 550 AD (Clark). Although we don't know the *Bēowulf*-poet, or even how close the lay is to the original, much can be deciphered about them through the text, specifically the poem's titular character. *Bēowulf* is heroic to a fault. His Christian benevolence, coupled with pagan dauntlessness, creates one of the most infallible and ethically puzzling heroes in literature. Saunder L. Gilman's concept of the "good" Other, manifesting itself in the infallible hero stereotype, elucidates this interplay of pagan and Christian themes in *Bēowulf*, offering a striking insight into the mindset of someone grappling to transition between two incompatible religions. Using this concept, what can the reader learn about the *Bēowulf*-poet? What centuries-old anxieties can be extrapolated from *Bēowulf*? My goal is to take this archaic hero stereotype, and reverse-analyze *Bēowulf*'s characterization, looking for specific compensations and what

they would reveal about the *Bēowulf*-poet's anxieties.

Gilman queries the nature of stereotypes in his book, *Differences and Pathology: Stereotypes of Sexuality, Race, and Madness* (London, 1985). In the introductory essay, "What are Stereotypes and Why do We Use Them?" Gilman proposes that the stereotype is formed as a coping mechanism to the "anxiety" that surrounds the lack of perception of control; by stereotyping, by compartmentalizing the world, we "buffer" our fears, separating them from us with a cushy layer of stereotype, thereby creating comfort. One of the most integral steps in this process happens early in life, when the developing mind makes its first distinction between the perceived "good" and "bad."

Gilman describes that in the world, there is the Self and the Other, each divided further into the "good" and "bad." The "bad" Other is a reflection of the "bad" Self, and often mirrors the perceived causes of the Self's loss of control. The "good" Other is what we *aspire* to be, it's everything we could be, *but cannot achieve*—that's the crucial part. The "good" Other is the main idea that I'll be working with; according to Gilman, "the 'good' [Other], with its infallible correctness, becomes the antithesis to the flawed

image of the self, the self out of control.... the 'good' Other becomes the positive stereotype.... which we fear we cannot achieve" (Gilman 20). The "good" Other differs from the reciprocal "bad" Other because it becomes fixed in our minds. We desire and reject it because we both crave and cannot have it. Again, to cope with this anxiety of never being able to have control of the "good" Other, we create a stereotype around it, a stereotype "labeled with a set of signs paralleling (or mirroring) our loss of control" (Gilman 20). The "good" Other stereotype is what we *want* to be, it is our ideal self, free from the anxieties that weigh us down; that is what Gilman means by "infallible correctness."

This positive stereotype is often expressed in writing, in the form of the protagonist. Writing allows the author to express their ideal self in a controlled environment: a simulation of how that positive stereotype would function. Gilman states that it is "within texts that we can best examine our representations of the world" which allow us to "buffer" our positive stereotype *with the text* (16). When distanced by the metaphorical 'space' between fantasy and reality, the "good" Other becomes contained and loses its power of anxiety, creating a unique situation where the "good" Other can be fully fleshed out and explored without feeling that passive envy that it would normally generate. It becomes a thing of fiction, so prevalent it becomes a stereotype, and loses that 'realness' whence comes its chief stress.

The *hero*, then, becomes the author's "good" Other, in complete control of the narrative, free from anxiety, and expressing that "infallible correctness" that is the "antithesis" of the author's self-image. Typically, these infallible heroes will have the societal markers of control: intelligence, strength, charisma, beauty, and any cultural norm that is prevalent at the time. Mary Bowman comments on this same change in values in her essay, "Words, Swords, and Truth: Competing Visions of Heroism in Beowulf on Screen." She analyzes various modern iterations of *Bēowulf* and how they differ from the original:

As scholars of medievalism are well aware, the way heroes of ancient and medieval tales are re-imagined for contemporary audiences says a great deal about our own conceptions of the heroic: what is desirable and what is possible in a hero for our time. (Bowman 147)

We reimagine our heroes because the "ideal" becomes reimagined. The societal "good" Other slowly changes, leading to a change in the infallible hero stereotype. However, the infallible hero is also marked (albeit more subtly) with the specific anxieties of the author: the "set of signs" which compensate for the author's negative self-image. These personal markers are the aspect of the stereotype I'll be looking at in *Bēowulf*, which reveal intimate details about the poet's internal conflicts and aspirations. But to fully analyze *Bēowulf*, it is crucial to have an understanding of the poem's history, and why a piece like it is so rare.

Around 1000 years ago, an anonymous East Anglian monk diligently transcribed all of *Bēowulf* into a small manuscript which then lay in the "secure neglect of a monastic library" for a few centuries where its only worries were rainwater and mites (Clark 3). During the dissolution of the monasteries by Henry VIII, the document was in the path of direct harm. "Most of the poetry of the Anglo-Saxon period and much else besides perished in a riot of looting led by the King's favorites; many ancient manuscripts were torn up, some to wrap fish, some for bookbinding materials" (Clark 3). However, the document was providentially spared, and later bound by an antiquarian named Laurence Nowell (hence the name *Nowell Codex*), who squirreled it away for modern scholars to marvel at. Thanks to that monk of East Anglia, we have *Bēowulf*, but at the cost of any other concrete information about its author, place of origin, or time of creation. That is why any inkling into the *Bēowulf*-poet's artistry would be so important for medieval and *Bēowulf* scholars.

In order to make judgements about the *Bēowulf*-poet, it is important to have a firm grasp of what was happening in the span of

Bēowulf's inception, and the major events that would have impacted the life of someone like the *Bēowulf*-poet. Within that 500-year window, England was going through one of the largest cultural clashes in the island's history. The Romans had abandoned the Britons a few centuries earlier, resulting in the invasions by the German Saxons. England, along with the rest of the previous Roman Empire, fell into the Dark Ages; education became passé, leaving very few written documents from that era. Yet following the Saxons came the steady inflow of the Christian Gospel to the isles, and the evangelization of the residents out of Saxon paganism. With that in mind, the themes of Christianity versus paganism in *Bēowulf* have an entirely new meaning. *Bēowulf* is a glimpse into this period of religious contention, a (slipping) compromise between two diametrically opposed moralities, reflected in the wrestling within *Bēowulf's* religious duality.

As a character, *Bēowulf* is obviously pagan. The plot of the epic follows his quest for glory: slaying beasts, becoming a beloved king, and earning for himself immortal fame after his glorious death fighting the wyrm. In all respects, these are in tune with Saxon ethics, which held that pride and fame were the great accomplishments that engendered immortality. In *Heorot*, *Bēowulf* shamelessly applauds his past deeds, recalling zealously his feats of strength clearing the ocean-ways of sea-beasts to *Unferth*: "Truth I claim it, / that I had more of might in the sea/ than any man else, more ocean-endurance" (MIT, lns. 532-4)¹. His tone does not reflect tentativeness or even jest; *Bēowulf* factually believes that he is stronger than any man in the water. It's not just an idle boast either. On top of pride and skill, he demonstrates almost inhuman ability, claimed to have "thirty men's/ heft of grasp in the gripe of his hand" (MIT lns. 379-80), and his outward

appearance is so stunning, that upon laying eyes on him, a horseman of *Hroðgar* states: "A greater ne'er saw I/ of warriors in world than is one of you, / yon hero in harness! No henchman he/ worthied by weapons, if witness his features, / his peerless presence!" (MIT lns. 247-50). This is only one example, but anywhere that *Beowulf* goes, his "peerless" countenance always heralds his arrival. These traits are representative of the old lays and heroes imported from Saxony that the *Bēowulf*-poet would have been exposed to. With Christianity being so new, so authoritative, wanting to be like the old pagan heroes would be a nostalgic comfort for the poet, a reach towards the familiar. After all, there was still a lot of fear and doubt in the population about the switch. In her essay, "Blurred Lines: Does Religious Polarity Create Problematic Heroes in the Poem, *Bēowulf*?" Doctor Elizabeth Bell Canon marks the nonlinear trajectory of the assimilation of Christianity on the island, and how during the black plague in 664, many returned to pagan gods, making sacrifices in old places of worship (Canon 58). Paganism was safer than Christianity and its Almighty God, and by having these values in their "good" Other, the *Bēowulf*-poet was trying to emulate that pagan control which *Bēowulf* had in his life.

This brings up the other half of *Bēowulf's* duality: on top of his pagan characteristics, *Bēowulf* is the ideal Christian. His speech and intelligence reflect his godly beliefs. King *Hroðgar* praises him on this as they depart *Heorot*: "These words of thine the wisest God/ sent to thy soul! No sager counsel/ from so young in years e'er yet have I heard. / Thou art strong of main and in mind art wary, / art wise in words!" (MIT lns. 1841-5). *Bēowulf* is more than just a worshipper, he is God's tool; God speaks through him, and he was sent by Him to purge the lands of *Grendel* (or "Cain's kin" as

¹ Also note, that since my analysis relies so heavily on the specific tonality of the original poet, I am using MIT's 2003 bilingual translation of *Bēowulf*, which is as close to the original Anglo-Saxon as I can readily find without quoting the Old English itself.

the poem often labels the demon, further adding to Bēowulf's Christian mission). Very literally, God was speaking through Bēowulf; his quest was ordained and blessed by God, who even intervenes in the plot. As the hero wrestles with Grendel's mother, the narrator says, "The Lord of Heaven allowed his cause;/ and easily rose the earl [Bēowulf] erect" (MIT lns. 1555-6). Before he dealt the final blow, his faith in the Almighty slipped ever so slightly, but just as a literary tactic to make his victory seem even more impressive: "But [Bēowulf] remembered his mighty power,/ the glorious gift that God had sent him,/ in his Maker's mercy put his trust/ for comfort and help: so he conquered the foe" (MIT lns. 1270-4). Bēowulf conquers Grendel's mother by faith. This battle transcends strength (thereby transcending paganism) and becomes a spiritual battle between Bēowulf (God's proxy) and Grendel's mother (primordial Evil). This characterization is illuminated even further against the backdrop of anti-pagan rhetoric the narrator expresses about Hroðgar and his following. In the exposition, the narrator highlights the pacts Hroðgar made with pagan "devils" in a vain effort to help purge Heorot of Grendel before Bēowulf arrived: "Woe for that man/ who in harm and hatred hailes his soul/ to fiery embraces; nor favor nor change/ awaits he ever" (MIT ln. 183-6). The juxtaposition between the "harm and hatred" and the "peerless" Bēowulf adds depth and pristinely defines the "good" versus "bad" that this poem sets up. Perhaps out of context, Bēowulf wouldn't appear so saintly, but against Hroðgar and the other Danes, Bēowulf is a stunning example of saintly principles. The *Bēowulf*-poet doesn't just want to be a Christian, they want to be the best Christian. Bēowulf is an example of not only being a believer in God, but being chosen by God. God has seen Bēowulf, accepted his traits, and selected him for this holy task of purifying great evils. In a way, God is blessing Bēowulf's pagan traits, and by including this in their "good" Other, manifests the *Bēowulf*-poet's desire to excel in the new and dangerous

faith that is sweeping England.

Moreover, the pagan themes directly contradict the humility and tone of the Christian narrator (it has even led many scholars to believe that the Christian elements were added later, amending an originally Saxon epic). Ideally, the *Bēowulf*-poet would have a unique agreement of the two, just like the titular character: God's support with Saxon ethics. But, because paganism and Christianity are mutually exclusive, the *Bēowulf*-poet knows he can never achieve the desired balance, which is why in his hero stereotype (reflecting the "good" Other), Bēowulf is that unity. Canon claims that Bēowulf is the "'worthy' pagan" (Canon 63), but the very nature of his religious duality creates an *imperfect* hero. Her argument is that Bēowulf is "in a state of religious limbo—moving imperfectly from pagan to Christian" and by trying to "zig zag" between Christian and pagan elements, the epic ultimately fails, creating neither a perfect Christian hero, nor a working pagan one (Canon 60).

He [Bēowulf] is a pagan hero with Christian morality but lacking salvation. Although he does not complicate his religious image with the same link to pagan devil worship that Hroðgar does, he is buried in the pagan tradition—adding to the problematic nature of Bēowulf as Christian-like hero. (Canon 62)

I disagree that Bēowulf is problematic. His death is a failure by Christian terms (not having the "salvation" of a righteous end), but is by all means a pagan success. He won for his kingdom a trove of unimaginable riches to spread among the citizens, and tales of his valor will be sung by minstrels for generations after. Although Bēowulf fails for not being either purely pagan or Christian, I don't think that was the point. This epic was the fulfilled product of the author's fantasy of having the best of both worlds. Historical Christians were not very tolerant of "part-time believers," and the resulting anxiety of not being able to reconcile your faiths—the core contradiction of Anglo-Saxon life for many—would cause tremendous stress to the

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- individual. A perfect blend like Bēowulf is impossible, something that the *Bēowulf*-poet would aspire to achieve, and the knowledge that it could never be actualized is that perceived lack of control that they would have to confront. In the *Bēowulf*-poet's "good" Other, paganism and Christianity harmonize. That harmony is then represented in the *Bēowulf*-poet's take on the infallible hero stereotype, and manifests itself in the curious emulsification of religions in Bēowulf that has intrigued scholars for decades.
- Bēowulf* is incredibly important to the greater English Canon, not just as one of the rare pieces of Anglo-Saxon literature, but because it peeks into one of the most paradigmatic shifts in English history. The battle between faiths reveals the internal battle that many, like the *Bēowulf*-poet, were experiencing. This is important since there are so few primary documents discussing this change. The revisionist views of the Catholic Church would (and have) largely overlooked the assimilation difficulties of Christianity into a pagan setting. With *Bēowulf*, however, medieval scholars are presented with an epic that successfully eluded the Church's Orwellian censorship. Understanding Gilman's "good" Other, and its relationship to the infallible Bēowulf, we can hold up a mirror to the Church's own internal conflicts, reluming the rightly-named Dark Ages.
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HOW MUTATIONS IN SYNAPSIN I AND SYNAPSIN II CONTRIBUTE TO SEIZURE-LIKE ACTIVITY AND EPISODES IN INDIVIDUALS WITH EPILEPSY

Atif Bhatti

ABSTRACT: Epilepsy is one of the most prevalent neurological disorders and has been associated with abnormalities in the functioning of synapse proteins known as synapsins. Here, we aim to further develop our understanding of how mutations in Synapsin I and Synapsin II may be correlated to seizure-like activity and episodes in individuals with epilepsy. In the quest to successfully establish an understanding, the work of three different articles will be synthesized together to provide a comprehensive literature review. Upon examining work done by an array of investigators and experts in this field, we see that mutations in Synapsins I and II, individually or simultaneously, can contribute to the seizure-like activity and episodes that individuals with epilepsy suffer in a chronic manner. This work is of vital importance to further understand how new methods, specifically pharmacological, can be created and devised to cure an epileptic individual's episodes in the future.

Introduction

Epilepsy is one of the most common and widely-researched neurological disorders that we are currently aware of. Furthermore, epilepsy is characterized by seizures that are chronic, and the episodes of this vigorous shaking and inability to control body movement vary greatly in a wide array of different points in times. Potential causes of epilepsy have been pinpointed, but the underlying mechanism of the disorder still remains unclear. One substantial sub-area of research being done within this field is examining how the connections between neurons may be different in individuals who suffer from epilepsy, relative to individuals who don't suffer from the disorder. Neurons are brain cells that connect to each other via synapses, where chemical messengers known as neurotransmitters are released from the first or pre-synaptic neuron onto the second or post-synaptic neuron. This process is vital to a multitude of mammalian functions such as heart and muscle contractions.

