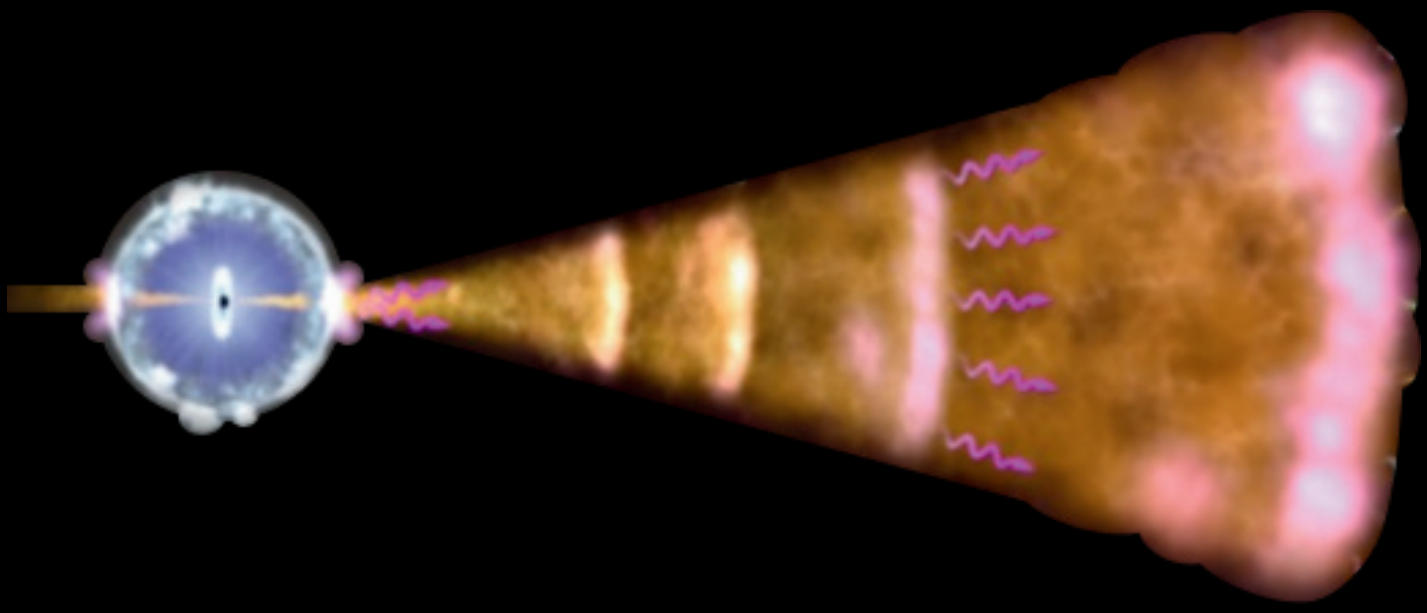
University
Honors Program
STANISLAUS STATE

Exhalations



Volume 20, Spring 2023

Exhalations

A Journal of Exploratory Research and Analysis

In this issue, we proudly publish articles that present the Capstone Research projects completed by graduating seniors in the Stanislaus State University Honors Program. These articles detail projects conceived from personal academic interests that were shaped by scholarly research, peer review, and the disciplinary expertise of faculty members familiar with the research and scholarship driving these efforts of discovery.

As I write this introduction, the last of three Commencement ceremonies celebrating students graduated in the 2022-2023 academic year is concluding. For the first time since the beginning of the COVID-19 pandemic, the ceremonies were conducted without any pandemic protocols—there are no social distancing requirements, no contact-tracing registration forms, no prohibitions on hand-shakes or hugs, and no mandatory masking, making it possible to see everyone's smiles of joy, pride, satisfaction, and even relief. All masking and vaccination requirements at Stan State were lifted on May 19, 2023, formalizing the "return to normality" that many had begun to experience during the academic year. That this milestone came later at Stan State than at many colleges and universities is an indication of just how hard-hit the region has been by COVID-19 and its aftermath, and of the challenges students, their families, and their communities have worked hard to overcome. Being Valley Strong during a global pandemic is tough in a region that is medically (and otherwise) under-resourced.

By the beginning of the 2022-2023 academic year, however, it had become clear that things were changing. While a surge in COVID-19 cases fueled by the highly transmissible Omicron variant triggered a two-week pause on in-person instruction just as students whose work is published here began their research in the Spring 2022 semester, we're thankful that this proved to be the last of the "pivots" between in-person and remote instruction these students would experience. They were able to complete, present, and publish their projects in the instructional modality of their choice during the 2022-2023 academic year without interruption, and look forward (if somewhat cautiously) to the same as they begin their postbaccalaureate lives.

The articles included in this issue of the *Journal of Exploratory Research* reflect strong attention to both the recent past, including the lingering effects of the pandemic, and the future unfolding in a world where SARS-CoV-2 is no longer a "novel" coronavirus nor the all-consuming focus of research, public policy, humanistic inquiry, and artistic expression. Students in this issue ask tough questions about topics that were, perhaps, thrown into high relief by the pandemic, but go beyond it. Articles interrogate disparities linked to the social determinants of health, additions, and mental health crises, they explore different ways to enhance mental, physical, and emotional well-being, they examine the different pedagogical interventions, they provide insight and solutions for the global climate crisis, and they dig deeply into the nuances of diversity, equity, and inclusion—and the ways in which institutions, organizations, and individuals continue to fall short of shared goals. All of this research is presented against the background of the pandemic, but it is not dominated by it in the same way as in the last two years. Here's hoping that, like Dante Alighieri in the final canto of *Inferno*, "*uscimmo a riveder le stelle" (we have come forth to see again the stars...*)

The Honors Capstone Project

Seniors in the Honors Program are encouraged to tackle complex problems using methods, insights and knowledge drawn from relevant disciplines. Honors Program faculty and capstone research mentors offer critical feedback and guidance along the way. The main objective is for students to explore, gather, and analyze information effectively, and to share their reflections on the implications of what they have discovered. Group discussions help to promote thoughtful questioning and critical analysis. The primary goal is to communicate knowledge, judgments, and original perspectives cultivated on the basis of careful inquiry, exploration and analysis.

Acknowledgements

Special thanks to Mr. Tim Held (Faculty Research Librarian), Dr. Jamila Newton (Biology), Dr. Suditi Gupta (Psychology), and Dr. Ellen E. Bell (Anthropology) for providing substantial critical and editorial feedback in HONS 3990, HONS 3500, HONS 4200, and HONS 4960 to students working on 2022-2023 Senior Capstone Research Projects and to Kirstin Halstead, Cristal Jimenez, Celina Bridges, and Jennifer Frisk for their hard work on the Capstone Conference and Journal.

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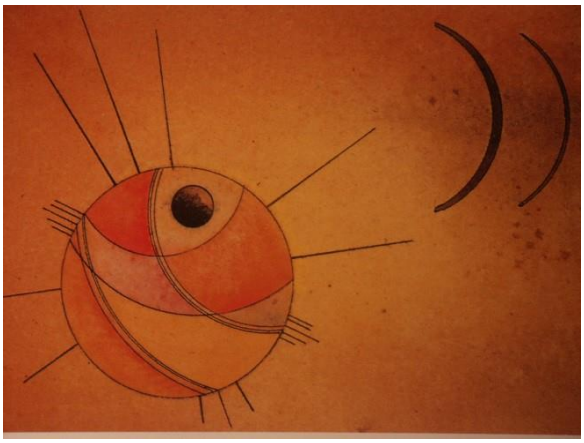
CONTENTS

HONORS PROGRAM
COMMUNITY STATEMENT

The Honors Program at CSU Stanislaus is a community of scholars bound together by vital principles of academic openness, integrity, and respect. Through focused study and practice involving exploration and discovery across a variety of disciplines, the Honors Program upholds these principles of scholarly engagement and provides students with the necessary foundations for further research and inquiry.



Our interdisciplinary curriculum is integral to this work and is intended to facilitate creative understanding of the irreducible complexities of contemporary life and knowledge. Personal and intellectual honesty and curiosity are essential to this process. So, too, is critical openness to difficult topics and respect for different perspectives, values and disciplines. The Honors Program aims to uphold these virtues in practice, in principle, and in community with one another.

The Social Phenomenon Surrounding Black Cosplay: The Unseen Toll of Racial Battle Fatigue

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Abstract

Black cosplayers are experiencing backlash for their chosen characters (which are often fictional) not being Black. There is an underrepresentation of the Black community in all forms of media. This lack of representation does not allow many options for those that participate in the subculture of cosplay. As cosplay is a marginalized group within society, Black cosplayers are a marginalized group within a marginalized group. An online survey for those involved in cosplay and voluntary participant interviews have been analyzed along with data collected from various social media platforms. All participants in this study are 18 years of age and older and are now or have previously been members of the cosplay community. Results of the online survey conducted show that many participants in cosplay have positive experience associated with the subculture. This information was consistent in interviews although members of the Black and Female community have experienced more negative backlash from the community. People of color are experiencing higher negative responses as a result of participating in cosplay, supporting the thesis that cosplay reflects systemic racism within society. While some Black cosplayers have noted that they believe they have the same experiences of their White counterparts, others note that members of the Black community have become accustomed to this type of behavior.

Keywords: Cosplay, Race, Black, Geek, Racial Battle Fatigue

Introduction

Throughout societies there are many marginalized groups of individuals with varying types of marginalization. Cosplayers are a marginalized group. Cosplay is a combination of the words costume and play which an individual dresses up as a character from a tv show, movie, video game, or a book. Cosplay is a form of expression of a marginalized group of individuals who are typically members of the "geek" community. Black cosplayers happen to be a marginalized group within a marginalized group.

With the common misconception that one must share a skin tone with the character to portray that character, it brings about a hierarchy of oppression. This study aims to identify if there is racial battle fatigue associated with being a Black cosplayer that stems from negative experiences due to racial discrimination. It is anticipated that the results of this study will prove that cosplay is a subculture which will reflect the racial biases of the dominant culture causing Black participants unnecessary racial trauma. Racism that is blatant or in the form of microaggressions has had a negative impact on Black people from the cradle to the grave.

There is importance in exploring the marginalization within this expressive community in its reflection of geek and popular culture as giving this a name and the attention it deserves will bring awareness to an issue that can cause added unnecessary emotional trauma to the lives of Black cosplayers. Anticipated results are that cosplay is a subculture which will reflect the racial biases of the dominant culture causing Black participants unnecessary racial trauma. In research done on the reduction of racial stress and enhancing racial coping mechanisms, it shows that there are harmful effects to the mental health which stems from racial discrimination.

Background

The backlash that is being received by Black cosplayers is often because the chosen character, which is frequently fictional, is not Black. Members of the Black community are underrepresented in all forms of media. Black individuals must constantly reshape and transform themselves to fit into white dominated spaces which often causes racial battle fatigue. Many of the activities that Black individuals partake in were not created with Black people in mind. There is a tendency for Black people to try to evolve superficially to similar characteristics of western societal standards to better fit in and receive less scrutiny. However, this convergence is often met with

negativity. Being Black in any environment comes with its own battles.

When members of the Black community are fighting for equality, it is most successful only when white and black interests converge. It is important to have one less space for black individuals to have to fight for inclusion without being attacked for existing in a white dominated space. “Black people are often subject to racism, and women, sexism, within the geek community.” (Jenkins, B.) Cosplay enthusiasts should pay attention to the details on the costume instead of the color of the person’s skin who is in that costume. It is important to explore the marginalization within this expressive community in its reflection of geek and popular culture. This phenomenon needs theorizing because giving it a name and the attention it deserves will bring awareness to an issue that causes an added unnecessary emotional trauma to the lives of Black cosplayers.

The research surrounding Black cosplay is lacking. While there have been articles written to shed light on the amount of discrimination, racism, sexism, and invisibility that is faced by Black cosplayers; it is also worth noting that there have been no studies (that I can find) which explore the unseen toll of racism and the emotional impact that Black cosplayers are experiencing. General research has shown thus far that, “studies on race and gender within cosplay and the geek community at large identify that geek culture is a White and male dominated space.” (Jenkins, B.) This has resulted in Black, non-binary, women, and other non-White cosplayers to experience marginalization within this community. Cosplay is a subculture which is an individual’s outward expression of passion for a favorite comic book character, video game, movie, anime character, or tv-show. The cosplayer can be whomever they choose to be if society will allow it.

Cosplay is both a presentation of live art and of fandom. When one portrays a character, it is important to embody that character and express one’s knowledge of that character. According to Bainbridge and Norris (2013), the cosplayer must express their knowledge of pop-culture by presenting an authentic and accurate depiction of the character. Cosplay is like gender roles where one acts in a performative manner to define one’s own identity. This is a social process in which the “fandoms” or sub-groups are indicated through cosplay.

Although cosplayers are more likely to experience marginalization and stigmatization outside of conventions, there are fans who are members of the minority group (like black cosplayers) who face the same marginalization and stigmatization within these conventions (Orme 2016). bell hooks writes about race and representation as they relate to performance practices by black individuals. She states that this performance practice has been a central part of the process of decolonization which is why it is important for black fans to be present in this space.

Methods

My research has included an online survey, ethnography of articles written about the subculture of cosplay, and interviews of select participants in from the survey. The survey has been collected online from voluntary participants aged 18 and over and include information from Black and non-Black cosplayers. Social media platforms TikTok, Instagram, and Facebook have been used to recruit participants. The sample size for the survey at the time of this article is 47 participants. While the survey was not anonymous, identifying participant information will not be shared only data collected. The survey consists of 17 questions which includes demographic information and questions regarding experiences during cosplay. I want to expand this research not only to include reactions towards Black cosplayers but also the racial battle fatigue that is experienced by these individuals. More research will also be conducted on what type of representation is needed. The primary focus of this research will be on the experiences and effects of being a Black cosplayer.

Results

This project investigates the emotional impact on Black cosplayers by surveying and interviewing Black and non-Black Cosplayers. The Survey has garnered responses from 47 individuals. The semi-structured interviews that have been conducted has allowed me to then analyze the collected data to assess whether there is an emotional trauma is present in Black cosplayers. Preliminary results show that comfort levels of characters portrayed have risen for those that have been involved in cosplay longer. While some participants have stated that they have had negative interactions when participating in cosplay events, others say that they have gotten more comfortable as time has gone on. When asked whether participants believe that race has an impact on the characters that Black cosplayers choose, several participants stated that they began by choosing characters based on who they looked most like. One participant states, “My first cosplay event I dressed as Nani from Lilo and Stitch because even though we don’t share the same race, at least she is brown, and it just felt more comfortable.” The study uses survey information as a control for data comparison.

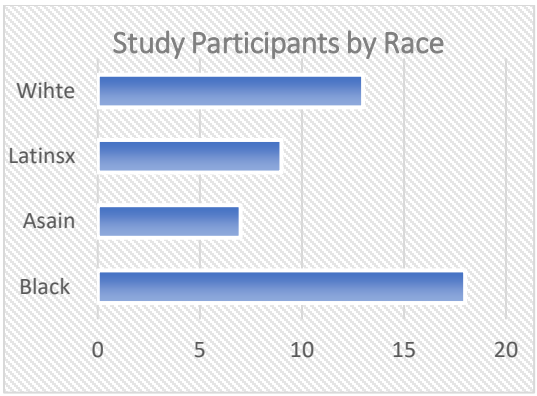

Figure 1. Participants in study broken down by race.

Results of the online survey conducted by this researcher show that many participants in cosplay have positive experiences associated with the subculture. This information was consistent in interviews as those who have negative experiences are of the Black or female community. During the analysis and interpretation of data, the impact on other groups of cosplayers has been considered. Although the overall experience of White cosplayers was more positive, survey results show that White female cosplayers have had more negative experiences than males. Data shows that people of color are experiencing higher negative responses as a result of participating in cosplay, which supports the thesis that the subculture of cosplay reflects the dominant culture within society." Racial slurs are a commonplace, but it seems like the same people who throw these slurs out are the very people who think it's okay to do black face or tape their eyes to appear more Asian."

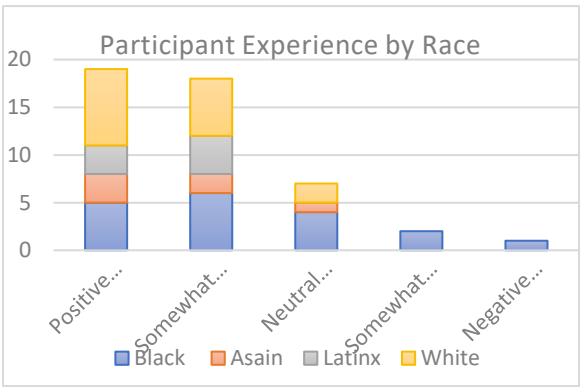

Figure 2. Type of experiences that participants have by race.

While some Black cosplayers have noted that they believe to have had similar experiences to those of White cosplayers, one participant notes: "It is important to remember that as Black people, we have gotten used to negative responses of others in our day to day lives. That doesn't make it okay, just means that we as Black people know that there are many spaces that we must grin and bear it." The results of the online survey show that Black participants have experienced more negative feed-back. Some participants note the lack of representation in media for people of color. This lack of representation does not allow many options for those that participate in the subculture. " You need to look like the character that you are cosplaying." For some the notion of looking like the character means that they need to share the same skin tone while others simply show their creativity by putting time and money towards creating the most accurate costume.

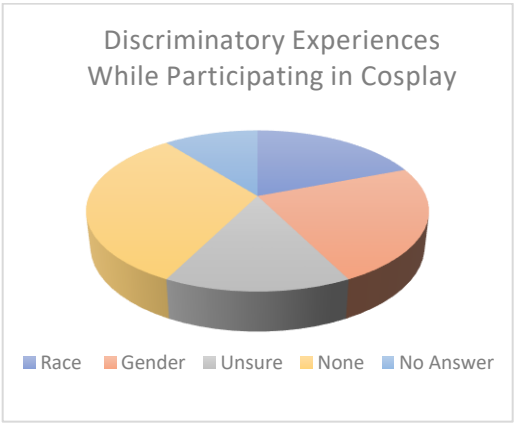

Figure 3. Type of discriminatory experiences while participating in cosplay.

Conclusion

There has been a correlation between being a member of the Black community and being involved in cosplay. While female cosplayers experience more backlash than their male counterparts, Black female cosplayers experience an even higher amount of backlash. Online research has shown that one of the largest issues that the cosplay community faces is racism. People of color are experiencing higher negative responses as a result of participating in cosplay, supporting the thesis that cosplay reflects the systemic racism within society. While some Black cosplayers have noted that they believe they have the same experiences of their White counterparts, others note that members of the Black community have become accustomed to this type of behavior. Although cosplay is a subculture that is praised for being acceptive of those that are within the geek community that feel as though they do not fit in society, improvement of the community is still needed when it comes to racial acceptance. Representation can create empathy outside of the Black community. It is the hope of this researcher that this information will help better educate people about the cosplay subculture and to show that the greater issues of society can be present even in accepting subcultures.

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EV Charging Desert: The Challenges with Electric Vehicle Charging in Modesto California

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Abstract

As the popularity of electric vehicles (EVs) increases, it has become clear that some regions are struggling to keep up with EV charging infrastructure. Stanislaus County in California's Central San Joaquin Valley is one such region, lacking a significant number of public EV charging stations. This research project explores proactive measures that the city of Modesto and, by extension, Stanislaus County can take to improve its public EV charging infrastructure. Given limitations in power infrastructure and cost, the optimal placement of charging stations is crucial. This project identifies the optimal travel routes to projected EV charging infrastructure in East Modesto based on a mathematical linear programming model using local census data. Ensuring future public charging infrastructure is evenly distributed across the region is essential for providing reasonable travel distances to public EV charging stations for all residents.

Keywords: Electric Vehicles (EVs), DC Fast Charging, Tesla Supercharging, J1772, Level-2 Charging

Introduction

In 2020, California State Governor Gavin Newsom issued an executive order banning the sale of new internal combustion light-duty vehicles by 2035 (Newsom, 2020). As a result, the popularity of fully electric vehicles (EVs) has increased, and California has led the nation in EV adoption. However, there are still regions in California which significantly lack EV charging infrastructure. One such region is Stanislaus County, which sits in the Central San Joaquin Valley. The city of Modesto, California is the largest city in Stanislaus County, yet the entire eastern half of the city has no convenient access to public EV charging infrastructure (Figure 1). The city of Modesto and, by extension, Stanislaus County, must prepare for the influx of new battery electric vehicles by increasing the number of publicly available EV charging locations.

In the current charging landscape, deciding where to add more EV chargers does not have a simple solution due to many factors including power infrastructure and cost limitations. Therefore, optimal placement of EV charging stations is important. Optimal placement of chargers should consider not only the number of chargers, but also the travel distance for residents in that area. In the recent report by Stanislaus County (2022), only one location was selected as a candidate for public EV charging infrastructure in East Modesto. The location at Scenic Place Shopping Center, was determined to be a good candidate for DC fast charging, unfortunately this would only serve to charge 4 EVs at once at the location (p. 56). While any additional charging is a welcomed improvement over current public charging conditions, this charging location would provide only a temporary fix to a long-term issue and would still be insufficient for the volume of vehicles already on the road.

The city of Modesto must take proactive measures to significantly improve public EV charging infrastructure in its eastern region before the rapid increase of electric vehicle demand overwhelms the current public EV charger supply. In this research study, a mathematical model was created which places chargers in off-street parking lots at public parks across the eastern region of Modesto. The model is used to determine the optimal travel routes for residents of East Modesto which minimize the total distance traveled. The results of this project suggest that without significant infrastructure improvements, local EV owners will be forced to travel significant distances to access public charging infrastructure.

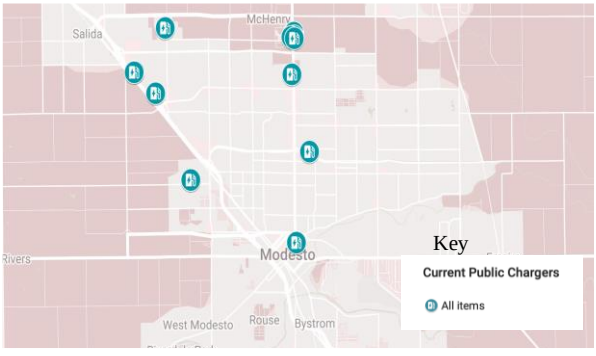

Figure 1. Current EV Charging Locations in Modesto (Google Maps, 2023)

Background

Recently, local EV ownership has increased with Tesla being the most popular choice for fully electric vehicles with 875 registered vehicles in the county as of 2020 (Stanislaus County, 2022). Tesla's local charging infrastructure offers the most convenience for local EV owners, with destination chargers and a Supercharger location in Northwest Modesto (Stanislaus County, 2022) and recently a new Supercharger in the nearby city of Turlock. This is a key reason why many residents choose Tesla as their first EV.

Figure 2. Tesla Model Y Supercharging

(Tesla Inc., 2022)

While Tesla has led the market in EV sales and adoption (Liu, 2021), many automotive manufacturers, including legacy brands like Ford, Nissan, Toyota, and General Motors, continue to increase the number of electric vehicles they produce (Stanislaus County, 2022). These vehicles use Combined-Charging System (CCS) chargers based on J1772 type connectors, which have quickly become the industry standard in North America but differ from Tesla's proprietary connector (Stanislaus County, 2022). These additional EVs have the potential to further increase the demand on an already underprepared and underfunded public charging system. It is worth noting that, unlike Tesla which operates charging locations primarily for their own brand of vehicles, public charging for CCS based EVs relies on separate 3rd party charging hardware operated by companies such as EVgo, Electrify America, and ChargePoint.

Figure 3. Nissan Ariya DC Fast Charging

(Nissan Motor Corp., 2022)

For most public charging installations, having different charge point operators increases the complexity (National et al., 2013) for public charging rollout with various regulations on installation types such as those in the federal Inflation Reduction Act (United States Congress, 2021). Optimal placement of new public EV charging stations is an important aspect of making public charging infrastructure accessible to all residents across a local area (Battapothula et al., 2019).

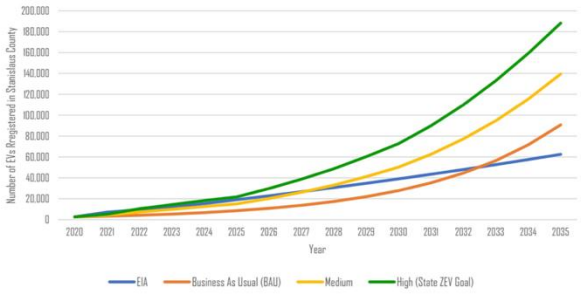

Figure 4. EV Ownership Growth Projection

(Stanislaus County, 2022)

Methods

The purpose of the research conducted was to analyze the feasibility of proposed EV charging locations in East Modesto that utilize existing public infrastructure, specifically public parks. While many locations can be used for public charging infrastructure, there were several factors that contributed to public parks being selected for this study. The most important being public access, currently all chargers that could serve East Modesto residents are in the city's north central region along McHenry Ave (Stanislaus County, 2022). These commercial properties, primarily automotive dealerships in an area known locally as "Dealership Row". These locations are subject to

company rules, policies, and business hours typically from 9AM to 5PM, which can limit access for EV owners, especially during emergencies such as a low battery. Additionally, Modesto City Parks are evenly distributed across the city, making them prime locations. Other cities in California provide an example, having also utilized public parks as charging locations in local communities such as the California State Capital; Sacramento (City of Sacramento, 2023).

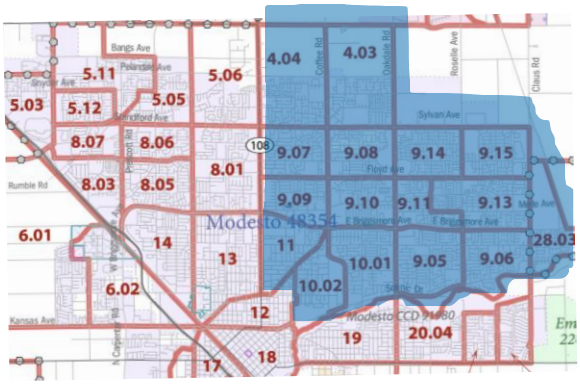

Figure 5. US Census Tracts: Modesto, CA

(US Census Bureau, 2020)

East Modesto was divided into neighborhoods corresponding to each census tract in the area (Figure 5). It was possible to assign one public park per neighborhood, except for census tract 28.03. In this census tract, no public park was within 2 miles and so the next best location type was chosen. This location was a local area gas station (Cruisers) which had sufficient parking for EV charging. It was then estimated that each off-street parking stall at each park would correspond to one EV charger. To determine the number of EV chargers that could be installed, each Modesto City Park location (including Cruisers) was surveyed using Google Maps Street view and satellite view (Figure 6). Data collected was then used to tally the total available parking stalls at each park. In total, 16 census tracts were evaluated, and 16 locations were tabulated for the number of available parking stalls that could have EV chargers installed. It is worth noting that there are a limited number of parks with dedicated off-street parking. Therefore, neighborhoods whose parks do not have off-street parking will need to travel to another park for charging. The mathematical model will determine the best proposed EV charging location for residents to go to which minimizes the total distance traveled.

With public parks as a set of proposed locations of EV chargers, a mathematical model was needed to analyze the travel routes for residents in this area. While several mathematical models were explored (e.g., Ahmad et al., 2022), the approach that most closely aligned with our goal of minimizing distance traveled was a network model analyzing potential charging station locations with plug-in hybrids vehicles (Zhu et al., 2016). Once all parking stalls and locations were calculated, the next step was to determine which locations could travel to other locations if needed within a two-mile radius. A total of at most three locations were chosen for each corresponding park location. Locations were labeled based on their distance from the starting location / park and would only be sent to another location if the constraints were met; less than two miles away and have dedicated off street parking. A map was then generated using google maps and the location information was imported as a .CSV file. This allowed for the locations to be displayed on a map of East Modesto shown in (Figure 7).

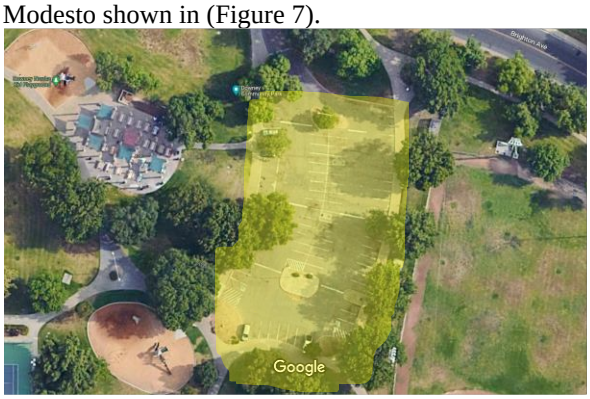

Figure 6. Public Park Parking Stall Evaluation

(Google Maps, 2023)

Each census tract will have a different number of EVs that require public charging due to several factors. These factors include the number of single family vs. multi-family housing units in the area as well as the household income. Homeowners with higher income will likely have home chargers installed, whereas renters living in multi-family housing units would likely need to use public charging. To estimate the total number of EVs in each census tract, it was estimated that there would be one EV per household. Furthermore, we estimated the number of EVs that need public charging will be proportional to the number of households with annual incomes of less than $100,000 (US Census Bureau, 2020). Then the estimated number of EVs in East Modesto was 29,473. However, the number of proposed chargers that will be installed is 291. Therefore, the number of EVs in each census tract was scaled down to 1% of the estimated number to have a correspondence between EVs and chargers. The mathematical model determines where residents in each census tract should travel to for charging while minimizing total travel time. The constraints the model must respect include (1) the number of EVs sent to a park can be no more than the number of parking stalls it

has, (2) every EV in each neighborhood must be assigned a charging location (i.e., a park) that is within 2 miles. This mathematical model was formulated in the Python programming language, using the Gurobipy package for optimization based on provided constraints (Gurobipy, 2023).

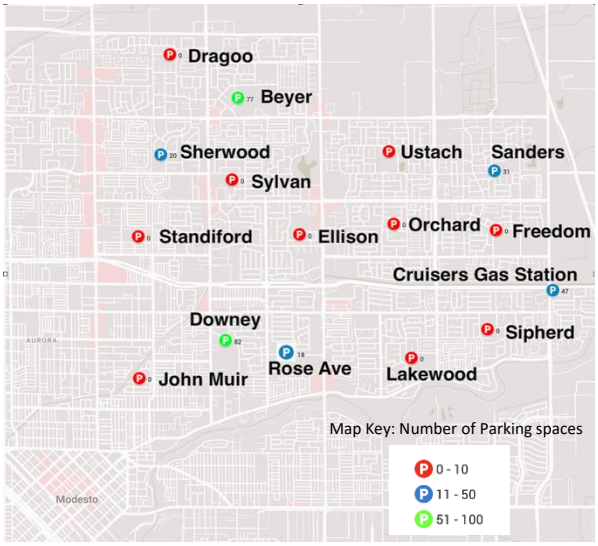

Figure 7. Parks in East Modesto Region

(Google Maps, 2023)

Results

During the data analysis phase of this project, it could be interpreted that many of the locations selected by the county's EV charging infrastructure study (Stanislaus County, 2022) in Modesto were too close in distance to each other and too few in number to have a significant impact on the local EV charging demand. Further, to model the EV charging needs of a small region of Modesto the projected number of EVs needed to be adjusted to approximately 1% of the total households with income less than $100,000. Therefore the quantity of EV charging locations will need to be scaled up significantly from our existing proposal of using only park locations. This finding supports the preliminary result, that more EV chargers are required than existing public infrastructure allows.

In our mathematical model of this EV charging problem, a total of 291 dedicated parking spaces at proposed locations across East Modesto would be used to meet the charging demand. These charging locations were formulated as a network model (Figure 8) to determine the optimal travel routes of EV owners from their resident census tract to proposed charging locations so as to minimize total distance traveled. These travel routes are illustrated in Figure 8. For example, Beyer Park which is in the top left corner of the model (Figure 8) has a total of 5 links, these links represent the EVs that would travel to this location to charge. Note that one of the links is a loop with 16 EVs represented, this represents EVs who belong to that census tract population (Beyer) who will charge at their own location (Beyer). All other links are EVs that are traveling from other locations to Beyer for charging because of insufficient charging stalls at their local park.

The optimized model (Figure 8) demonstrated that the Modesto City Park locations could be easily reached by EV owners while respecting the two-mile maximum travel distance between locations, thus representing a reasonable travel distance. However, notice that at some neighborhoods that do have proposed chargers at their corresponding park, such as Rose Ave Park, all the EVs in that neighborhood are expected to charge at another location rather than charging at the neighborhood's park itself. Ultimately, this result highlighted the need for additional charging even beyond the number of chargers proposed in this study, in ideal conditions each location's EV owners would not have to travel outside their own neighborhood to obtain public EV charging. These results also demonstrate that a time of use model should be further explored to balance charging demand and even potentially a queue solution via charge point operators' applications could be used.

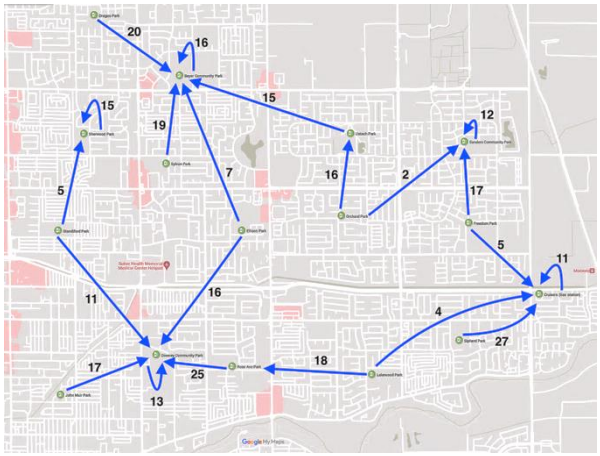

Figure 8. Optimized Network Model: EV Flow of Travel

(Google Maps, 2023)

Conclusion

The result of this research has many important implications for future EV charging infrastructure across Modesto and Stanislaus County. While the county has identified key locations marked for potential charging infrastructure in their recent report (Stanislaus County, 2022), these locations can be further supplemented by public park locations. This study identified improvements that could be made to the county's plan. These improvements consider distance traveled between neighborhoods and public charging stations to prevent uneven distribution and charging station oversaturation. If future charging locations are

chosen solely based on their proximity to the local highway (CA 99), then a large percentage of Modesto's population will be left out of the opportunity to utilize public charging infrastructure, including households that lack at-home charging capabilities. Additionally, the distance requirements and city park locations outlined in this study, if implemented would ensure equitable access to public EV charging infrastructure across East Modesto and could be scaled for other parts of the city and county.

Future Work

A key limitation of this study is that, while each location has been identified as a candidate for public EV charging, the type of charging each location should provide has not been evaluated. For example, areas with higher density need faster throughput of vehicles and thus DC fast charging could be implemented, whereas most locations looking to save on installation costs could implement level 2 charging (Stanislaus County, 2022). In future studies, this topic could be further explored. Only through additional research and supplemental charging station installations can Modesto move toward universal public EV charging access and resolve the current EV charging desert that exists across the city today.

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Responsibility in the Math Classroom and its Correlation with Mathematics Anxiety

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Abstract

While recent research in education has explored alternative teaching models that are increasingly student-centered, Emerson's (1962) power-dependence theory suggests responsibility can help students gain greater control over the mathematics learning process regardless of teaching methodology. Consequently, this initial study investigated the relationship between student and teacher perceptions of responsibility and the potential correlation between student responsibility and mathematics anxiety. We conducted a mixed-methods study, surveying 5 math teachers and 100 students from advanced and regular math classes in one public high school in Stanislaus County, California. Preliminary Likert-type scales were developed to measure responsibility and Mahmood and Dr. Khatoon's (2011) Math Anxiety Scale was used to assess mathematics anxiety. Preliminary results indicate: 1) advanced and regular math students have differing perceptions of student responsibility and 2) mathematics anxiety negatively correlates with student perceptions of student responsibility. Ultimately, the initial results of this exploratory study show responsibility is a complex component of the mathematics classroom requiring further analysis.

Keywords: Responsibility, Mathematics Anxiety, and Math Classroom

Introduction

Mathematics learning is an important component of students' educational journey. Specifically, many students require a strong mathematical understanding to accomplish both their educational and professional goals. Nonetheless, mathematics is a traditionally difficult subject area that deals with highly abstract and complicated topics. For this and many other reasons, numerous students worldwide also experience mathematics anxiety, a term that describes the stress and unease some students feel while working/solving math problems (Richardson and Suinn, 1972, as cited in Dowker et al., 2016). Unfortunately, mathematics anxiety has been repeatedly found to be negatively correlated with mathematics performance, which in turn affects students' efforts to accomplish their math goals (Zhang et al., 2019). Drawing on Emerson's (1962) power-dependence theory, we claim students can increase their role in the learning process by assuming more responsibility for their learning. Specifically, increased student responsibility can lead to increased student involvement and control over the mathematics learning process.

As such, this exploratory study is multifaceted and analyzes two key concepts. Primarily, this study examines responsibility perceptions to better understand the current student-teacher expectations in the math classroom. Secondly, this research analyzes the relationship, if any, between students' perceived learning responsibility and mathematics anxiety so as to better understand students' anxiety surrounding mathematics. Ultimately, this study explores an important dimension of the learning environment and deepens our understanding of the student-teacher relationship.

Background

In recent years, researchers' efforts to optimize learning have led to a close inspection of the student-teacher power dynamics in the classroom. Specifically, researchers and educators alike are acknowledging the role power plays in student-teacher interactions (Hao Kuo Tai, 1998; Eva, 2017). In this study, we use Emerson's (1962) power-dependence theory to define and measure power as the mutual dependence between two or more parties. Thus, we measure the power of A over B by examining the degree of B's dependence on A and vice versa.

In the classroom, students and teachers depend on each other to accomplish their respective goals. For example, students rely on their teachers to learn new materials and pass their courses. Conversely, teachers depend on their students to collaborate in the classroom and fulfill their professional responsibilities. As such, students and teachers partake in a unique power relationship in the classroom, wherein both depend to varying degrees on the other party. However, power is often not equally distributed in the classroom because teachers often get to dictate what, how, and when their students learn (Eva, 2017). Consequently,

current research in education has focused on developing and studying the effects of alternative teaching methodologies that increase the student's role in the classroom. For example, researchers have studied teacher scaffolding, the gradual release of responsibility model (GRR), and student-centered learning, all of which modify instruction to better meet student's needs (Tan & Saligumba, 2018; Van de Pol et al., 2010; Webb et al., 2019; Wright, 2011). Often, the goal is to increase students' involvement in the learning process and as such create a more dynamic power relationship in the classroom.

Nonetheless, various studies show that both teachers and students acknowledge and expect a certain degree of teacher authority in the classroom, so as to provide structured classroom activities and a safe learning environment (Evertson, 2006). As such, the problem is not solely the imbalance of power in the classroom but rather the relative permanence or flexibility of this power relationship. Alternatively, Emerson's (1962) power-dependence theory suggests that, regardless of teaching methodology, students can increase their involvement in the learning process when they assume more responsibility for their learning. For instance, when students ask questions or attend tutoring outside of class hours, they are taking tangible steps to consolidate their learning which may result in increased feelings of self-efficacy; an increased belief in their ability to reach their math goals. Since self-efficacy has been found to be negatively correlated with mathematics anxiety, increased student responsibility may also negatively correlate with lower feelings of mathematics anxiety (Lee, 2009).

However, in their study Hansson (2012) studied the link between responsibility in the math classroom and student performance and concludes that teacher responsibility is an essential component for effective learning in the math classroom. Similarly, the gradual release of responsibility model (GRR) subdivides the learning process into various stages where responsibility for learning is gradually transferred from teacher to student (Pearson & Ghallagher, 1983; Webb et al., 2019). As such, it is not enough for students to assume more responsibility because the synergy between student and teacher responsibility expectations are equally as important. Nonetheless, research in the past has often focused on independently studying students' perceptions of responsibility (Ayish & Deveci, 2019). What is more, there are many factors that can affect the distribution of responsibility in the classroom, including the educational environment. For instance, Cam and Oruc (2014) found that many instructors feel unable to implement student-centered learning, which traditionally gives more responsibility to students, because class sizes are too large, and the curriculum is too vast. As such, educators often fail to foster in their students a sense of responsibility for their learning and instead assume more responsibility themselves. Coupled with the observation that students and teachers rarely explicitly discuss responsibility in the math classroom, additional research is required that *jointly* studies students' and teachers' perceptions of responsibility in the *high school math* classroom.

Therefore, this initial study analyzes perceptions of responsibility in the math classroom at one public high school in Stanislaus County, California. We sought to study two questions: (1) Do perceptions of responsibility in the math class differ between students and teachers? and (2) What about between advanced and regular math students? The latter question stems from our observations that advanced math classes tend to cover more material at a quicker pace, which may result in different perceptions of responsibility between students in an advanced math class as compared to students in a regular math class. Thus, our hypothesis is that both groups have different perceptions of responsibility. Lastly, given the increased involvement in the learning process, we also hypothesized that student responsibility and mathematics anxiety are negatively correlated. Studying these questions will help educators better understand student expectations in the math class. Specifically, in her study Hansson (2012) also concludes that additional research is required studying the relationship between student activity and student performance. As such, the first step is to first try to understand student perceptions because doing so will help us understand the role responsibility plays in the math classroom. Additionally, this analysis will help us further understand the different dimensions of MA and explore potential tools for students with high MA.

In this study, responsibility will be measured using activities that span the learning process. Specifically, the original GRR model subdivides the learning process into three stages: 1) areas where the teacher is primarily responsible, 2) areas where the student is primarily responsible, and 3) areas where the student and teacher share responsibility (Pearson & Ghallagher, 1983; Webb et al., 2019). Transcending its original reading instruction application, the GRR model also applies to mathematics instruction because students are prompted to learn new mathematical topics, apply them in a group setting, and then demonstrate competency in assignments and assessments. Thus, we utilized the GRR model as a guide to identify tangible activities where students/teachers can display responsibility. Importantly, we acknowledge that there are different learning styles that can influence how students learn in the math classroom (Bay, 2021). As such, given that

public education is not an individualized activity where the teacher is able to adapt to the many different learning styles, we claim students should and can assume responsibility throughout the entire learning process because. Consequently, given that misunderstandings can arise at any stage in the learning process, our student composite responsibility scores include activities that span the entire learning process. Overall, jointly analyzing multiple questions allows us to create composite responsibility scores and get a better perception of student perceptions as compared to teacher expectations and vice versa.

Lastly, mathematics anxiety (MA) was measured using Mahmood and Dr. Khatoon's (2011) Math Anxiety Scale (MAS), which they found to be a bidimensional scale that is reliable and valid. Specifically, MAS was designed for secondary and senior secondary students and "assess[es] positive and negative dimensions of math anxiety" (pg. 176, Mahmood & Khatoon, 2011). What is more, Mahmood and Dr. Khatoon (2011) mention their scale produced two factors: "the first representing concerns about doing well in math and second representing strong negative effective reactions to math" (pg. 176). This is important because they align with previous studies findings of "cognitive" and "affective" dimension of math anxiety (Wigfield and Meece, 1988, as cited in Dowker et al., 2016). Overall, much research has been conducted on math anxiety and its related constructs, such as test anxiety and self-efficacy (Dowker et al., 2016). Consequently, analyzing math anxiety alongside student responsibility will improve our understanding of the various dimensions of this construct. Thus, this preliminary study seeks to provide key information meant to guide future research in responsibility in the math classroom and mathematics anxiety.

Methods

Participants

From the 222 10th and 11th grade students and 7 high school math teachers invited to participate, 100 students and 5 teachers participated in the study. In the recruitment stage, we randomly selected eight 10th and 11th grade math classes from one public high school in Stanislaus County, California, half of which were advanced math classes. Of the 100 final student participants, 52 came from an advanced math class and 48 from a regular (college prep) class. Respondent's ages ranged from 14 to 18 years old. For this study, 12th grade students were not invited to participate because they were not required to enroll in a math class. Also, it was reasoned 9th grade students were in a transitory period where confounding factors could lead to different views of responsibility in the math classroom. Before administering the survey, parental consent forms were shared with parents, and students and teachers also completed consent and assent forms on the day of the survey. These forms contained detailed descriptions of the study's purpose alongside the minimal risks associated with the study. Participation was always voluntary, and participant's confidentiality was assured through the anonymity of their responses.

Materials

This mixed-research design study utilized an online Qualtrics survey with four sections for students and three sections for teachers; see Appendix A and Appendix B for a copy of the utilized student and teacher survey. Both surveys included a student responsibility section and a teacher responsibility section. To measure student responsibility, a revised 9-item student responsibility scale asked participants to rate student responsibility while completing different activities that spanned the math learning process. These activities were rated according to the following scale: (1) Not at all responsible, (2) A little responsible, (3) Somewhat responsible, (4) Very Responsible, and (5) Completely Responsible. For each participant, the sum of all items was tallied and then divided by the total number of items in the scale. To increase the face validity of the student responsibility scale, these questions were reviewed by math professors and a doctoral student in education and adjusted accordingly. To measure reliability, we calculated a Cronbach's alpha score of 0.844 for student responses and 0.773 for teacher responses, which indicated acceptable reliability for the student responsibility scale. A similar process was followed for the 6-item teacher responsibility scale. However, we were unable to calculate the Cronbach's alpha score on the 6-item scale for teacher responses. As such, a Cronbach's alpha score of 0.844 for student responses meant we primarily analyzed student responses for the teacher responsibility scale; see Appendix C for a more detailed description of the survey measures, including the average inter-item correlation. Additionally, the following question regarding responsibility was modeled after Ayish and Deveci's (2019) survey: "On a scale from one to five, to what extent do you feel you are responsible for your own learning in [your math] class?" Lastly, mathematics anxiety (MA) was measured using Mahmood's and Dr. Khatoon's (2011) Mathematics Anxiety Scale (MAS), which consisted of 14 positively and negatively worded statements. A Cronbach's alpha score of 0.919 and average inter-item correlation of 0.449 also indicated high internal reliability. Sample questions include: "To what extent do you agree or disagree with the following statement:

Math makes me feel comfortable and easy." Negatively phrased items were scored on the traditional 1 to 5 Likert-scale and scores were reversed for positively phrased items; composite scores were created for each student. Lastly, the survey had one open-ended question, which gathered qualitative information about student and teacher perspectives and was analyzed and sorted into general categories. These responses were also compared with quantitative data to identify general trends and perceptions regarding learning responsibility and mathematics anxiety.

Procedure

After receiving UIRB approval, all 10th grade math teachers were divided into regular and advanced categories based on the math classes they taught. An online computer program then randomly selected two regular 10^{th} grade math teachers. For each teacher, one class was randomly selected from all their applicable math classes. This randomization process was repeated with 11th grade regular math teachers. Since only one teacher per grade taught advanced math classes, two classes from each advanced teacher were randomly chosen using the online computer program. Upon selection, every teacher was then contacted to invite them to participate in the study. A survey date was established, and student's parents/guardians had nine days to complete electronic parental consent forms. After the parental consent process, participating students primarily completed the online survey on the same day in their math class but could submit the survey until the end of the day. This was done to capture a snapshot of student perspectives of responsibility and control for changes in perceptions. In the data analysis stage, SPSS was used to measure mean, median, mode, standard deviation, frequency, correlation, and the Mann-Whitney U-Test. R was used to conduct linear regression with math anxiety and student responsibility. In all analysis, statistical significance was taken at $p<0.05$.

Results

Student Responsibility (SR)

An overview of the SR data is presented in (Table 2). The final scale was measured on the continuous interval from 1.00 to 5.00 and (Table 1) shows the score interpretation.

Table 1: Composite Responsibility Score Interpretation

Range	Interpretation
1.00-2.00	Low Responsibility
2.00-3.00	Moderately Low Responsibility
3.00-4.00	Moderately High Responsibility
4.00-5.00	High Responsibility

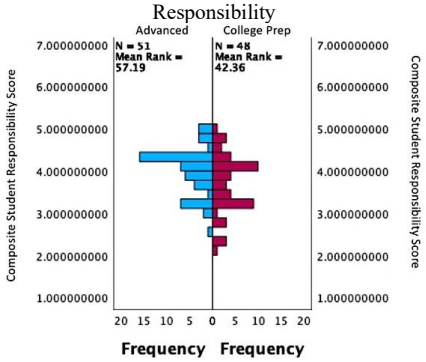
When analyzing the data, we defined minor and major outliers as those that fell 1.5*IQR and 3*IQR below the first quartile or above the third quartile, respectively. When analyzing student responsibility, we identified one minor outlier in the responses for advanced students (n=51) and zero outliers for college prep students (n=48). However, since the point seemed to be a true student score, it was included in the data analysis. Regardless, teachers and students tended to agree that students had moderately high responsibility in the mathematics classroom.

Since responses were not normally distributed, we conducted the Independent-Samples Mann-Whitney U Test to measure the differences in the student responsibility scores. Running the test with advanced versus regular students, we get a p-value of 0.01. Thus, there is sufficient evidence to reject the null hypothesis that the distribution of student responsibility scores is the same for both advanced math students and regular students. The differences in these distributions are visible in (Figure 1), as the score distribution for advanced students tends to be left-skewed, whereas there is more variation in the distribution of regular math students.

Table 2: Student Responsibility Statistics

	Mean	Standard Deviation	95% Confidence Interval for Mean
Student	3.812	0.662	[3.679, 3.945]
Advanced	3.980	0.569	[3.821, 4.140]
College Prep	3.632	0.711	[3.425, 3.839]
Teachers	3.444	0.609	[2.689, 4.200]

Figure 1: Grouped Histogram of Student Responses on Student Responsibility



Second, comparing student (n=99) versus teacher responses (n=5), we get a p-value of 0.204. Thus, there was not sufficient evidence to reject the null hypothesis that the distribution of student responsibility scores is different between teachers and students.

Teacher Responsibility

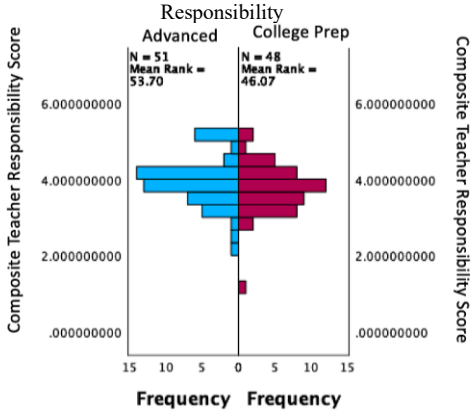
Since Cronbach's alpha and the average of inter-item correlation were both within their ideal range, composite scores for teacher responsibility were created for students. The teacher responsibility scale was measured on the continuous interval from 1.00 to 5.00 and interpreted following (Table 1). In all cases, students seemed to agree that teachers had moderately high responsibility in the mathematics classroom; see (Table 3). We identified one minor outlier for the advanced student responses (n=51), and four minor outliers and one major outlier for the college prep student responses (n=48). Since there wasn't any evident reason for the outliers to not be true student scores, they were included in the data analysis. To account for the major outlier, the data analysis was conducted with all the data points and without the major outlier. Conducting this analysis, we see that the mean teacher responsibility score increases from 3.698 to 3.752 and the standard deviation decreases from 0.641 to 0.527.

Table 3: Teacher Responsibility Statistics

	Mean	**Standard Deviation**	**95% Confidence Interval for Mean**
Students (Joint)	3.785	0.634	[3.658, 3.911]
Advanced	3.866	0.623	[3.691, 4.041]
College prep	3.698	0.641	[3.512, 3.884]
College Prep *(no extreme outliers)*	3.752	0.527	[3.600, 3.907]

Running the Mann-Whitney U test to compare advanced versus regular student scores, we get a p-value of 0.184 with all data points and 0.243 without the major outlier. Thus, there is not sufficient evidence to reject the null hypothesis that teacher responsibility perceptions are different between advanced and regular math students in either case. The distribution of students' scores according to the type of math class they were enrolled in is displayed in (Figure 2). Again, we decided not to compare student and teacher composite scores for teacher responsibility due to the low reliability scores for teacher responses on the teacher responsibility scale.

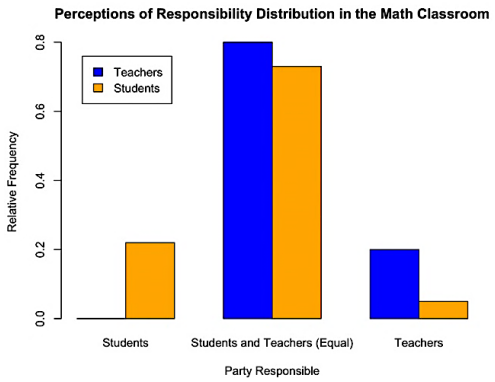
Figure 2: Grouped Histogram of Student Responses on Teacher Responsibility



Qualitative Data Analysis

Participants' open-ended responses were first grouped according to their response to part-one of the two-part question. In part one, participants were asked to specify who they perceived to have more responsibility in the math classroom. Participants chose one of three options: 1) Mostly students, 2) Students and teachers share equal responsibility and 3) Mostly teachers. Of the 100 student responses, 22% selected option (1), 73% selected option (2), and 5% selected option (3). Of the 5 teacher responses, 0% selected option (1), 80% selected option (2), and 20% selected option (3); see (Figure 3). In the second part of the question, participants were then prompted to explain their choice to part-one. Responses in each of the three categories were analyzed and inter-grouped according to similarities in response justifications and explanations.

Figure 3: Students' and Teachers' Responsibility Distribution in the Math Class



Students

Participants who said *students* were more responsible in the learning process had three main justifications. Primarily, some students emphasized that students had to be accountable and take the *initiative* to ask questions and consolidate the material

covered in class. For example, one student mentioned: "…students have to make sure that they know the math themselves and if they don't know they would have to spend extra time outside of class to understand the math lesson…" Secondly, other students implied that students had more *personal responsibility* in the math classroom, focusing on personal goals and responsibilities. For example, one student stated, "I think the students have more responsibility because their education depends on themselves…" Similarly, these students seemed to focus on getting good grades and successfully completing their math course. Lastly, some students focused on the *math learning environment*, citing the teacher to student ratio, fast-paced courses, and vast curriculum as reasons for students having to assume more responsibility. For example, one student stated: "…Teachers can't spend individual time with each and every one of their students, or else we would progress very slowly."

Students and Teachers

Participants that said *teachers and students* had equal responsibility in the math class tended to describe the learning process as a cooperative activity with a clear divide in teacher and student responsibilities. Primarily, students emphasized that teachers were responsible for: creating and explaining lessons effectively, fostering a good learning environment, and providing help to students. Accordingly, students were responsible for: asking questions, seeking help, paying attention in class, and completing any assigned work. For example, many students stated a variation of one student's response: "Teachers have the responsibility of creating and teaching the lessons to the best of their ability, along with answering questions but students are responsible for understanding and paying attention to the lessons, as well as asking questions, or getting help." Comparably, teachers also divided the math learning process, wherein they were primarily responsible for providing the appropriate resources, lessons, and activities, and students were responsible for participating in class, paying attention, and engaging with the lesson. Thus, students and teachers tended to agree that successful learning required both student and teacher effort, albeit in varying ways.

However, there were two interesting observations that arose when analyzing both students' and teachers' responses in these categories. Primarily, there were students and teachers that focused on the reciprocal nature of the student-teacher relationship in the math classroom, often phrasing their responses as conditional statements. For example, one student mentioned: "…if the student doesn't put in their own effort, then they will never learn the topics, but if the teacher doesn't teach it or help the student understand it, then there is no way the student will be proficient." Similarly, one teacher stated: "…I can do everything in my power to prepare students to reach a standard, but if a student does not put in the effort, they most likely will not succeed." Thus, these students and teachers responded by identifying the consequences in learning when students and/or teachers did not fulfill their role in the mathematics learning process, emphasizing the dependency of students on teachers and teachers on students for successful learning to occur.

The second interesting observation that arose dealt with student comprehension. In contrast with the aforementioned clear division in teacher and student responsibilities, students and teachers tended to be divided on who was responsible for student comprehension. For example, some teachers and students stated *teachers* were primarily responsible for student comprehension, stating a variation of one student's response: "Teachers have to teach us and make us understand what they're teaching us…" Similarly, a teacher stated, "Teachers are responsible for the lessons they give and making sure the students are understanding the lesson they are given." Conversely, other students emphasized students were primarily responsible for student comprehension, stating a variation of one student's response: "…in the end, it's the student's responsibility to make sure they are working towards understanding the topic". In between, there were students and teachers that implied both were responsible for student comprehension, stating a variation of one student's response: "…students play a key role in their education their effort and overall asking to understand, but teachers also need to teach well enough for people to understand the topics they are going over." Similarly, a teacher stated, "I provide the materials and help facilitate understanding, but students need to fulfill their half of the learning role by participating and making their best effort." These observations also tended to coincide when analyzing clusters of questions in the student responsibility scale. Analyzing (Table 4), we tended to see more variation (with regards to median and mode) both within student responses but also between student and teacher responses with questions that dealt with student efforts to consolidate comprehension. Nonetheless, due to the small teacher sample size we were not able to analyze the statistical significance of these differences, emphasizing the need for additional research.