In continuation of the theme of how synaptic connections may be suffering from an abnormality of some sort in individuals with epilepsy, it's critical to understand what synapsins

are, and the implications they present. Synapsins are proteins that are currently understood to bind to synaptic vesicles that contain the neurotransmitters which are transmitted from one neuron to the next, thus demonstrating that synapsins may play a significant role in neurotransmitter regulation (Lakhan et al, 2010). There are currently three members of the synapsin family that we are currently aware of, those being Synapsin I, Synapsin II, and Synapsin III. An important aspect to take note of is that Synapsin 1 and Synapsin 2 are often written as SYN1 and SYN2 respectively. With the current foundation we have laid down, it seems practical that mutations in synapsins may be creating abnormal neurotransmission, thus resulting in the seizures we see in those with epilepsy. This literature review examines work previously done that was aimed to understand how mutated forms of both SYN1 and SYN2 are potentially correlated with the neurological disorder of epilepsy. Ultimately, the objective is to understand how mutations in the two more-researched and better-understood synapsins, that being SYN1 and SYN2, may be associated with epileptic and seizure-like activity.

Body

To understand whether or not mutations in SYN1 and SYN2 could be correlated with epilepsy, it is of vital importance to examine scenarios in which only one of the two proteins are mutated, then dive into situations where both proteins have been mutated. To understand SYN1 to a greater extent, Garcia et al did extensive work with a four-generation family. This family has some males who suffer from epilepsy alone while other males suffer from a combination of epilepsy along with learning disabilities, macrocephaly, and aggressive behavior (Garcia et al, 2014). To better understand the particular causative factors explaining these neurological deficits in the males of the family, Garcia et al performed linkage analysis, which consisted of extracting DNA, or deoxyribonucleic acid, from the blood, amplifying and priming it, and running gel electrophoresis of those samples. For the linkage analysis, a common linkage program known as MLINK was utilized by the investigators. These steps were crucial to take in order to understand what gene or genes fell in the segment of the X chromosome microsatellite polymorphisms, where they would be deemed as causative. Garcia et al found that SYN1 was present in this region, and upon screening the protein for any potential mutations, the investigators discovered that there was a mutation in the gene that encoded for Synapsin I, thus prompting the conclusion that this mutation is likely the cause of epileptic phenotype seen throughout the generations of this family.

Likewise, Lakhan et al examined individuals in their study, but the sample size was far greater with 571 individuals, 372 of which had epilepsy. The aim of their work was to better understand SYN2's potential role in epileptic activity. The group had hypothesized that an A>G mutation in the rs3773364 polymorphism of the SYN2 gene would be more prevalent in the individuals who suffered from epilepsy (Lakhan et al, 2010). This particular mutation essentially

describes that instead of having an "A" in the segment of the gene, like the individual's ancestor had, the individual themselves has a "G" in the very same position instead. The rs3773364 polymorphism refers to the portion of the SYN2 gene that is of specific interest in this study. To test their hypothesis, Lakhan et al isolated DNA samples from each of the subjects, primed them via the polymerase chain reaction and restriction fragment length polymorphism methods, before performing gel electrophoresis and utilizing SPSS (Statistical Package for the Social Sciences) software for the statistical analysis. The group found that the frequency of the A>G mutation was substantially higher in the epileptic subjects relative to the control subjects, although no other particular mutation within the polymorphism was detectable to have a significant difference in its frequency to the same extent (Lakhan et al, 2010).

Aside from mutating either SYN1 or SYN2 at a time, there are benefits in mutating both proteins simultaneously to see if there's still a correlation with epileptic and seizure-like activity present. Fassio et al explored this idea by mutating Synapsin I and II individually and then simultaneously. The group was of the mindset that mutations in the aforementioned proposed synapsin I and II combination would indeed be correlated with an epileptic phenotype (Fassio et al, 2011). To test this idea, the group drew from previous work that has already been done in the field in order to contribute to the development of the understanding of synapsin mutations and epilepsy. Fassio et al created mice lines consisting of mutations of just SYN1, just SYN2, and SYN1 and SYN2 simultaneously, or all three synapsins simultaneously. All neurons of interest were cultured under well-controlled conditions and electrical activity was recorded with electrodes. The key result that arose from the work was that the most intense epileptic activity observable was seen when the SYN1/SYN2 knockout mice was exhibiting its peak expression (Fassio et al, 2011). This information is indicative that in instances where both SYN1

and SYN2 were both simultaneously mutated, a strong epileptic phenotype was demonstrated.

Discussion and Conclusions

The aim of this review was to examine the relationship between epileptic activity and synapsin mutations and see if a strong correlation is present. Upon reviewing the studies throughout the course of this review in great detail, there is certainly a strong connection between mutations in Synapsins I and II and epilepsy. It was demonstrated that each male member who suffered from epilepsy in the four-generation family that Garcia et al examined through their work had an obvious mutation in their SYN1 polymorphism region. Likewise, the epileptic subjects in Lakhan et al's work had a significantly higher A>G mutation frequency than the control subjects, demonstrating that a mutation in SYN2 had a positive correlative relationship with the individuals who suffered from epilepsy. This topic is of vital importance because epilepsy is one of the most prevalent neurological disorders and there are currently only methods to suppress epileptic and seizure-like activity, but no way to completely cure any individual from having episodes. From a pharmacological perspective, a plethora of anti-epileptic drugs have been created, but it may be of interest and potential benefit in the future to examine creating a drug that prevents mutations in synapsins from occurring. However, a historical breakthrough such as this would require more work being done, specifically examining mutations in not just one or two of the known synapsins, but all three. Ultimately, additional research and further strides in this field have to continue being made in order to solve a key piece of concern regarding one of the most common and detrimental neurological disorders that we are currently aware of.

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THE EFFECTS OF YOUTH PARTICIPATORY ACTION RESEARCH (YPAR) ON LEADERSHIP DEVELOPMENT AMONG YOUTH

Anna Tran

ABSTRACT: Youth Participatory Action Research (YPAR) is a critical form of action research used in educational curriculum that focuses and values on the youth point of view. YPAR stands for youth participatory action research. This learning process is based from action research, or research steps and techniques alongside community member action. YPAR can be a powerful process that unites youth and adults in research projects that improve our communities and conditions of youth lives. The information that results from the YPAR process is meant to be used to advocate for change in communities.

As humans, we are always learning throughout our entire lives. As we grow older, we navigate a range of unexpected circumstances and experience the depth of our beliefs and values in the decisions we make. This makes K-12 education crucial in preparing for life. In education and learning, two largely regarded goals of schooling are to prepare students to be productive workers in society and to produce effective citizens that reflect our country's democratic values (Banks et al., 2007). The relationships built in and outside of school influence students in ways they may not fully understand. These relationships impact and shape personal identity. Learning and acquiring knowledge is constructed through interactions with others. This social component to learning makes Youth Participatory Action Research, or YPAR, significant to improving education. This paper is a literature review that seeks to answer: Among youth participants, how do YPAR programs affect their leadership development? The literature reviewed focuses on youth, leadership development and YPAR program research. YPAR programs support youth leadership development through its improvement in communication, critical thinking, and social relationship-building skills.

Definition of Relevant Terms

PAR and YPAR

In the field of educational studies, the topic of action research is a familiar one to educators. Participatory action research, known widely as PAR, is an empowering, self-reflective, and collective approach to learning. PAR involves participants working alongside researchers to understand and improve practices surrounding their lives. Participants are given the opportunity to improve their local community or environment (Baum, MacDougall, & Smith, 2006). PAR follows a cyclic action research process of identifying a problem, collecting and interpreting data, acting on evidence, evaluating results, and improving next steps (Ferrance, 2000). Eventually youth became the focus of PAR.

PAR has led to the development and emergence of YPAR. YPAR is composed of widely regarded action steps taken by adults and youth participants in a research process. It is an opportunity for youth and adults to collectively address, question, theorize, and act against social injustice in schools and/or local communities (Scorza, 2017). Rodriguez and Brown (2009) conceptualized YPAR using three guiding principles that reframe its approach to focus on a meaningful learning experience

for youth. Those principles are: inquiry-based, participatory, and transformative. In this research process, young adults are encouraged to explore and inquire about an investigative topic related to their life experiences and concerns. The second principle, participation, is shown by the guiding behaviors from adults. Adults value and respect youth as equivalent researchers alongside them. This, in return, allows the young researchers to express their voice. Together, both parties collect and analyze their own data. Hence, project direction and power are equal in this educator-student relationship. Lastly, YPAR is transformative in the way it has improved the lives of marginalized youth and their communities. (Rodriguez & Brown, 2009). The equal nature of this adult-youth relationship requires a definition of collective leadership in the context of YPAR.

Collective Leadership

Collective leadership is a prominent characteristic in YPAR programs because students are positioned as researchers making collective decisions together (Fox, 2015). Friedrich, Vessey, Schuelke, Ruark, and Mumford (2011) define collective leadership as, “a dynamic... interdependent process in which a... set of leaders selectively utilize skills and expertise... (to solve) the situation or problem at hand” (p. 1). It is beyond the skills of one person; each leader is capable and applies his/her unique perspective and skills to influence the solution process. In YPAR, developing a student’s collective leadership skills can lead the student towards becoming a knowledgeable and democratic citizen later in life. There is potential to support life-long learning beyond adolescence in deep and profound ways.

Theoretical Constructs

In this discussion about YPAR and leadership, the theoretical constructs used are a youth-based lens, equity lens, and life-long, life-wide and life-

deep learning perspectives. In the first analyzing framework, a youth-based lens means that the perspective of youth is more than acknowledged, it is accounted for. Youth voice is incorporated as qualitative evidence that skill development does occur in leadership. According to Chen (as cited in Kornbluh, Ozer, Allen, & Kirshner, 2015), youth voice refers to youth being respected for their ideas and opinions, as well as feeling empowered to share them to an organization or related program. When youth have a voice within contexts that affect them, opportunities for positive development arise. Their voice is an essential puzzle piece to successful service-learning programs (Chen, as cited in Kornbluh et al, 2015).

The second analyzing framework is about three distinctive learning perspectives. Incorporating these learning perspectives is useful for students in YPAR programs to transfer school learning and skills into the context of everyday life. The first, life-long, refers to how learning occurs throughout an entire lifetime. The second, life-wide, means that one learns a variety, or breadth of experiences. Lastly, learning is life-deep in the way it “embraces religious, moral, ethical, and social values that guide what people believe, how they act, and how they judge themselves and others” (Banks et al., 2007, p. 12). Learning occurs in formal environments such as at school. More commonly later in life, it happens in informal places such as at work, in sports teams, and within religious institutions. Using these three distinct perspectives is helpful for educators to improve teaching practices.

Lastly, this paper acknowledges and strives for equitable teaching practices in education. Equity is valued to serve and improve the lives of vulnerable groups of people. YPAR programs are used as a mechanism for students of color to not only navigate institutional systems, but combat oppression involved (Bertrand, 2018). Bertrand’s research is one of many examples in the literature that show students develop agency and leadership skills.

Literature Review

Literature surrounding YPAR largely concentrate around qualitative case studies that explore the effectiveness of programs from start to completion. Studies analyze program implementation, evaluation practices, methodologies, and relationship/power dynamics. One of many common outcomes adults and youth have described is the positive social change in one or more levels: local, national and (sometimes) international scales (O'Donoghue, Kirshner & McLaughlin, 2003). Most of the outcomes reported in youth, gathered from outside observance and self-reflection, include improvement in agency/leadership, social, emotional, interpersonal, cognitive, academic/career, and critical consciousness (Anyon, Bender, Kennedy & Dechants, 2018). By evaluating over 3,000 peer-reviewed articles using a progressive database system, researchers uncovered that the most common outcome connected with YPAR participation. This outcome is the development of agency and leadership (Anyon et al., 2018). In fact, the researcher, Ben Kirshner, is leading the pathway in studies of youth activism.

Kirshner (2007) uses youth activism to support the development of adolescents. Supporting development is done by reframing student learning environments to incorporate collective problem-solving and positive youth-adult interactions. Youth activism is an outlet for students to grapple with their identities meaningfully. Exploring one's identity is difficult, and it helps when adult educators are present for guidance. Additionally, youth build upon their knowledge and meaning of institutions. Students take their experiences of academic institutions and connect it with larger, civic institutions. Adults who care for the interest of youth tend to provide opportunities for them to experience identity development, healthy adult relationships, teamwork, and connection to civic systems (Kirshner, 2007). A common and key factor to these experiences is

the skill, communication.

Communication

YPAR studies demonstrate that the research roles of young people provide ideal conditions for building communication skills essential in leadership development. Ferrance (2000) points out that participants practice many modes of data collection such as keeping field notes and journals, facilitating meetings, interviews, surveys, focus groups, and recording media. A portfolio of various types of data are sometimes be collected (Ferrance, 2000). For example, when youth showed interest in women's health, they used photos, field notes, interviews, and focus groups with a critical approach to enhance the state of women's health in their community (Wang, 1999). What's more, the participants of Powers and Tiffany (2006) gained public speaking skills and learned how to give presentations to a diverse audience. In a case study involving two girls in a three-year leadership program, each girl and their surrounding adult supporters confirmed improvement in communication skills (Conner and Strobel, 2007). One girl, Desiree, transformed into a "visible, direct, vocal, and articulate leader" who "led by doing", and "convey(s) her knowledge and understanding." The other girl, Celeste, transformed into a "encouraging and supportive presence," "careful listener," and "strong (small group) meeting facilitator" (p. 282). Though Celeste exhibited introverted qualities, observers found her "always willing to be part of the conversations, even if that meant listening more than speaking" (Conner & Strobel, 2007, p. 285). Additionally, Celeste highlighted that the program helped to find her voice and confidence needed to speak in front of others (Conner & Strobel, 2007). They each discovered communication skills for a leadership style suitable to themselves personally. Desiree and Celeste are not outliers. Conner and Strobel's study is one example from many case studies that are part of a greater common theme: When the participants

and adults involved in YPAR programs reflect upon their learning, they observed stronger communication skills.

Additionally, Govan, Fernandez, Lewis, and Kirshner's (2015) international studies demonstrate the impact of leadership activities on communication skills. In these international studies, young participants were supported by a range of leadership opportunities that school adults agreed would be useful for careers later in life, including facilitating workshops, recruiting peers for their action research issue, participating in hiring committees, public speaking, managing logistics for youth summits, and strategic planning/marketing discussions (Govan et al., 2015). In the context of their communities, YPAR's action research process provides tailorable leadership activities for young people to improve their communication skills.

Critical Thinking and Decision-Making

As communication skills progressed among youth, research studies also showed meaningful critical thinking and decision-making skills that followed. Students that performed action research presentations to key stakeholders also demonstrated improvement in public speaking (Tiffany & Powers, 2006). Following the presentations, youth participants clearly demonstrated critical thinking in the practices of answering the questions and answers portion. During these "Q & A" sessions, students form responses that advocate for issues of importance to them and show support for their peers (Tiffany & Powers, 2006).

Critical thinking can lead to developing different leadership styles and is also shown in conversations about the implications of social issues. Critical thinking is additionally shown when analyzing and interpreting data in the research process. For instance, Foster-Fishman, Law, Lichty, and Aoun (2010), determined that when youth engage in the data analysis step of YPAR, it promoted their critical awareness and

thinking concerning social issues relevant in their community. For example, in Conner and Strobel's (2007) case study student, Desiree, she actively and vocally shared her voice during meetings, trying to comprehend and think of solutions using data to back her logical thinking. In contrast, the other case study student, Celeste, quietly applied her critical lens to focus on understanding youth issues on a personal level in her effort challenge the perspectives of adults. In this sense, Celeste showed leadership in speaking with peers one-on-one, and then banding together student voice and perspectives before coming forth with an issue. They demonstrated two different critical thinking approaches in their leadership style (Conner & Strobel, 2007).

Furthermore, in a school closure study, Kirshner, Pozzoboni and Jones (2011), points out that high school and higher education students struggled managing personal bias against "disconfirming or alternative evidence" about their school (p. 140). Yet, participants on their own still made logical decisions in their projects that showed support for the school. The internal tension and bias one feels shows that students were tackling critical thinking and decision-making. Schools are social structures and institutions. When a school undergoes something serious like a closure, it can provide opportunities for students to collaborate, reflect, and express their voice in the interest of doing what is best for the school.

Most interestingly, critical social analysis is also part of YPAR programs, sometimes, to develop critical thinking. Govan et al. (2015), describes critical social analysis (CSA) as a constructive process involving collaborative and reflection-based discussion that is embodied by visual expression and narrative. In these facilitated conversations, participants make the connection between real experiences and social structures including systematic forms of power and oppression (Govan et al., 2015). When YPAR programs demonstrate CSA in their learning, young people are encouraged to find

their critical lens and eventually, their overall voice (Govan et al., 2015). In the context of their communities, the action research process provides tailorable leadership opportunities for youth which have been demonstrated to improve their critical thinking skills. Additionally, participation in the action research process also can build meaningful relationships.

Improvement in Relationship-building

YPAR programs help young people improve their social skills and build relationships. Preparing youth with these invaluable social skills helps them to build positive and healthy relationships, which in turn, creates a positive impact on their learning in life-wide ways. Positive relationships are important sources of social support for youth, and in particular, when established between adult staff and youth learners, it helps build communities, strengthen trust, and provide encouragement for one another (Govan et al., 2015). Govan (2015) dives even further and explains how these sources of social support can cause youth to display additional commitment to their action research project and demonstrate evidence of leadership development.

YPAR relationships help prepare youth to be colleagues with adults in the future, versus the typical hierarchical school structure that students commonly experience. In preparing to work with adults, youth experience intergenerational relationships. Intergenerational relationships in YPAR are when adults and young people of all ages and generations organize collectively to empower organizations and/or schools so that it gains additional insight in furthering their mission (Govan et al., 2015). Intergenerational relationships between adults and students promote tolerance and inclusion of other cultures (Mitra, 2005). Kornbluh et al. (2015) explains that these relationships have the potential to help the adults in direct supportive roles; it can strengthen their leadership, group facilitation, and instructional practices.

Strong relationship skills are helpful for young people to heal in life-long ways as well. Young people have reported improvement in their mental health when programs focus on healing from oppressive experiences (Govan, 2015). Research by Govan et al. (2015) describes how “deep and intentional relationships, focused on healing and solidarity, engender trust, a sense of family, and commitment to transforming systems of oppression” (p. 92). A continuous focus on healing one’s self is important to cope with in order to grow into a strong leader.

Significance of YPAR

Identity and Intergenerational Partnerships

By participating in action research, youth not only reflect on their positionality, but also learn in life-deep ways. This happens when they discover their personal beliefs or issues they deeply care about. There is substantial evidence of identity development for youth (Bertrand, 2018). In many cases, youth find themselves interested in and taking action on are social justice issues. Supporting identity development is beneficial for youth to learn about themselves in life-deep ways and can help students become confident when building relationships with adults.

When young people are placed into the position as researchers, youth-adult partnerships are formed and can benefit all parties involved. Youth-adult partnerships are when youth voice and their perspective are valued equally alongside school adults (Govan et al., 2015). When youth are given opportunities to explore improving their school or community, this can lead to meaningful experiences because they are guided by their educators and leaders from the organizations they work with (O’Donoghue et al., 2003). When students work with an organization, the organization’s leaders are in a role just as significant as school educators. As a matter of fact, Bertrand and Rodela (2018) have found that all parties involved: youth, school educators, and the organization’s adults develop

leadership skills. Adults and educators are in the direct position of being an excellent role model for students, especially when students have the opportunity to interact with them outside of traditional school settings. Valuing and centering youth perspective in these projects can benefit the educational research process in unique and positive ways.

Conclusion

When a YPAR program promotes authentic and meaningful involvement, youth have opportunities to discover aspects of their identity that lead to strong connections with others (Friedrich et al., 2011). Focusing on leadership skills can create stronger pathways to identity development and intergenerational relationships. The leadership skills built from previous YPAR programs resulted in youth exhibiting stronger communication, critical thinking, decision-making, and relationship-building. Through meaningful service-learning experiences, young people are likelier to learn in ways that are life-long, life-deep, and life-wide. Accounting for the three learning perspectives when building curriculum is one way to ensure student learning remains a focus in education. The field of education and schooling has a responsibility to prepare students to be productive workers and effective citizens in society. For all students to grow into effective leaders, it is important to tailor the approach to the individual. John W. Gardner (1990) once described leadership style by saying, “Leaders come in many forms, with many styles and diverse qualities. There are quiet leaders and leaders one can hear in the next county. Some find strength in eloquence, some in judgment, some in courage” (p. 5). Fostering and improving YPAR programs is a useful educational tool to accomplish the goals of schooling and impact every student. Concentrating on personal leadership growth in youth can play a dynamic role in advancing the future of educational studies.

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COLLEGE RELATIONSHIPS AND GRADES

William Appel

ABSTRACT: Emerging adulthood is when many college students experience a reduced level of parental involvement and increasing adulthood responsibilities. Some of the responsibilities include being on one's own for the first time, friendship, family, work and college responsibilities. This proposal explores the association of dating and grades in college among college-age students in Washington State's universities. Using a cross-sectional design with an online survey, the proposal asks demographic questions, as well as dating-related questions, along with academic success questions such as grades received, and number of hours studied each week. The results are expected to yield differences among year in college, how long students have been in a relationship and academic success.

Introduction

Emerging adulthood is the development period from late teens through early twenties, ages 18-25, in which many college students experience a reduced level of parental involvement and increasing adulthood responsibilities (Arnett, 2000). Arnett (2000) suggested that these emerging adults are in a time of frequent change and exploration. In addition, for many people the late teens to early twenties is a time for many possibilities with regard to worldview, romantic relationships and communication (Arnett, 2000).

College students have numerous options for communication and interactions using social media and mobile communication devices. Social interactions play an important role in helping students adjust to college with today's multimedia society. Jacobsen and Forste (2011) noted that college students today are using electronic media higher than any previous generation. Some examples of social media include Facebook, Instagram and Twitter. In fact, college students use an average of 12 hours per day on electronic media, including texting and talking on the phone (Jacobsen & Forste, 2011). Even though some students may use excessive waking hours on social media, it serves as a way to help with college success. This is because social networking sites can serve as a way for

students to develop their identity and help with the stress of college (Pierceall & Keim, 2007). Other predictors of academic success include students' cognitive abilities such as intelligence, students' interests in a specific subject and their motivational factors to do well in college (Cheng, Ickes, & Verhofstad, 2012).

Along with many new ways of communication, current college students have many responsibilities and new experiences in their environment which lead to an increase in stress. Pierceall and Keim's (2007) research show approximately 75% of college students considered themselves moderately stressed and about 12% were severely stressed. Stress during the transition to independence includes academic, financial, time or relationship-related (Dusselier, Dunn, Wang, Shelley, & Whalen, 2005). Female students were found to experience higher stress levels compared to male students (Pierceall & Keim, 2007). It is not surprising that college students experience many stressors including academic issues, financial concerns, and lack of sleep (Abouserie, 1994; Arnett, 2000; Dusselier et al., 2005). Academic-related activities such as the rigors of course load, examinations and students' high expectations of doing well contributed the most to university students' stress (Abouserie, 1994; Dusselier et al., 2005). Arnett (2000) noted about one third of students who go off to college after high school spend their

next several years in independent living such as the college dormitory or a fraternity or sorority house. Finances associated with living away from home means having to work while in college and relying on family at the same time while juggling other environmental factors such as lack of time (Darling & Turkki, 2009). Juggling hours at work and college expectations contribute negatively to students' health including inadequate sleep (Dusselier et al., 2005). However, students have family and social support which contributes to their academic success.

Numerous studies show the positive association between family and social support and college success. For example, Alnabhan, Al-Zegoul, and Harwell's (2001) study showed higher university GPA is associated with the presence of strong family support. Similarly, another research demonstrated family interaction acted as a stress buffering mechanism which is a contributing factor to high academic performance (Cutrona, Cole, Colangelo, Assouline, & Russell, 1994). In addition, Stecker (2004) found that students in their early academic years who had regular contacts with their family dealt with academic challenges better than students who did not have regular family interactions and support. Regular family interaction plays a significant role in students' academic success because it helps students cope with stress as well as increase their satisfaction while in college.

While stress may act as a hindrance or a risk factor to life satisfaction among college students, being in a relationship may serve as a protective factor. Arnett (2000) argued that the forming and continuing to be in a romantic relationship is essential to college students' lives. This agrees with Dusselier et al.'s (2005) study in which they suggested that romantic relationships contributed to college students' overall happiness and satisfaction with life. This is because romantic relationships are viewed as the closest relationship in which college students are engaged in that contribute to their overall happiness and life satisfaction (Arnett, 2000). Other contributing factors to life satisfaction include personal characteristics.

Personal characteristics such as age and gender

may play a role in forming romantic relationships and life satisfaction. Men and women have different time management skills, social behaviors and factors that contribute to their stress differently. For example, Dusselier et al. (2005) found that women reported better time management skills compared with men in college. With respect to age, older students appear to have better time management skills compared with younger students while younger students spend more time on social media compared to older students (Jacobsen & Forste, 2011; Netting & Reynolds, 2018). However, older students usually have more environmental pressures than younger students such as family responsibilities and jobs. Regardless of age, personal behaviors have great influences on college students' life satisfaction and relationships.

Negative personal behaviors such as poor sleep and engaging in non-social interactions may hinder college students' life satisfaction. Dusselier et al.'s (2005) study showed an association of irregular sleeping patterns to students' low grades and also lower life satisfaction compared with those who get regular sleep. The use of electronic media among today's college students far exceeded all previous generations of college students (Jacobsen & Forste, 2011). Electronic media may entice students to engage in more non-social interactions such as watching online TV shows or online gaming. The large volume of college materials to master in such a short time each quarter and the stress of taking exams may lead students to revert to non-social online activities as a way for students to cope (Abouserie, 1994; Jacobsen & Forste, 2011). Other ways that college students use to cope with stress and maintain life satisfaction is that of having romantic relationships.

Dating and having romantic relationships are a normal part of college life for many students. Kuperberg and Padgett (2015) defined "hookup" as a "casual, noncommittal encounter of a sexual nature between two individuals, which may or may not include sex" (p. 517). In the U.S., some characteristics of hookups in college students include gender and class standing differences. Males tend to hook up more than females,

and freshmen tend to have more hookups than upperclassmen since freshmen are experimenting with their new freedom (Kuperberg & Padgett, 2015). Women place more emphasis in avoiding risk taking in hookups than men because of the increased personal risk of pregnancy and sexual assault during sexual encounters (Kuperberg & Padgett, 2015). Students who are in upperclassmen status seemed less interested in hookups and more interested in dating (Kuperberg & Padgett, 2015), and also older emerging adults in early to mid-20s may be ready to be involved in a deeper level of intimacy (Arnett, 2000).

The definition of a committed romantic relationship is exclusively dating one individual in college for at least six months. There is a plethora of research on dating violence, hookups and stress associated with college students. However, there seems to be a lack of research on the association of being in a romantic relationship and academic success in college.

Current Study

The current study aims to examine the association of being in a committed romantic relationship and academic success in college. This study will use a theoretical framework of emerging adulthood outlined by Arnett (2000) on the development of late teens through twenties. Arnett (2000) suggested the concept of development in the emerging adults is a subjective balance of new, relationship, and responsibilities with the rigors of school, while still trying to live independently with some reliance on families. In addition, this study will also use the framework proposed by Darling and Turkki (2009) in which each individual is influenced by their environmental factors such as family interactions, work, peers, and physical surroundings. In addition, biological characteristics as mentioned above such as work and family obligations, age, gender and adequate sleep also contribute to a student's overall life satisfaction.

For this study, there are two research questions: RQ1) Is there a positive association between being in a romantic relationship and academic success among

college students? RQ2) How does the amount of time spent studying in college affect the quality of relationship? The first hypothesis is that there is a positive association academic success and being in a romantic relationship. The second hypothesis is that the increase in time spent studying has little effect on the quality of romantic relationship. The independent variable is romantic relationship and the dependent variable is academic success.

Methods

Study Design

This study will use a cross-sectional study design. Participants will be allowed to respond one time using an online anonymous survey.

Proposed Sample, Sampling Frame and Sampling Technique

The proposed sampling frame will consist of undergraduate students attending the University of Washington (UW) tri-campus of Bothell, Seattle and Tacoma and students from the three campuses of Washington State University (WSU) located in Everett, Spokane and Vancouver.

Students attending the three UW and three WSU campuses (a total of six universities) will be contacted online to determine if they are interested in participating in the online survey. The inclusion criteria include at least 18 year olds, undergraduates, marital status including single, engaged, married and divorced students, and currently attending UW or WSU at least part-time (taking two classes). The exclusion criteria include anyone attending college taking less than two classes, or not attending the six campuses mentioned above. It is hoped to have at least 2,000 students who will respond to take the online survey.

The sampling technique that will be used is random probability sampling. Structured questions that are closed-ended will be asked in the survey. The survey will contain questions with multiple choice answers and the survey will be anonymous.

Each school will be contacted for permission to post the online survey. Upon approval from each of the six participating universities, a student researcher (SR) attending each of the six universities

will provide each school's contact a copy of the flyer and survey as part of the approval process. After that, the SR will post colorful and eye-catching flyers containing the study's information and online survey in places where all undergraduate students frequent such as campus cafeterias, student unions and recreational centers. Flyers will contain information about the anonymous study such as its purpose, recruiting undergraduates to respond to the survey, the one-week time frame the students can log in in order to complete the survey, the link to the survey, whom to contact for questions about the study, and a chance to win one of the 200 \$25 Visa gift cards upon completion of the survey. After the completion of the survey, a drawing will be conducted a week after for those who wish to enter the random drawing. All that is required is that they add their name, email address or cell phone number so that they can be entered into the drawing.

Data Collection Method

An online survey will be available for one week in order for students to participate in the survey. Interested students can log in to the link provided on the flyers as well as from the all campus email blast at their university. Once the students click on the link, the survey will appear with a short description of the study including the study's purpose, it is anonymous, to answer each question truthfully, and study's results will be shared with the six universities after they are analyzed and written up within six months after the study is over. The directions will also include an optional chance at the end for each participant to enter the drawing for the \$25 Visa gift card. Each student will only be allowed to take the survey once. Using an online survey tool such as Survey Monkey (SM), data will be collected using SM and will be downloaded daily during the one-week survey period open to students at the six campuses. All students who wished to enter the gift card drawing will have their information stored separately.