Table 4: Student Responsibility Statistics

Question	Mode			Median		
	A	R	T	A	R	T
Q1: Student participation	4	4	4	4	4	4
Q2: Student comprehension	4	4	3	4	4	3
Q3: Understanding the problem-solving process	4	4	3, 4	4	4	3
Q4: Spending time outside of class learning a math topic	3, 5	3	2	3.5	3	2
Q5: Studying for math exams	5	4	4	4	4	4
Q6: Asking questions in math class	4	4	4	4	4	4
Q7: Seeking help from teacher	5	4	2	4	4	2
Q8: Attending tutoring after class	5	3	2	4	3	2
Q9: Homework completion	5	4	4	5	4	4

Reference Key 1 and Key 2 Below

Key 1: Participants

A	Advanced Math Class
R	Regular Math Class
T	Teachers

Key 2: Coded Values

1	Not at all Responsible
2	A little Responsible
3	Somewhat Responsible
4	Very Responsible
5	Completely Responsible

Teachers

Lastly, students that said *teachers* were more responsible primarily focused on the teacher's experience and their role in the classroom. For instance, some students implied the teachers' experience increased their responsibility to convey the math lesson effectively, stating a variation of one student's response: "…teachers have more responsibility in the classroom because it is their job to teach us. They make a living by teaching us the lesson in a way that all the students can understand it…" Similarly, another student stated: "…although some students have responsibility the teacher has more because they make the presentations and help the students learn the math topic." Thus, some students implied the teacher's role in the classroom requires them to initiate learning because they oversee creating the lessons and materials used in class. Thus, these students primarily appealed to the teacher's experience and role in the learning process. As a sidenote, one teacher also said teachers had more responsibility in the math classroom, but no explanation was provided. Overall, it is important to emphasize that these were the primary justifications that surfaced, but in all cases, responses often overlapped with different categories.

Mathematics Anxiety and Student Responsibility

98 complete mathematics anxiety responses were recorded. (Table 5) provides the mean MAS score and additional statistics for student's responses. (Table 6) indicates how MAS scores were interpreted in this study. We observed two minor outliers in responses for advanced students (n=51) and four minor outliers in responses for regular students (n=47), but since there was no reason to believe these were not true student scores, they were included in the initial analysis.

Table 5: Mathematics Anxiety Statistics

	Mean	Standard Deviation	95% Confidence Interval for Mean
All Students	2.682	0.754	[2.530, 2.833]
Advanced Students	2.608	0.651	[2.425, 2.791]
Regular Students	2.761	0.852	[2.511, 3.011]

Table 6: Student MAS Score Interpretation

Range	Interpretation
1.00-2.00	Low Mathematics Anxiety
2.00-3.00	Moderately Low Mathematics Anxiety
3.00-4.00	Moderately High Mathematics Anxiety
4.00-5.00	High Mathematics Anxiety

Analyzing all 97 complete MA and SR responses, Pearson's correlation coefficient is -0.391 with a 95% confidence interval of (-0.548, -0.208) and Spearman's rank correlation coefficient is -0.348 with a 95% confidence interval of (-0.516, -0.154). In both cases, we get a significance of less than 0.001 for the two-tailed correlation. Thus, the preliminary results indicate a negative correlation between mathematics anxiety and student responsibility. To further analyze this relationship, we conducted an initial linear regression with the 97 complete MA and SR responses. The resulting linear regression equation is: $y = -0.449x + 4.391$. Interpreted in another way, MAS = -0.449(SRS) + 4.391. We also get a p-value of <0.001 for our coefficient indicating that our student responsibility coefficient is significant. We also get a p-value of 0.000 for our F-statistic, indicating that our model is useful for predicting mathematics anxiety. Thus, as (Figure 4) shows, the linear regression model also indicates that as student responsibility scores increase, mathematics anxiety scores tend to decrease. In our linear regression model, we also got an R-squared value of 0.153, which indicates how well our independent variable explains the variation in our dependent variable; a score of one indicates a near-perfect linear fit of the data. (Figure 4) also provides a plotting of the residuals of the linear model, indicating an overall acceptable meeting of linear regression assumptions.

Figure 4: Initial Linear Regression Model

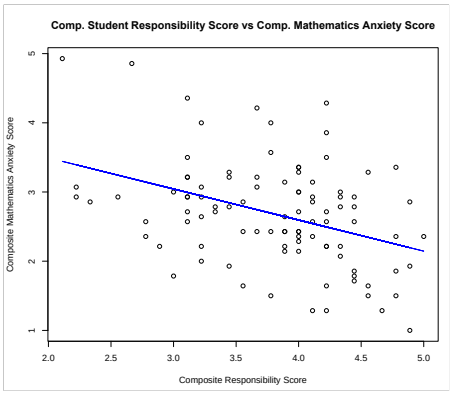
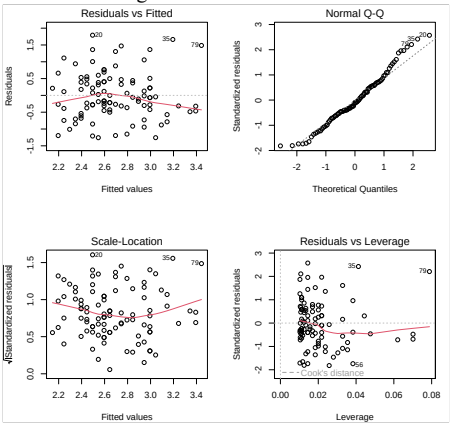


Figure 5: Initial Residual Plots



As the residuals vs leverage plot in (Figure 5) show, however, there were a few points that had an initial high leverage score. For this analysis, high leverage was measured as points with a Cook's distance greater than 0.06. With this measure, there were three points with an initial high leverage. Removing these three points, we get a Pearson's correlation coefficient of -0.271 with a 95% confidence interval of (-0.449, -0.072) and a Spearman rank correlation coefficient of -0.286 with a 95% confidence interval of (-0.467, -0.082) with p-values < 0.01(n=94). The new linear regression also produces the line: y = -0.292x+3.769. Interpreted in another way, MAS = -.292(SRS) + 3.769. We also get a p-value of 0.008 for the student responsibility coefficient and a p-value 0.008 for the F-statistic. Lastly, the linear model produces an R-squared value of 0.073. Therefore, removing points with high leverage did decrease both the magnitude of the correlation between mathematics anxiety and student responsibility and also the predictive power of student responsibility on MA. Nonetheless, the negative link between the two prevails. As such, additional research can provide greater insight on the strength and nature of the relationship between mathematics anxiety and student perceptions of responsibility.

Discussion

In this study, we sought to better understand the perceptions of responsibility of both students and teachers. With regards to the first question, we see that there wasn't sufficient evidence to conclude that teachers and students have different perceptions of student responsibility. However, since our teacher sample size was five, additional testing with larger sample sizes or alternative study designs are required to obtain more comprehensive results. Interestingly, the limited teacher sample size emphasizes the unique power relationship in the classroom because the teacher must fulfill multiple students' expectations whereas the student only has to focus on one teacher's expectations. Thus, additional research with larger sample sizes will provide a clearer picture of student and teacher expectations and provide more conclusive results that either support or challenge this study's results.

Interestingly, analyzing students' and teachers' qualitative responses, we saw that both tend to divide the learning process into activities where the student should display responsibility and activities where the teacher should display responsibility. Nonetheless, there seems to be more ambiguity with regards to the responsibility distribution for student comprehension of math concepts. This is of special significance because student comprehension of mathematical concepts is crucial for student maturity and continued development in mathematics. Returning to Pearson's and Gallaghers' (1983) GRR model, the results of this study indicate that even though students and teachers tend to coincide in their understanding of responsibility distribution at both ends of the transition of responsibility period, there tends to be more ambiguity during the middle transition period. In addressing this ambiguity, teachers have various options and opportunities to optimize mathematics learning. On the one hand, this study emphasizes the need for improved student-teacher communication, where both student and teachers explicitly share their needs and expectations. Teachers can achieve this through group feedback, class surveys, and/or individual student sessions throughout the year. Beyond improving student-teacher communication, teachers can also focus on providing responsive learning opportunities to students. Specifically, Webb et al. (2019) argues that a flexible release of responsibility model allows the teacher to provide multiple scaffolding opportunities to meet both individual students' and the class's learning needs. Consequently, students receive targeted, constructive feedback and multiple opportunities to ask questions and consolidate learning. Though these strategies require more teacher effort, they increase student-

teacher communication and have the potential to improve mathematics learning.

Consequently, an interesting consideration is the idea that there may be two distinct types of responsibility in the math classroom: procedural and implicit responsibility. On the one hand, procedural responsibility describes the activities where teachers and students share an agreed understanding of the party responsible for completing an activity in the learning process. Conversely, implicit responsibility describes the activities that require more student initiative. This may be due to a variety of reasons including that teachers have not explicitly nor consistently established who is responsible for these activities. Specifically, different learning and teaching ideologies may contribute to different student expectations. Consequently, students may then have to adapt to these varying expectations, some of which may only be implicitly understood because a formal discussion regarding these responsibilities wasn't undertaken. Thus, future research can focus on analyzing the varying dimensions of responsibility in the math classroom, paying special attention to the role student-teacher communication plays in responsibility perceptions.

Regarding the second question, we saw that the distribution of student responsibility scores tends to differ between advanced and regular math students, but the distribution of teacher responsibility scores does not. Significantly, this indicates all students tend to have relatively clear teacher expectations but differing student expectations. Since this study did not identify the specific activities where these differences arise, high school math teachers can demonstrate an awareness of differing attitudes towards student responsibility by striving to understand their class's specific attitudes. Regardless, different distributions indicate differing overall perceptions of student responsibility scores that may affect the student-teacher dynamic and should be of special interest to future researchers, specifically with regards to procedural and implicit responsibility. Thus, understanding student expectations of their instructors and themselves can help teachers better fulfill the needs of their students and improve the student-teacher dynamic in the math classroom.

With regards to the third question, we see that mathematics anxiety and student responsibility tend to be negatively correlated, which means that students that perceive themselves to be more responsible in the learning process tend to experience lower feelings of mathematics anxiety. This is important because multiple studies have found mathematics anxiety to be negatively correlated with mathematics performance (Zhang et al., 2019). These findings in turn corroborate our understanding of mathematics anxiety and its multiple dimensions. Currently, it is still unclear if mathematics anxiety influences poor mathematics performance or if poor mathematics performance increases feelings of mathematics performance (Dowker et al., 2016). Nonetheless, our preliminary linear regression fittings indicate that increasing student responsibility may result in lower feelings of mathematics anxiety. Specifically, since our survey measured responsibility through tangible *activities* in the learning process, our results provide tangible steps students can take to assume more responsibility in the learning process. Therefore, future research can verify these preliminary findings with larger sample sizes and employ additional experimental testing that analyzes the relationship between tangible increases in student responsibility and the resulting effect on mathematics anxiety.

Limitations

In this study, one key limitation was the student and teacher sample size and representativeness. Specifically, compared to the high school student and teacher population, our respective sample sizes were relatively small. What is more, the parental consent process reduced our sample size by about 50%, limiting the responses we received. Coupled with our choice to focus on 10^{th} and 11^{th} grade students, our results may not generalize to the entire high school student and teacher population. Thus, future studies can focus on increasing the sample size to produce more generalizable and verifiable results.

Additionally, perceptions of responsibility are nurtured by a student's social and cultural environment. Specifically, this includes a student's respective school culture and social values. Thus, it is possible that students in different regions may hold different perceptions of responsibility as compared to the ones we observed. Thus, future research should delve on investigating how geographical location and/or the cultural environment influences students' perceptions of responsibility and math anxiety.

Lastly, another key limitation was our study design and study instruments. Since the student responsibility scale and teacher responsibility scale were specifically created for this study, these survey instruments must undergo additional testing and modification to increase their robustness and uni-dimensionality in measuring student and teacher responsibility. Conversely, future research can implement alternative research designs, such as exploratory factor analysis or experimental design, to gather supplementary information about responsibility. In this way, future work can also focus on the effect of other predictors, such as gender, grade level, and parental background,

on student perceptions and operationalization of responsibility and mathematics anxiety.

Conclusion

The results of this initial study lay a foundation for future work on responsibility in the math classroom. Specifically, these results are not meant to be conclusive but should serve more as a starting point for future researchers to analyze different aspects of responsibility and their effect in the math classroom. From these initial results, we see that math teachers should strive to explicitly share their expectations with their students. Simultaneously, teachers should provide a supportive learning environment where students can receive responsive feedback and develop mathematical maturity for future math classes. Conversely, initial results also imply that students could benefit from assuming more tangible responsibility in the math classroom because, by asking questions and utilizing all available resources, students increase their involvement in the learning process. Lastly, the initial results also indicate a negative correlation between mathematics anxiety and student responsibility. However, additional research should analyze this relationship further, with the goal of understanding the strength and potential implications of this relationship. Overall, responsibility is an important part of the math classroom and additional research can establish its causes and effects on the student-teacher relationship and the mathematics learning process.

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Appendix A

Student Survey

The following document includes a copy of the complete student survey utilized in this study. The student survey is divided into four sections and contains 36 questions. Section 1 and 2 uses a Likert-Scale from 1 to 5: (5) Completely responsible, (4) Very Responsible, (3) Somewhat Responsible, (2) A little Responsible, (1) Not at all Responsible. Section 3 uses a Likert-Scale from 1 to 5: (5) Completely, (4) A lot, (3) Somewhat, (2) A little, (1) Not at all. Section 4 uses a Likert-Scale from 1 to 5 for negative statements and the reverse scoring for positive statements: (5) Strongly Agree, (4) Agree, (3) Neither Agree nor Disagree, (2) Disagree, (1) Strongly Disagree.

Student Responsibility Section

1. In your math class, rate to what degree you are responsible for participating in your math teacher presentations, lessons, and activities.
2. In your math class, rate to what degree you are responsible for understanding a new math lesson.
3. When your math teacher works out practice problems in class, rate to what degree you are responsible for trying to understand the problem-solving process.
4. When you don't understand a math lesson, rate to what degree you are responsible for spending time outside of class researching the math topic. For example, watching extra math videos, reading your textbook, etc.
5. In your math class, rate to what degree you are responsible for studying for a math exam.
6. In your math class, rate to what degree you are responsible for asking questions if you have any misunderstandings.
7. If you don't understand a new math concept or topic, rate to what degree you are responsible for seeking additional help from the teacher after class.
8. If you don't understand a new math concept or topic, rate to what degree you are responsible for attending tutoring after class.
9. Rate to what degree you are responsible for completing your homework to the best of your ability and on time.
10. When you work in a group to complete math problems, rate to what degree the group is responsible for working through the problems.
11. When your math teacher works out practice problems in class, rate to what degree your teacher is responsible for making sure you understand the problem-solving process.

Teacher Responsibility Section

1. Rate to what degree math teachers are responsible for creating presentations, lessons and activities that students find engaging.
2. Rate to what degree math teachers are responsible for making sure that the majority of students understand a math lesson before moving on to a new topic.
3. When math teachers work out practice problems in class, rate to what degree the teacher is responsible for making sure students are following along and understand the problem-solving process.
4. Rate to what degree math teachers are responsible for making sure that students don't have any questions or misunderstandings.
5. When students work in a group to complete practice problems, rate to what degree the math teacher is responsible for helping students work through the problems.
6. Rate to what degree math teachers are responsible for making sure that every student understands a math lesson before moving on to a new topic.
7. Rate to what degree math teachers are responsible for applying mathematical concepts to real world situations.

Overview

1. To what extent do you feel you are responsible for your own learning in your math class?
2. To what extent do you feel your teacher is responsible for your own learning in your math class?
3. Overall, who do you think has more responsibility in the math classroom?
4. Please explain your response to Question #3.

Mathematics Anxiety

1. Math makes me feel comfortable and easy.
2. Math is the subject I dread the most.
3. I feel worried before entering the math class.
4. I find math interesting.
5. Math is one of my favorite subjects.
6. I am always afraid of math exams.
7. Solving math problems is always pleasant for me.
8. I feel nervous when I am about to do math homework.
9. I feel happy and excited in a math class as compared to any other class.
10. I would prefer to study math as one of my subjects in higher studies.
11. Math is a headache for me.
12. I am afraid to ask questions in math class.
13. Math doesn't scare me at all.
14. My mind goes blank when the teacher asks math questions.

Appendix B

Teacher Survey

The following document includes a copy of the complete teacher survey utilized in this study. The teacher survey is divided into three sections and contains 23 questions. Section 1 and 2 uses a Likert-Scale from 1 to 5: (5) Completely responsible, (4) Very Responsible, (3) Somewhat Responsible, (2) A little Responsible, (1) Not at all Responsible. Section 3 uses a Likert-Scale from 1 to 5: (5) Completely, (4) A lot, (3) Somewhat, (2) A little, (1) Not at all. The teacher survey also included an additional open-ended question, namely question five in section three that was not analyzed in this study.

Student Responsibility Section

1. In a math class, rate to what degree each student is responsible for participating in the teacher's presentations, lessons, and activities.
2. In a math class, rate to what degree each student is responsible for understanding a new math lesson.
3. When a math teacher works out practice problems in class, rate to what degree each student is responsible for trying to understand the problem-solving process.
4. When a student does not understand a math lesson, rate to what degree they are responsible for spending time outside of class researching the math topic. For example, watching extra math videos, reading their textbook, etc.
5. In math class, rate to what degree each student is responsible for studying for a math exam.
6. In math class, rate to what degree each student is responsible for asking questions if they have any misunderstandings.
7. If a student does not understand a new math concept or topic, rate to what degree each student is responsible for seeking additional help from the teacher after class.
8. If a student does not understand a new math concept or topic, rate to what degree each student is responsible for attending tutoring after class.
9. Rate to what degree each student is responsible for completing their homework to the best of their ability and on time.
10. When students work in a group to complete math problems, rate to what degree the group responsible for working through the problems.

Teacher Responsibility Section

1. Rate to what degree you are responsible for creating presentations, lessons and activities that students find engaging.
2. Rate to what degree you are responsible for making sure that the majority of students understand a math lesson before moving on to a new topic.
3. When you work out practice problems in class, rate to what degree you are responsible for making sure students are following along and understand the problem-solving process.
4. Rate to what degree you are responsible for making sure that students don't have any questions or misunderstandings.
5. When students work in a group to complete practice problems, rate to what degree you are responsible for guiding students through the problems.
6. Rate to what degree you are responsible for making sure that every student understands a math lesson before moving on to a new topic.
7. Rate to what degree you are responsible for applying mathematical concepts to real world situations.
8. When you work out practice problems in class, rate to what degree you are responsible for making sure every student understands the problem-solving process.

Overview

1. To what extent do you feel each student is responsible for their own learning in your math class?
2. To what extent do you feel you are responsible for each student's learning in your math class?
3. Overall, who do you think has more responsibility in the math classroom?
4. Please explain your response to Question #3.
5. Do your views on responsibility change with each student OR do you hold every student to the same standard of responsibility?

Appendix C

Cronbach's alpha and the average inter-item correlation were used to measure the reliability of the teacher and student responsibility scales created for this study. Recall, the original student responsibility scale (SRS) had 11 items. However, the 10^{th} item on both surveys and 11^{th} item on the student survey were removed because further contextual analysis showed that they did not measure individual student responsibility. Thus, the revised student responsibility scale was a 9-item survey that asked participants to rate the level of responsibility students had in different activities that spanned the learning process. From (Table 7)**,** the Cronbach's alpha for the student responsibility scale ranged between 0.773 for teachers to 0.844 for students, with a score of 0.841 if all the responses were analyzed together. Additionally, in (Table 8) we found that the average inter-item correlation for both student and teacher responses fell within the range of 0.2 and 0.5, which we used as the range of acceptable inter-item correlation (Paulsen & BrckaLorenz, 2017).

On the other hand, the teacher responsibility scale (TRS) was originally a 7-item scale that asked participants to rate the level of responsibility teachers had in different activities that spanned the learning process. However, the 6^{th} item on both surveys and the 8^{th} item on teacher survey were removed because further contextual analysis showed that they were very similar to the second question and third question, respectively. The Cronbach's alpha for the teacher responsibility scale ranged from 0.786 for student responses to 0.731 for teacher responses, with a score of 0.783 if all responses were analyzed together. Additionally, the average inter-item correlation for both students and teachers fell within the range of 0.2 and 0.5. However, Cronbach's alpha score for teacher responses was only calculated on five items in the scale due to a lack of variance in the third item. Thus, the statistical data analysis primarily focused on the student responses for teacher responsibility. Lastly, it is important to mention we observed negative inter-item correlation for the teacher responses on both the student and teacher responsibility scales. We did not see any negative inter-item correlation for student responses on either the student or teacher responsibility scale. This indicates the need for increased teacher sample size and/or improved survey measures.

Table 7: Cronbach's Alpha Scores SRS and TRS

	Cronbach's Alpha	
	Student Responsibility Scale	Teacher Responsibility Scale
Joint Responses	0.841	0.783
Teacher Responses	0.773	0.731
Student Responses	0.844	0.786

Table 8: Average Inter-Item Correlation for SRS and TRS

	Average Inter-Item Correlation	
	Student Responsibility Scale	Teacher Responsibility Scale
Joint Responses	0.374	0.378
Teacher Responses	0.202	0.459
Student Responses	0.379	0.381

Proposed AAV-Induced Upregulation of Aquaporin-4 as a Means of Bolstering Beta-Amyloid Oligomer Efflux

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Abstract

Alzheimer's Disease is a terminal illness which accounts for 60-80% of all cases of dementia; despite this, there are only "disease-modifying drugs" which merely temporarily delay neurodegeneration. In 2012, Iliff et al. discovered a glia-dependent nonspecific metabolite waste clearance system (termed the "glymphatic system") which was determined to be a principal actor in maintaining proper brain function. Although the neurodegenerative consequences of glymphatic failure have been characterized, there is yet no research investigating whether glymphatic-supplementing procedures may yield a neuroprotective effect. Therefore, reinforcing the glymphatic system's function and longevity, such as through upregulation of aquaporin-4 (AQP4) expression, is a logical step in the evaluation of therapeutic avenues against neurodegenerative diseases, especially Alzheimer's Disease. We thereby intend to utilize murine models of Alzheimer's Disease and an adeno-associated virus (AAV) vector in order to upregulate AQP4 and evaluate this procedure's neuroprotective potential and overall therapeutic viability.

Keywords: Alzheimer's Disease, aquaporin-4, LRP1, adeno-associated virus, glymphatic system, gene therapy

Introduction

The glymphatic system remains one of the newest and least-understood physiological pathways within the brain to-date. Yet, further research continues to establish the centrality of its dysfunction to the onset of several neurodegenerative pathologies, including Alzheimer's Disease (AD) and amyotrophic lateral sclerosis (ALS). The glymphatic system falters with age or traumatic brain injury (TBI), linking the onset of dementia with its signature demographic. Therefore, it is of great interest to us to investigate strategies for prolonging the glymphatic system's longevity, as well as improving its function. One such method of accomplishing this goal may be through upregulation and polarization of channel protein aquaporin-4 (AQP4), which the glymphatic system relies upon. We intend to test whether AQP4 upregulation may hold preventative or acute therapeutic viability in either pre-or-post-symptomatic murine models of AD; to quantify the transduction rate, magnitude, and longevity of AQP4 upregulation via viral vector; to test whether induced polarization improves outcomes or augments neuroprotection; and to evaluate the degree of interdependence observed between glymphatic clearance, genetic risk factors for AD, and other mechanisms of waste removal. We thereby present a proposed methodology intent on accomplishing these aims (see Table 1).

Background

Prior endeavors aimed at treating AD, resting upon the basis of the amyloid hypothesis, primarily employed passive immunotherapies or enzymatic inhibitors targeted against beta-amyloid (Aβ)— a waste metabolite protein widely believed to be the cause/initiator behind AD. The applications of such treatments either proved to be clinically ineffective or directly detrimental to patients' health and cognition, as seen in the failure of γ-secretase inhibitor semagacestat[1]. These shortcomings have led to more rigorous consideration of previously subaltern, clearance-oriented therapeutic strategies, as well as deeper investigation into the mechanistic interplay between the various systems involved in AD pathology and pathogenesis.

Discovery of the Glymphatic System

The identification of a glia-dependent pseudo-lymphatic waste clearance pathway (aka "glymphatic system") within the brain expanded neuroscience research, given its implications in both the progression and resolution of various neuropathologies— particularly, due to its action of nonspecific waste clearance from the brain, including Aβ[2] and hyperphosphorylated tau (P-tau)[3,4,5], two key compounds of interest heavily implicated in AD onset and progression. It was determined that the glymphatic system operates in a sleep-dependent manner[6,7], leading to an inverse

relationship between hours slept and Aβ burden localized to the right hippocampal and thalamic regions—pointing to the glymphatic system being responsible for a larger share of waste clearance from the brain than initially believed[7]. This establishes the first of many potentials for positive feedback, given that sleep disruption elevates Aβ and elevated Aβ disrupts sleep[6].

Furthermore, glymphatic dysfunction has been strongly implicated in the presentation of cognitive impairment[8,9], further reinforcing the idea of glymphatic function being a cornerstone of neural homeostasis and longevity. These observations make the pursuit of glymphatic therapies particularly enticing, given its ability to disrupt neurodegenerative cascades via nonspecific removal of both initiating *and* downstream metabolites. Prior AD therapeutics are now suspected to have been clinically ineffective due to this shortcoming— that despite having disrupted initiation (via removal of Aβ), they could not interfere with downstream intermediates (such as P-tau, which forms neurofibrillary tangles (NFTs)), and therefore could not halt the process once it had already begun and become self-sustaining[1,10]. Another contributing factor to prior failures is that these treatments were largely targeted to Aβ plaques, which are now considered benign, with oligomeric-form Aβ now being seen as the primary culprit[11,12].

Glymphatic Dependence Upon Aquaporin-4

Further research has implicated a heavy reliance of the glymphatic system on the function of astrocytic aquaporin-4 channel proteins, which intersperse and provide avenues of fluid transport across the blood-brain barrier (BBB)— facilitating waste clearance through interactions between cerebrospinal fluid (CSF) and interstitial fluid (ISF) "washing" through the parenchymal spaces[2,3,13].

However, glymphatic clearance (and therefore cognitive integrity) is dependent not only on AQP4 expression, but also polarization— the perivascular localization of these proteins to their proper positions on astrocyte endfeet[14]. Conversely, it can then be stated that AQP4 depolarization serves as a marker of AD progression and cognitive decline[3]. Both average AQP4 expression levels[14] and depolarization rates were reported to rise with age, either as a natural consequence of aging[15], response to traumatic brain injury (TBI)[4], or in progression of AD itself[16,17]. These opposing responses paint a complicated picture of AQP4 and its role in mediating neurodegenerative pathology. Beyond astrocyte depolarization, the age-attributable disruptions to sleep are well-characterized— something that glymphatic clearance is dependent on, as mentioned prior[7,9]. The multifactorial interplay between age and AD may then be partially explained by these factors. In support of this, a review by Reddy and van der Werf reports that glymphatic clearance begins to fail at the end of the reproductive lifespan, with old mice expressing diminished levels of AQP4 and prevalent depolarization, yielding a 40% reduction in Aβ clearance; glymphatic activity within these mice was reported to be reduced by 80-90%, attributable in part to reduced lung efficiency and diminished intracranial pressure (ICP)[9].

It must be noted, however, that the relationship between AQP4 and neurodegenerative disorders is still largely a matter of discussion and debate[18]. Overexpression of AQP4 has been linked to onset and resolution of hydrocephalus and cerebral edema, for example— yet at the same time, it is the cornerstone of glymphatic clearance[19,20]. It has been posited that AQP4 depolarization may represent an attempt by the body to surround Aβ plaques, thereby containing them[12]; however, there is a much greater volume of studies citing AQP4 depolarization as a pathological consequence. Beyond the established loop of waste buildup exacerbating clearance reduction via obstruction of drainage pathways[8.9], Aβ deposition itself (cerebral amyloid angiopathy, CAA), depolarizes AQP4[21,22] and Aβ-induced cell damage downregulates of AQP4[22]. It is our opinion that this deliberation regarding changes in AQP4 dynamics as either a cause or consequence of neurodegeneration represents a "chicken or the egg" argument, given that regardless of either's precedence, each gives rise to the other, effecting in further reduction of clearance and exacerbation of the loop.