Construct Operationalization and Measurement

The survey will contain 20 multiple choice questions. The survey will ask about demographic

data such as the student's age, gender, and year in school. The survey will also ask each student's major or intended major, how many hours they work per week, if any, how many classes they are taking, and hours per week each student spent study excluding the hours they attend classes. Hours spent studying each week is measured by using the response options of 1-4 hours per week, 4-6, 6-8, 8-10, 10 or more hours/week. Academic success is measured by using each student's cumulative grade point average (GPA) as of the previous quarter. The GPA is measured using a four-point scale of A=3.5-4.0, B=2.8 – 3.49, C= 2.0-2.79 and D=1.0-1.99.

Questions about committed romantic relationships using an interval scale include: "Are you in a committed romantic relationship? This means that one is exclusively dating one person for at least six months" and the responses are "0 = no relationship, 1 = in relationship for less than 6 months; 3= in relationship for 6-12 months, 4= in relationship for 12-24 months, 5 = in relationship for more than 24 months". A question about marital status will be measured dichotomously with a yes or no responses. The next question is "How much time do you spend with your girlfriend/boyfriend/significant other each week?" and response choices include "0-1 hour, 1-3 hours, 3-5 hours, 5-7 hours, more than 7 hours each week". The survey also contains a question about how many people they are dating in the past six months (this question will confirm that each student is in a committed romantic relationship).

Also, the survey will contain questions about students' views on romantic relationship, average hours of sleep each night for the past week, how often they use electronic devices each week, and if they receive financial assistance from their parents, their support system such as how supportive their friends, family members and co-workers, if applicable. The last question of the survey will be an open-ended question that asks, "Is there anything else you'd like to share with us about your college experience, dating, committed relationship or anything else?" There will be a blank space where the students can write their own responses for this question, if they wish to do so. Each student will

have a chance to review their responses to the 20 questions before they submit the online survey. In the analysis section, all multiple-choice questions will be analyzed using quantitative multivariate analysis, controlling for the number of classes each student takes. The last question will use qualitative analysis since it is an open-ended question.

The purpose of the study is to examine if there is an association between being in a committed romantic relationship and academic success among college students. The study also will assess whether number of hours spent studying has any association with being in a romantic relationship or not. Lastly, the study hopes to see whether environmental factors such as family and/or friends' support such as financial and emotional support play a role in their life satisfaction and romantic relationships while in college.

Limitations

The study has a few limitations. First, the study design is a cross-sectional design of one-time data gathering of students at six campuses; therefore, causality such as being in a romantic relationship and academic success cannot be inferred to all students. Second, the results are limited to the students at the six campuses and cannot be generalized to students at other colleges and universities. Third, it is an online survey and we cannot determine the truthfulness of the students' self-reported survey items such as GPA and whether they are in a committed romantic relationship of at least six months or not. Also, it cannot be determined whether a student is needing money and participated in the survey just for the \$25 drawing, leaving many questions blank and therefore will affect the study's results.

Other limitations include the types of questions asked and not asked. For example, some students may feel uncomfortable about questions such as how many hours they spent online using electronic media such as cell phone, online gaming and watching online TV shows. Students' uneasiness and possibly untruthfulness in answering these questions may affect how they respond to other questions in the survey. Some questions that

were not asked include examining students who are married and if they do better in college compared with students who are in committed relationships. Also, academic majors and intended majors were asked, but it may be hard to find an association between majors, the ability to be in a romantic relationship and academic success. The study touched on environmental factors such as family and peer financial and emotional support; also, whether the students participate in religious attendance or not may act as protective factors which were not examined in this study. These factors would be an interesting follow up for a future longitudinal study following the students from the time they are freshmen to the completion of their senior year.

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DO SOCIOECONOMIC FACTORS CONTRIBUTE TO A PATIENT HAVING A HOSPITAL ACQUIRED INFECTION IN WASHINGTON

Michael Prothman & Alex Wang

ABSTRACT: Throughout history there has been a strong link between healthcare outcomes and socioeconomic status. In spite of this during our research we found little to no data discussing how socioeconomic status affects hospital infection rates, even while hospital acquired antibiotic resistant infections become a greater threat each year. To investigate this relationship we propose a broad sampling of 10 Washington State hospitals, randomly selecting patients admitted at the time of the study. Patients selected who agree to participate would be given a questionnaire regarding socioeconomic status in the hospital and a brief follow up afterward to determine if they contracted an infection resulting from their hospital stay. It is imperative that we continue to investigate and better understand the role socioeconomic status plays on our health and we believe this proposal is an important step in doing so.

Introduction

Since the inception of hospitals, hospital acquired infections (HAI) have been a serious issue. In the 18th Century, some physicians recognized the rates at which their patients were contracting HAIs and as a result, some began to approach procedures differently. In 1846, the physician Ignaz Semmelweis was the first to practice hand hygiene before every procedure and it was through this practice that hospitals were able to start decreasing the rates of HAI by 70 to 90 percent (Sherman, 2007). Today it is estimated that two million HAIs occur each year in United States hospitals, resulting in nearly 100,000 deaths (Klevens, Edwards, & Richards, 2017). Even with improvements in modern medicine and our understanding of germ theory, HAI is still a major threat, especially now as antibiotic resistance becomes ever more common. Most studies pertain to either HAI rates or how socio-economic status (SES) affects overall health, but does not evaluate if SES affects rates of HAI. Our goal is to identify socioeconomic factors that may increase the likelihood of HAIs in the hopes of

identifying people at greater risk so care plans can be developed to avoid dangerous and costly infections.

The development of antibiotics has played a large role in combating many diseases, but over time some strains of bacteria have adapted to become resistant to antibiotic treatment, raising the danger of HAIs. The increasing rates of antibiotic and antimicrobial resistance results in greater likelihood of contracting an infection while at the hospital (Yokoe & Classen, 2008). These types of infections can be difficult to treat and are one of the world's most pressing medical issues (Dobson, 2015). Fifty-one percent of deaths due to HAI are attributed to resistant strains of bacteria with the leading contributor being Methicillin-Resistant Staphylococcus Aureus (MRSA) (Ventola, 2015). Many of these infections require newer antibiotics for effective treatment at greater cost, frequently creating an even greater burden amongst people in lower socioeconomic status (SES), (Kangovi et al., 2013).

Throughout history there has been a strong link between healthcare outcomes and SES. When puerperal fever was at an all-time high

in maternity wards in the 18th century, the hospitals with the highest death rates were run as charitable institutions offered to women that were poor or unmarried (Dobson, 2015). The wealthy have always had advantages when it comes to treatments and health outcomes due to their ability to obtain the best treatments, products and physicians. In modern times it is estimated that the average person over the course of their lifetime will spend over \$316,000 on healthcare (Alemayehu, & Warner, 2004). Treatments for infections caused by antibiotic and antimicrobial resistant strains of bacteria due to HAI can cost as much as \$1,000 to \$3,000 per course and cancer chemotherapy can cost tens of thousands of dollars (Ventola, 2015). The price of many medical treatments and procedures carry a heavier burden on those of lower SES with many going into debt and adding preventable strain to the healthcare system itself.

Increased individual medical debt forces the healthcare system to in turn make up for this gap in patient income and cost through elevated spending. Associated costs due to Central Line Infections (CLI) were estimated to cost between \$30,919 and \$65,245 on a per case basis (Zimlichman et al., 2013). In total, the annual costs of the five major HAIs on the healthcare system was between \$8.3 and \$11.5 billion with surgical site infections contributing the most to overall costs (Zimlichman et al., 2013). Reducing HAI and the associated costs specifically for low SES patients, has the potential to save significant amounts of money for a vulnerable population while also reducing the costs to the healthcare system overall.

Direct patient care is necessary in a hospital setting and many cases of HAI are due to this direct interaction. Studies of healthcare workers on a coronary care unit and intensive care unit (ICU) showed that of 134 screened healthcare workers, five members or 3.7 percent were MRSA colonized (Papastergiou & Tsiouli, 2018). In healthcare settings the healthcare workers themselves are a reservoir for HAI and a potential source of transmission to the patients

that they care for (Papastergiou & Tsiouli, 2018). Another source of HAI has been through colonization of multidrug resistant strains on healthcare workers' mobile phones. In a 15 bed ICU, bacterial colonization was assessed on 56 healthcare workers' mobile phones and 46 administrative employees' phones. After analysis, the healthcare workers' phones had a higher number of different species of bacteria per phone (Missri et al., 2018). With recognition that healthcare workers are a major factor for HAI in hospitals, we are able to account for them when considering other, less obvious causes such as SES. Beyond the healthcare workers, many procedures themselves come with increased risks of HAI.

The Centers for Disease Control and Prevention (CDC) and World Health Organization (WHO) have listed the most common and significant HAI as surgical site infections, bloodstream infections due to the use of central lines, antibiotic resistant bacteria, ventilator associated pneumonias, and urinary tract infections due to indwelling bladder catheters (Yokoe & Classen, 2008). It is estimated that between 5 and 10 percent of hospitalized patients develop an HAI from these procedures (Klevens & Richards, 2007). Low SES patients are twice as likely as high SES patients to require urgent emergency department (ED) visits and four times more likely to require admission to the hospital (Kangovi et al., 2013). People of low SES are possibly the population most impacted by HAI, both due to their experiencing the majority of complications from procedures and comprise the majority of ED visits.

No matter the route or severity of the HAI its effects can be costly in multiple ways to individuals of low SES. HAIs not only cause emotional stress but, in some cases, lead to disabling conditions that reduce the quality of life (Weinstein, 1998). Healthcare costs can increase to debilitating levels for daily life and function through extra procedures which can be difficult to recover from (Weinstein, 1998). Depending on the age of the patient and the severity of the

Method

infection, individual effects will vary. The most pressing concern is not the extended stays in hospitals, but the compounding effects an HAI has on one's life, family, and finances.

Increased length of hospital stays and medical complications due to HAI can cause significant and lasting complications for patients. Approximately 2.6 percent of operations performed each year are complicated by Surgical Site Infections (SSI) (Mangram, Horan, Pearson, Silver, & Jarvis, 1999). Treatment for an SSI prolongs hospitalization an average of seven days and creates an average of \$3,000 in additional medical costs (Mangram et al., 1999). Patients with HAI were at greater risk of readmission compared to patients that didn't contract an HAI; of the total days spent in the hospital 9.3 percent were considered to be excess days attributed by these infections (Rahmqvist, Samuelsson, Bastami, & Rutberg, 2016). These excess days place a population already at an increased risk of financial burden at an even greater risk due to the associated costs of more time spent in the hospital.

Certain individuals are at higher risk of contracting a HAI which also parallels people's SES. Factors that are also included in the increased risks of HAI include the elderly, the young, and the immunocompromised population (Ducel, Fabry, & Nicolle, 2002). The data shows that rates of HAI in the elderly are nearly double that compared younger patients (Avcı, Ozgenc, Coskuner, & Olut, 2011). The more that we can understand about the risks, risk factors, routes of transmission and the people or groups that are most affected by HAI, the better we can combat it and relieve its burden not only on individuals but on the healthcare system itself. Do socioeconomic factors contribute to a patient having a hospital acquired infection in Washington? The hypothesis that lower SES increases the likelihood of a HAI does appear to have some validity to it but requires further research.

Design

The research performed will be a cohort study of 10 Washington hospitals using cluster sampling with each hospital being its own cluster.

Sampling

Our Target population will be all patients, newborn and older, admitted to hospitals in Washington State. Hospitals will be selected by weighting primarily for the percentage of the state population in their service area. To do so we will use the population data of the most recent state census for the counties in that service area. This would be followed by evenly distributing hospitals involved across the state, to account for the greater density of population in western Washington.

Quotas will be set for each hospital based on their average weekly admittance. This approach will be used to prevent skewing of data to either more populated areas due to higher admittance rates or lower population areas if the same quota was applied to all the hospitals.

The administration of each hospital we select for this study will be approached individually, where we will explain the design, purpose, and goals of the study. If a hospital declines to be part of the study we will select another that most closely matches it using the same criteria. After the hospital administration has approved of the study, we will notify the staff via emails and flyers in the break and work areas of the hospital.

To collect this data, a researcher will be placed at the given hospital and will randomly select newly admitted patients. The researcher will notify the patient or guardians of the study. Each individual will give written consent to participate and access to their medical records for this hospital visit. Following the participant's consent, they will be given a questionnaire about their demographic information and have their contact information collected for a follow up survey. One month following their initial questionnaire participants will be given a phone interview to confirm if they contracted an HAI, what they were treated for, and

what treatments were provided. If participants are still in the hospital at the time of the follow up a second phone interview will be attempted one month later. If the participant is still in the hospital two months after the initial contact they will be marked as, “Still receiving treatment” and the interview will be completed.

Measures and Variables

For this study, our interest is the difference in socioeconomic factors between patients who do and do not contract an HAI resulting from a hospital visit. Therefore, the independent variable will be the socioeconomic factors reported by each patient such as ethnicity, age, income, etc. The dependent variable will be contraction of an HAI by a participant during their hospital stay. In addition to the independent and dependent variables being examined we will also be examining the purpose for the participants visit and what care was provided. The care provided and reason for the participant’s visit while not directly related to the study at hand could affect the resultant data, thus qualitative categories will be created for each. To better understand how SES might affect HAI outcomes it is important that we account for both of these confounding variables.

Analysis

The data will be broken down using qualitative methods. Answers to survey questions will be multiple choice, (e.g. “What is your ethnicity? Select below”, “What is your annual income?”, etc.) with quantitative questions such as income being broken down into number ranges of 4 to 5 answer for participants to choose from. This is being done to make data entry and analysis of this large data set much easier. This ease will be necessary as we will be using multivariate analysis. All participants are a combination of many socioeconomic factors all of which play differing priority in that person’s health outcome. To simplify and normalize the two confounding variables of, “reason for visit” and “treatment provided while there” for the study we will create general qualitative categories for both such as:

- admitted to hospital for: upper respiratory infection, trauma (major/minor), myocardial infarction, stroke, etc.
- Treatment provided: steroid, antibiotic, surgery (major/minor, planned/emergency), etc.

Again, this will allow us to still account for these important factors but not focus overly on either factor.

Ethics

This study will require Institutional Review Board, (IRB) approval from the University of Washington along with each hospital to ensure the privacy and participants’ rights throughout the study. Participants will be given both a verbal and written explanation of their rights while involved in the study. In addition, patients or their guardian will sign a release form giving their informed consent, with participants between the ages of 14 to 18 signing an additional assent form. Patients under the age of 14 will not require assent due to their age.

This study will be confidential since we will collect participants’ medical, demographic, and contact information. To ensure the participants’ right to privacy we will create separate databases, one for their socioeconomic and medical information, and a second for their name and contact information. Both databases will be encrypted following all Health Insurance Portability and Accountability Act, (HIPAA) and National Institute of Health, (NIH) or other appropriate oversight body guidelines.

Discussions

Limitations

We have worked extremely hard to reduce the expected limitations of this proposal, though we have found some. It is important to note this study will only be a snapshot of what occurred in those hospitals in Washington state during the study. While the study will likely be a strong representation of Washington and the United States as a whole, it likely will become less representative of other countries and regions the more dissimilar their demographics are due to difference in

socioeconomic factors and social structure in those areas. Since we are only taking a one-time look and will not track how socioeconomic factors change the outcome for each participant, a causal relationship between factors and outcomes will not be possible.

Future Research

Following this study it will be important to repeat it in another geographic area of the United States, though sample sizes would be determined using the same method as above and not based on the size of this study. This repetition should be done to confirm the validity of any statistically significant correlations found between specific socioeconomic factors and likelihood of contracting an HAI in a region with different but similar demographics. In addition to repeating the study, if statistically significant relationships are found between certain socioeconomic factors and an increase in HAIs follow up studies will need to be performed looking into possible causation.

Importance

We created this proposal because we found the available information to be somewhat lacking and wanted to design an exploratory study to look into how socioeconomic factors influenced the contraction of HAI. During our research we found there to be plenty of information regarding how socioeconomic status affects an individual's overall health and how hospitalization or treatment affected their likelihood of contracting an HAI, but none looked at both. As antibiotic resistance increases the need to be able to predict and target individuals at risk of infection rises. This study is a first step in identifying people at risk of HAI in order to develop better means of prevention.

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DEPRESSION AND EXERCISE: DOES EXERCISE HELP PEOPLE WITH DEPRESSION?

Ameena Mohammed

Depression is a worldwide health problem that is experienced by many individuals throughout all age groups and especially the youth. Depression can cause many social and emotional problems such as mood swings and low self-esteem. Unfortunately, if not managed, depression can lead an individual to commit suicide. Studies have shown that exercise is an effective alternative in the management and treatment of depression. This proposal will look into how depression in college and university students can be successfully managed with exercise. In this proposal, the Patient Health Questionnaire (PHQ-9) will be used to study the levels of depression. It will also discuss various types and intensities of exercise and their effects. This proposal will reveal that individuals who manage their depression with exercise see positive results and have more control over their symptoms.

Introduction

According to the World Health Organization (WHO), depression is second on the list of global healthcare problems (Krogh, Hjortoj, Speyer, Gludd, & Nordentoft, 2015). Depression affects one in five people with a sizeable number of cases occurring in the youth and it is also the leader on the list of global burden of disease in people younger than the age of twenty-five (Bailey, Hetrick, Rosenbaum, Purcell, & Parker, 2017). Out of the total world population, it is estimated that about 15% experience various levels or intensities of depression (Bailey et al., 2017). Depression causes multiple unpleasant symptoms such as sadness, guilt, low self-confidence and changes in sleep patterns and eating habits. Additionally, depression increases one's risk of committing or attempting suicide. Furthermore, depression is a contributing factor to suicide, particularly in university students and increasing the chance of substance abuse (Alsarairoh & Aloush, 2017).

Depression is a significant public health problem where those afflicted with it are usually prescribed medications and psychotherapy (Helgadottir, Forsell, Hallgren, Moller, & Ekblom, 2017). However, those medications usually have negative side effects that gets in

the way of successfully treating depression (Helgadottir et al., 2017). Both psychotherapy and medications come with a high price tag that can be hard to afford for some (Krogh et al., 2015). While there are some effective treatments available, only about 35%-50% of depression would be eased (Harvey, Overland, Hatch, Wessely, Mykletun, & Hotopf, 2017). Due to the modest results of treatments, reports say that there is anywhere between 12% and 40% of a dropout rate in clinical trials which usually occurred after 6-8 weeks of treatment (Krogh et al., 2015).

An alternative method to treat depression is exercise. A study of rodents running on wheels has shown to be effective for improving the effects of depression (Morgan, Singhal, Corrigan, Jaehne, Jawahar, & Baune, 2018). When patients with clinical depression were referred to exercise programs, there was little to moderate effect on the symptoms of depression (Krogh et al., 2015). If all adults exercised for only one hour per week, then 12% of new cases of depression could be prevented (Harvey et al., 2017). Given all this information, this proposal research question is: what are the effects of exercise on depression? The hypothesis is that exercise will affect depression in a positive way and it will provide them with additional benefits.

Background

There are many benefits of exercise that allow individuals to feel better about themselves both on the inside as well as the outside. When depressed people engage in physical exercise and receive positive feedback from others, it creates a feeling of self-efficacy. Self-efficacy helps build confidence in one's self and makes it easier to combat depression. Moreover, being in the habit of exercising in gyms or other facilities gives people the opportunity to socialize with others. This serves as a distraction from negative thoughts and could result in improved mood (Bailey et al., 2017). The benefit of socializing while exercising could be an important part of the process to help treat depression. Furthermore, mastering a new skill, such as some type of exercise, will act as a motivator, help manage depression and improve one's mood (Lawlor & Hopker, 2001). All of these benefits of exercising help build motivation in individuals as well as feelings of accomplishment and self-confidence which result in easier management of depression.

The intensity of exercise also plays a significant role. According to Heinzl et al. (2017), those in a high intensity exercise group compared to a low intensity exercise group will have better performance in the neuropsychological test and a positive effect on depression. Helgadottir et al. (2017) says that if one exercises according to public health recommendations, then depression would be reduced at a higher rate than if one exercised below that recommended amount. Another study found that exercising for a longer amount of time was more effective in treating depression than exercising for a less amount of time (Helgadottir et al., 2017). Helgadottir et al. (2017) showed that those who participated in high intensity weight training had better results in treating depression than those who participated in low intensity weight training. In treating depression, there was a recommendation of engaging in exercise of 60%-80% of maximum heart rate (MHR). However, one review found that 61%-74% of MHR was less effective than

lower and higher intensity of physical activity (Helgadottir et al., 2017). The results of another study showed that intensity was not a huge factor because all three groups of varied exercise levels experienced similar results in reducing their depression (Harvey et al., 2017).

The type of exercise is also an important factor in determining whether exercise has an effect on depression or not. Bailey et al. (2017), stated that anything can be categorized as exercise as long as any part of the body moves by the skeletal muscles which causes the use of energy more than resting levels. Another study included yoga because the researchers believed that it gives a positive response to participants with depression (Helgadottir et al., 2017). In another study, the researchers' intervention included only aerobic exercise which increases heart rate, breathing and sweating showed that aerobic exercise had meaningful results in reducing depression (Pritchett, Daley, & Jolly, 2017).

Several types of people may be afflicted with depression. A recent study found that when nursing students engaged in exercise, they showed a significant drop in depression scores (Alsarairh et al., 2017). Bailey et al.'s (2017) study found exercise as a treatment to manage adolescents' depression showed to have positive results. Furthermore, because young people seem to easily incorporate physical activity into their lives, they can have an easier time to manage depression with regular exercise. In another study of postpartum women, it showed that exercise (this study focused on aerobic exercise) was an effective treatment to manage postpartum depression (Pritchett et al., 2017). Because of its effectiveness, the authors of this study believe that exercise should be a depression-management option for postpartum women. Furthermore, in the study of Pritchett et al. (2017) there was heterogeneity (diversity in character/content) present which could have influenced the results because some individuals could have managed their depression with exercise better than others. Also, a bonus benefit is that exercise is an extremely low cost to free intervention and it is

easily available.

Moreover, mindfulness meditation is also comparable to exercise as a way to manage depression. In the study of Alsarairoh et al., 2017, researchers compared mindfulness meditation versus exercise in managing depression. The results of the researchers' study showed that both meditation and exercise were effective in treating depression in nursing students, however mindfulness showed slightly more favorable results than exercise.

Methods

Study Design

Prospective longitudinal design has been chosen for this research. This design will span over a fairly lengthy period of time including more than one time point to assess to what point the independent variable effects the dependent variable.

Participants

This study will focus on depressed college/university students. Specifically, the students will be in the state of Washington. The students will be between the ages of nineteen and twenty-six. 800 depressed students, male and female, will be selected from colleges and universities around the state. There will only be one cohort of students. The sampling method to be used will be multi-stage sampling. Since there is a large population, multi-stage sampling seems appropriate for this research. Ten counties will randomly be chosen in Washington State. Then between three to five colleges/universities will be chosen from each of the ten counties. Then students from the randomly chosen colleges/universities will be chosen to participate in the study. However, it will be important to make sure that the randomly chosen students self-identify themselves as being depressed.

Ethical Considerations

Participation in this study is voluntary. Information and data obtained from the

participants will remain confidential. Consent forms will be needed to inform the participants of anything that could happen. The participants will be informed that all the conductors of the study will adhere to the Health Insurance Portability and Accountability Act (HIPAA) to make sure that all the data collected will remain private. The proposal of this study design and sampling methods will need to be reviewed by the Institutional Review Board (IRB) from the colleges and universities to approve the study. Additionally, no harm will be done to the participants and they will have the choice to drop out at any time if they wish.

Measures and Variables

The independent variable in this study is the amount of exercise the depressed participants engage in. The dependent variable in this study is the level of depression for which the Patient Health Questionnaire (PHQ-9) will be used. This instrument measures the severity of depression. On the PHQ-9, it asks questions about how one has been feeling for the past two weeks. For example, how often in the past two weeks has one been "feeling down, depressed or hopeless?". Then one picks from the options of: 1) Not at all 2) Several days 3) More than half the days 4) Nearly every day. The scores for each question added together then determines what level of depression one has. If there are participants in the population that already have signs or symptoms of the dependent variable around the first time point in the study, then those people must be excluded from the study because it will not be possible to assess whether they develop the outcome. Other important variables include the type of exercise or the intensity of exercise. Intensity of exercise could be divided into groups of low intensity, moderate intensity and/or high intensity.

Procedures

During the first time point, researchers will conduct face-to-face interviews with the randomly selected participants throughout the state. The interviews will collect data on how

much exercise the participants currently get and on how they have been feeling lately. The participants will also take the PHQ-9 during this time to see how depressed each participant is. Next, all the participants will be enrolled in exercise classes, while ensuring that they are getting more exercise than they had been previously. The researchers will follow up with the participants every other month over a period of 2 years. At the end of study, a final interview will be conducted with the participants and they will take the PHQ-9 again to assess whether or not exercise had an effect on treating their depression.

Analysis

This study includes a combination of qualitative and quantitative analysis. The face-to-face interviews contribute to qualitative analysis while the PHQ-9 is considered quantitative analysis. Bivariate analysis will be used when comparing the amount of exercise and the level of depression.

Discussion

Significance and Implications

Depression is a mental health problem that can lower one's quality of life and can take a toll on students' education. Students with depression may start to feel discouraged and think of education as useless and not take it seriously. If this study supports the hypothesis that exercise can help manage depression, then exercise can be used as a main treatment method.

Limitations

One disadvantage to a prospective longitudinal research design is the amount of time required. A lengthy period of time is needed to collect the data and to follow up with the participants. Another disadvantage is that longitudinal designs are very expensive. Plenty of money will be needed to conduct a longitudinal study design. One more disadvantage is the problem with attrition where there is a possibility of the loss to

follow up with some participants because some may have dropped out or there is a possibility that a participant may pass away or cannot continue to participate in the study. Lastly, it is necessary to have a large sample size because the more participants there are, then the more likely it is that the findings will be meaningful.

Future Research

In future research, it would be interesting to take into consideration if the intensity of exercise has an effect on depression. Instead of focusing on the amount of exercise, researchers could study if the intensity of exercise is more effective. Future research could expand this study to a nationwide study and compare the Washington State findings with the nation findings. In the future, research could be done on a different population. For example, researchers could study whether exercise has an effect on depression in adults over the age of 60. Even by narrowing down the population to a very specific group, for example, researchers in the future could study whether exercise has an effect on depressed lawyers or businessmen.

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THE EFFECT OF THE GREAT PERMIAN EXTINCTION ON SURVIVAL OF CHEMOSYMBIOTIC BIVALVES: HOW ALTERNATE DIETS AND METABOLIC PROCESSES ALLOW ORGANISMS TO SURVIVE MARINE HYPOXIA

Katherine Lu

ABSTRACT: As fertilizer runoff and other nitrogen rich pollutants cause dead zones in the ocean, there are many implications of what types of organisms will survive modern marine hypoxia. The purpose of this project is to determine if the Permian-Triassic Extinction, also known as the P-T event, approximately 252 million years ago caused mass marine extinction via hypoxia. This is one of the most common theories regarding the Permian extinction. According to this theory, the meteor strike sent debris and smoke into the atmosphere, blocking out the sun. Marine plants and algae, which rely on sunlight for photosynthesis, produce less oxygen. Dissolved oxygen in the water is quickly consumed, and marine animals suffocate en masse. Chemosynthetic bacteria can live without light because they capture energy from chemical bonds instead. Multicellular organisms are incapable of chemosynthesis by themselves, but they can survive by hosting chemosynthetic bacteria within themselves. If this were the case, the Permian Extinction would not have affected the survival of bivalve species with a chemosymbiotic diet. The author of this paper determined the effect diet had on survivability by comparing the numbers of chemosymbiotic bivalves before and after the Permian Extinction using data from the Paleobiology Database, an online data archive of fossils including their contemporary location, species, surrounding rock matrix type, and other specific information. The numbers of bivalve species of various chemosymbiotic diets in two time ranges were compared: from 300 to 250 million years ago and from 250 to 200 million years ago. These time ranges cover the late Permian and early Triassic periods, respectively. The hypothesis was wrong in that the Permian extinction did significantly affect the number of chemosymbiotic species. The number and distribution of chemosymbiotic bivalves actually increased following the Permian extinction.

Keywords: Bivalve, Chemosynthesis, Chemosymbiosis, Hypoxia/Anoxia, Great Permian Extinction, Deposit feeding, Suspension feeding

Introduction

The effect of the P-T event on isolated ecosystems such as deep-sea vents and burrowing animals is a common topic in the scientific community, and more insight into and interpretations of data will better our overall understanding of what actually happened 250 million years ago. Oxygen deprivation

inducing mass extinction during the Permian is one interpretation of events, justified by the dominance of anaerobic brachiopods in the rock layer formed during that time (Wignall and Hallam 1992). Chemosynthesis uses chemical bond forces to generate energy. The specific method here uses carbon dioxide and hydrogen sulfate. Unlike the most common methods of generating energy (photosynthesis

from fixing atmospheric carbon dioxide with sunlight, aerobic respiration from converting oxygen and glucose into carbon dioxide and water) chemosynthesis does not require light or oxygen. Chemosymbiotic organisms generally cannot synthesize by themselves and instead host chemosymbiotic bacteria (Mae et al. 2007).

Bivalves are aquatic mollusks of the class Bivalvia enclosed in two hinged shells. They are an excellent model organism because their hard shells fossilize easily, are found in marine environments all over the world, and modern bivalves are very similar in form and living conditions to their ancestors. Because of this, the author believes the effect of hypoxia on ancient bivalves would relate closely to the effect of hypoxia on modern bivalves. Bivalves, such as the well-known oysters, scallops, and clams, are also important to modern human culture and economy, and any changes for them will likely affect us.