The Glymphatic System and Alternate Clearance Pathways

It should be acknowledged that interactions between Aβ and bodily receptors do not exhibit a simple, linear relationship— nor should it be believed that glymphatic clearance is the sole route of Aβ efflux. Although glymphatic clearance comprises a significant portion of clearance[2,15], considerable clearance of $A\beta_{1\text{-}42}$ also occurs via low-density lipoprotein receptor-related protein 1 (LRP1) receptor-mediated endocytosis (RME), in both astrocytes and neurons[22,23]. From there, wastes such as Aβ may be enzymatically degraded or transported into systemic circulation. Various aspects of AD pathogenesis are tied to LRP1, such as the APOE4 allele[24], PICALM[25], and alterations in MHC-I presentation causing cell-and-region-specific tauopathies[26], although these are extraneous to this manuscript.

In conclusion, disruption of glymphatic clearance appears to also impair other clearance mechanisms, compounding failure and Aβ deposition, culminating in pathology— as has been amply alluded to. In conjunction with glymphatic disruption, it is crucial to be cognizant of an important caveat regarding RME clearance: while AQP4 and LRP1 expression

are positively correlated and Aβ exposure upregulates LRP1, LRP1-mediated astrocyte RME of $A\beta_{1\text{-}42}$ is only beneficial at low-to-moderate concentrations; at high concentrations, excessive astrocyte uptake of $A\beta_{1\text{-}42}$ induces glutamate cytotoxicity and apoptosis— destroying both astrocytes and the AQP4 channels localized upon them, as well as downregulating AQP4 in surviving cells[22]. Astrocyte loss thereby diminishes both glymphatic and LRP1 clearance, representing yet another positive feedback loop and further establishing the interdependence of Aβ clearance mechanisms.

Aquaporin-4 and Neurotransmitter Dynamics

Although we have established the role of AQP4 in glymphatic function and related clearance mechanisms, we would be remiss in failing to discuss AQP4 in relation to changes in neurotransmitter dynamics characteristic of AD, particularly glutamate. The interplay between aquaporin-4 and neurotransmitter dynamics are not particularly salient, and are therefore the topic of this section. Loss of AQP4 downregulates glutamate transporter GLT-1 on astrocytes, reducing glutamate cytotoxicity but also glutamate uptake[27], leading to buildup of extracellular glutamate. AQP4 loss also downregulates LRP1[22], which in turn leads to degradation of synaptic NMDA glutamate receptors, reducing glutamate uptake further[28]. Accumulated glutamate then interacts with extra-synaptic NMDA receptors, triggering apoptosis and neuron death[29].

Aquaporin-4 in Reactive Astrogliosis

Reactive astrogliosis (RA) is the most commonly-observed astrocyte modification in post-mortem AD tissues, both human and otherwise, and therefore must be covered, if only briefly[30]. RA is a compensatory shift in astrocyte morphology and behavior in response to CNS trauma/TBI and Aβ deposition[31]; AQP4 is increasingly depolarized as RA occurs, limiting glymphatic clearance[32,33]. One study reported a sustained 60% reduction in glymphatic clearance post-TBI[4]. Activated astrocytes therefore reduce glymphatic clearance but increase LRP1-mediated RME, putting themselves at risk for Aβ-induced apoptosis[22,30]. Activated astrocytes also begin releasing high concentrations of inflammatory cytokines, chemokines, reactive oxygen species (ROS), and other neurotoxic compounds, which contribute to both neuron and astrocyte damage and death[31,34]. Persistent neuroinflammation, either from lipids, cell damage, or Aβ-induced proinflammatory gene expression was found to be a contributing factor for RA initiation[31,34]. Lastly, severity of RA was reported to track cognitive decline[35] and P-tau deposition[34] much more strongly than Aβ load, reinforcing the centrality of both RA and tauopathy in AD progression.

Studies have also characterized AQP4 as contributing to neuroinflammation/edema and cytokine secretion[36]; however, while therapeutic strategies pursuing AQP4 downregulation or inhibition have been reported to ameliorate edema, they are largely myopic in nature— treating a symptom while exacerbating the root cause.

Future Directions

These studies construct a narrative in which Aβ clearance falls below the rate of synthesis, initiating several positive feedback loops which exacerbate Aβ oligomerization and buildup— allowing oligopeptides to initiate synapse destruction and tauopathy onset, ultimately presenting as Alzheimer's disease[37,38]. It is imperative, then, to prevent and disrupt these cascades, as well as to prolong the longevity of these systems in place responsible for accomplishing such: the glymphatic system. Even prior to the glymphatic system's discovery, neuroscientists posited that the larger the brain, the more dependent upon bulk flow the animal would be for efficient interstitial solute clearance[39]; after its discovery, researchers hypothesized that the glymphatic system's importance may be even more pronounced in humans than in murine models[33].

Given AQP4's centrality to AD pathogenesis, it is specifically this aspect of its pathology we seek to rectify, via upregulation and polarization of AQP4. Prior studies have established that upregulation of AQP4 has no adverse effects other than an increased susceptibility to cytotoxic brain swelling when water intoxication was intentionally induced[40].

Experimental Design

Animals

Mice used are male and female Tg APP/PS1 (MMRRC stock #034832-JAX) AD models[41], GFAP-APOE4/APP/PS1 Tg conditional knock-in (cKIs) (JAX stock #004631) mice[42], GFAP-AQP4 conditional knock-outs (cKOs)[43], GLAST-LRP1 cKOs[44], and C57BL/6J (JAX stock #000664) wild-type strain controls. Mice aged 1-4 months are deemed young adults; mice aged 9-11 months are deemed middle-aged. Mice will be kept as previously described[45]. Mice will be sacrificed via decapitation, CSF collected[46], and right hippocampal brain tissue sampled via vibratome sectioning[2] and slide mounted.

AAV Serotype Optimization and Pilot Study

In order to balance between efficacy and immunogenicity, a preliminary pilot study will be conducted in order to determine the optimal serotype and other necessary alterations to our vector. We expect the AAV-PHP.eB pseudotype in conjunction with a GFAP promoter to show promise in glia-targeted intravenous administration[47,48]. AAV will be administered to murine AQP4 KO glial/neuronal cell culture to quantify in vitro transduction efficiency and observed rescue effect[49]; viral titer and sample sizes will be adjusted accordingly and signs of immunogenic response and/or cytotoxicity will be monitored. A subset of cultures will be supplemented with mitochondrial division inhibitor 1 (Mdivi-1) at a concentration of 25mg/kg/day, maintained over the course of a week[50]. Cells will be slide-mounted and prepared for analysis[45].

Age-Differential AQP4 Upregulation

Mice will be age-matched and sorted into either young adult or middle-aged cohorts. Trials will consist of wild-type (wt) and APP/PSN1 groups for each age cohort, and an APP/PSN1 middle-aged supplement group. All aforementioned groups are experimental groups and will be normalized amongst themselves. Negative control (wt and APP/PSN1 sham) data will be gathered from prior studies, if able; otherwise, study will include sham groups. A separate cohort of young adult mice will be observed longitudinally as they progress to middle-age, and will henceforth be referred to as the aged cohort (see Table 2 for a timeline). Mdivi-1 will be administered via lumbar puncture at a concentration of 25mg/kg/day in supplement groups[50]; AAV will be administered intravenously[47].

Mice will be given a one-week latent period to allow transduction. Mice will then undergo once-weekly timed puzzle box trials, with completion time (CT) tracking cognitive integrity[51] (see Figure 1). Blood will be drawn via tail vein and subjected to C-reactive protein (CRP) assay. Mice will be anesthetized and glymphatic flow quantified via MRI[52]; hydrocephalus will be quantified similarly[53] (see Figure 2). Ten random mice from each group will be sacrificed via decapitation at the conclusion of measurements every four weeks (see Table 2), and heads stored in neutral buffered formalin (NBF)[45]. Four heads will be dedicated to proteomic study, while four are dedicated to cytological analysis. The aged cohort will be kept for longitudinal study post-treatment; above procedures will be deferred until young adult mice have entered the age range of middle-age, approximately 31 weeks later. CTs will be compared across groups and analyzed via ANOVA to determine treatment efficacy (see Figure 1).

Interactions Between AQP4, APOE4, and LRP1

Middle-aged APP/PSN1/GFAP-APOE4 Tg mice, hereby referred to as GFAP-APOE4 mutants, will be compared as treatment (tx) vs. non-treatment (ntx) and undergo trials/metrics identical to those delineated above. If mutants cannot be adequately generated, middle-aged GFAP-APOE4 mice may be substituted. Data will be compared against age-matched wild-type and APP/PSN1 mice for differences in outcomes/efficacy.

Replication of procedures on middle-aged LRP1 cKO mice will offer insight regarding glymphatic versus LRP1 clearance and its connection to AQP4 expression and polarization. Middle-aged crossbred APP/PSN1/LRP1 cKO triple mutants treated according to established procedures will allow for temporal association of $A\beta_{1\text{-}42}$-induced, LRP1-facilitated astrocyte apoptosis[22].

Quantification of AQP4 Rescue Effect

Accurate quantification of AQP4 upregulation, polarization, transduction rate, and longevity are necessary for refinement of procedures. To that end, GFAP-AQP4 cKOs will be treated and sacrificed every four weeks, without trials or associated measurements, along established procedures.

Proteomics and Cytological Analysis

Hippocampal slides will be prepared and undergo anti-AQP4 immunofluorescence and visualization via CellProfiler[45] (see Figure 3). Degree of LRP1 expression can be analyzed similarly, but would necessitate dual immunofluorescence. CSF will be analyzed for CRP levels and anti-AAV capsid T cells. Resultant data will be evaluated via ANOVA.

Preliminary Results

Age-Differential Aquaporin-4 Upregulation

Derived from existing literature, we have reason to expect that upregulation of AQP4 may reduce the presentation of symptoms characteristic of AD (see Background), marked by improved cognitive integrity and prolonged longevity of stable cognitive ability, with the former operationalized as lower observed completion times (CTs) in APP/PSN1 treatment groups relative to positive controls (APP/PSN1 no-treatment) in our middle-aged cohort, and the latter operationalized as treated mutants from the aged cohort yielding a lower mean CT than either their wt aged or wt middle-aged (treatment and sham) counterparts. Treated middle-aged wt mice are expected to measure lower CTs than their untreated wt counterparts, while the young

adult cohort is expected to exhibit on-par cognitive ability with untreated wt mice. All wt groups are expected to perform more favorably than APP/PSN1 groups across the board. Supplemented treatment groups are expected to yield lower CTs than non-supplemented treatment groups, but the longevity of this boosted function is only expected to persist for as long as the supplement is regularly administered. The viability of this treatment, however, is limited both by variability in treatment efficacy (investigated via right hippocampal tissue analysis, which evaluates the magnitude of altered AQP4 expression) and by incidence and severity of hydrocephalus, which is expected to be present in experimental groups sporadically but infrequently, with mean ΔICP measuring <10mmHg (see Figure 2). Immune response is another anticipated outcome, with assay readings for blood/CSF CRP and AAV capsid-reactive T-cell activity expected to increase over the first several weeks and may explain sudden lapses in puzzle box performance or other efficacy metrics, should such a phenomenon be observed.

AQP4 upregulation in late-stage subjects may lead to elevated glutamate cytotoxicity and apoptosis, inadvertently lowering the amount of functional AQP4 and Aβ clearance, worsening treatment outcomes[22]. For this reason, improvement in cognitive function and/or delayed onset of cognitive decline is expected to be more pronounced in young adult groups rather than middle-aged groups. Ultimately, we expect this procedure to hold more benefit as a preventative measure— in order to optimize these procedures into a therapeutic context, augmentations (such as LRP1 inhibition/KO, or a treatment targeted against soluble Aβ) may be necessary to avoid astrocyte cytotoxicity and apoptosis[22]. Data gathered on cognitive integrity, glymphatic clearance, and treatment longevity relative to control groups will determine the procedure's efficacy in treating or preventing AD, while data gathered pertaining to immune response and incidence/severity of hydrocephalus will establish standing risks.

Interactions Between AQP4, APOE4, and LRP1

AQP4 upregulation in LRP1 cKOs allow us to characterize the degree of independence or interdependence between the glymphatic and LRP1-RME pathways. Cognitive integrity in these groups is expected to be slightly lower, observed as earlier dementia onset (higher CTs at earlier weeks) attributable to absence of the LRP1 transcytosis/RME pathway and resultant diminished levels of AQP4 expression/polarization, both of which reduce waste clearance; however, members of this group should also be less susceptible to Aβ-induced astrocyte cytotoxicity, potentially boosting total longevity and which may compensate for diminished total clearance. Analysis of the APOE4 allele's contribution to earlier AD onset is linked to dysfunction of the LRP1 transcytosis/RME pathway, and as such, observed data is expected to present as an intermediate phenotype between wt and LRP1 cKO performance trends. Should we observe clearance rates in LRP1 cKOs or APOE4 mice identical to wt, that would imply sufficient independence of the two systems, along us to adjust treatment strategies in a way that precludes LRP1-mediated apoptosis without compromising our principal aim of stably improving glymphatic waste clearance.

Quantification of AQP4 Rescue Effect

Extrapolated from the original publication, we expect this AAV to transduce upwards of 50% of GFAP-expressing astrocytes[47]. However, the longevity of transgene expression is highly contingent upon viral load and vector immunogenicity, as well as delivery, all of which must be modulated carefully.

Discussion

Design

This section is intent on elaborating upon experimental design. Regarding serotype selection, AAV-PHP.eB was selected due to combined high viral titer efficiency and astrocyte uptake[47]. Age ranges for this procedure were augmented to account for the latent period required for transduction, as well as the expected ages at which cognitive decline becomes apparent in APP/PSN1 mice[54,55]. APP/PSN1 was selected due to its humanized gene expression, optimizing translational applications; one drawback is that these models fail to express tauopathy, a critical player in neurodegeneration. AQP4 is polarized to astrocyte perivascular endfeet by the dystrophin-glycoprotein complex (DGC) via association with α-syntrophin[56]; however, AQP4 can be chemically polarized by Mdivi-1[50]. α-syntrophin may be a viable therapeutic target in the future, especially given that polarization may play a more critical role than expression in human application[57]. Given AAV cassette size constraints and the ~5kb size of both human and murine AQP4, the trans-splicing dual-vector approach will be employed spliced with human AQP4[58]. Lastly, intravenous administration was favored over invasive procedures (such as stereotaxic injection) due to their constituting a TBI and subsequent disruption of glymphatic function, thereby favoring pathology and confounding accurate data collection[4,59].

Limitations

These procedures may be limited in scope of duration and may be unable to evaluate treatment efficacy longitudinally, which is a therapeutic priority. This study is also limited by incongruencies between murine and human AD pathology; although the glymphatic system clears P-tau[5,13], this phenomenon is not appreciable within our models due to the apparent absence of murine NFTs formation (either due to a difference in sequence, or simply that the mice do not live long enough for NFTs to become readily apparent)[60].

AAV efficacy may be limited by immunogenic titer concentrations and off-target delivery, which are correlated[61,62]. Other factors include integration strategy[58]; cytotoxic complement activation or anti-AAV capsid T cell activity disrupting transgene expression[63]; and route of transmission (in which dorsal root ganglion pathology was occasionally observed after blood/CSF AAV-administration)[64].

Given our decision to employ a trans-splicing viral vector, transduction efficacy will likely be decreased due to reduced mRNA expression[58]; however, if data from APP/PSN1 aged mice resemble APP/PSN1 middle-aged sham groups, it may indicate that our current application lacks sufficient longevity for long-term efficacy. Lastly, long-term administration of Mdivi-1 is not particularly well-characterized.

Conclusions

Limitations notwithstanding, this experiment merely seeks to establish a proof-of-concept and is therefore acceptable in being largely rudimentary and short-term in scope. By design, this study should provide a comprehensive analysis of treatment efficacy, longevity, and risks, thereby informing our decisions as to this procedure's therapeutic viability as it applies to human AD pathology. Although it may be constrained by the depth and extent to which behavioral and cognitive variables are measured, it is expected to provide useful data and further inform our pursuit of an effective, accessible, and long-lasting therapeutic strategy against AD. Given that the glymphatic system remains relatively novel and understudied, any data which may offer insights to its function are highly valuable in pursuit the next generation of clearance-oriented approaches.

This endeavor pursues a novel applied route of glymphatic clearance manipulation within a potentially therapeutic context. Observed data in accordance with expected trends (rescue effect in treated APP/PSN1 groups compared to untreated) would support our hypothesis for the clinical potential of AQP4 upregulation against AD. Data reflecting other trends would of course, necessitate re-evaluation and further study. However, if viable, this treatment strategy may be scrutinized, refined, and adapted to human medicine as either an acute or preventative measure.

Regarding future directions, further investigation of the glymphatic system's reliance upon AQP4 and other transport mechanisms may pioneer novel avenues in multidisciplinary contexts, such as treatment strategies directed against early onset dementia attributable to COVID-19, migraines, and potentially, gaining a better understanding of human microgravitational physiology. Any breakthroughs improving astrocyte-targeted AAV mRNA expression levels, otherwise improving transduction rates, transgene longevity, or refining viral titer efficiency are all viable advancements warranting a revisit to these procedures, while insights into the interdependence of the glymphatic and LRP1 RME/transcytosis pathways remain a timely topic regarding AQP4 and related clearance-oriented therapeutic strategies.

We thereby conclude by reiterating that AQP4 polarization may represent a more significant clinical priority than AQP4 expression, and suggest future endeavors take this into consideration[57]. Therapeutic strategies targeted directly to these polarization mechanisms, such as the DGC or α-syntrophin/SNTA1, may pose an equal, or even more promising target for clearance-oriented AD therapeutics than AQP4 alone.

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Tables and Figures

Table 1
Breakdown of Experimental Aims

Experimental Aim	Procedure(s)
Acute therapeutic viability	Age-differential: Middle-aged cohort
Preventative therapeutic viability	Age-differential: Young adult, aged cohorts
Investigation of interplay with APOE4 and LRP1	Interactions: APOE4/APP/PSN1, APP/PSN1/LRP1 cKO cohorts
Quantification of rescue effect, transduction rate	Quantification: AQP4 cKO cohort
Investigation into importance of polarization	Age-differential: Supplement cohorts
Determination of treatment longevity	Age-differential: Aged cohort

Table 2
Procedure Timeline Breakdown

Weeks Post-Treatment	Procedure
0	Genotyping, age-matching, treatment administration
1	End of latent period, baseline sacrifices, weekly memory trials and sample collection begins
5	Midpoint sacrifices, trials/assays continue
9	Endpoint sacrifices, conclusion of 8wk trials, data analysis begins
10+	Aged cohort longitudinal study continues until middle-age, then 8wk trials begin

Note: The aged cohort longitudinal component is an optional expansion intent on determining procedural therapeutic efficacy in a simulated long-term therapeutic context.

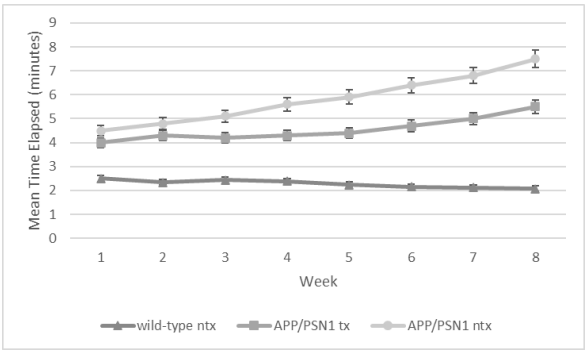

Fig. 1. [SAMPLE DATA] Mean Puzzle Box Completion Time (CT) in Middle-Aged Mice, by Week
Note: Sample data. APP/PSN1 are murine models of AD; tx and ntx represent treatment and non-treatment, respectively. CT tracks inversely with cognitive integrity; lower CTs indicate more intact cognition, and vice versa. Rescue effect observed in treated APP/PSN1 group.

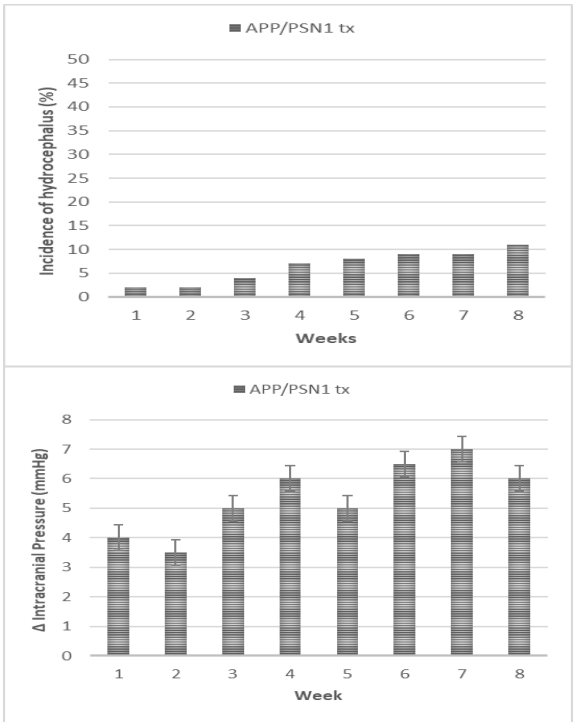

Fig. 2. [SAMPLE DATA] Incidence and Severity of Hydrocephalus in Middle-Aged Mice, by Week
Note. Sample Data. Graph at top indicates relative proportion of subjects which experienced hydrocephalus at any point during the trials; the graph at bottom indicates mean intracranial pressure above baseline in mice with hydrocephalus.

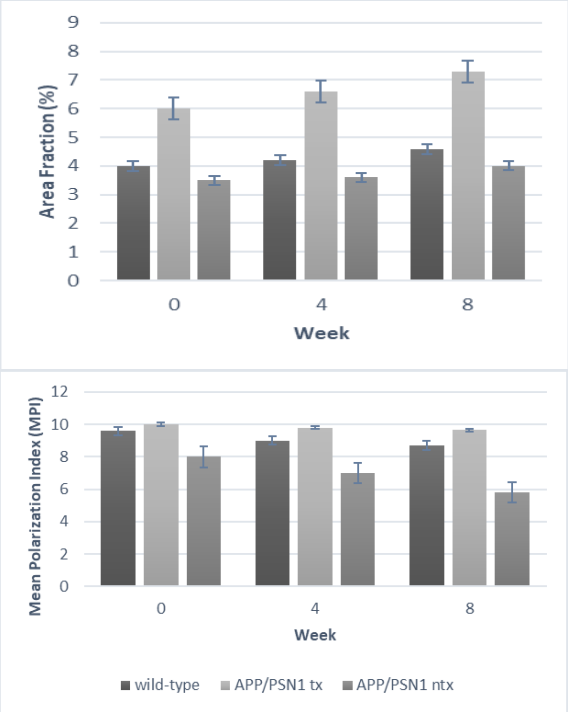

Fig 3. [SAMPLE DATA] Quantification of Aqp4 Expression and Polarization in Middle-Aged Mice, by Week

Note. Sample data. Area fraction is a metric used by CellProfiler Analyst to quantify expression density; MPI is a similar metric used to quantify levels of protein polarization.

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Ethnogeology: The State of Interdisciplinary Engagement within Studies of Indigenous Knowledge

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Abstract

By weaving myths and observations together, Indigenous cultures around the world have developed rich understandings of the Earth's landscapes which surround them. Not only did this knowledge serve them in terms of locating and identifying lithic and mineral resources (Miller & Siegfried, 2017), but it also allowed them to live near some of the Earth's harshest geological processes, and the environments that they create. The term ethnogeology has been referenced a handful of times, but the earliest definition put forth was by geologist John James Murray, referring to the valid scientific observations and ideas that were incorporated and reflected within Indigenous knowledge of geological features and processes (1997). Despite the perspective that is implied with the *ethno-*, most of the work done in this small subfield has been conducted by geologists and geoscientists. Lacking is the anthropological perspective that I believe is necessary for future studies of this subject. Through an integrative literature review, I demonstrate the continued necessity of interdisciplinary approaches to understandings of Indigenous knowledge systems. This project is dedicated to honoring traditional knowledge systems through the amplification of Indigenous voices, which is achievable by highlighting the work of Indigenous anthropologists and geoscientists who have already contributed to these fields. By focusing on the ways in which Indigenous communities understand and steward the geological landscapes which they call home, I aim to highlight their potential applications within applied environmental anthropology.

Keywords: Ethnogeology, Traditional Knowledge, Indigenous Knowledge, Native Communities, Interdisciplinary Approaches, Applied Collaboration

Introduction

By weaving myths and observations together, Indigenous cultures around the world have developed rich understandings of the Earth's landscapes which surround them. Not only did this knowledge serve them in terms of locating and identifying lithic and mineral resources (Miller & Siegfried, 2017), but it also allowed them to live near some of the Earth's harshest geological processes, and the environments that they create. The term ethnogeology has been referenced a handful of times, but the earliest definition put forth was by geologist John James Murray (1997), referring to the valid scientific observations and ideas that were incorporated and reflected within Indigenous knowledge of geological features and processes. Despite the perspective that is implied with the *ethno-*, most of the work done in this small subfield has been conducted by geologists and geoscientists; fields that are not necessarily trained in humanistic and holistic research approaches. Lacking, is the anthropological perspective that I believe is necessary for future studies of this subject. Through an integrative literature review, I assess the current state of interdisciplinary collaboration in the study of traditional Earth knowledge. Interdisciplinary approaches, which must include Indigenous/Native collaborators, offer a more holistic and applied perspective to the ongoing narrative surrounding Indigenous knowledge and the ways in which it must be protected. This project is dedicated to honoring traditional knowledge systems through the amplification of Indigenous voices, which is achievable by highlighting the work of Indigenous scholars and authors who have already contributed to these fields. By focusing on the ways in which Indigenous communities understand and steward the geological landscapes which they call home, I aim to highlight their potential applications within applied environmental anthropology.

Background

Ethnogeology seeks to understand the traditional Earth knowledge from Native and Indigenous

communities, to create more holistic and culturally relevant models of environmental and ecological knowledge. There are many facets of Traditional Earth Knowledge (TEK) which fall under the definition put forth by Murray, including, but not limited to: geomythology, toponomy, Scientia, and the countless ways in which humans have interacted with geological processes and features through time.

Ethnogeology has roots in an earlier field known as geomythology. Introduced and developed by geologist Dorothy B. Vitaliano (1968), it is the study of the oral traditions of prescientific cultures to explain geological phenomenon (Mayor, 2004). Utilizing a multidisciplinary approach, it aims to interpret mythological explanations of catastrophic events, geological features, and landscapes. Since this field was introduced, various disciplines have approached geomythology, often with multidisciplinary collaboration. Geologists have teamed up with environmental sociologists to understand how geomythology can be factored into conservation efforts (Unjah & Halim, 2017). Volcanologists have examined geomythology in order to gain a deeper understanding of responses to volcanic events and disaster mitigation strategies (Cashman & Cronin, 2008). Additionally, philosophers of science have explored the role of geomythology as a form of science communication (Nocek, 2018). Anthropologists have also contributed to this field. Walsh et al. (2017) utilized geomythology within the context of archeological and paleoenvironmental frameworks. Archaeologists have applied the studies of geomythology within the assessment of disaster archaeology, to culturally contextualize the data from archaeological sites within known natural disaster zones (Liritzis et al., 2019). While geomythology may be the precursor to ethnogeology, it has its limitations. This field solely focuses on geology within the framework of mythology, with heavy inclinations towards catastrophic events and landscape-defining geological features. It excludes Indigenous knowledge of passive geology, such as lithic or mineral identification and location knowledge. The literature also contains a bias towards the mythology of ancient civilizations, focusing more often on the stories rooted in Greek, Norse, and Egyptian cultures.

Murray (1997) was one of the first geologists to begin using the term ethnogeology, referring to the “science of our planet that comes out of, and speaks specifically to, aboriginal people”. He recognized that traditional knowledge is not neutral; rather it is filtered through the shared experiences, cultural values/traditions, and history of a community. Taking a more comprehensive approach than geomythology, ethnogeology attempts to understand TEK through whichever Indigenous lens may have been applied. Murray applied ethnogeology within the geoscience curriculum taught in Aboriginal communities; an applied focus that continues today.

Steven Semken is a geologist who has furthered this applied focus in the American Southwest, with a particular emphasis on ethnogeology as a place-based study of traditional knowledge (Semken & Morgan, 1997; Semken, 2005; Semken & Freeman, 2008; Apple et al., 2014). His work incorporates place-based systems of traditional knowledge with current models of geoscience curriculum, producing materials and activities that holistically represent the geological history of any specific region. He has done some of the most comprehensive and recent work in this field.