In this paper, the hypothesis, the number of chemosymbiotic bivalve species being unaffected by the Permian extinction because they did not rely on photosynthesis related food sources, is tested. The author predicts the number of chemosymbiotic bivalve species did not change before and after the Permian Extinction.

bivalve data were separated into six categories: obligate chemosymbiotes, deposit feeding + chemosymbiosis, and suspension feeding + chemosymbiosis between the earlier 300 and 250 mya, and obligate chemosymbiotes, deposit feeding + chemosymbiosis, and suspension feeding + chemosymbiosis between the later 250 and 200 mya. Deposit feeders eat small pieces of organic material fallen to the sea floor. This is commonly known as bottom feeding. Suspension feeders eat even smaller pieces of organic material afloat in the water. Most bivalves are suspension feeders. All of these variables are categorical. The data were downloaded from the Palaeobiology Database on October 24th, 2018, using the genus “Bivalvia”, palaeoenvironment = marine, and a species-level specificity, with the time range from 300 to 200 million years ago. R Studio, a programming language for statistical computing, was used to create subsets containing only the relevant data and Microsoft Excel was used to conduct a six-category X2 test with an alpha of 0.025 and generate the figure below. The author chose an alpha value of 0.025 because the relatively small number of chemosymbiotic bivalve species in comparison to total bivalve species of all diets within these time periods requires more precision. The purpose of this test was to determine if the differences between these categories are significant.

Methods

Results

A X2 test to determine the validity of a hypothesis by calculating the likelihood of the null hypothesis being statistically significant was conducted. The

To test the author’s hypothesis that the Permian extinction had no effect on the number of chemosymbiotic bivalve species, the resulting p

	200-250 mya (million years ago), pre-extinction	250-300 mya, post-extinction
Obligate chemosymbiote species	21	188
Deposit feeding, Chemosymbiotic species	60	7
Suspension feeding, chemosymbiotic species	0	2

Fig. 1: Time Ranges and Diet Types of Bivalve Species

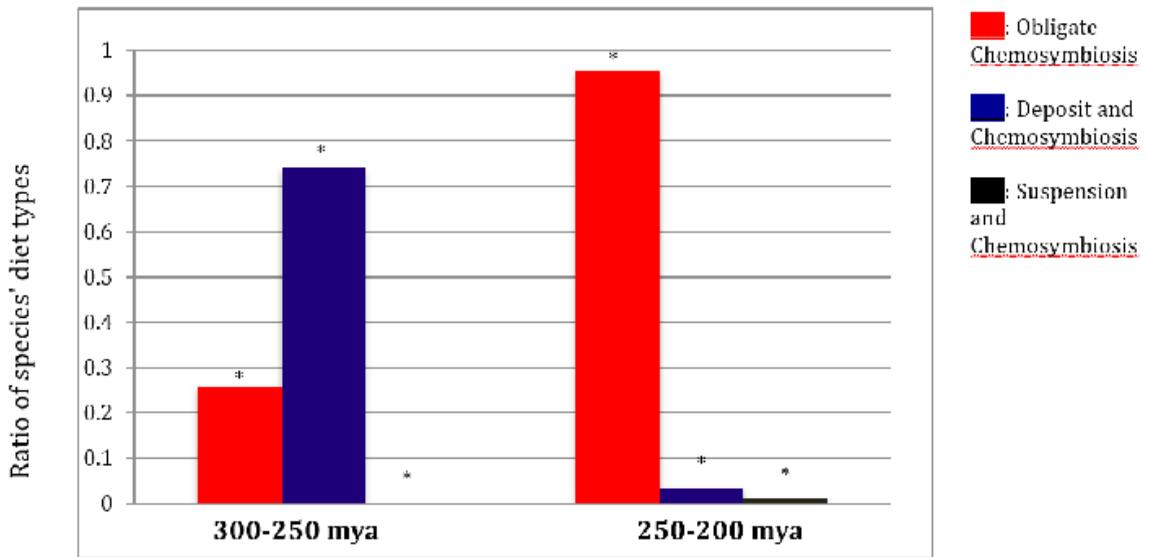


Fig. 2: Frequencies of various feeding patterns of chemosymbiotic bivalve species (obligate chemosymbiotes, chemosymbiosis and deposit feeders, and chemosymbiosis and suspension feeders) between 300-250 mya and 250-200 mya, $p = 7.62E-18$, $\alpha = 0.025$

must be greater than 0.025 for it to be significant. The X2 test result for all chemosymbiotic bivalves is much less at 7.62E-18. The null hypothesis and research prediction are rejected. There is a significant difference in number of chemosymbiotic bivalve species before and after the extinction. As seen in the red leftmost bars in Figure 2, the proportion of obligate chemosymbiotic bivalve species increased, with very few post-extinction chemosymbiotic bivalves having alternate forms of diet. Additionally, the total number of chemosymbiotic species increased from 81 in pre-extinction to 197 in post-extinction.

Post-hoc (further and more specific statistical analysis done after the first test) X2 tests done in pairs between obligate and chemosymbiosis + deposit feeding bivalves had a resulting p of 1.05E-18, meaning there is a significant difference between the proportions of pure chemosymbiotes and bivalves capable of chemosymbiosis and deposit feeding. Between chemosymbiosis + deposit and chemosymbiosis + suspension, the p value is 9.56E-11, meaning this difference is also significant. Between obligate and chemosymbiosis

+ suspension, the p value is 8.22E-10. This difference is also significant. This means the diet of bivalves has a significant effect on their survivability.

Discussion

The number and diet diversity of chemosymbiotic bivalves did not remain unaffected by the Permian extinction as hypothesized, but they increased in number of species and reliance on chemosymbiosis. The hypothesis of the bivalve species being unaffected by the extinction was false. Initial reasoning of chemosymbiotic bivalves not relying on photosynthetic food sources can still be applied here. From the decreased number of deposit feeding bivalves, it can be inferred the extinction of other marine species led to less organic detritus from organisms that require oxygen to support their diet.

A very recent study of marine life during the P-T event provides an alternate explanation. Hypoxia may have been caused or exacerbated by the P-T event increasing the surface temperature of oceans, which also increases the metabolic rate of cold-blooded organisms in the water, causing them to

consume oxygen at a much higher rate and then suffocate (Penn et al. 2018). Many chemosymbiotic bivalves are found in deep-sea vents and cold seeps, which are full of sulfur compounds required for chemosynthesis (Mae et al. 2007). These environments are far from the surface and likely change temperature less drastically. Even if the metabolisms of organisms in these environments increase, they do not require oxygen and are unlikely to suffocate. This theory would be supported if other deep-sea vent and cold seep organisms followed the same survival patterns as bivalves, but other chemosymbiotic organisms in these environments, such as tube worms and polychaete worms, have changed greatly following the P-T event despite their apparent isolation from climate change (Little and Vrijenhoek 2003).

It may be a far reach to assume distantly related organisms had the same reaction to the P-T event as bivalves. Brachiopods are similar to bivalves, with the most obvious differences being upper and lower shells, as opposed to the usually symmetric shells of bivalves, and a stalk anchoring the brachiopod to the ocean floor. Brachiopods are common throughout evolutionary history and chemosymbiotic brachiopods were found in the same environments as chemosymbiotic bivalves in many eras including the Permian (Campbell and Bottjer 1995). Similar to the increased survival of obligate chemosymbiotic bivalves, immediately following the Permian Extinction event, obligate chemosymbiotic brachiopods of the genus *Lingula* were the most common fossils found in the sedimentary layer, dated to immediately after the extinction event (Wignail and Hallam 1992). Anaerobic brachiopods in the *Lingula* genus today, although they continue to evolve genetically, have traits and living environments superficially identical to their ancient ancestors (Luo et al. 2015). It is a mark of great efficiency and adaptability for chemosymbiosis that it has allowed these organisms to survive the Permian extinction, remain relatively unchanged to today, and may potentially survive any future mass extinctions if current environmental trends continue.

Acknowledgements

Many thanks to Dr. Price for giving such a good clarification of proper X2 graph formatting that I was able to fix my original figure from a ten-minute office visit. I am immensely grateful towards fellow BES 301 student Alex Wachter for reviewing my paper even though it wasn't assigned. Also thanks to Linda Simonsen for assigning R programming homework that happened to be extremely useful for this project. I acknowledge my friend Arnold for trying and failing to fix my computer.

Supplemental Material

	Pre Extinct	Post Extinct	Type Totals
pure chemosymbiosis	21	188	209
chemo and deposit	60	7	67
chemo and suspension	0	2	2
Time range totals	81	197	278

Fig. 3: Excel Data Used to Conduct Tests

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CANID AND HUMAN COHABITATION: CANIDS DID NOT MOVE INTO CAVES WITH HUMANS

Lauren Kirk

ABSTRACT: It is not known how long dogs and humans have had a relationship. If dogs and humans coexisted in the past, then their fossils should be located in the place they both resided. As canids developed a relationship with humans, it would make sense that they moved into caves when humans did. Data was obtained from the Paleobiology Database and sorted by time period, Pleistocene and Miocene versus Paleogene, and further sorted depending on if the fossil was found in a cave and tested for a relationship with humans showing coexistence by a χ^2 -test. It was found that canids did not move into caves along with humans. In fact, there was a statistically significant difference that supports that there may be a negative relationship. Since canids were very recently domesticated with respect to the time periods evaluated, a coexisting relationship may not have existed previously.

Key Words: Canid, Caves, Paleogene, Pliocene, Miocene, Homo Sapiens, Coexist

Introduction

In some cultures today, dogs are considered man's best friend. The connection between a dog and human includes a level of social interaction that seems to be unparalleled in regard to other species. Since dogs have a unique relationship with people, scientists have begun studies on the behaviors of dogs, as well as comparisons of wolves and dogs (Heberlein, 2016). Dogs, unlike wolves, are unique in that they are domesticated and can also serve as special needs support or help identify the existence of cancer cells in a lab, making them not only a great companion, but also a great support for other tasks (Bjartell, 2011). Many scientists have been interested in the relationship that dogs have with humans, but do not know how long this relationship has existed (Frantz, 2016).

Determining if dogs and humans always coexisted may help us understand the relationship between the two species and how such a relationship evolves. This may broaden understanding of how domestication, selection pressures, and training animals may benefit the human population. Since *Homo sapiens* and canids have evolved in similar time periods, it

would be logical to assume that they may have crossed paths and began to develop a relationship (Stringer 1988). Because canids are omnivorous and pack animals, they have been able to have peaceful communal feeding and typically are not nocturnal (Kleiman, 1973). Since they are awake during the day and are more approachable during feeding than cats, humans may have been able to interact with dogs easily in order to develop a relationship in the past (Kleiman, 1973).

In this paper, I test the hypothesis that dogs did not need to live in caves previously and as time increased, dogs moved into caves because of their relationship with humans since humans evolved and lived in caves. Previous hominid fossils, such as a Neanderthal in Croatia and another in Siberia, have been found in caves which suggests that hominids utilized the protection of caves (Green 2006, Reich 2010). If dogs had also resided in caves, it would prove that dogs and humans have always had a close relationship and coexisted. Before hominids evolved, canids had no reason to live in caves. As the hominids evolved and developed a relationship with canids, I predict that canids moved into caves along with the hominids.

Materials and Methods

All data that was modified and sorted was obtained from the Paleobiology Database. The data was downloaded from the Paleobiology Database on October 25, 2018 by Dr. Rebecca Price by using the class “Mammalia,” which I then narrowed down to occurrences of Canidae that could be identified to the species level. The data was further narrowed down. The Canid species were then differentiated by age – whether the species occurred in the time period of Paleogene or Miocene and Pleistocene. The Paleogene time period spans from 56 million years ago to 23.03 million years ago, while the Miocene spans from 23.03 million years ago to 5.33 million years ago (Walker, 2018). Additionally, the Pliocene spans from 5.33 to 2.58 million years ago (Walker, 2018). Since this study focuses on Canid occurrences over time, the most recent Neogene epochs were not used. If the data did not fall into these categories, it was eliminated. If the data overlapped and was found in more than

one time period, it was categorized by whichever time period it was more abundant in. I determined whether the remaining species were ever found in caves. If the species did not have a location noted in the Paleobiology Database, it was not analyzed.

After the data was sorted, pivot tables were used to combine the information for one species into a single row. The total number of canids found in caves and not in caves during each of the Paleogene and Miocene and Pleistocene time periods were totaled and placed into a table. Using these values, frequencies were obtained by dividing each value by the total value in each time category. The significance level of 0.05 was decided since this is not a medical study and no harm will be done when testing the significance through analysis. A χ^2 -test was conducted using the number of species found in caves and not found in caves in the Paleogene to predict the numbers found in the Miocene and Pleistocene. A graph depicted in Figure 1 was then created to compare the frequency values run in the χ^2 -test.

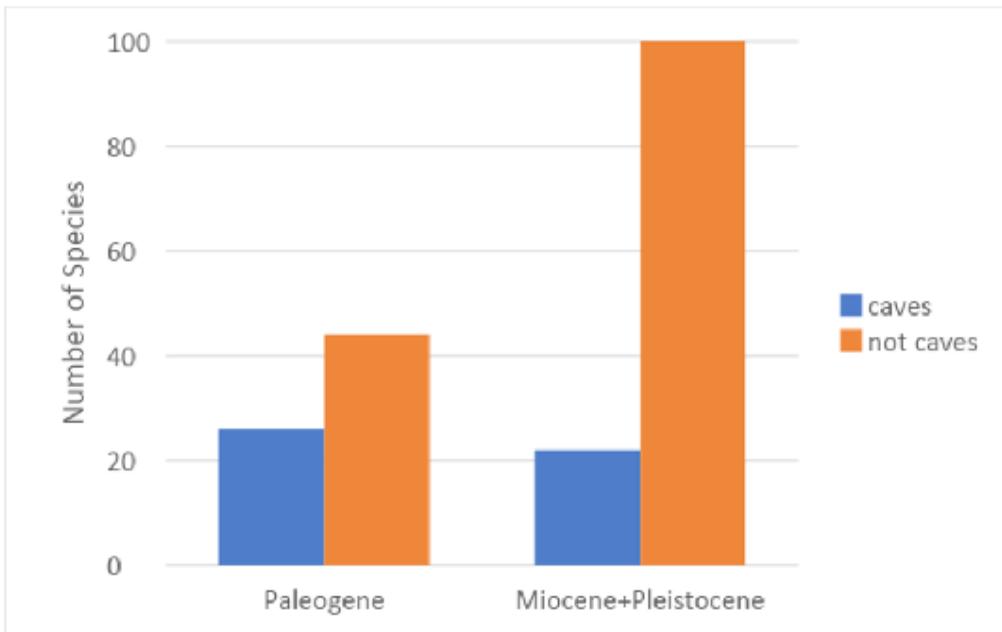


Figure 1: There is a proportionately significant amount of canid fossils found elsewhere than caves in the Miocene and Pleistocene compared to the Paleogene. This comparison was done by a χ^2 -test and resulted in a p-value of 7.9E-06.

Results

As depicted in Figure 1, statistical analysis with the χ^2 -test was used to determine the number of species of canids found in caves versus not in caves among two different time periods, resulting in a p-value of 7.9E-06. The p-value of 7.9E-06 indicates that the probability of getting these results by random chance is correct; therefore, I reject the null hypothesis. This demonstrates that the results are statistically significant, but findings in Figure 1 indicate that the research hypothesis is also incorrect. Therefore, the research hypothesis is also rejected in favor of the conclusion that proportionately more canid fossils were found outside of caves in the Miocene and Pleistocene than in the Paleogene.

Discussion

It was predicted that dogs and humans have always had a close relationship and were living together in the past. This was tested by a χ^2 -test as previously seen in Figure 1. Although the assumption that dogs moved into caves may have not been correct, leading to a rejection of the research prediction, there was a statistical significance in the data. Therefore, the null hypothesis that there is no change is rejected. In fact, the number of species found in caves went down as depicted in Figure 1, indicating that dogs may have been moving out of caves as humans were moving in, demonstrating a contradicting negative relationship.