Narrower definitions and approaches have been attributed to ethnogeology over time. Mark Harvey (2016), an anthropologist and linguist, defined ethnogeology as Aboriginal stone knowledge and terminology. Benjamin Wilkie et al (2020) defined it as “Aboriginal explanations of geological events and features", while implying that elsewhere in the world, geomythology would be the corresponding term. It should not be surprising that ethnogeology is so closely associated with the Aboriginal studies of Australia, given that Murray included this in his early definition. However, Semken has more than demonstrated ethnogeology as a relevant study in any region that is rich in both geology and traditional knowledge; a much broader and more inclusive perspective.

My background review found lacking any anthropological studies which utilize the term ethnogeology, outside of Harvey’s (2016) narrow definition. This same background review has also failed to produce any interdisciplinary studies conducted jointly by geologists and anthropologists. Acknowledging that anthropology has indeed contributed extensively to our overall understanding of traditional knowledge systems, it is assumed that these studies are not being cohesively incorporated into current studies of ethnogeology. Geology and anthropology are utilizing different scholarly language and frameworks to discuss TEK, leaving space for an interdisciplinary approach to bring these two fields together under the umbrella of ethnogeology. Interdisciplinary collaboration between Earth scientists, social scientists, and Indigenous collaborators can lead to the co-production of knowledge; which in turn, can potentially be applied to a variety of complex climate and environmental challenges. When we create space for the co-production of knowledge, on both local and global

scales, we open the door to innovative solutions and approaches to challenges faced by both Indigenous/Native populations and the greater global community.

Methods

I conducted an integrative literature review, utilizing an interdisciplinary approach. Examining scholarly works (n=30), across a variety of disciplines (n=4), my goal was to explore the contributions to ethnogeology that have yet to be recognized within this field of study. I began by identifying twenty keywords that are commonly associated with TEK. I then identified one hundred published articles that included one or more of these keywords in their searchable keyword list. From this pool of articles, I took a random sample of thirty to utilize within this literature review. In three cases, the discipline of the author was unclear, and the article was excluded from the study; replaced by another article from the starting pool at random. The publication year of the selected articles ranged from 1968 - 2021; with 90% of the articles published in the last twenty years.

By collecting quantitative data on the field of study of both the author and journal in which their work is published, I was able to determine whether any attempts have been made at interdisciplinary approaches to this field. The selected papers were sorted into three classifications: singular discipline, multidisciplinary, and interdisciplinary. For this review, I defined singular discipline as a single author publishing within their own discipline, or multiple authors from the same discipline publishing together. I defined multidisciplinary as either a singular author publishing outside of their discipline, or multiple authors representing a total of two disciplines publishing together. Interdisciplinary was defined as multiple authors representing three or more fields, publishing together for a greater academic audience than that of any singular discipline.

Next, I collected data on the terminology that is being used to reference traditional Earth knowledge to show that all of these fields are utilizing different scholarly language and terminology to discuss the same topic, leaving room for an interdisciplinary approach. I began with the twenty keywords that I had identified as representing TEK, and then included any other words/terms that were found within the body of the articles themselves.

I also collected data on the frequency with which Indigenous scholars are being cited, allowing me to explore the ways in which Indigenous voices are being amplified within the various fields that are exploring the subject of TEK.

Table 1
Data Collected From Selected Articles

1	Field of study of the Author(s)
2	Field of study of the Journal
3	Terminology/language used to identify TEK
4	Frequency of Indigenous/Native citations

Results

My first data point focused on the academic discipline of the first author listed for each selected publication included in this literature review. This information was determined by considering both the discipline of the highest degree achieved by the author, as well as the way in which they self-identify the work they have done in their career. Table 2 shows the distribution of first authors within their respective fields.

Table 2
Distribution of the Discipline of the First Authors

Discipline	Percentage
Social Sciences & Humanities: Anthropology, Sociology, Geography, Philosophy, History, English	33%
Earth Science: Geology, Hydrology, Meteorology, Physics	27%
Environmental Science: Ecology, Environmental Conservation, Biological Conservation, Natural Resource Management, Sustainability Science, Climate Change	27%
Indigenous Studies: Indigenous Scholars, and non-indigenous experts in Indigenous Studies	13%

This distribution demonstrates that there are a variety of fields exploring TEK that could contribute to future collaborative studies of ethnogeology. 54% of the authors identified within the Earth or environmental sciences, fields that do not always prioritize holistic and humanistic methodologies in the way that the social sciences do. Many of these fields would benefit greatly from the cultural brokering skills that anthropologists are uniquely equipped with. I did not find any collaborative work concerning TEK conducted jointly by

anthropologists and environmental/Earth scientists within the scope of this literature review.

The next set of data that I collected focused on the field of study of the authors listed after the first author (if any), as well as the discipline of the journal in which the article was published. For the sake of this review, I identified three degrees of collaboration, by which the articles would be classified. Singular approaches included articles written by a single author publishing within their own discipline, as well as multiple authors from the same discipline publishing in a journal that falls within their respective fields of study. Multidisciplinary approaches were defined as a single author publishing outside of their field of study, as well as two or more authors representing two distinct disciplines and publishing in a journal from one of those two fields. Interdisciplinary approaches were defined as multiple authors representing three or more disciplines publishing together to a broad scientific or academic audience. Table 3 illustrates the percentage of articles that fell within each of these classifications.

Table 3
Degree of Collaboration Between Disciplines

Classification	Percentage
Singular	23.3%
Multidisciplinary	46.7%
Interdisciplinary	30%

This review has failed to find any collaborative work conducted jointly by geologists and anthropologists. Acknowledging that anthropology has contributed extensively to our overall understanding of traditional knowledge systems, it is assumed that these frameworks are not being cohesively incorporated into current studies of ethnogeology. Thirty percent of the articles included in this literature review took a truly interdisciplinary approach, further demonstrating that interdisciplinary collaboration in studies of TEK are not yet the norm.

This project also focused on data concerning the keywords that were used to identify TEK within each publication. These words were identified early in the project to generate the pool of articles that were selected from for the literature review. Once the thirty articles were randomly selected, I recorded the frequency in which these terms were found throughout the articles. Figure 1 is a word cloud that demonstrates the frequency with which these terms were used, with larger and bolder words appearing more frequently throughout the review than the smaller words in the cloud. There are a wide variety of words and terms that are being utilized to reference the Traditional Knowledge that a Native or Indigenous community holds about their local surroundings. Different fields are utilizing different scholarly language and frameworks to discuss the same subject, leaving space for an interdisciplinary approach to bring these fields together under the umbrella of ethnogeology.

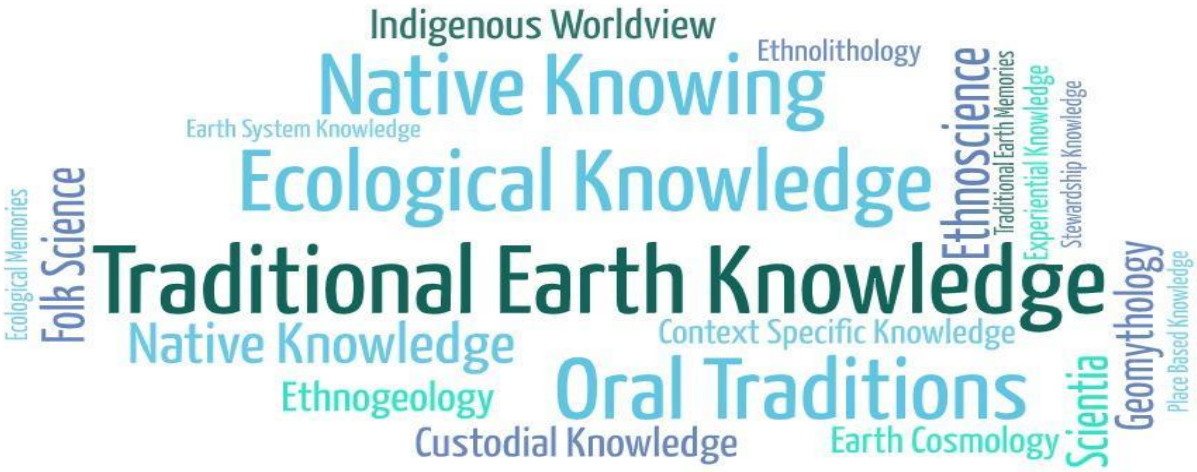

Figure 1: Word Cloud Illustrating the Frequency of Terminology Found

The final data point collected concerned the amount of Indigenous scholars and Indigenous first authors that are being cited in the publications included in this review. This was a painstaking endeavor of research; though it was necessary to determine the degree to which Native and Indigenous voices are being amplified in the study of TEK. There were a total of 1,884 references cited throughout the selected publications included in this review. Of this total, 208 (11%) of these citations included an Indigenous/Native-identifying scholar(s) and/or author(s); with only 119 (6%) of these citations referencing an Indigenous/Native first author. These results have been disappointing, often with a "token" Indigenous publication included in the reference list as a demonstration of inclusion; more often with little cultural relevance to the community being discussed in the publication.

Discussion & Conclusion

This literature review demonstrates the lack of interdisciplinary collaboration in the study of traditional Earth knowledge. Anthropologists have historically examined this subject in Native communities using relatively extractive practices. Meanwhile, geologists are exploring ethnogeology in order to incorporate these themes into the local science curriculum. My work argues that collaboration is needed between these fields, and that interdisciplinary approaches open a wide range of applied applications, such as: disaster mitigation, land-back movements, resource sovereignty advocacy, and bridging the gap between Indigenous stewardship practices and Western conservation models. This co-production of knowledge can best be described as a process of weaving; wherein all parties approach the knowledge systems of one another with mutual respect and determine goals that seek to incorporate knowledge systems together, rather than to replace or explain away the knowledge of one another (Verran & Christie, 2007). This work is also beginning to show that Indigenous scholars and representatives are not being included in these studies to the degree that we should be striving for as a field. A primary goal of this project has been to demonstrate to other scholars the importance of interdisciplinary models and the necessity to include Indigenous voices in these bodies of work. I aim to encourage the scholars from the variety of fields included in this review to consider the contributions that are possible when we create a space that encourages the co-production of knowledge between academics and Native communities. I also hope to encourage them to familiarize themselves with Native scholars who are defining methodologies on Native terms, and who are doing the most poignant work in the studies of traditional Earth knowledge. Many of our fields have been incredibly extractive of Native communities, solely for the sake of contributing to the greater body of knowledge. Indigenous scholars are re-defining boundaries around this knowledge, and it is only through the study of their work that we can begin to approach these topics from more ethical perspectives; seeking to position our academic fields as allies to their communities.

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Appendix

Publications Included in This Literature Review

Author	Title	Year
J. Apple, J. Lemus & S. Semken	Teaching Geoscience in the Context of Culture and Place	2014
J. J. Murray	Ethnogeology and Its Implications for the Aboriginal Geoscience Curriculum	1997
M. Harvey	Stones and Grinding: Wagiman Ethnogeology	2016
B.Wilkie, F. Cahir, & I. D. Clark	Volcanism in Aboriginal Australian oral traditions: Ethnographic evidence from the Newer Volcanics Province	2020
M.Brugnach, M. Craps, & A. Dewulf	Including Indigenous Peoples in Climate Change Mitigation: addressing issues of scale, knowledge, and power	2014
D.Green, G. Raygorodetsky	Indigenous Knowledge of a Changing Climate	2010
D. B. Vitaliano	Geomythology: The Impact of Geologic Events on History and Legend w/ Special Ref. to Atlantis	1968
M. Gadgil, F. Berkes, & C. Folke	Indigenous Knowledge: From Local to Global	2021
K. V. Cashman & S. J. Cronin	Welcoming a monster to the world: Myths, oral tradition, and modern societal response to volcanic disasters	2008
I. Liritzis, A. Westra, & C. Miao	Disaster Geoarchaeology and Natural Cataclysms in World Cultural Evolution: An Overview	2019
J. Maldonado, T. M. Bull Bennett*, K. Chief*, P. Cochran*, K. Cozzetto, B. Gough, M. H. Redsteer*, K. Lynn, N. Maynard, & G. Voggeser	Engagement with Indigenous Peoples and Honoring Traditional Knowledge Systems	2016
A. Mayor	Geomythology	2004
M. McGurl	The New Cultural Geology	2021
A. M. Miller* & E. Siegfried*	Traditional Knowledge of Minerals in Canada	2017
A.J. Nocek	Geology, Myth, Media	2018
J. H. Tepper	Connecting Geology, History, and the Classics Through a Course in Geomythology	1999

K.P. Whyte*, J. P. Brewer II* & J. T. Johnson*	Weaving Indigenous Science, Protocols, and Sustainability Science	2015
K. Walsh, A. G. Brown, B. Gourley, & R. Scaife	Archaeology, Hydrogeology, and Geomythology in the Stymphalos Valley	2017
T. Unjah & S. H.l Halim	Connecting Legend and Science Through Geomythology: Case of Langkawi UNESCO Global Geopark	2017
C. Thrush & R. S. Ludwin	Finding Fault: Indigenous Seismology, Colonial Science, and the Rediscovery of Earthquakes and Tsunamis in Cascadia	2007
R. Hill, C. Adem, W. V. Alangui*, Z. Molnar, Y. Aumeeruddy-Thomas, P. Bridgewater, M. Tengo, R. Thaman, C. Y. Adou Yao, F. Berkes, J. Carino*, M. Carneiro da Cunha, M. C. Diaw, S. Diaz, V. E. Figueroa*, J. Fisher, P. Hardison*, K. Ichikawa, P. Kariuki, M. Karki, P. OB Lyver, P. Malmer, O. Masardule*, A. A. Oteng Yeboah, D. Pacheco, T. Pataridze, E. Perez, M-M Roue, H. Roba*, J. Rubis*, O. Saito, & D. Xue	Working with Indigenous, Local and Scientific Knowledge in assessments of Nature and Nature's linkages with people	2020
S. Semken	Sense of Place and Place-Based Introductory Geoscience Teaching for American Indian and Alaska Native Undergraduates	2005
C. J. Robinson, T. Kong, R. Coates, I. Watson, C. Stokes, P. Pert, A. McConnell, & C. Chen	Caring for Indigenous Data to Evaluate the Benefits of Indigenous Environmental Programs	2021
D. P. M. Lam, E.Hinz, D. J. Lang, M. Tengo, H. von Wehrden, B. Martin-Lopez	Indigenous and Local Knowledge in Sustainability Transformations Research: A Literature Review	2020
S. Aswani, A. Lemahieu, W. H. H. Sauer	Global Trends of Local Ecological Knowledge and Future Implications	2018
E. M. Riggs	Field-Based Education and Indigenous Knowledge: Essential Components of Geoscience Education for Native American Communities	2004
S. Driver	Negotiating Indigenous knowledge at the science-policy interface: Insights from the Xáxli'p Community Forest	2017
I. S. Selemani	Indigenous knowledge and rangelands' biodiversity conservation in Tanzania: success and failure	2020
M. E. Duarte, M. Vigil-Hayes, S. Littletree*, & M. Belarde-Lewis*	"Of Course, Data Can Never Fully Represent Reality": Assessing the Relationship between "Indigenous Data" and "Indigenous Knowledge," "Traditional Ecological Knowledge," and "Traditional Knowledge"	2019
T. R. Maloney & M. Street*	Hot debate: Identifying heat treatment in Australian archaeology using science and modern indigenous knowledge	2020

* indicates Indigenous/Native authors

Finding the Best Fit Models of Afterglows of Gamma Ray Bursts

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Abstract

Gamma Ray Bursts (GRBs) are one of the strongest and brightest explosions in the universe. They produce an afterglow after the explosion, and there are two types of GRBs: short GRBs, where the afterglow lasts less than two seconds, and long GRBs, lasting more than two seconds. We are focusing on the afterglow of the short GRB, GRB130603B. This was a complex, well-observed afterglow with detections in X-Ray, optical, and radio, and evidence for a jet break. This was observed using the Swift satellite. We are going to use the fit from GW170817, a structured jet, and apply the same assumption to GRB130603B. The program is going to do Markov Chain Monte Carlo iterations with the data set from GRB130603B to find the best fit line settling on values for the best fit parameters. Our goal is to see if all short GRBs can be fit with the same structured jet, or, if not, what range of jet shapes and energies may be needed.

Introduction and Background

GRBs are the most energetic events to occur in our own Universe. Releasing more energy in 10 seconds than our own Sun would in its entire 10-billion-year lifetime.[1] They were accidentally discovered when the US had sent up Vela satellites that are able to detect (γ-rays). In 1963, the US, Great Britain, and the Soviet Union signed the Nuclear Test Ban Treaty that banned nuclear weapons testing in the atmosphere, outer space, and under water.[2] The US did not trust the Soviets to uphold the Nuclear Test Ban Treaty which lead to the launch of these satellites in 1965 because gamma rays were created from the splitting of atoms in these nuclear weapons. γ-rays are simply light like the same light that allows your eyes to see colors, and is only a small section of the electromagnetic spectrum shown in Figure 1.

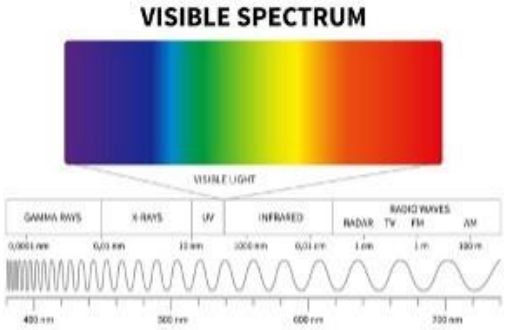

FIG. 1: The electromagnetic spectrum where light can take many forms, and needed instruments to see other sections other than light.

A scientist named Ray Klebesadel of Los Alamos Scientific Laboratory assumed the continuing programatic responsibility for the γ-ray instrument. They were detecting γ-rays, but 53 were not coming from earth. It was not until in 1972, scientists were able to deduce that the detections were of "cosmic origin".[3] After measuring the distance to GRB, scientist found that they release more than $10^{50} ergs$.

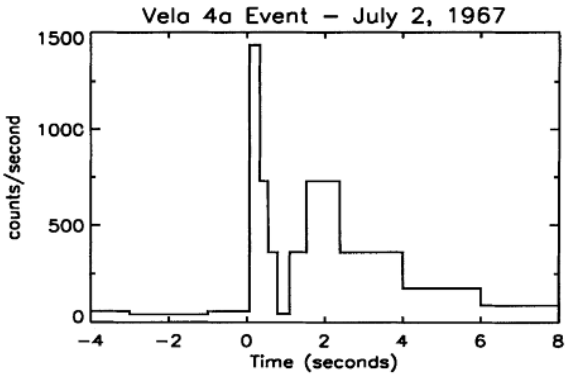

FIG. 2: First observed GRB by one of the Vela Satellites: Vela 4a. The y-axis is the number of γ-rays photons the satellite is detecting over time.

Their origins were associated with black holes, neutron stars, and supernovae. To put that into perspective, $10^{51} ergs$ is equal to 10^{45} *Joules(J)*. One kilogram of TNT releases about 4.2 × 106J. You would need to fill up about 120,000,000 Earths worth of TNT to equate that power.[4] There are two types of GRBs: short GRBs and long GRBs. Short GRBs last less than

2 seconds, and long GRBs last more than 2 seconds. They have found strong correlations between supernovae and long GRBs.[4] The origin of short GRBs, however, was unknown until 2017, when simultaneous detections of gravitational waves and a burst of γ-rays were detected, GW170817 GRB170817A, creating an after- glow in x-rays, optical, and radio indicating the merging of two neutron stars (NS-NS merger) created the short GRB.[5] Gravitational waves are 'ripples' in space-time, shown in Figure 3, caused by some of the most violent and energetic processes, such as neutron star mergers, in the Universe, and the Laser Interferometer Gravitational-Wave Observatory (LIGO) has many resources to dive deeper into gravitational waves, the only importance to us is confirming the correlation.[6]

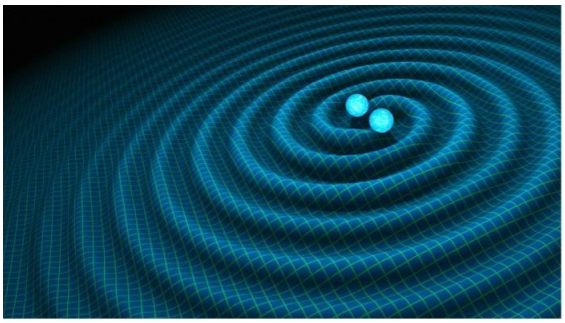

FIG. 3: Illustration of an engine, neutron star merger, powering the GRB jet. As the jet sweeps up more material, the light becomes less energetic become different forms of light such as x-ray, optical, and radio.

Efforts by various groups (e.g. Lazzati et al. 2018, Mooley 2018)3,7 were able to create physical models of this event and theorize what kind of environment the stars had to be in for us to see this afterglow. Afterglows happen when the blast wave starts expanding, it sweeps up material from the surrounding environment which is shown in Figure 4.[7]

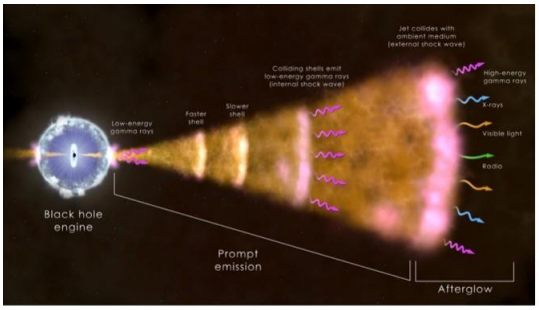

FIG. 4: Dense neutron stars spinning around each other 60,000 a minute creating ripples, stretching, and contracting space, like the ripples in a pond.

This causes the blast to slow down into smaller less energetic wavelengths such as: x-ray, optical, and radio. The Chandra X-ray Observatory saw the afterglow in X-ray, VLA and among other facilities saw it radio, and several ground-based telescopes saw it in optical later on. My mentor, Dr. Brian Morsony, and others collaborated on a paper trying to find the best fit parameters of this NS-NS merger.[8] What they were able to conclude is that the jet was pointed 30 degrees away from Earth, and it was a structured jet. Meaning the more relativistic and energetic part of the jet was in the middle. Which is why the afterglow slowly rising, peaking, and then quickly fading away shown in Figure 5.

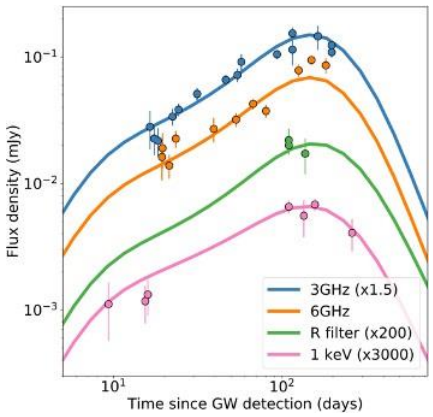

FIG. 5: This is the plot my mentor, Dr. Brian Morsony, and others collaborated. The points are the observational data. The line is the best fit line they calculated. The blue and orange are radio observations, green is optical, and pink is x-ray.

The importance of this is we want to take this same method of fitting GW170817, and applying it to another GRB afterglow, in this case, GRB130603B. This was a complex, well-observed afterglow with detections in x-ray, optical, and radio, and evidence for a jet break. We want to test the idea can we fit all GRBs with this same method, and with the assumption that all GRBs are structured jets that come from NS-NS mergers.

Methods

To make any meaning to the data, we are going to be using the computer programming language Python, and an after- glow program that my mentor, Dr. Brian Morsony has created, to do all the fitting. The basic idea of doing fits in Python is you have a set of points on a plot like in Figure 6.

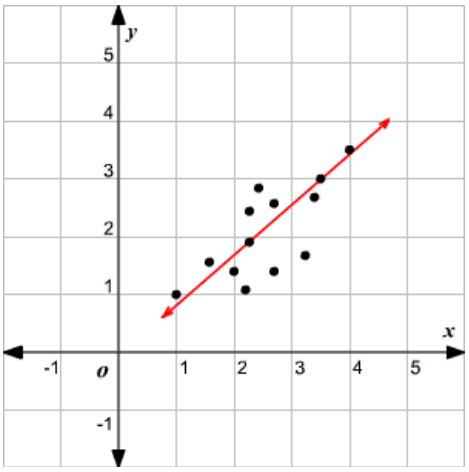

FIG. 6: A set of points with a best fit line going through the points. The form of the line is y = mx + b.

The best fit line will be in the form of $y = mx + b$ where the two parameters are the slope and the y-intercept. Now, we want to answer the question, can we fit the same form of the function with another set of points shown in Figure 7. To be extra clear, we are not using this exact slope function. Our function is more complex with 5 parameters. So the question still applies, can we use this complex function that was used all GRBs are structured jets that come from NS-NS mergers. to fit GW170817, to fit GRB130603B.

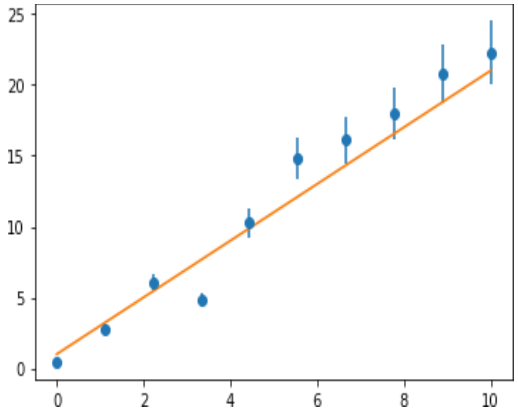

FIG. 7: A different set of points. The x and b will be different, but the important part is that the fit is using the same function.

For this fit, we used an afterglow code made by my men- tor Dr. Brian Morsony. What the code utilizes is a Markov Chain Monte Carlo (MCMC) iteration. The reason for this is our function will have 5 parameters. The parameters are the fraction of the shock energy given to accelerate the electrons (ε_e), the fraction of shock energy that is converted in magnetic fields (ε_b), the density of the surrounding area of the merger (n_{ism}), the angle pointed away relative to the Earth (θ), and the slope of the power law for the energy distribution between the electrons (p_{index}). In the intro example, we only had x and b. However, there are 5 parameters making parameter space larger. This becomes a problem because in Python, to make fits, you must give it some initial guesses. The reason being is that in the parameter space there are global minimums in which the best fit parameters can fall in shown in Figure 8.

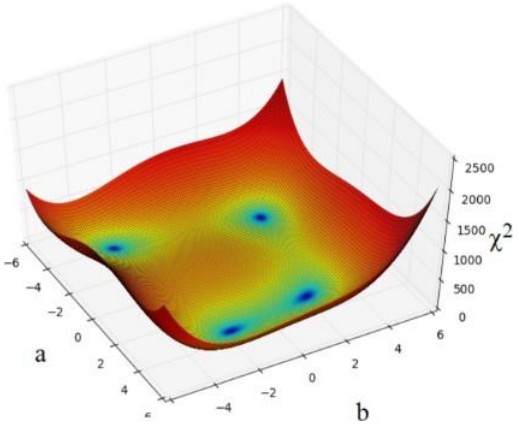

FIG. 8: An example of a parameter space. The goal is to have initial guesses that would fall into the global minimum where chi-squared is the lowest.

There is too many points to guess and check which is where the advantage of MCMC method comes in. The program will be making big jumps around the parameter spaces, checking whether or not the previous step was better than the step it currently is at. The next step will be dependent on this. It will keep jumping around eventually settling in a minimum that it likes. The process of the steps is shown in Figure 9. The range of the values is stated in Table 1.

Parameters	Range
ε_e	1e-04 < ε_e < 1e-01
n_{ism}	1e-06 < n_{ism} < 1e4
θ	1e-01 < θ < 15
ε_b	1e-04 < ε_b < 1e-01
p_{index}	2.05 < p_{index} < 3.5

TABLE I: Range of values that we chose for the MCMC to check for the best fit parameters.

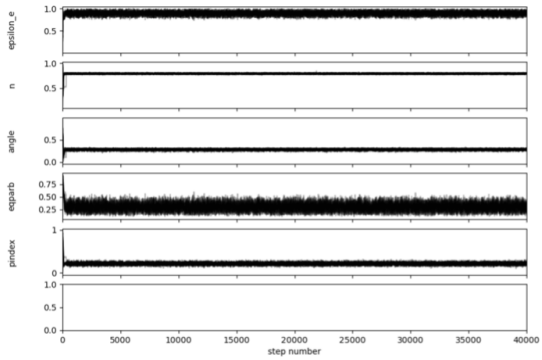

FIG. 9: Step function picking random numbers and settling on a best fit parameter. The first 10,000 samples were removed, so that it doesn't look messing in the beginning.

Then, these values are tested with each other to show if any combination of two parameters are independent or dependent of each other. The corner plot shown in Figure 10, if the box shows a concentrated circle, this means that the parameters are independent of each other. However, if you look in the first column, second row from the bottom, it shows a contracted line. This shows that the two parameters are dependent on each other.

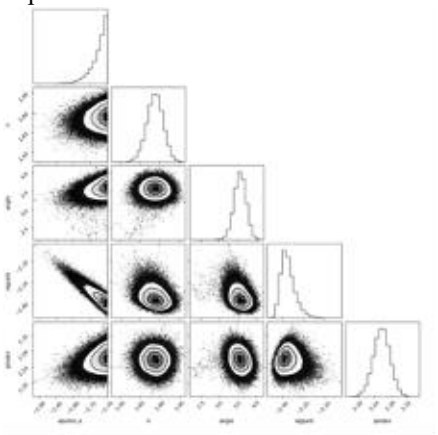

FIG. 10: Corner plot showing the degeneracy of the parameters. The set up is the first column is comparing εe to the other four parameters. The second column is nism with pindex, εb, and θ . The it keeps going for the third and fourth column.

From there, the program gives a plot shown in Figure 11. The plot itself can't really tell you if it is a good fit or not. In the statistical analysis, the likelihood will tell you if it is a significant fit. The best fit parameters are shown in Table 2 with the likelihood below it.

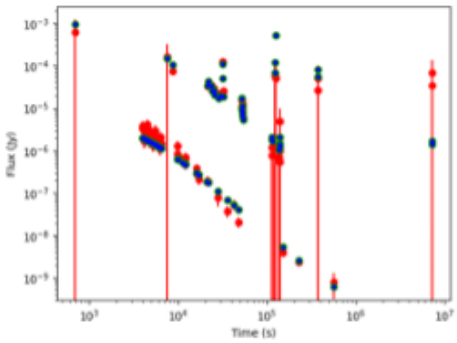

FIG. 11: This plot shows the comparison of observational data (red), and our best fit (blue). The y-axis is the flux of energy we are detecting over the x-axis, time in seconds. The big red lines are non-detections for the observational data.

Parameters	Value	Uncertainty
ε_e	0.0191	- 0.0012 + 0.0006
n_{ism}	57.9	-7.7 + 8.5
θ	3.56	- 0.16 + 0.16
ε_b	0.0043	- 0.0004 + 0.0006
p_{index}	2.26	-0.02 + 0.02
likelihood	-160.52	

TABLE II: These are the best fit parameters of the models we have. The likelihood at the bottom will tell you how significant the fit is. The more negative the likelihood, the better the fit. For now, is it more of a reference point to compare to other models we will run.

I wanted to elaborate more on the big red lines in Figure 11. These are non-detections where they did not have a high enough probability to be considered a detection, however, it is still enough to be significant. They take the detection, scale it up so that it is a "detection" which results in the very big error bar that falls to the bottom of the plot.

Results and Conclusion

The values in Table 2 3, shows the best fit parameters and the likelihood of the of these values. As ε_e becomes lower, the more negative the likelihood meaning the better the fit. The results show us that keeping ε_e fixed at some values, in this case 0.1 and 0.01, the program shows that it is pretty likely that ε_e can be a fixed parameter. The importance of trying these fixed parameters is finding out that we may not need to include one of these values, and be a constant. These preliminary results shows some significance in tackling the question of whether or not we can use the

same methods to fit GW170817 to fit all other short GRBs by starting with GRB130603B.

The future work that is in progress now is doing fits where all the models, the data points in blue in Figures 11, 12, 13, are fixed at $\varepsilon_e = 0.1$ to see if that gives a better fit or not. This will show that if we need to make new models every time we want to test a fixed parameter. Furthermore, we are going to change the error on the observational data from 15 percent to 5 percent, and see if that gives us a better fit.

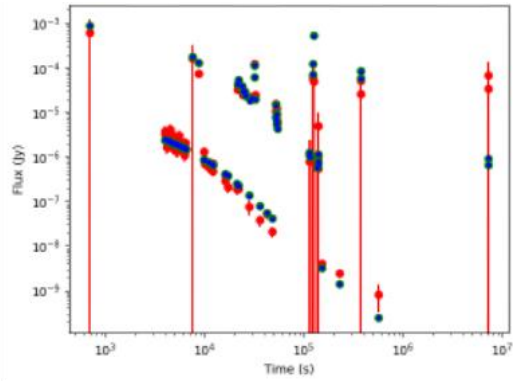

FIG. 12: Plot of ε_e fixed at 0.1. The x-axis is time. The y-axis is the flux density.

Parameters	Value	Uncertainty
ε_e	0.0999	- 3.24e-06 + 3.33e-06
n_{ism}	99.5	- 14.7 + 14.6
θ	4.67	- 0.11 + 0.12
ε_b	0.0002	- 1.55e-05 + 1.82e-05
p_{index}	2.45	-0.02 + 0.02
likelihood	-162.8	

TABLE III: These are the best fit parameters of the models for ε_e fixed at 0.1

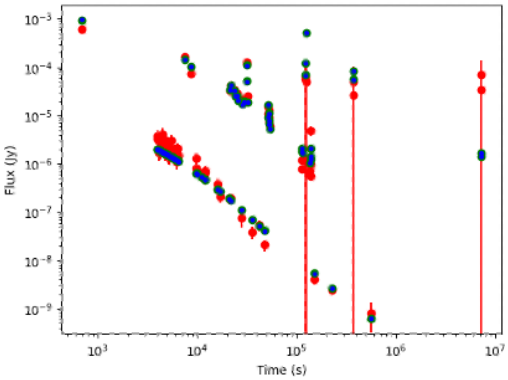

FIG. 13: Plot of ε_e fixed at 0.01. The x-axis is time. The y-axis is the flux density.

Parameters	Value	Uncertainty
ε_e	0.0099	- 3.33e-07 + 3.29e-07
n_{ism}	44.96	-6.43 + 6.84
θ	3.03	- 0.16 + 0.16
ε_b	0.0149	- 0.0009 + 0.0010
p_{index}	2.184	-0.017 + 0.016
likelihood	-181.6	

TABLE IV: These are the best fit parameters of the models for ε_e fixed at 0.01

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The Impact of Stress on Opioid Addiction

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Abstract

Nationally and Internationally opioids have reached new heights in usage and death rates. Previous research has indicated that stress plays a role in addiction and relapse vulnerability, however, the extent of discussion of the interrelatedness between stress and drug addiction is underdeveloped. The intersection of these topics needs to be further examined and addressed to develop educational advancements, as well as new treatment approaches. What is the impact of stress on opioid addiction? I have focused my research and analysis on relevant peer reviewed articles within these topic spheres, narrowing searches based on specific inclusion criteria. I have noted that stress will be championed as the critical factor in addiction and its related components. To this end, I thoroughly examined the literature to create a clear composite model of stress and addiction.

Keywords: Stress, Addiction, Opioid Use Disorder (OUD)

Introduction and Background

In the past two decades, opioid use has transformed into a deadly epidemic. Opioid overdose has been the leading cause of United States drug overdose deaths since 2007 (MacLean et al. 2019, as cited in Jalal et al., 2018). Stress appears to be a prominent emerging risk factor of approaching addiction and the elements that follow (Schwabe & Wolf, 2011). Research centered on this topic is necessary to understanding how stress affects the various components of addiction to opioids, and what that impact entails. This topic spans multiple fields of study. Previous research has clearly indicated that stress plays a role in addiction and relapse vulnerability. Due to the wide range of scientific input, there are a multitude of approaches that have indicated connections. However, there has been limited discussion on the extent of the impact between these variables, as well as a lack of concrete understanding of the overall relationship. It is then necessary to analyze the relationship between these two important concerns, to assess their covariance.

What is the impact of stress on opioid addiction?

In 1877 Berlin, the monograph titled "Die Morphiumsucht" written by Edward Levinstein was the first record of discussion focusing on opioid addiction as an illness (Schütz & Froese, 2018). During this time, the focus of this illness was considered physical rather than psychological. Today, debate over the limitations of the psychopathology of addiction and conceptualization of addiction as a disease continues, however Koob (2020) notes that Opioid Use Disorder (OUD) is recognized by the psychology community and described in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5). Addiction alone poses a serious health care emergency and produces economic strain on taxpayers. Wemm and Sihna (2019, as cited by US Department of Health and Human Services, 2016) support this claim and explain that substance use disorders "are estimated to cost $400 billion across a variety of domains, including crime, poor health outcomes, and lost productivity". Along with these health and economic risks, families and communities are ravaged by the current opioid epidemic. McHugh et al. (2020, as cited by Center for Behavioral Health Statistics and Quality, 2018) relay that "An estimated 2.1 million people in the United States meet diagnostic criteria for an opioid use disorder and more than 11 million people misuse opioid.". The opioid epidemic continues to spread regardless of the detriments or harm it entails.

Opioids are attractive to possible users for their euphoric properties and ability to suppress pain and stress. Not all forms of opioid use are illegal, as there is a large subset of opioids prescribed by medical professions for medicinal purposes. Although some forms of opioid use begin legally, dependence on their effect can cause a transition into Opioid Use Disorder, and the possibility of seeking illicit forms of opioids. This drug class consists of heroin, fentanyl, methadone, hydrocodone, oxycodone, morphine, and codeine, etc. Addiction to opioids can be characterized by compulsory need, hyperkatifeia, and inability to control intake amount. Hyperkatifeia is the continued increase of a negative emotional state and involved symptoms and motivations as withdrawal from drug abuse ensues (Koob, 2020). Attempts to wean off opioids are met with extreme symptoms of withdrawal that include physical and

somatic properties as well as intense dysphoria. Koob (2020) explains that as users continue to abuse and experience withdrawal, their sense of hyperkatifeia and similar properties increases. As a result, changes in stress response elicit an attempt to regulate these effects by continuing further drug intake. This points to use of opioids reinforcing strong negative feedback, making treatment more challenging. This can be attributed to the interactions between opioids and the brain, specifically pathways that involve stress.

Ruisoto and Contador (2019) introduce discussion of how stress hormones affect the brain, specifically the negative effects on the hippocampus, amygdala, and prefrontal cortex (PFC). Particularly changes in these regions result in deterioration of memory formation, increased anxiety, and fear response as well as impairment of executive decision processes. Another study focusing on the molecular and genetic substrates linking stress and addiction, provides that the cAMP response element binding (CREB) pathway and its related factors are implicated in the relationship between drug addiction and stress (Briand & Blendy, 2010). In short, Briand and Blendy (2010) explain that the CREB activation pathway is affected by exposure to stress which in turn sensitized behavioral responses to drug use. This pathway is interconnected with the brain-derived neurotrophic factor (BDNF), the corticotropin-releasing factor (CRF), and Dynorphin, all which influence regulating behavioral responses to acute and chronic stress in relation to addictive behavior. This then provides background for the importance of understating the stress and addiction relationship and its implications for treatment purposes.

On trend with the research of Briand and Blendy (2010), Schwabe and Wolf (2011) argue that excessive and prolonged stress responses promote addictive pathology. As there is focus on the nervous system and its relation to addiction, changes in the nervous system are acknowledged as neuroadaptive. Schwabe and Wolf (2011) note that as stress continues to be neuroadaptive it will affect susceptibility to addiction and vulnerability to relapse. Integrating the CREB related factor Dynorphin and stress response, Ruisoto and Contador (2019) explain that "The dynorphin-κ aversive opioid system" impairs the brain's dopamine reward system and promotes negative emotional states to facilitate addiction and addictive behaviors. An important concept to understanding negative behavioral reactions to stress among the addict population is the idea of allostasis. Allostasis is the ability to respond to stressors to regain homeostasis. Therefore, the stress response system in the brain can often be referred to as the allostatic load. The neuroadaptations caused by the aforementioned pathways as a response to stress, allow allostasis in addicted brains to manipulate and change the reward system and its mechanisms increasing relapse and addiction risks (Ruisoto and Contador, 2019). Therefore, there is consensus on the belief that stress plays a role in addiction and relapse based on molecular and genetic pathways involved in regulating brain function and cataloging the neuroadaptations that alter these functions. Furthemore Van Bockstaele et al. (2009) reveals that "the effects of opiates on different components of the stress axis can impact on individual responsibility to stressors and potentially predispose individuals to stress-related psychiatric disorders." This strengthens the consensus denoted earlier and offers new insights into the effects of opioids on stress and associated disorders.

In research with a further specification on the effects of stress on opioid use disorder MacLean et al., (2019) conducted a systematic review focused on medication assisted treatment (MAT) and associations as there is a lack of behavioral focused studies. They found that in individual stress appraisal settings there was a general strong association to increased craving of opioids, however when put into treatment practice results were mixed. There is disagreement to which degree stress plays a role in addiction and relapse. Saraiya et al. (2021) explain that of their stress and no stress comparison groups, stress had no significant effect on time to opioid use after the task, however stress did influence the amount of opioids taken. In another experimental study, the results offered that cravings have a stronger prediction value or link to drug use compared to stress (Preston et al., 2018). These findings link discussion of opioid addiction, stress, and cravings. Furthermore, these findings offer further conversation on the role of stress in cravings as discussed by Ruisoto and Contador (2019) when they noted the reliability of stress as a prominent trigger for cravings, and in turn relapse. In conjunction, Koob et al. (2014) express that the "brain stress response systems are hypothesized to be activated by acute excessive drug intake, to be sensitized during repeated withdrawal, to persist into protracted abstinence, and to contribute to the development and persistence of addiction". The counterparts of opioid addiction, such as cravings and relapse, provide important insights to the relationship between stress and opioid dependence. This is supported by Wemm and Sinha (2019) in their note that "Regular, high levels of drug use alter stress and reward responses both in tonic and phasic responding and recent findings suggest that such alterations are significantly associated with the tolerance, withdrawal and intoxication effects of drugs as well as in predicting current drug use and future relapse." These connections require further investigation and experimentation.

Research has determined that stress impacts addiction and its related factors through various pathways within the brain. Due to a variety of

changes and neuroadaptation from stress responses and concurring factors, there is no consensus on a clear relationship between stress and opioid addiction. Therefore, further research must be conducted to determine a definitive relationship between stress and addiction with emphasis on opioid use to better understand how the two concepts relate, and to offer new insights to enhance and improve the efficacy of treatment for those facing opioid use disorder and addiction. What is the relationship between stress and opioid addiction? How does stress impact opioid addiction and related factors, i.e., cravings, relapse, etc? How can understanding these connections apply to real world scenarios involved in the legal and healthcare system? Understanding these questions will have a positive effect on individuals, families, communities, and the fields of education and health, etc. Using this template will enable you to prepare your paper in accordance with the instructions for authors for ICSM 2000 papers with a minimal amount of manual styling and formatting.

Method

The research design for my study was nonexperimental. An extended literature review allowed me to focus my efforts on the analysis of information within my proposed topics of interest. With a focus on non-experimental methods my participants consisted of data from literature rather than the live participants often utilized in an experimental design. The participants across the literature consist of a variety of different backgrounds, including ages, races, ethnicities, occupations, and genders. I concentrated on the analysis of relevant articles centered on stress, both psychological and physiological; as well as addiction, specifically involving opioids. All articles were screened according to the inclusion criteria noted below to determine their applicability to my study. Utilizing the One Search tool of the University Library I began collecting articles for review. Targeted and manual searches were completed, resulting in a focus on specific databases. Materials were pulled from the databases of PubMed, Psych Info, Psych Articles, and ScienceDirect. Using these tools, I was able to narrow my search, finding a variety of relevant experimental and nonexperimental peer-reviewed articles.

During research the searches were limited by publication date, articles were constrained to a fifteen-year prior release, meaning all articles were published in the last fifteen years. This was employed to ensure relevancy. Again, both nonexperimental and experimental studies were included. Studies met the inclusion criteria if 1) They discussed relevant interpretations of stress, whether psychological or physiological; or 2) They focused on addiction, with a concentration in opioid addiction and a discussion of Opioid Use Disorder (OUD); or 3) They discussed the impact, relatedness, or relationship between stress and addiction, as a whole or with a concentration on opioid use. Articles that were categorized as reviews were not excluded, however references were screened for further source information. During initial research all titles were reviewed for relevancy and abstracts were analyzed for the aforementioned criteria. Studies that were not peer reviewed were excluded. After extensive research I analyzed twenty-seven peer-reviewed articles focused on stress, opioid addiction, and their relationship.

I used a mixed methods approach to analyze the data collected from the various databases discussed earlier. By utilizing a mixed methods approach I was able to assess a variety of sources spanning multiple fields of study. More specifically, complementary, and comparative data analysis incorporated in the mixed methods approach allowed me to assess the prevalence of my variables, while also interpreting the consensus on the relationship between the two. Majority of analysis will focus on qualitative data. Quantitative data analysis will be scarcer on this topic. The primary and secondary sources of my review allowed me to build connections that allowed me to measure the interrelatedness of my variables stress and opioid addiction, prompting an answer to my research question.

Results

Preliminary results noted that overall stress would be regarded as one of the most critical factors in determining susceptibility to addiction, cravings, and relapse. I also predicted the relationship between stress and opioid addiction would be deemed cyclical. These predictions are from the research already conducted on the topic supporting the role of stress in addiction, and more specifically opioid addiction. Focusing on the interdisciplinary approach there was an examination of a variety of data. Figure 1 demonstrates the expanse of this specific topic. There were clear connections made between the fields of psychology, neuroscience, pharmacology, and biology, as well as small involvement from the field of Epidemiology. The data confirmed that nearly half of all articles were involved in the field of neuroscience. Furthermore, connections made through the interdisciplinary approach would have likely been overlooked if the inclusion criteria were more focused, meaning new and necessary comparisons resulted from this approach.

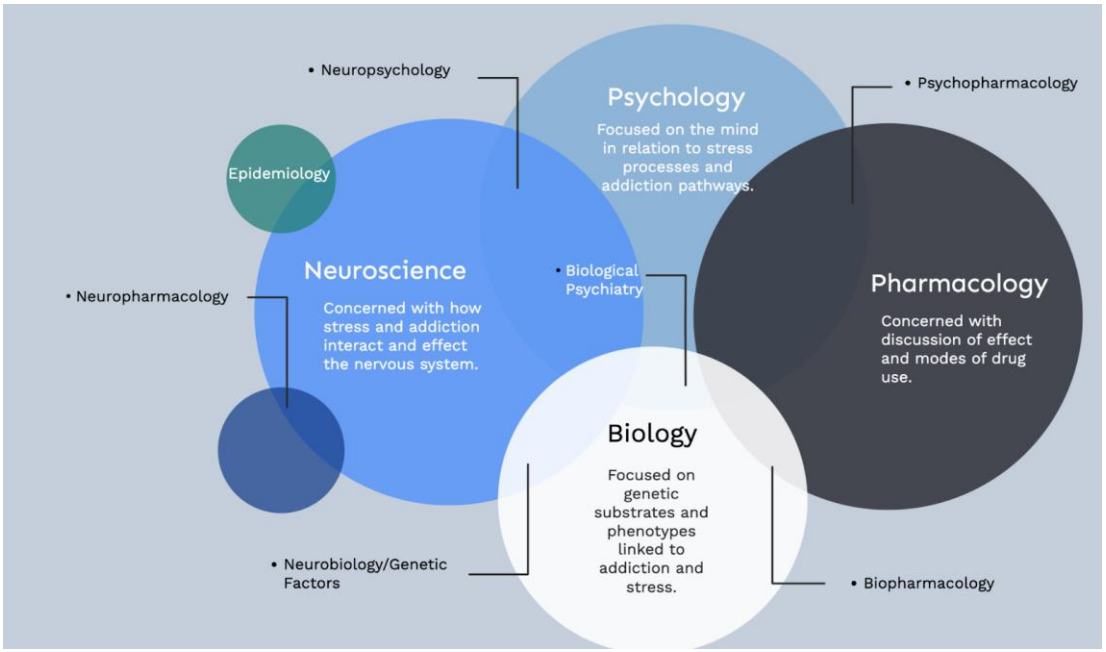

Fig. 1. Interdisciplinary Venn Diagram. Neuroscience focused articles accounted for nearly half of articles in this review. Neuropsychology accounted for 3 article intersections. Neuropharmacology accounted for 5 article intersections. Neurobiology accounted for 6 article intersections. Biological Psychiatry accounted for 4 article intersections. Bio pharmacology accounted for 2 article intersections. Psychopharmacology accounted for 8 article intersections. Neuropharmacology accounted for 5 article intersections. The Endocrinology and Neuroscience intersection accounted for 2 article intersections. Article intersections exceed article total due to overlap between fields.

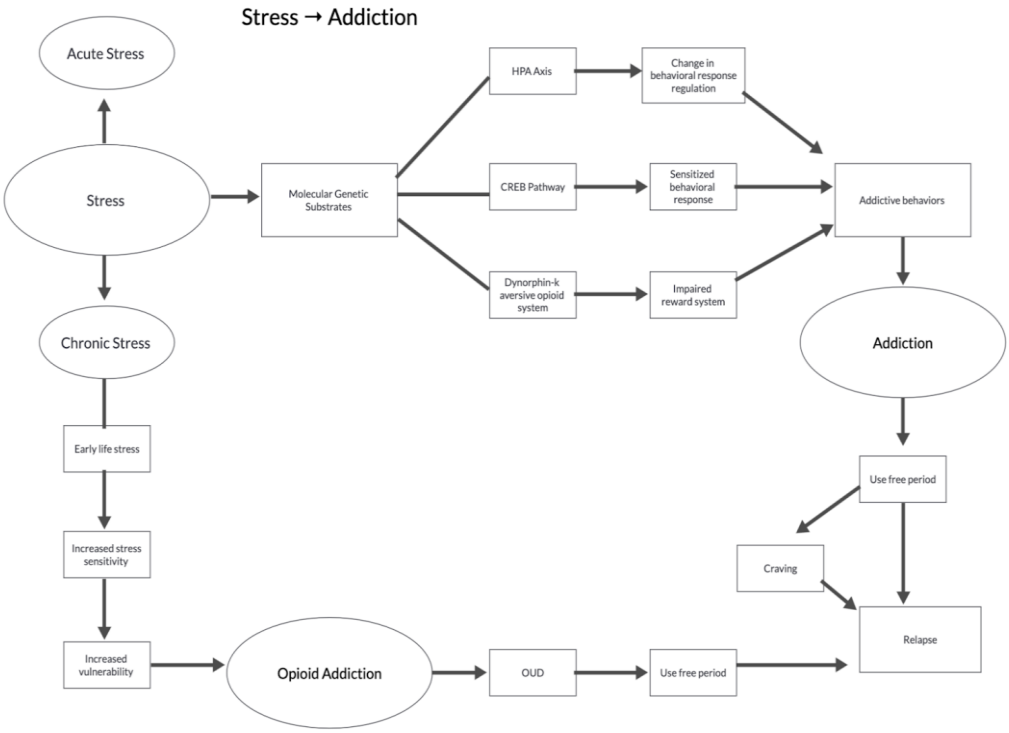

Fig. 2. The Stress to Addiction Pathway. Stress pathways and associated mechanisms that contribute to the development of addiction in general (on the right) and to opioids (toward bottom left). Connections between stress, cravings, and relapse. Not pictured: genetic mechanisms associated with heroin dependence.

In Figure 2 the pathway from stress to addiction is outlined. As noted, stress can be categorized either chronic or acute. Moving down through chronic stress, Oswald et al. (2021) relate early life stress to susceptibility to opioid addiction through increased stress sensitivity and vulnerability. Moving back to the start at stress, if we move right into molecular and genetic substrates, we can see the HPA Axis, Creb Pathway, and Dynorphin-k aversive opioid system. These systems outline the connection between neural pathways associated with stress and mechanisms of opioids. Each path contributes to modulated responses and in turn addictive behaviors that lead to addiction. These connections were noted by Briand and Blendy (2010), Koob et al. (2014), and Ruisoto and Contador (2019) in the introduction. These findings are further supported by Van Bockstaele et al. (2009), Wise and Koob (2014), and Schwabe and Wolf (2011). Although not included in the diagram, clear connections between stress and susceptibility to opioid addiction, specifically heroin, are outlined by Levran et al. (2014), Su et al. (2018), and Levran et al. (2018) with discussion of stress related genes. The CRHBP gene (rs379273), the FKBP5 gene, and LncRNA associated with SNP rs255105 have demonstrated modulations in stress response that directly correlates with the development and maintenance of opioid addiction. These connections can also be supplemented by Oswald et al. (2021) in relation to early life stress and susceptibility to opioid addiction, as well as O'Brien at al. (2022) with discussion on behavioral phenotypes associated with opioid addiction susceptibility.

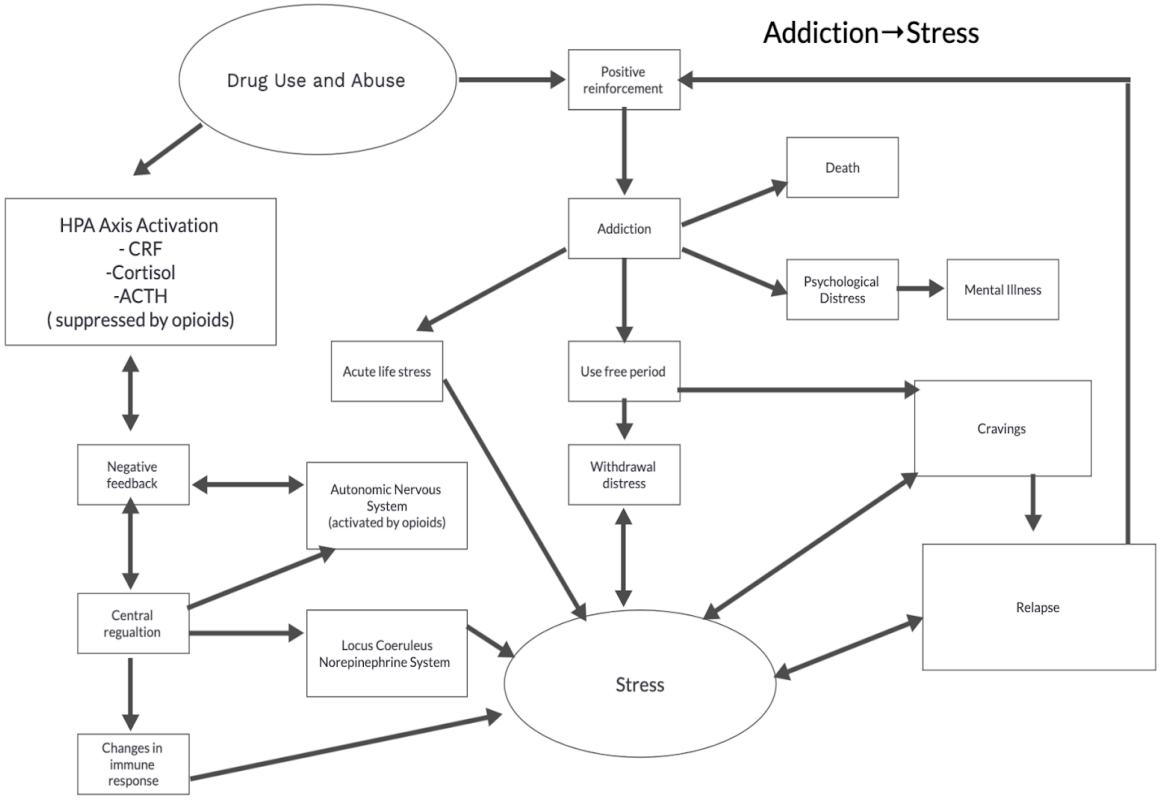

Fig. 3. The Addiction to Stress Pathway. Neurological pathways affected by addiction that led to modulation in stress. Connections between stress, cravings, and relapse.

Furthermore, in Figure 3 the addiction to stress pathway is outlined. Starting at drug use and abuse we can move down into the HPA Axis and associated negative feedback loop further comprised by the autonomic nervous system (ANS) and central regulation. In terms of opioid use, the HPA Axis is suppressed by opioids affecting the stress hormone release systems, while the ANS is activated resulting in physiological changes to heart rate and respiration, etc, as noted by Wemm et al. (2019). Focusing on central regulation in the cycle, changes in immune response and the locus coeruleus norepinephrine system are directly associated with use and central regulation, this is outlined by Hofford et al. (2019) and Biernacki et al. (2020). The relationships between addiction, the positive reinforcement reward system, acute life stress, psychological distress, and withdrawal distress are outlined by Gold et al. (2020), Chan et al. (2020) and Burgess-Hull et al. (2021). All these factors result in increased stress within the user. Connections between both Figure 2 and Figure 3 can be outlined through discussion of cravings and relapse. A relationship between opioid use and cravings was outlined by Maclean et al. (2019), noting elevations of stress as predictors for cravings and in turn relapse. This idea was supported by many works as noted in the background, furthermore, Woodcock et al. (2023) expressed that there are divergent effects on opioid craving among persons with OUD because of noradrenergic vs. glucocorticoid stimulation involved in the ANS. Thus, furthering the discussion of the interrelatedness between stress and cravings, and in turn relapse vulnerability.