Dogs were the first animals to be domesticated; dogs and humans have been living in the same environment for several years, nearing about 10,000 years (Heberlein, 2016). Given this evidence, it is possible that dogs and humans existed in caves with each other in the past, but not during the time period that was tested for statistically. The most recent time periods of the Paleogene and Neogene that were evaluated was 2.58 million years ago. Although the statistical test showed that dogs did not move into caves as they evolved during the previously mentioned time periods, this may mean that dogs and humans existed elsewhere besides caves together.

Because dogs were domesticated many years ago, but fairly recently with respect to the data evaluated, humans and dogs have a good relationship. The close relationship is evident by the social communication that is present between a dog and a human. Dogs are able to pick up human communication and social cues by following a human's gaze (Teglas 2012). Not only was it found that dogs communicate efficiently with humans, but wolves did not communicate as well as domesticated dogs, suggesting that there is a greater component to the relationship between a dog and human than just genetic relatedness between species (Kaminski 2012). Another theory may be that canids were going to come into human territories without human intervention by selection pressures alone, which could have intensified the relationship between humans and dogs today (Trut, 1999).

Limitations and Further Research

Although the assumption that dogs moved into caves may have not been correct, there was a statistical significance in the data; therefore, the null hypothesis is rejected. This suggests that dogs did have some relationship with hominids in the past. A more accurate study may be to look at more recent time periods of the Pleistocene versus the Neogene and Paleogene. To better understand the relationship, the geographical distances that canid fossils were found from the hominid fossils should be examined. A more comprehensive analysis should be conducted to determine the extent of the relationship. Since only the fossils located in caves were studied, it could be expanded to evaluate all of the location's canid fossils are found in comparison to the hominid fossils. It is also important to note that the presence of canid fossils in caves may not mean they were in the presence of human fossils. Another avenue to further expand research is to evaluate if humans coexisted with dogs could be to study domestication in further detail. One way to determine when a dog was domesticated is to find evidence pertaining to the time floppy ears and other morphological features appeared and the seasonal rhythm of reproduction changed (Trut,

1999). If those morphological and reproductive changes can be tracked, it may be possible to see if there are any fossils that exhibit these changes in the Paleogene and Miocene and Pliocene. Additionally, limitations may have occurred in deleting some pertinent data from the Paleobiology Database or missing data in the Paleobiology Database. It is also important to note that the fossil record is not a complete record and may have bias as to which fossils are researched (Benton 2000, Koch 1978).

Acknowledgements

First and foremost, I would like to thank Dr. Rebecca Price for her patience and willingness to help throughout the entire research process. Second, I would like to thank my fellow peers for reviewing and editing my work. Finally, I would like to thank my husband for helping me find the time to complete my education.

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Supplemental Materials

Exel file available upon request.

MICROBIAL SUSCEPTIBILITIES AND RESISTANCES TO *CAMPYLOBACTER JEJUNI* ISOLATES FROM CROW FECAL MATTER IN WASHINGTON STATE

Neha Chhabra

ABSTRACT: This research investigates the antimicrobial resistance profile of *Campylobacter jejuni* (*C. jejuni*) isolates obtained from crows within Bothell, Everett, Mercer Island and Factoria, Washington. While campylobacteriosis is a self-limiting disease, severe or prolonged cases of campylobacteriosis need treatment with antibiotics. However, antibiotic resistance (AR) can develop. Antibiotic resistance is a growing public health issue because resistance to some antibiotics defeats the purpose of having antibiotics for treatment. This study seeks to scrutinize the antimicrobial susceptibilities and resistances of forty *Campylobacter jejuni* isolates obtained from crow feces from different sites around Washington State. Crows were used during this study because they can serve as environmental indicators of the antibiotic usage of the places they visit during their daytime scavenging activities. Kirby-Bauer method was used with eleven antibiotics, including tetracycline, ampicillin, ampicillin-calvulanic acid, ciprofloxacin, chloramphenicol, streptomycin, nalidixic acid, azithromycin, erythromycin, gentamicin, and clindamycin. The *C. jejuni* isolates showed maximum resistance to ciprofloxacin (34.21%) and to tetracycline (31.5%). Sixteen total isolates showed multiple drug resistance (resistance to three or more antibiotics). Two isolates, F18 and F19-2 obtained from the Bothell wetlands showed resistance to 6 antibiotics, including intermediate susceptibility. These results show that crows are capable of spreading antibiotic resistance through the bacteria *C. jejuni*.

Keywords: *Campylobacter jejuni*, antibiotic resistance

Introduction

The fundamental goal of this study was to determine the antimicrobial resistance profiles for the *Campylobacter jejuni* (*C. jejuni*) isolates within Northwestern Washington State. Research performed in the United States, Kolkata, India and China have observed results for their respective countries on antibiotic resistance in *C. jejuni*. According to the World Health Organization, the *Campylobacter* species are extensively dispersed in most warm-blooded animals and prevalent in food animals like poultry, cattle, pigs, sheep, ostriches, and in pets, including cats and dogs. The bacteria have also been found in shellfish (WHO, 2018).

Raw or contaminated milk, undercooked meat or meat products, contaminated water or ice are all routes of transmission from animals to humans and thus *Campylobacter* infections are usually foodborne. Antimicrobials used in food-producing animals have been associated with the development of resistance in both *C. jejuni* and *C. coli* (McDermott et al., 2002). *C. jejuni* is an important organism to study because it is the most commonly reported bacterial cause of gastrointestinal disease in the United States. A result of having a *Campylobacter* infection could be Guillain-Barré syndrome (GBS), a disorder resulting in acute neuromuscular paralysis, and 40% of patients with the syndrome have evidence of a recent *Campylobacter* infection (Altekruse,

1999, para 4). Diseases or infections that have antibiotic resistant bacteria are more difficult to treat and have a heavier impact on individuals. Therefore, resistant infections can become an issue. They feed on animal and human waste among other things, and thus obtain and carry the bacteria from these substances. The aim of this research is to determine antibiotic sensitivity and resistance patterns of *Campylobacter jejuni*. Crow *C. jejuni* isolates were investigated because they can be important indicators of the AR of that environment.

Methods & Materials

Rationale and Application of Techniques: Protocol

Growing Isolated Strains

50 fecal samples of crows from Seattle, Washington, USA, were obtained during 2014-2015. At a singular time, fresh fecal samples from individual birds (3-8 samples) were streaked on campy CVA blood agar for the selective isolation of *Campylobacter*. Campy CVA blood agar contains peptamin that can provide carbon, sulfur, and nitrogenous compounds required for growth. Yeast extract provides B vitamins to the medium, and dextrose is incorporated as an energy source. Sheep blood supplements the medium with X-factor and other growth factor requirements (Hardy Diagnostic, 1996). Details of the collection can be found in (Sen et al., 2018, pp. 1-13). Isolates were stored as glycerol stocks at -80° C. For the antibiotic resistance studies, the stocks were streaked out on CVA blood agar. All methods incorporated aseptic techniques and procedures that maintained the sterility of all experimental materials. The plates were incubated at 37°C under microaerophilic conditions (5% O₂, 10% CO₂, and 85% N₂) by using a CampyGen pouch (Oxoid Limited), with first observation after a 36-48-hour incubation period. Individual grown colonies of *C. jejuni* were collected using proper sterilization technique with flaming an inoculating loop and spinning it between fingers

into ~1mL of Trypticase Soy Yeast (TSY) broth. The turbidity of the suspension was measured using a spectrophotometer, in which a control TSY broth maintained the 'blank' status, and suspensions having an optical density at 600 nm between 0.060-0.090 was used.

On Müller-Hinton (MH) Blood Agar Plates, 100µL of the suspension was streaked using a turntable hockey stick in fast back-and-forth motion while spinning the plate. The plates were allowed to air dry for 10-15 minutes. For each isolate, two MH Blood Agar plates were used to calculate the antibiotic resistance. Using forceps and aseptic techniques, a total of 11 antibiotics were placed on two separate plates: five antibiotic disks were placed on one plate for an isolate, and six antibiotics were placed on the other plate for the same isolate. Antibiotic disks were placed 15 mm from the edge of the plate and 20 mm from each other, except for the sixth one, which was placed in the center (*Figure 1*). Up to four plates were placed in a plate-sealing bag with a dampened paper towel and CampyGen pouch (Hardy Diagnostics, 1996), a self-contained gas generating system used in closed environmental chambers to rapidly generate microaerophilic atmospheres, which are essential for the isolation and growth of *Campylobacter*. After a 36-48-hour incubation period under microaerophilic conditions as described above, antibiotic disks were read. In this study, the American Type Culture Collection *C. jejuni* strain, ATCC 33560 was used as a quality control organism.

Analysis of AR Disks

After incubation, the plates were inspected for zones of growth inhibition around the colonies. This method identifies bacterial strains that produce inhibitors in the agar. It is a circular area around the spot of the antibiotic in which the bacterial colonies do not grow. In table 1, zone diameters are observed from *Enterobacteriaceae* values. Using an electronic caliper, diameters were measured from one end of the growth to the other. If results were obscure or growth was blended into the next antibiotic, radii of the zone

of inhibition were measured and then doubled to get the complete zone of inhibition. The zone diameters were checked according to Clinical and Laboratory Standards Institute guidelines. The CLSI clinical breakpoints for an antibiotic towards *Enterobacteriaceae* were used to assign isolates sensitive, reduced susceptibility or resistant status (Table 1).

Creating DNA

Several representative isolated colonies were obtained using a sterilized inoculating loop and suspended into 100µL of PrepMan Ultra Sample Preparation Reagent (Life Technologies). The suspension was heated in a heating block at 95°C, to break the cells open to release the DNA, for ten minutes. The tubes were cooled to room temperature or 50°C for about a minute, and then placed in a centrifuge to precipitate the cell debris into a pellet. The supernatant containing the DNA was saved for multi-locus sequencing typing and other genetic studies.

Storing in TSY + glycerol

Isolates from the initial incubation period were used in creating bacterial glycerol stock. A 30:70 ratio of 50% glycerol and TSY broth was mixed to use as a freezing medium to store *C. jejuni* isolates. Using a sterile cotton tip applicator, isolates were wiped and collected from the plate, then suspended into 400µL TSY + glycerol medium. The goal of the stock is to produce a thick slurry. This was immediately put on ice and within 30 minutes stored at -80°C.

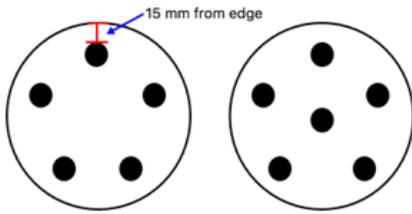
Results and Discussion

Table 2 shows 11 antibiotics used for susceptibility testing of *Campylobacter jejuni* isolates. Resistant phenotypes were determined highest for ciprofloxacin, and for tetracycline in which 13 out of 40 isolates, (34.21%) and 12 out of 40 isolates (31.5%) were resistant, respectively. Thirty-six out of forty *C. jejuni* isolates were susceptible to gentamicin (92.30%) and thus gentamicin seems to be the most effective against these isolates. F28 and F43 showed similar AR profiles in that they were susceptible to all antibiotics except for gentamicin against which F28 was resistant, and F48 had reduced susceptibility. Both these isolates belonged to the same cluster by *fla*SVR analysis, although they were collected on 2 separate dates. Being sister taxa, B56 and B8 show similar results in that they were both resistant towards ciprofloxacin, but only B56 showed resistance towards nalidixic acid while F81 showed susceptibility. Although being of the same common ancestry, and from the same collection dates, F21.2 and F23-2 did not show similar results in that some antibiotics were completely sensitive whereas others were completely resistant (Figure 2, Table 2). For example, F21.2 showed resistance or reduced susceptibility to ciprofloxacin, nalidixic acid, and streptomycin whereas F23-2 showed only susceptibility. F61 and F62 also showed

Table 1. Zone diameters according to Clinical and Laboratory Standards Institute guidelines (CLSI)

		Resistant	Reduced Susceptibility	Sensitive
Ampicillin	AM-10	≤13	14-15	≥17
Ampicillin-Clavulanic Acid	AMC-30	≤13	14-17	≥18
Azithromycin	AZM-15	≤13	14-17	≥18
Chloramphenicol	C-30	≤12	13-17	≥18
Ciprofloxacin	CIP-5	≤15	16-20	≥18
Clindamycin	CC-2	≤14	15-15	≥17
Erythromycin	E-15	≤13	14-22	≥23
Gentamicin	GM-10	≤16	17-19	≥20
Nalidixic Acid	NA-30	≤13	14-18	≥19
Streptomycin	S-10	≤11	12-14	≥15
Tetracycline	TF-30	≤14	15-18	≥19

Figure 1. Placement of 11 antibiotics on 2 separate MH Blood Agar Plates for a singular isolate

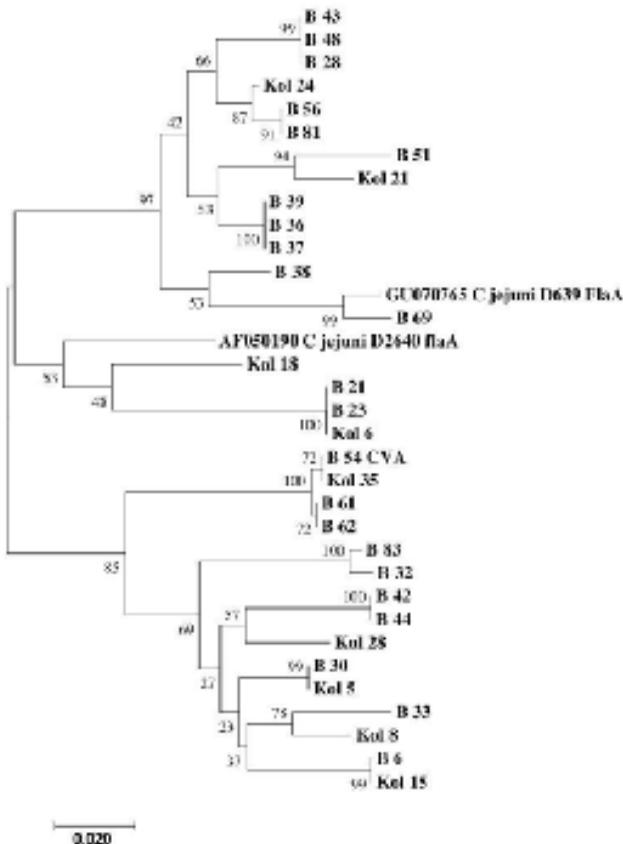


significantly different results although both were collected on the same dates from Factoria, WA. They were similar in that both showed reduced sensitivity to streptomycin, and clindamycin but different resistant values to ampicillin, nalidixic acid, ciprofloxacin, and tetracycline. Isolates

F83 and B32 showed exact same results in that all antibiotics proved to be susceptible. B42 and B44 were different in their AR profile although they were collected on the same day but from different fecal samples. There is a chance that F42 growth may not have been *Campylobacter*

Figure 2. Phylogenetic tree indicating ancestry (clustering together) of isolates from crow fecal samples.

"KOL" for Kottkata samples. "B" for UW Botfield (Reproduced from Sen, et al. Appl Env. Microbiol: (2018): 84.6 e01893-17, Figure 6).



jejuni because F42 had moldy growth. These results will be confirmed in the future. 15 of the *C. jejuni* were multi drug resistant (MDR), where the bacteria were resistant to 3 or more antibiotics (Table 2).