Analysis of twenty-four selected sources in these fields revealed a clear relationship between stress and opioid addiction. These findings are supported by hypothesis because there is a clear pathway demonstrated between addition and stress, and vice versa. If we were to connect the two pathway diagrams a figure eight like shape would be apparent. The configuration may differ, meaning the point of convergence would change between addiction, stress, and relapse depending on where the cycle begins on an individual, case by case basis. These connections support stress as a prominent factor in the development and maintenance of addiction, in particular addiction involving opioids. The models created promote the hypothesis of a cyclical nature between the two subjects.

Discussion

Based on the results I have come to the consensus that stress and addiction are interrelated. The relationship of stress and addiction is cyclical. Data has confirmed that neuroadaptive stress response and stress sensitivity play a determining factor in addictive behavioral patterns. More specifically, in opioid use, vulnerability has also shown genetic stress modulation polymorphisms related to opioid addiction. Aside from stress, drug use alone has clear impacts on neural feedback loops and central regulation, which in turn affects immune response, hormones, and associated stress systems in the brain. Stress has been greatly associated with increased cravings and in turn increased vulnerability to relapse. Stress and addiction feed off one another creating a cyclical relationship, this is extremely apparent when discussion of craving and relapse come into play. While the initial trigger may be different on a case-to-case basis, the point in which the cycle starts is not imperative, as it appears stress and drug addiction will always be interconnected on some level.

In terms of limitations, the fact that the design is a non-experimental extended literature review opens the work to bias of determination. This could result in gaps within the literature and omission or dismissal of relevant works. Errors in the translation of data from the original source are also possible limitations of my study. I made all efforts to avoid bias and mistranslation within my work, however it is important to note the possibility of differences between my interpretation of the data and the original source.

The research area of addiction and stress is important to study because of the positive implications that may follow the understanding of the relatedness of the two subjects. Recent research has revealed a strong cyclical relationship between stress and addiction. There are real world implications involved in this research that could one day affect how we view and manage addiction. My research focused on opioid addiction and stress exposes the implications of the connection between these two subtopics. As we become more aware of the interrelatedness of these two topics, there is a possibility that proactive steps can be taken and new or modified forms of treatment for addiction may be introduced. This will have effects on individuals, families, communities, and fields of education and health etc. Further research on these topics could have further impact on the healthcare and criminal justice fields. The healthcare system can benefit greatly from new and more effective treatments for addiction, in particular opioid addiction. New findings can make waves in the effectiveness of treatment and prevention of relapse, which will combat the epidemic of opioid deaths in the United States. In terms of criminal justice, understanding the relationship between addiction and stress can impact police interactions with addicts, as well as courses of action in relation to effective sentencing and rehabilitation of offenders.

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The Effects of the Foster Care System

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Abstract

Foster care is a service almost every American is aware of, yet one of the least discussed topics in the media. There are several goals for this service: to protect and nurture children, meet the children's developmental needs, support the relationship and reunification between children and their families, and to help them build healthy, lasting relationships with those around them. Although this is the intention behind the service, and there are cases that have proven to be successful, the impact of the current system in the United States on children is not always ideal. This study aims to demonstrate the systemic consequences that foster children experience. It is then important to research unique factors that create differences between the children who are placed in the system and children who grow up in stable homes– meaning a safe home, having healthy relationships with family and friends, where they keep their possessions, and a home where they positively interact with their school and community—to show to the public the necessary changes that must be implemented in order to make this institution a more equitable system. This study highlights these substantial differences through the lenses of factors, including behavior, academics, and health.

Key words: foster care, behavior, academic, health, alumni, youth

Background

Effects of the Foster Care System

Orphanages emerged in the 1800s as an attempt to improve care for children without a family. Yet, it was frequently difficult for these institutions to give each kid the individualized care and psychological help they required to succeed. As a result, in the beginning of the twentieth century, the idea of contemporary foster care started to take shape. Charles Loring Brace, who established the Children's Aid Society in New York City in 1853, is regarded as a principal forerunner of the foster care system. Brace thought that instead of confining children in orphanages, children might do best if they were put with loving families. He established a community of volunteers to put children in homes around the area, and the idea caught on across the nation (Sethi, 2021). By establishing the Federal Children's Bureau in the early 1900s, the US government subsequently became active in foster care. This organization gave financing to states so they could create foster care systems and establish guidelines for the upbringing of children in these placements. The foster care system proceeded to develop in the decades following, resulting in a stronger focus on keeping families together, assistance for birth parents, and initiatives to place children in forever homes by means of adoption (usgovACF, 2012). The foster care system witnessed considerable shifts during the 20th century as reforms took place to deal with problems including abuse and neglect. With the creation of thorough education and training courses for foster parents, greater financial support for child welfare agencies, and new legislation intended to prevent abuse, the foster care system underwent significant advances in the 1960s and 1970s (Herman, 2012). In many nations currently, the foster care system continues to be a vital component of the child welfare system, and it is still evolving as it adapts to new problems and shifting societal mores. Its history demonstrates that development is achievable and the duty of taking care of children who are in need should be undertaken by everyone in a community. However, there is still a great deal to be done to improve the well-being of these children.

Foster Care service is a temporary situation designed for children whose homes and family dynamics are not in order. When authorities believe abuse or neglect has been committed, child protective services administered at the state or municipal levels may remove children from their homes and temporarily place them with informal caregivers. These children must be temporarily removed from their homes into a new family since there is a lack of infrastructure among the family, the raising of the child is too difficult for the parents to handle, or because it is unsafe for the child to live with their

parent(s) (Leve et al., 2012). This process referred to as foster care placement—involves a challenging exchange between safeguarding children and maintaining families. The US child welfare system has been known for dealing with this dilemma since the beginning of its establishment. "Orphan trains" carried thousands of abandoned children out of cities and onto farms where they were housed and worked during the early 20th century. Financial welfare programs, at the time, with the explicit goal of letting children reside with their biological families—such as Mothers' Pensions and Aid to Dependent Children—were put in place primarily as a result to this (Aizer et al., 2016; Testa et al. 2020).

Gardenhire (2019) provides that children who encounter these institutions oftentimes endured some sort of abuse prior to entering the system; they noted that according to The Adoption and Foster Care Analysis Reporting System (AFCARS, 2016), 61% deal with neglect, 32% had a parent that substance abuse problems, 13% suffered from physical abuse. All these factors mentioned constitute a guarantee to place the children into foster care. Although there is no national approach, policy, or even many media coverage frequently honing on this issue, many publicly and privately funded organizations provide research for the public to be aware of this recurring issue. Leve (et al., 2012) also concluded that children do better when agencies give foster families support directed toward improving at- home experiences that involve behavioral and neurobiological factors and placement conditions.

When examining the state of California's foster care system, nearly 63,000 youth were removed from their homes because of maltreatment or neglect from their biological families (Danielson & Lee, 2010). The original intent of this institution may have been for the benefit of the children, but in recent times, unfortunately, widespread criticism is leveled against the foster care system for failing the children and families it is meant to support (Rymph, 2017). Although the foster care system does provide aid-- such as an escape from an unstable home-- to those children in need to some degree, there are still, to this day, currently over 400,000 children remaining in the system in the U.S. As previously stated, the main goals of this system are to protect and nurture children, meet the children's developmental needs, to help them build healthy, lasting relationships with those around them, and most importantly, to support the relationship and reunification between children and their families. Every state provides a subsidy to foster families, to cover the costs of the basic needs to raise children, depending on the number of foster children taken into the household (Steenbakkers, 2018). The child remains with this family while the family courts decide whether it is safe and stable for the child's original family to take the child back. One common issue that these authors can highlight with this process is that there is not enough emphasis on reunification with the child and their original families.

Behavioral health is measured as "a state of mental/emotional being and/or choices and actions that affect wellness. Behavioral health problems include substance abuse or misuse, alcohol and drug addiction, serious psychological distress, suicide, and mental and substance use disorders" (U.S. Dept. of Health and Human Services, 1983). Overall grades, standardized tests, and teacher evaluation systems that represent teachers' assessments of students' academic behavior and attitudes are used to gauge academic achievement (Wilder, 2014). There are many definitions of 'health,' but in terms of the context for this study, it is defined as 'the state of being free from illness and injury' (Brüssow, 2013). As far as "stable" homes, children and young people from these living situations can feel safe and prepared to thrive when they have a safe environment at home, a school where they can build positive, trusting relationships with others so they can thrive, and a network of reliable adults in their lives (Children's Commissioner for England, 2018).

Comparisons can be examined when looking at lifestyles of both children in stable families and children in foster care. Golberg and Carlson (2014) conclude in their research that children with higher levels of parental supportiveness tend to have lower levels of both externalizing and internalizing behaviors. On the other hand, one study reveals that adults with histories of foster care as children were also almost twice as likely to have had mental health issues in the previous 30 days of their data collection than adults without such histories (Zlotnick et al., 2012). When examining academics, Kelly (et al., 2021) found that children living in stable homes with relatives tend to participate in extracurricular activities, stronger relationships with adults, and were able to achieve much academic success; the study also found a disconnect between children in welfare systems without adequate support and their education. However, over half of the students in samples of some studies reported receiving disciplinary referrals, one in five had to repeat a grade, and many received special education services. These are all above-average rates.

(Somers, et al., 2020). An implication from these results may be that they will be useful in improving preventative and intervention strategies and making sure that major developmental growth stages are not overlooked. This assists in enhancing focused efforts and educational aid for children in foster care. These children perform lower in academic achievement than stable-family children. In terms of physical health, according to reports, children were enrolled by general practitioners and had all their vaccines up to date, but their interactions with primary and specialty health care were limited to a variety of only minor issues (Anderson et al., 2004). In contrast, according to McGill's (2016) analysis on the physical health of children in foster care, many of them face difficulties obtaining regular health care, mainly because of the constant change of locations and caregivers resulting in a discrepancy of the child's medical information. A trend in these findings reveals that children from stable families oftentimes exhibit better behavior, academics, and better overall health compared to those children in foster care.

Examining the negative impact of the current foster care system on children today through the lenses of specific factors, can assist in identifying areas that require improvement to refine this system; an institution whose primary goal of operation is to help promote a child's development—not stagnate it. So, what are those impacts on the current system? The purpose of this study is to show how children enrolled in foster care are enduring effects from the system, by examining outcomes of behavioral health, physical health, and academic reporting's from scholarly sources.

Method

Participants

Articles and studies that addressed behavioral health, physical health, and/or academic outcomes for foster youth. Both alumni of the system and youth who were in the system at the times the studies took place across the world had been selected for this review. Aging out of care is defined differently in each nation, and even state. This research covered any studies that looked at youth who had any experience with the foster care system, as determined by the state where they lived.

Materials

Conducting the systematic search and review methods outlined in Mulrow et al. (1998), several scholarly databases (EBSCO Academic Search Premier, ScienceDirect Journals, EBSCO APA PsycARTICLES, and Project Muse Standard Collection) were searched using CSU Stanislaus Library Database engine, for the following key terms: foster care, behavior, physical health, academics, alumni, and youth. The significant information that will be highlighted for each of the sources in this review will be the author, year of publication, the population of foster care participants, a sample size, the location of the study, and the outcomes considered. New research methods that have assisted in research so far are filtering the results of articles to those that are recent and peer-reviewed for credibility and narrowing down key words in the search bar has also helped to hone in on specific subjects. The current study will also be controlled for the time; articles were only extracted from the years between 2012 and 2023 to maintain recent and relevant data.

The concept of "behavioral health" will be instrumentalized as the activity of people interacting with their environment, this term will be used interchangeably with articles that refer to this outcome as mental health. "Academics" can be analyzed in this study as performance outcomes of the students indicating the extent, they have accomplished specific goals that were the focus of activities in school (elementary, middle, high school, or college) environments. Also included in this definition is the youth's or alumni's preparedness for college. And the concept of overall "physical health" in the context of this study can be defined as a person's mental or physical condition, as well as considering the costs of maintaining physical health.

Design

The methods conducted will not require any collection of new data. Instead, the focus is to synthesize a broad range of literature (15 sources). It compiles and summarizes all empirical material that satisfies predetermined eligibility criteria to address a specific research issue. These measures are effective because this analysis of multiple sources will serve as a benchmark to provide a glimpse in time of the current state of the foster care system. A qualitative systematic review will be used to focus on synthesizing a broad range of information collected to

offer a specific perspective on the effects of the current foster care system on children today. The study will focus on three factors: behavior, academics, and overall health. The sources that are included in this study will be limited to peer-reviewed sources used after 2012.

The type of descriptive research designs selected for the research question is a qualitative systematic review. This is defined as "when the results of primary studies are summarized but not statistically combined" (Mulrow et al., 1998). The variables to assess in the literature in the descriptive research are behavior, academics, and overall health of foster youth, and they will be measured by looking at the studies that other sources have identified to show the current state of the foster system.

Procedure

A variety of different studies by different researchers will be analyzed. The research will be first carried out by filtering different terms within the databases such as: foster care, behavior, physical health, academics, alumni, and youth. The researchers will provide studies that they found about "participants" (foster children or alumni) in the context of the "variables" (behavior, academics, and overall health). Since this is a descriptive research study, the search strategies used will be electronic, including dates, databases, and keywords used. The types of studies include surveys, correlational studies, and interviews. The approach that will most likely be used to select the studies to analyze will be quantitative studies. The amount of time it should take to analyze these studies took about a month, gathering ideas for each of the three concepts (behavior, academics, and health).

Eligibility/Inclusion Criteria

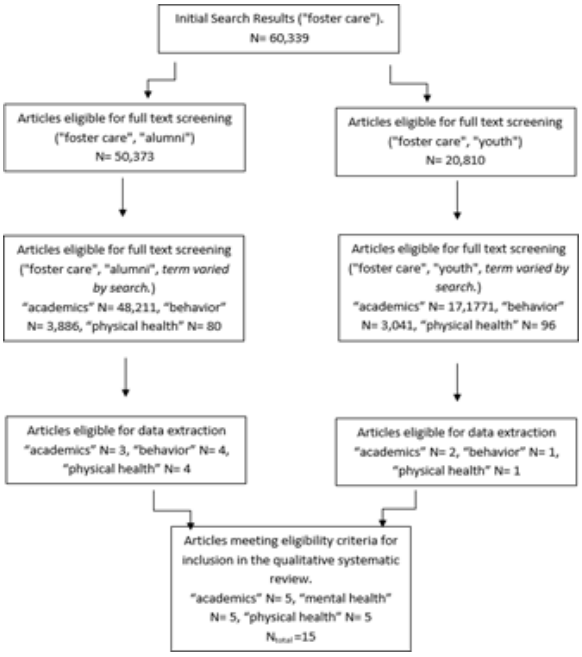
Must be peer-reviewed and published after the year 2012. Must also have the term "foster care." Data from each source must have relevant information on foster youth outcomes in either behavioral/mental health, physical health/wellbeing (or costs), and school/academic. The participants of those studies must be either alumni or foster youth at the time of the study.

Search Strategies

Determine key terms such as: foster care, behavior, physical health, academics, alumni, and youth. "Foster care" and "alumni" were constant when entering the three main factors key terms individually. The same method was used for "youth" instead of alumni.

Search Results

Fig. 1- Flow Chart



Study Screening and Selection

There were thousands of results to choose from in both types of groups, but the maximum number of sources for articles for this study was set to be 15, so the data was narrowed down drastically. Many articles were disqualified from this study due to titles, abstracts, and results not being eligible criteria.

Data retrieval

Reading through the entire text of the included studies, retrieval of relevant information for analysis included both features of the studies, as well as findings. The former was measured distinguished by author and year of publication, population (alumni or youth, and ages), sample size, location of the study, and the outcome considered. Many of these studies found additional information on factors that affect foster youth, such as gender, parent relations, peer and social support, race, employment situation, etc. However, the information relevant for the main three factors of this study was extracted.

Results

Behavioral Health

While examining behavioral health, much of the literature revealed that many foster care youth and alumni still exhibit poor behavioral health (see Table 1). Font (2014) found while examining academics, behavior, and health between two groups, youth placed in kinship care and youth in nonrelative care, that health had no difference in scores and academic scores were lower in kinship care. The behavioral measures show various patterns. Both groups show decreasing rates of externalizing and internalizing behavior difficulties with time, but the youth who were largely placed with kin in the beginning had fewer behavioral issues. However, the behavioral issues still prevailed in both groups. Villegas et. al in their 2012 study of foster alumni discovered the prevalence of mental illnesses ranges from 33 to 45%. Even more foster care alumni are susceptible to a lifetime diagnosis, with 62–63% having at least one psychological disorder. Disruptive disorders, depression, social phobia, and ADHD were shown to have the highest frequency of occurrence. In this assessment, roughly 4% of men and 14% of women reported having a mental health diagnosis. The results in relation to gender and outcomes for mental health are consistent.

Compared to men, women exhibit worse mental results. In another peer-reviewed literature, Jackson et al. (2015) identified the types of mental disorders that alumni are more susceptible to falling victim to. Alumni diagnosed with three or more mental disorders in this study had a diagnosis rate of 10.4%, 9.8% had two simultaneous diagnoses, and 20.8% had just one.

As a result, 41.1% of these individuals had a current mental health diagnosis. PTSD being the most common, with 21.6% of alumni having it. The second most common condition was major depression (15.1%), which was followed by social anxiety (12.1%), chronic panic disorder (11.4%), anxiety disorder (9.3%), drug and alcohol abuse (3.8%), and bulimia (2.7%). In Villagrana's (2018) research, experts measured the perceptions of foster care alumni towards mental health services through interviews. The discovered that mandated services left them feeling powerless, lack of self-determination was due to being uninformed for the reasons of the service, and there was a lack of meaningful explanation provided to the youth about their circumstances (either none was given, or when it was, it lacked significance, or the child was too young to comprehend). Additionally, some alumni in the study felt that in the short run they did not enjoy going to the services, but in the long run, it helped them later in life. However, more than half in this study reported disappointment in the services; this can be attributed to lack of information provided, having high expectations with treatment, and their own hesitation to participate in these services.

Youth claimed that they avoided participating in the services offered because they were receiving them inconsistently, particularly because of placement instability that resulted in new services and therapists. Reported reasons for this were due to overwhelmingness of starting over, as well as hesitancy to place trust into new therapists.

Finally, in Salazar's (2013) study, the data revealed that although job security, health, financial satisfaction, home ownership, happiness were only slightly lower in the foster alumni groups compared to the general population group, home ownership and mental health were significantly higher lower. Foster care alumni graduates showed significantly more days of poor mental health and higher levels of sadness over the last month.

Physical Health

In terms of physical health, research indicates that generally, foster youth and foster alumni in America demonstrate both poorer physical health, and in turn experience health costs (see Table 2). Data in Zlotnick et al.'s (2012) research show 72% of people with a history of foster care reported having good or excellent health status; compared to 85% of those without a childhood history in foster care. However, comparing the minorities of both groups with poor health status, those in the former group reported worse health and greater morbidity rates (e.g., diagnosed with asthma, diabetes, hypertension, stroke, heart disease/cancer, epilepsy, and are active smokers). In addition, Fusco (2020) even compared foster alumni to low-income adolescents; in which alumni reported higher rates of trauma, anxiety, and smoking marijuana. A longer sleep delay, considerably fewer sleep hours, and more overnight awakenings were also observed. The overall sample's three sleep factors were all connected to previous foster care placement, according to the regression model, and a past of child abuse predicted less sleep time.

Depression, anxiety, and smoking of marijuana were linked to shorter sleep durations, and anxiety to more nightly awakenings. Another study conducted by Salazar et al. (2016), researchers examined foster care

alumni college graduates' strengths, challenges, and supports they experienced while in college that affected their success. They were measured through an open- ended survey which revealed several different themes, one of which was physical health.

Participants also experienced challenges related to physical health. Health challenges include accidents, illnesses, physical disabilities, poor diet, and lack of access to health care. One participant described the aftermath of a severe accident that forced her out of school, while another mentioned the health impacts of "my very unbalanced diet." Several participants were affected by a lack of health insurance or access to basic medical care.

In terms of health costs, other experts revealed in their studies through regression analyses not only show child abuse and neglect, but especially instability in out-of-home placements related to foster care are the factors most indicative of greater health care expenses. For instance, while examining the effects of maltreatment and parent risk factors, this study found that the biggest correlation between rising behavioral health expenses ($1700) and medical costs ($620) was placement instability (Patton et al., 2019).

The studies were all taken place in the United States. However, in an analysis taken place in Israel reveal contradictory results. Researchers in Israel sent out a questionnaire to both groups of the foster care alumni (what they refer to as youth villages) and the general population asking them various questions about their health status. They discovered that an adolescent in the general population as well as a graduate of a youth village had an equivalent chance of being predicted by having high health condition. This result directly differs with research looking at the adolescent outcomes of foster care graduates from the United States. (Kushel et al. 2007, Zlotnick et al. 2012). Although health habits of smoking were increased in youth village alumni than the general population, a good / excellent health status was reported in most of both groups-- especially in areas such as BMI and low fast-food consumption (Zlotnick et al., 2017).

Academics

While assessing the outcomes of foster youth and alumni through the context of academics, generally, experts concluded in their investigations that these groups face many challenges when trying to achieve high academic standards. However, this mostly seems true for foster youth in K-12 settings, rather than college. One study found that both males and females claimed they have limited information of how to pay for and enroll in college. A two-year (68%) college or four-year (64.5%) university's requirements, for instance, were not familiar to about two-thirds of the participants. Only one in five respondents were briefed on Pell grants, and only 37.2% said they were aware of academic loans, despite cost being a major worry. Additionally, only 55.0% of the males in the sample reported having a grade point average of 3.0 or higher (Kirk et al., 2012).

Other studies investigated the various factors that contributed to lower rates of academic achievement in foster youth and alumni. Goldberg and Moyer (2019) reported in their data that Differential treatment (lower academic expectations and pity), lack of trauma-sensitive approach, difficulty prioritizing school, academic progress hindered because of poor ties with their schools. In Clemens et al's (2018) investigation, in one of the subsample analyses' main findings is that adolescents enter the foster care system with academic deficiencies. Prior to removal, average academic growth in math, reading and writing were at its lowest. Despite an improvement in academic advancement both during and after removal, performance persisted below the 50th percentile, leading to a concomitant drop in average proficiency. The best illustration of this was in the subject of math, where foster students had the slowest rate of skill improvement. The average competence level thus decreased during the same time frame relative to grade-level expectations, even though academic growth rose following separation from the family. In addition to this, Chambers et al.'s (2018) study found key themes during their study. (1) Continuous moving; (2) losing relationships; (3) excluded from placement decisions; (4) trouble graduating from high school; (5) dangerous placements; and (6) feeling unwelcome in placements. Specifically looking at the difficulty of high school completion, students ran into trouble with dealing with credit or transcripts not being adequately transferred, or even being lost. They also faced social challenges such as making new friends and adjusting to new teachers.

However, there were results in studies that discussed youth and alumni with high academic achievement, and even investigated the factors that contributed to this. Salazar and Schelbe (2021) discovered in their research that of the foster care alumni who did finish their college degrees, many determinants, including demographics and life situations while in college, were discovered to be

related to different post- college outcomes. General social support (from supportive relationships and community connections), life skills (22% being enrolled in independent living programs), and physical and mental health (from college campus resources) were the college student life contexts that had the strongest correlations with post-college outcomes.

Discussion

Limitations

One methodological limitation of this study includes the sampling of each of the studies that are included in the qualitative systematic review. Although there is not much larger-scale research, most of them have limited sample sizes and other restrictions that prevent the conclusions from being generalized. As far as conceptual limitations are concerned, there may be more information in one area of study than others—for example, there are ample studies to show for the mental health of children in foster care, but not as much for the physical health. Additionally, the only demographics recorded within this study were age and youth in foster care (at the time of the study) and foster alumni. Demographic information such as gender and race were excluded since not all the studies that were examined for this project contained that information when conducting their surveys and experiments; therefore, in order to prevent inconsistency of demographics in this study, gender and race were excluded.

Overview

The results of the present study reflect that those children who have experienced the foster care system generally have more experience behavioral health issues, lower academic achievements, and poorer health conditions than are standard. Although many of these results show that these conditions most likely may have been exhibited by these children prior to enrolling in the system (not from the system), this goes to show there is still much room for improvement that the system should partake in to help these children perform higher in these outcomes. Even the alumni and youth that do show progress and success, most of the success is not from the system itself, it's from other sources (college programs, youth's individual perseverance, etc.).

A common recurrence that is found in many of these studies is instability. The youth often are forced to move frequently—negatively affecting their grades, their already-altered mental state, and in the long run, their health. The present study may prompt future studies to investigate and further research the impact of instability on foster care, to identify the source of the problems arising in the system and hopefully implement reforms. Literature analyzing child welfare services highlights the imperativeness of placement stability to children's future well-being.

The research of this study is to enhance a theory or body of knowledge that is already present, rather than bringing new information to light. This phenomenon is an important topic to study because foster care is a service almost every American is aware of, yet one of the least discussed topics in the media (Han et al., 2019). These studies are significant because they help provide information overviewing the situations of children enduring abuse or unstable family situations at home. They also examine the negative impacts of children in the system— regardless of what the intent or goal of foster care is. Additionally, the findings that reveal a glimpse of the current foster care system state, may further influence agencies to put more effort in reforming this system, so that a significant amount of these children (if not all), can have an equitable opportunity to prepare for the real world, just as those who do are not in the same situation as them. This study may serve as an initial basis for establishing governmental policies and resources essential to lessen the negative effects of foster youth and alumni growth in academic development, physical health, and behavioral health. It may serve as a “call-to-action” for other scholars to contribute to this research as well, serving as an intentional effort to initiate a constructive conversation in America and other countries which utilize child welfare systems. But overall, most of the articles seem to agree with each other and the authors’ findings correlate to help answer the question of what specific aspects of the current foster care system affect the children enrolled in it today.

Table 1. Summary of Studies on Behavioral Health used in this review (n = 5).

Author(s), year	Population	Sample size	Location of study	Outcome considered
Font, 2014	Foster youth (ages 6-17)	n= 1,215	Wisconsin	Behavioral health
Villegas et. Al, 2012	Foster alumni (20-49)	n= 810	Major cities in AZ, CA, HI, ID, LA, MT, ND, OK, OR, SD, TX, WA, WY	Behavioral health
Jackson et al., 2015	Foster alumni (20-49)	n=1038	Major cities: AZ, CA, HI, ID, LA, MT, ND, OK, OR, SD, TX, WA, WY	Behavioral health
Villagrana, 2018	Foster alumni (18-24)	n= 13	Southern California	Behavioral health
Salazar, 2013	Foster alumni and general population (21-37)	n= 250 (alumni), n= 195 (general)	43 states	Behavioral health

Table 2. Summary of Studies on Physical Health used in this review (n = 5).

Author(s), year	Population	Sample size	Location of study	Outcome considered
Zlotnick et al., 2012	Foster care Adults by Childhood Histories	n=2355 (with foster care childhood history), n=68 101 (without)	California	Physical health
Patton et al., 2019	Medicaid-enrolled adolescents (12-17)	n= 180, 000	Washington	Physical health
Fusco, 2020	Foster alumni (18-24)	n= 111	US (unknown local agency)	Physical health
Salazar et al., 2016	Foster alumni (20-37)	n=248	Portland State Uni, OR	Physical health
Zlotnick et al., 2017	Youth village (21-55)	n= 154 (alum), n= 304 (gen. pop)	Israel	Physical health

Table 3. Summary of Studies on Academics used in this review (n = 5).