Conclusions

We noted that differences in AR profiles of the crow isolates from the same date, and site of collection did not always show similar results. It is possible that the crows visited different places during their day time scavenging activities or fed on different substances. Future studies by banding the crows and studying them may shed more light on this.

There was also MDR in sixteen out of forty-three total isolates with resistance to least three antibiotics. Other studies have shown that there is high resistance to tetracycline and ciprofloxacin (EFSA, 2014). This correlates with

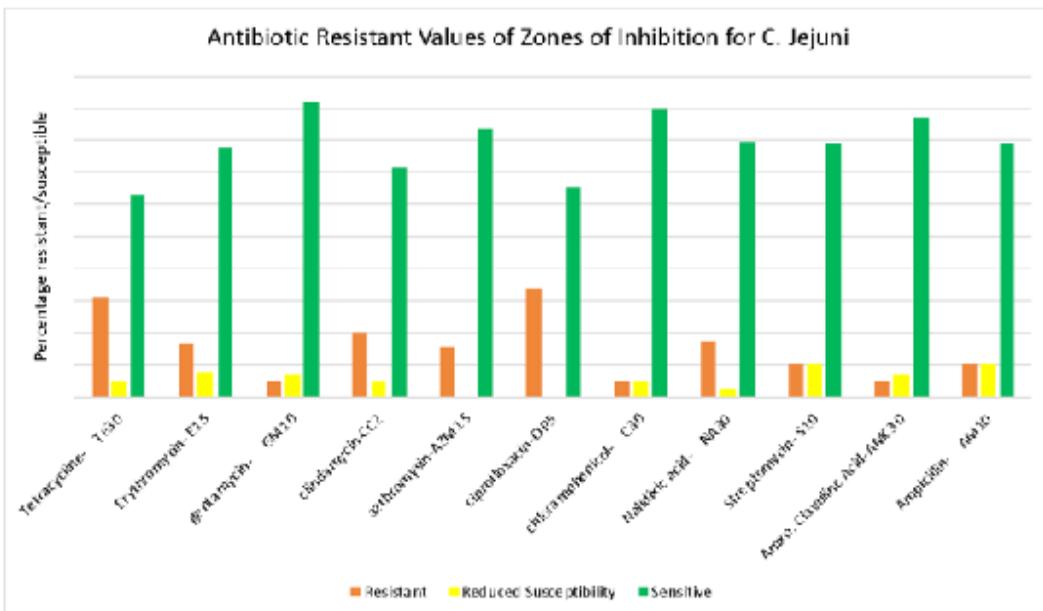
our findings of high resistance to tetracycline and ciprofloxacin.

Lastly, although the *C. jejuni* strains isolated from the crows are not infectious to humans because they lack a functional CDT toxin (Sen et al., 2018, pp. 13), the crows can spread antibiotic resistance through these bacteria, and thus can be of potential threat to human health. Other results from Dr. Sen’s laboratory have shown a large number of the bacteria *E. coli* isolated from these fecal samples to also carry antibiotic resistance and several of them were MDR (manuscript submitted).

Acknowledgement

Throughout this course and this paper, the continuous contribution and advice from my peers in this course is evidently shown within this piece. Without their assessment, recommendations, and guidance, the

Figure 3: Percentage of *C. jejuni* fecal isolates (n = 40) showing susceptibility to 11 selected antimicrobials. The susceptible isolates include only those isolates that were sensitive to the various antibiotics as determined from the CLSI table.



accomplishment of this research and analysis would have been vastly challenging.

I would like to show my gratitude to those who have contributed to this research. My thankfulness for Nidhi Patel for her assistance through the preparation of DNA for some isolates and conducting qPCR to confirm the identity of *C. jejuni*. My appreciation for David Ricci for confirming the measurements of the zones of inhibition and to Dr. Keya Sen, whose knowledge and mentorship have been of great value. Without her continuous support and sincerity throughout the quarter, this research would not have been possible.

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ABOUT THE STUDENT AUTHORS

William Appel is a senior majoring in Global Studies. He enjoys political science and other global studies-related courses. He has extensive volunteer experience in his community as well as leadership experiences from the various extracurricular activities in school. He is the vice-president of pre-law society at UWB. He also works part-time as a teaching assistant in a school district. He enjoys writing, mixed martial arts, reading science fiction, playing DnD, and is a fan of Marvel movies. William plans to attend law school this fall.

Atif Bhatti graduated from the University of Washington Bothell in Autumn 2018, majoring in Biology and minoring in Neuroscience and Chemistry during his time at UWB. Since then, Atif has been working as a medical scribe alongside a cardiologist as well as studying for his MCAT. Atif has deep interests in medicine and biomedical research and plans to attend medical school in the future. During his three-and-a-half years at UW Bothell, Atif had the opportunity to serve as president of the Pre-Health Society, provide assistance to fellow students through his role as a Biology Teacher's Assistant, and be involved in crow vocalization research. In his free time, Atif enjoys volunteering with the Epilepsy Foundation-Washington chapter as well as attend Seattle Sounders games in the Emerald City Supporters' section!

Rachel Calder will graduate in June of 2019 with a Bachelor's of Science in Biology and a minor in Chemistry. At UW Bothell she enjoyed both the inspiring biology courses and helping new students in the Orientation and Transition Program. This led her to work at the Institute for Systems Biology where she currently collaborates with leading scientists to create open resources and opportunities for students to help improve equity in the science field. She believes that everyone has a natural curiosity as to how the world works, but many lack the mentorship and support to explore it, which is why making STEM education more accessible to students is so important.

Joyce Chester is an Alaskan Native Aleut, who grew up in a household with seven siblings in the town of Egegik. Soon after her wedding, she moved down to Washington state with her husband, where they raised their four children. She has worked in education for the last twenty years and recently transferred to University of Washington, Bothell Campus, from Edmonds Community College to complete her teaching certification and undergraduate degree. After graduation, she hopes to teach History and/or Special Education in a middle school setting.

Neha Chhabra graduated in Winter 2019 with a Bachelor of Science degree in Biology and a minor in Chemistry. She is currently working towards becoming a dentist to serve underrepresented communities and care for their oral health. Neha has had plenty of involvement on campus, particularly through her role as an Achieving Community Transformation (ACT) Service Lead and progressed in her third year to an ACT Student Chair. Her commitment to community and social justice was recognized when she was selected as one of UW Bothell's Husky 100. When she is not working on campus, she is diligently working on her research to assess bacteria in the crow gut. She hopes to take her knowledge of bacteria and study microbial interactions in the oral cavity in dental school. After graduation, Neha plans on working directly with underrepresented communities to better their oral health.

Ashley Forsyth will graduate in Fall 2019 with a Bachelor of Arts in Society, Ethics and Human Behavior. They plan to pursue a master's degree after graduating, either in library and information science or cultural studies. They are interested in how history and power dynamics influence society and tries to incorporate social issues in their storytelling. They like to write sci-fi and fantasy stories and hope to publish one someday.

Jakob Johnson (Jamie Sanford) is a sophomore planning to graduate with a Bachelor of Science in Biology in 2021. He is currently working towards a career in molecular biology, which combines his passions for chemistry, biology, and research. His interests include animation, cuisine, and theatre, as well as Early English literature and psychology (perhaps due to early and prolonged exposure to J.R.R. Tolkien) which led to his submission on *Bēowulf* for the CROW's 2019 edition.

Lauren Kirk graduated University of Washington Bothell in winter of 2019 with a B.S. in Biology and minor in Chemistry. She holds an A.S. degree in both Health Information Technology and Medical Assisting. She enjoys learning and playing with her son during her free time. After graduation, she will be completing a Master's degree and is planning on attending medical school.

Brynley Louise will be graduating in June of 2019 with a Bachelor in Media and Communications. She currently works as a tutor at the Writing and Communication Center at UW Bothell. She also spends time cultivating a digital community based around online video entertainment. After graduation she is excited to commit to full time work in entertainment and media. In her free time she enjoys spending time learning how to paint and draw, going to the movies with friends, writing, and cooking.

Katherine Lu is a second year undergraduate pursuing a B.S. in Biology and a Mathematics Minor with the intention of a future biomedical research career. Her interests include bioinformatics, food science, and molecular biology. Katherine makes and sells jewelry, writes short stories, and occasionally accepts graphic design commissions. Having little prior experience with scientific publication, archive research, and statistical data processing, Katherine hopes getting published in the CROW will be the first step in a series of personal achievements in biology research.

Ameena R. Mohammed will graduate in Summer 2019 with a Bachelor of Arts in Health Studies. After graduating, she hopes to start her career in healthcare administration. Currently she is an intern at NAMI Eastside and assists with administrative tasks. She hopes that this experience will benefit her when applying for jobs after graduation. Ameena is very thankful for the opportunity to have worked with the CROW to review and publish her research proposal. The peer review process was a positive learning experience that will be helpful in the future.

Hannah Preisinger is a student of UW Bothell, graduating in 2019 with a BA in Culture, Literature and the Arts and a minor in Consciousness Studies. She is also actively involved with the gravitational wave astronomy research group, works as a Student Web Assistant with the school's Marketing and Communications team, and owns and operates a small theatrical production company. She is an avid investigator of all things strange and unexplained. After graduation, she plans to continue practicing theater and attend a local coding bootcamp. She also might sleep sometime.

Michael (Mike) Prothman will graduate in summer of 2019 with a Bachelor of Arts in Health Studies. He previously earned a Bachelor of Science in Individual Studies in Geology and Mathematics from Central Washington University and currently volunteers as an EMT and Ski patroller for King County Search and Rescue and The Summit at Snoqualmie ski resort. He works for Catholic Community Services of Western Washington as an Advocate in their Bridge Shelter for the homeless and is applying to medical school where he hopes to specialize in emergency or internal medicine.

Anna Tran is a life-long learner and advocate for quality and relevant education. Anna focuses on curriculum, instruction, and equity in her studies and is graduating from the University of Washington Bothell with a Bachelor's of Arts in Education this December '19. She believes that a common humanity is the first step in celebrating our differences—differences that inform our cultures, values, minds, and all our ways of 'being' in the world. Her appreciation of learning through play gives reason for her involvement with the ARC, Northwest Folklife, and Redmond Parks & Recreation. Aside from work and school, you can find her thrifting, bowling, playing ping pong or darts, and eating gyoza.

AJ True is currently a second-year student pursuing a Bachelor's degree in Health Studies and upon graduating he plans on attending graduate school for a Master's degree in Public Health. He intends on working with public health policy at home and abroad in the hopes of improving the quality of life for poor, marginalized, and disempowered communities. Outside of academia, AJ loves both creating and consuming food and music as a way of experiencing other cultures and bringing joy to his friends and family.

ABOUT THE EDITORS

Brandee Badgett is a fourth year undergraduate pursuing a bachelors of arts in Health Studies and a minor in Chemistry. Her experience has included being part of the Veterans Life Initiative Task Force, The Chancellor's Advisory Committee for Students, volunteering and working full time in retail. Upon graduation, She plans to attend a medical school to study to become a general surgeon. Her interests include medicine, helping others, and film. She is thrilled to be apart of the CROW and is looking forward to helping others publish their own work.

Stephen Ball will graduate in Fall of 2019 with a B.S in Health Studies. He is currently working towards becoming a Physician's Assistant with a specialty in orthopedics. He is currently trying to gain experience in the medical field by working as an EMT, and by establishing connections through shadowing PA's and physicians. His interests include playing sports, composing music, playing piano, and studying new research related to mental disease and illness. His interest in research led him to become an editor of the CROW, where he hopes to continue learning and growing as both a student and member of the community.

Zarefah Baroud graduated in Winter of 2019 with her Bachelor's degree in Media and Communication Studies. She will be continuing with her Master's degree in Policy Studies at the University of Washington come Fall. Zarefah also works as a writing consultant at the University of Washington Bothell's Writing and Communication Center.

Marina Burandt is a first-year graduate student in the MFA Creative Writing and Poetics program at UW Bothell. Her undergraduate degree was in English Literature from Chapman University in Orange, California. She minored in Art and Italian Studies. In line with her plans to one day be a college professor, Marina works as a peer consultant at UWB's on-campus Writing and Communication Center. She is looking forward to using her skills as a writer and tutor for The CROW's editorial board.

Kimberley Cross will be graduating in Spring 2019 with a Bachelor of Arts in Health Studies. She currently works in the UW Bothell Writing and Communication Center as a peer consultant and has done undergraduate research on trauma-informed practice, as well as the relationship between stress and immune dysfunction. Upon graduation she will be entering the Master of Public Health program at Claremont Graduate University. She enjoyed being on the CROW Editorial Board last year and is enthusiastic about research writing, and that is what led her to be an editor for the CROW's fourth volume.

Mischaella (Shae) Foley will be graduating June 2019 with a Bachelor of Arts degree in Health Studies and a minor in Health Education and Promotion. Her experience includes a research internship at Seattle Children's Research Institute assisting with studies aimed at increasing physical activity in preschoolers, as well as studying the effects of transportation on wellness. She is currently assisting with sexual and reproductive health education as an intern with Public Health-Seattle and King County. Although busy with internships, homework, and employment at Seattle Children's Hospital, her most important job is raising two children and a rescued dog with her husband, Ben. Shae's interest in research led to her joining the CROW editorial board and she feels fortunate to be involved in the collaborative process. Following graduation she plans to combine her passions for research, social justice, and health to improve the lives of those in her community and beyond.

Mariah Kunz will be graduating in Spring 2019 with a Bachelor of Arts in Health Studies. She currently works on campus as a peer health educator focusing on sexual health resources on campus. When not at UWB, she also works for a local global health non-profit called VillageReach. A passion for data and research has led to her current role on the Editorial Board for the CROW. Upon graduation, Mariah plans to pursue a Master's degree in public health at the University of Washington, Seattle campus focusing on reproductive health in resource-poor communities. For fun, Mariah enjoys going for hikes with her dog, Twix.

Nasrin Rasool will be graduating on (in) June 2019 with a Bachelors of Arts in Health Studies and a in Biology. She previously worked as president of Health and Wellness Campaign in Champlain College Saint-lambert in Canada. Currently, she is a member of BIO club in UW Bothell, helping to plan events in the upcoming weeks. Upon graduation she plans to pursue a masters degree in Pharmacy. She is enthusiastic about research writing, which led her to join the CROW editorial board. She is excited to use what she learned in the past as an editor.

Antoinette (Anny) Smith will be graduating with Magna Cum Laude honors in Spring 2019 with a Bachelor of Arts degree in Health Studies and minors in both Health Education and Promotion and in Gender, Women, and Sexuality Studies. Anny was named to the Husky 100 this year and had the opportunity to be the student speaker, alongside Dr. Julie Shayne, at the Chancellor's Reception, highlighting professor/student relationships made possible by our UWB donors. She currently sits as chair on the Redmond Human Services Commission, volunteers with Friends of Youth at the Landing, and is a student representative on the Health Studies Curriculum Committee here at UWB. She is able to accomplish all this with the support of her husband, Alex, and her four children. Anny's research proposal was published in the 2018 edition of the CROW which is what lead to her current role on the Editorial Board. After graduation, Anny will attend the University of Washington, School of Social Work in the Master in Social Work Day Program. She hopes to work with people experiencing homelessness, specifically youth and women, with the goal of applying a health and Chicana Feminist perspective for a more holistic approach to care that centers on dignity and respect of all people.