Author(s), year	Population	Sample size	Location of study	Outcomes considered
Goldberg and Moyer, 2019	Foster alumni (18-25)	n= 12	Massachusetts	Academics
Clemens et al., 2018	Foster youth (4th - 10th grades)	n= 7674	Mountain region state	Academics
Chambers et al., 2018	Foster alumni (20-33)	n= 43	Institutional Review Board (IRB) at California State University, Long	Academics

			Beach approved all research protocols.	
Kirk et al., 2012	Foster Youth (17-20)	n=550	Kansas	Academics
Salazar and Schelbe, 2021	Foster alumni (20-37)	n= 262	US- Casey Family Scholarship Program Foster Care to Success's national scholarship program	Academics

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What Perpetuates the Relationship Between Social Media Usage and Eating Disorders among College Students

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Abstract

The question of the impact of social media on its users has been widely debated in the field of psychology with scholars such as Dr. Aparicio-Martinez and Dr. Ioannidis arguing that increased time on social media (SM) puts users at risk of developing an eating disorder. However, these perspectives have not adequately addressed the issue of which variables of SM perpetuate the relationship between eating disorders and SM usage. My paper addresses the issue of increased rates of eating disorders among college students with special attention to the role that SM usage plays. Specifically, I will be implementing the Eating Disorders Examination Questionnaire (EDEQ), Sociocultural Attitudes Toward Appearance Questionnaire (SATAQ), Depression, Anxiety, and Stress Scale (DASS-21), Social Media Engagement Questionnaire (SMEQ), and the Inventory of Peer Influence on Eating Concern (IPIEC) to show that increased usage of social media, especially on picture-based applications, promotes a sense of unhappiness about one's appearance which puts them at risk of developing an eating disorder. I argue that increased SM usage puts college students at risk of developing an eating disorder. In conclusion, this project, by closely examining what promotes the risk of developing an eating disorder, sheds new light on the neglected issue of unregulated SM content.

Keywords: social media, eating patterns, dieting, college students, eating disorders

Introduction

During the last decade, the rate of mental health complications has steadily increased, especially among the demographic of college-aged adults with eating disorders having the highest mortality and morbidity rates (Aparicio-Martinez et al., 2019; Ioannidis et al., 2021). Several factors like a new routine, schedule, and stress make college a risky time for students to develop disordered eating habits. This phenomenon has been increasingly common among female students with about 17% being affected, compared to about 4% of male students; but male students are less likely to seek treatment (Lipson et al., 2017; Burnette et al., 2019).

Mass media has been a prevalent tool used for decades to influence societal views and has been linked as a powerful contributor to the dissatisfaction women feel about their bodies (Slater et al., 2016). With up to 90% of college students being active on social media, it is the new mass media and content within these social sites is poorly regulated and prey on the vulnerabilities of their users with image-based marketing tactics to get them to engage longer (Slater et al., 2016; Rounsefell et al., 2020). The purpose of this study is to find if increased social media usage influences college student's eating attitudes, and what perpetuates that relationship by looking several dimensions such as most frequently used websites and exercise habits. The overall literature on this topic lacks longitudinal data on the long-term effects of social media on eating habits due to it being a newer form of mass media, as well as the differences in effects based on age, gender, and other demographics. There is also a weakness in the literature about platform specific data, with most studies either focusing on one type of social media or not specifying at all.

Literature Review

Gender and Eating Disorders

The inclusion of gender and sexual demographics provides an insight to researchers on how eating disorders affect different populations on college campuses. The literature on gender and eating disorders tends to fall into two groups: one that examines differences in the prevalence and presentation of eating disorders between males and females, and another that investigates the role of gender in the development and maintenance of eating disorders. Lipson and Sonneville (2017) found that eating disorder symptoms were more common among female students, at 17%, compared to male students at 5.5%, with transgender and gender non-conforming students being at even higher risk. In addition, the study found that students who reported experiencing sexual assault or harassment were more likely to exhibit eating disorder symptoms (Lipson et al., 2017).

Similarly, Quick and Byrd-Bredbenner (2013) found that female students scored higher on the Eating Disorders Examination Questionnaire (EDE-Q), which assesses disordered eating behaviors and attitudes, compared to male students. When examining weight suppression motivations among undergraduate students, it was found that appearance-focused weight suppression motivations were associated with higher levels of body dissatisfaction and disordered eating behaviors, particularly among female students (Burnette et al., 2020). However, the study also found that health-focused weight suppression motivations were not associated with disordered eating behaviors, suggesting that the motivation behind weight suppression may be an important factor to consider when examining gender differences in eating disorders.

These studies suggest that gender is an important factor in the development and prevalence of eating disorders among college students. Female students may be at higher risk for disordered eating behaviors, and body dissatisfaction and experiences of sexual assault or harassment may contribute to this risk (Burnette et al., 2019; Quick et al., 2013; Lipson et al., 2017). However, the motivation behind weight suppression behaviors may also be an important factor to consider, as appearance-focused motivations may be particularly problematic for female students (Burnette et al., 2019). These findings emphasize the need for tailored interventions and support for students struggling with eating disorders, considering the specific risk factors and motivations that may be present. Since the literature mostly focuses on the demographic of women, it is important to include all genders within our study pool.

Social Media and its Role

Several previous studies suggest that social media can play a role in promoting eating disorders and negative body image (Rodgers et al., 2020; Saiphoo et al., 2019; Fardouly et al., 2016). Rodgers et al. (2020) and Fardouly and Vartanian (2016) emphasize that social media plays a role in the development of body image concerns by promoting unrealistic beauty standards and the internalization of these ideals, also known as Objectification Theory. These studies also suggest that social media use can increase the risk of disordered eating and other negative outcomes related to body image concerns as well as contribute to the development of body image concerns and disordered eating behaviors, particularly among vulnerable populations such as adolescent girls and boys (Rodgers et al., 2020; Saiphoo et al., 2019; Fardouly et al., 2016). The articles highlight the need for further research in specific demographic areas, as well as the development of interventions to help mitigate the negative effects of social media on body image and eating behaviors.

'Fitspiration'

In contrast to the work of Rodgers, Saiphoo, and Fardouly, Slater et al., (2016) believe that social media users could just be accessing the wrong kinds of content. They conducted a study of 160 undergraduate students to compare the effects of 'fitspiration' content, which is content such as images, videos, quotes, and advice from users about nutrition and exercise, with self-compassion content on social media. Their results found that there were no immediate effects to individual's body satisfaction after viewing the 'fitspiration' content, but that individuals who viewed self-compassion content had a greater body satisfaction than the other participants. Rather than internalizing 'fitspiration' content, users are much more likely to internalize self-compassion content. This study suggests to researchers that social media can be a beneficial tool for one's outlook on themselves.

To discover what causes eating disorders, studies by Aparicio-Martinez et al., (2019) and Raggatt et al., (2018) used the EAT-26 survey, which uses behavior, feelings, and attitudes to measure eating disorder risk, to study young adults. Aparicio-Martinez et al., (2019) findings suggest that social media use is associated with higher levels of thin-ideal internalization, body dissatisfaction, and disordered eating attitudes, particularly among females. This is in contrast with Raggatt et al. (2018) findings that individuals who engage with fitness inspiration on social media perceive it as a positive influence on their health and well-being, including motivation to exercise and eat healthily. Still, Raggatt et al. (2018) acknowledges the potential negative consequences, such as feelings of inadequacy and guilt when individuals compare themselves to the images they see on social media.

Ioannidis et al., (2021) conducted a cross-sectional study testing multiple hypothesizes on over 600 participants and found that in both men and women, excessive exercise was linked with the consumption of fitspiration content. This adds to the findings of Raggatt et al., (2018) and Slater et al., (2016) by showing how consumption of this content can motivate users to become more active, but it can also push them into the excessive exercise mindset. Others suggest that social media promotes a 'culture of comparison' (Rounsefell et al., 2020; Zhang et al., 2021; Burnette et al., 2019).

Though the topic of eating disorders and social media usage has been a well-researched topic, scholars are still calling for more research to be conducted on the underlying mechanisms that cause the relationship (Burnette et al., 2019). Due to this, future work in the field should focus on clarifying the relationship between mental health outcomes and social media usage, focusing mostly on body image. There is also a lack of longitudinal effects of social media usage in the literature, which is an area that should be examined closely so users are aware of any long-term effects.

The aim of this study is to contribute to the field of ongoing research by implementing well-used measures such as the EDE-Q, SATAQ, DASS-21 and the SMEQ. The research question looks to find if increased social media usage influences college student's eating attitudes. The general hypothesis of this study is that increased social media usage negatively impacts student's eating patterns and hypothesizes that: frequent use of social media will be related to a high score in shape concern, eating restriction, and media internalization.

We will focus on how specific demographics, such as being a college student, gender, and ethnicity, play a role in the relationship between social media usage and eating habits; as well as on specific social media websites that are used by respondents and how that may change their outcomes.

Recently in the field of eating disorders, there have been more calls for research examining the implications that technology and social media play in the role of mental health. By examining the relationship between social media usage and eating disorder risk, we will be adding to the ongoing study of how social media really affects an individual.

Method

Procedure

At least ninety people over the age of eighteen from Stan State were asked by a professor or me to participate in a survey about social media usage and eating habits on

Qualtrics. When the student agreed, they were first informed through a disclaimer about the purpose, procedure, risks, benefits, and all other details of the study that would not give away the hypothesis. If they continued with the study, they were asked to sign a consent form before moving to the survey. Participants were then prompted to the altered version of the surveys and asked to complete the survey at their own pace. After the subject finished their survey, they were notified they had finished, and they were debriefed on the study and thanked for their participation. A copy of the debriefing form can be found in appendix G. The survey was available on Qualtrics for a month.

Once all surveys were submitted, data was analyzed using R language for statistical analysis (R Core Team, 2022). All data collected was captured using Qualtrics, which is password protected and encrypted for protection. All data used was unidentifiable and will not be able to be traced back to the participants in the study.

Design

The general hypothesis of this study is that increased social media usage negatively impacts student's eating patterns and hypothesizes that: frequent use of social media will be related to a high score in shape concern, eating restriction, and media internalization.

Variables that were studied in this design are social media, eating patterns, and influence. Social media was measured by time, usage, content type, and platforms. Eating patterns were measured by restraint, eating concern, shape concern and weight concern. Influence measured rates of anxiety, stress, depression, and media-internalization.

The design of this study is a non-experimental correlational research study of participants that are students from CSU Stanislaus. Questions on the survey were pulled from several inventories from the Eating Disorders Examination Questionnaire (EDEQ), Sociocultural Attitudes Towards Appearance Questionnaire (SATAQ), Depression, Anxiety, and Stress Scale (DASS-21), and Social Media Engagement Questionnaire (SMEQ) that asked the participant about their social media and eating habits as well as attitudes they have toward both. All five measures needed to be included in this survey to measure different variables that were input into a best fit model. Each item has a unique inventory that will be measured against our hypothesis. Administering this survey measured the association between social media usage and a person's eating patterns through a linear regression model. The independent variable was social media usage, and several dimensions were analyzed depending on the frequency.

Participants

We targeted 110 college students, age 18 years or older, from California State University, Stanislaus. We targeted this number in hopes of getting the most accurate results to generalize to the population being looked at. Students were asked to participate in this research study voluntarily and anonymously through the platform Qualtrics utilizing a convenience sample selection to obtain the greatest number of respondents possible for more precise results. Respondent's personal information was kept anonymous to protect the individual as well as allow them to feel comfortable responding to questions that may be uncomfortable. Since the survey is online, it could be done anywhere at any time at the comfort of the respondent, until the deadline closed. The Qualtrics link was distributed on SONA which is an online recruitment site hosted by the Department of Psychology and Child Development.

At the beginning of the survey the consent form appeared; participants will either accept or decline. When they accept the consent, demographic questions appeared at the beginning of the survey indicating the participants gender (male, female, or other), age, race, and ethnicity. A copy of this consent form can be found in appendix F. There was one exclusion criteria question asking participants if they have been diagnosed with an eating disorder at the beginning of the survey. Participants who answered with 'yes' were prompted to the end of the survey, so that they did not skew the results of the survey. Participants who answered 'no' were prompted to the survey questions. A copy of the demographic questions used in this survey can be found in appendix E.

Instruments (Materials)

The survey contained inventory from previous studies; Inventory from the Eating Disorder Examination Questionnaire (EDE-Q 6.0), Sociocultural Attitudes Toward Appearance Questionnaire (SATAQ-3), Depression, Anxiety and Stress Scale (DASS-21), the Social Media Engagement Questionnaire (SMEQ), and the Inventory of Peer Influence on Eating Concerns (I-PIEC) were included. Questions on the survey were Likert-scale questions and multiple-choice questions. Likert-scale questions were measured on the 5-point scale reading: (1) Strongly disagree; (2) Disagree; (3) Neither agree nor disagree; (4) Agree; (5) Strongly agree. Multiple-choice questions will have four or more varying answers to pick from. A copy of each survey can be found in its respective appendix.

The EDE-Q is a self-report questionnaire surveying for risk of eating disorder that consists of twenty-eight items that assess four subscales: restraint, eating concern, shape concern and weight concern. The questionnaire, developed in 1993 by Fairburn, Cooper, and O'Connor (2014), has been used consistently around the globe, making it a well implemented measure that we will have many scores to compare to. This allows us to see where our population falls within the global trend of scores and assess if this is a widespread phenomenon or localized in certain regions. A copy of the questionnaire can be found in Appendix A.

To examine the effect that social media has on internalization, pressure, and information, the self-report SATAQ-3 was adapted and implemented in this study. This questionnaire by Thompson, Berg, Roehrig, Guarda, and Heinberg (2004) originally measured internalization of the media through TV, movies, magazines, and sports athletes, but in this study, it was replaced with social media and social

media influencers. This well-used instrument allows us to see how the change in media consumption has affected students' internalization of beauty ideals. A copy of this revised questionnaire can be found in appendix B.

The SMEQ is a five-item self-assessment questionnaire that measures the participants social media usage. It was originally adapted by Przybylski, Murayama, DeHaan, and Gladwell (2013) to help measure the fear of missing out (FoMo) phenomenon but was used in this study to measure the social media usage and what time of day participants frequently use social media. A copy of this questionnaire can be found in appendix C.

The 21-item DASS-21 assessment created by Lovibond, S. and Lovibond, P. (1995) is a self-report instrument used to measure the mental state of the participant looking at levels of stress, anxiety, and depression. It has been widely used as a valid instrument in studies across the world and will be used in this study to measure the mental state of the participants. They were asked questions like "I found it hard to wind down" and asked to respond with, 0: Did not apply to me at all, 1: Applied to me to some degree, or some of the time, 2: Applied to me to a considerable degree or a good part of time, or 3: Applied to me very much or most of the time. A copy of this assessment can be found in appendix D.

To assess if peer pressure was a motivating factor for developing an eating disorder, the twenty item Inventory of Peer Influence on Eating Concerns (I-PIEC) was included in the study to measure for a confounding variable. This self-report measure was implemented by Oliver, K. and Thelen, H. (1996) to measure peer influence on adolescents eating and body concerns based on three constructs: messages, likability, and interactions. Messages measures the frequency that one receives negative feedback from peers about their body or eating; Interactions measures the frequency peers discuss concerns about body shape and diet, and likability measures how much one believes their thinness relates to their perceived level of likability. Originally, this measure included gender, but for this study it will be excluded to measure general peer influence from one's friend group. It is graded on a five-point Likert-scale and a copy of it can be found in appendix H.

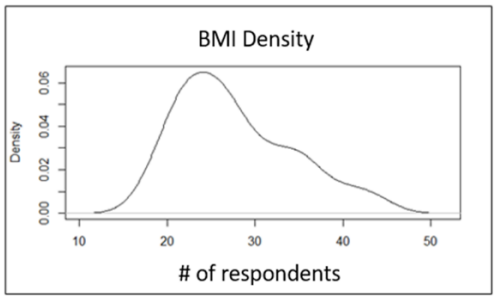
Results

Demographics

Of the 110 people included in our analysis, 91% identified as female and 11% identified as male, no gender minorities volunteered to be in the study. Roughly 35% of people in this study were between the ages of 18-21, 30% were between 22-25, 21% were between 25-30, and 14% were 30 years old or older. When given an open-ended question about their race, 18% of participants identified as white, 62% identified themselves as Hispanic, 5% were Filipino, 3% black, 9% were Asian, and American Indian, Punjabi, and Middle Eastern all matched 1% of respondents.

Respondents were asked to self-report their weight and height in the demographics section of the survey. The data for weight is skewed left with most of the respondents in this survey weighing between 100 pounds(lbs.) to 200 pounds. Around 22% weighed 98-128lbs, 31% weighed 128-158lbs, 26% weighed 158-188lbs, then begins to decrease with about 11% of respondents weighing 188-218lbs, 3% weighed 218-248ibs, 5% weighed 248-278lbs, and less than 1% weighed over 278. When asked to report their height, 16% of people in this study reported they were 5'0ft or shorter. About 50% of the respondents in our study were between 5'3 and 5'5, and there were no respondents who were over 6 feet tall, so we have a rather short population. Looking at the density plot in figure 1, the results are skewed to the left showing that most of our respondents fall on the lower end of the BMI scale, this can be seen on the scatterplot as well where the data is more concentrated toward the beginning.

Figure 1

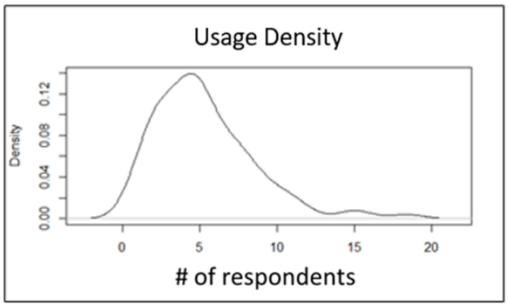


Usage

When examining self-reported usage by social media type, Tik Tok was found to be the most popular with 88% of respondents being users. Instagram and YouTube came in second with both having about 84% of respondents being users. Snapchat was next with about 68% of respondents being users, then it began to taper down from there. These findings are interesting because the most frequently used sites by the respondents were all picture-based applications.

When we asked respondents to self-report their daily social media usage, we found the average time to be about 5.4 hours per day with the minimum reported time being about half an hour and the maximum reported time being a little bit over 18 hours. In the density plot for usage in figure 2, the data is skewed to the left again with most of the respondents falling between about 2 to 8 hours on social media per day.

Figure 2



Scales

With the scales that we implemented in this study, we found that the Depression, Anxiety, and Stress (DASS-21) scale was not a strong predictor of ED risk, the highest score one could get on the survey was a 3 and the means for all scales with this tool fell below 1, which shows there is not a high risk.

The Social Media Engagement Questionnaire (SMEQ) was a better scale for ED risk, with the highest possible score on the exam being a 7 and the mean score being almost 5. This questionnaire reflected on how users engaged with social media, as in what time of day and if they did so while eating.

The Sociocultural Attitudes Towards Appearance Questionnaire (SATAQ) tested three different subscales, pressure, information, and internalization. We found that information had the strongest relationship with ED risk because the mean score was about 3.1 while the highest possible score on that measure was 5. The variable information is related to the importance one places on the sociocultural information they gather on social media like attractiveness and fashion.

The Inventory of Peer Influence on Eating Concern (IPIEC) was also not a good measure for ED risk in this study, the highest score one could get was a 5, and the mean score on all measures fell below 2 which does not show a strong relationship.

The Eating Disorder Examination Questionnaire also did not measure ED risk well in this study because the mean for this tool on all measures fell below 2.5, and the highest score one could get was a 6. This shows that there is not a strong correlation. The values for each of these scales can be found in figure 3.

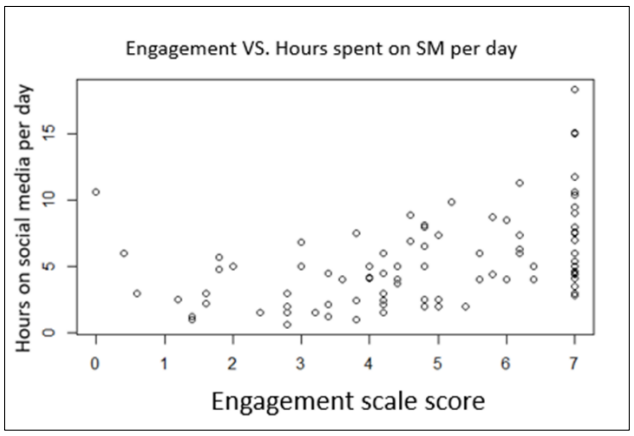
Figure 3

	Variable	MIN	1ST Q	MEDIAN	MEAN	3RD Q	MAX	NA
DASS-21:	anxiety	0	0.14	0.43	0.63	1	2.86	1
	stress	0	0.29	0.71	0.87	1.29	2.71	3
	depression	0	0.14	0.43	0.67	1	3	3
SMEQ:	engagement	0	3.45	4.8	4.84	7	7	0
SATAQ:								
	pressure	1	2.57	3.0	2.89	3.29	3.86	2
	information	1	2.86	3.14	3.1	3.29	4.14	0
	internalization	1.14	2.43	3.21	3.01	3.57	4.36	0
IPIEC:								
	messages	1	1	1	1.23	1.25	3.5	0
	interactions	1	1	1.6	1.88	2.4	4.6	1
	likability	1	1	1	1.395	1.57	4.14	0
EDEQ:								
	restraint	0	0.6	1.4	1.64	2.4	5.6	0
	shape concern	0	1	2.25	2.44	3.63	5.63	0
	weight concern	0	1	1.7	2.12	3.2	5.4	0
	BMI	17.16	22.62	26.57	27.72	32.24	44.62	1

Best Fit Linear Model: Engagement and Information

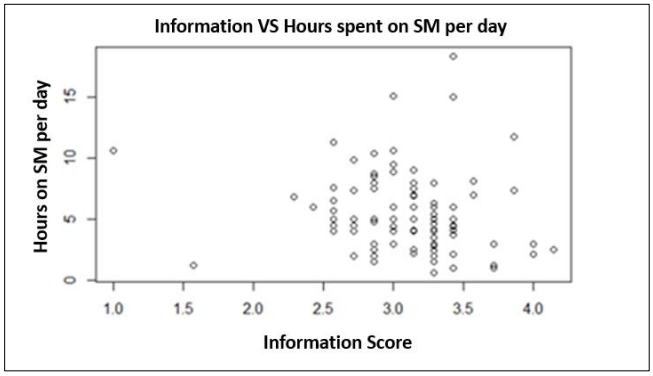
When we uploaded all response data to R language and coded a best fit model testing the thirteen different variables, it computed that the variables engagement and information had the strongest relationship with their self-reported social media usage. With this information, we plotted a linear model of engagement versus time spent on social media per day as well as a linear model of information versus time spent on social media per day. In figure 4, the graph Engagement VS. Hours spent on SM per day shows a positive, linear correlation between engagement and time on SM. This means that the more one engages throughout the day with SM, the more likely they are to spend more time on SM.

Figure 4



In figure 5, the graph of Information VS. Hours spent on SM per day, shows how most respondents in this study believed that social media was an important source for gathering information about sociocultural attitudes, especially about attractiveness and fashion. The X-axis on the scale refers to their Likert-scale score, which shows that generally all respondents agree that SM is important for information about sociocultural trends.

Figure 5



Conclusion

In conclusion, this research article has explored the relationship between social media usage and eating disorders among college students. The findings from the literature review indicate that female students are more susceptible to developing disordered eating habits, and social media has emerged as a powerful contributor to body dissatisfaction and negative body image. While some studies suggest that social media promotes unrealistic beauty standards and the

internalization of these ideals, others propose that social media can have positive effects on body satisfaction through self-compassion content.

The existing literature also highlights the need for further research on the underlying mechanisms that perpetuate the relationship between social media usage and eating disorders. Longitudinal studies are particularly lacking in the field, and more attention should be given to platform-specific data, as most studies either focus on one type of social media or do not specify at all.

The present study aims to contribute to this ongoing research by examining the influence of social media usage on college students' eating attitudes. It takes into account specific demographic factors such as gender and ethnicity and focuses on the most frequently used social media websites. By utilizing well-established measures, the study aims to provide insights into the association between social media usage and eating patterns, including shape concern, eating restriction, and media internalization.

The study design is non-experimental and correlational, involving participants from California State University, Stanislaus. The use of validated inventories and a linear regression model will help analyze the data and determine the associations between social media usage and eating patterns. The study's findings will contribute to a better understanding of how social media truly affects individuals, particularly in terms of their mental health and body image.

In conclusion, this research seeks to address the existing gaps in the literature by investigating the relationship between social media usage and eating disorders among college students. By considering various dimensions of social media usage and employing validated measures, the study aims to shed light on the complex interplay between social media, body image, and eating attitudes. The findings will have implications for future interventions and support programs targeting college students struggling with eating disorders and body dissatisfaction in the digital age.

Discussion

The literature review revealed that eating disorders are a growing concern among college-aged adults, particularly females. Studies have shown that female students are more likely to exhibit eating disorder symptoms compared to male students. Factors such as body dissatisfaction, experiences of sexual assault or harassment, and appearance-focused weight suppression motivations contribute to the higher risk among female students. These findings underscore the need for tailored interventions and support for students struggling with eating disorders, taking into account the specific risk factors and motivations that may be present. However, there is a lack of research focusing on eating disorders and social media usage among all genders, which highlights the importance of including all genders in the study.

Social media has emerged as a powerful contributor to body dissatisfaction and the development of eating disorders. Research suggests that social media promotes unrealistic beauty standards and the internalization of these ideals, leading to negative body image and disordered eating behaviors. The content within social media platforms, such as images, videos, quotes, and advice, can negatively impact individuals' body satisfaction. However, there are conflicting findings regarding the effects of social media on body image and eating behaviors. Some studies suggest that self-compassion content on social media can have positive effects on body satisfaction, while others highlight the potential negative consequences of excessive exercise and the culture of comparison promoted by social media.

The present study aims to contribute to existing research by examining the association between social media usage and eating attitudes among college students. The hypotheses suggest that increased social media usage will be related to high scores in shape concern, eating restriction, and media internalization. Furthermore, social media usage will be correlated with anxiety, depression, and stress. The study will also explore the role of specific demographics, such as being a college student, gender, and ethnicity, in this relationship, as well as the impact of specific social media platforms on outcomes.

The study design will be a non-experimental correlational research study using well-established measures such as the EDE-Q, SATAQ, DASS-21, and SMEQ. These measures will assess social media usage, eating patterns, and various influences. Data analysis will involve the use of R language for statistical analysis, and measures of reliability, such as Cronbach's Alpha, will be implemented to ensure the consistency and reliability of the survey.

The target participants will be college students from CSU Stanislaus, and a convenience sample selection will be utilized to obtain a sufficient number of respondents. The study will be conducted online using Qualtrics, ensuring anonymity and protecting participants' personal information. The survey will include demographic questions to capture relevant participant characteristics, and exclusion criteria will be applied to exclude individuals diagnosed with eating disorders.

The findings from this study will contribute to the ongoing research on the implications of social media usage on mental health, particularly body image and eating disorders. By examining the association between social media usage and eating disorder risk, the study aims to shed light on the underlying mechanisms and provide valuable insights for interventions and support programs.

However, it is important to acknowledge the limitations and gaps in existing literature. The literature review highlighted the lack of longitudinal data on the long-term effects of social media on eating habits, as well as the limited focus on platform-specific data. Future research should aim to address these gaps and provide a more comprehensive understanding of the relationship between social media usage and eating disorders.

In conclusion, the present study seeks to contribute to the field by examining the relationship between social media usage and eating attitudes among college students. The findings will help enhance our understanding of how social media influences body image and eating behaviors, with implications for tailored interventions and support programs.

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Appendix A

Eating Disorder Examination Questionnaire – EDEQ

Fairburn, C., Cooper Z., & O'Connor, M. (2014) Eating Disorder Examination. *Child Outcomes Research Continuum*, 17.0D. https://www.corc.uk.net/outcome-experience-measures/eating-disorder-examination-questionnaire-ede-q/

Instructions: The following questions are concerned with the past four weeks (28 days) only. Please read each question carefully. Please answer all the questions. Thank you.

Questions 1 to 12: Please choose the appropriate number. Remember that the questions only refer to the past four weeks (28 days) only.

ON HOW MANY OF THE PAST 28 DAYS ...

No Days	**0**
1-5 Days	**1**
6-12 Days	**2**
13-15 Days	**3**
16-22 Days	**4**
23-27 Days	**5**
Every Day	**6**

1. Have you been deliberately trying to limit the amount of food you eat to influence your shape or weight (whether you have succeeded)?

2. Have you gone for long periods of time (8 waking hours or more) without eating anything at all in order to influence your shape or weight?

3. Have you tried to exclude from your diet any foods that you like in order to influence your shape or weight (whether you have succeeded)?

4. Have you tried to follow definite rules regarding your eating (for example, a calorie limit) in order to influence your shape or weight (whether you have succeeded)?

5. Have you had a definite desire to have an empty stomach with the aim of influencing your shape or weight?

6. Have you had a definite desire to have a totally flat stomach?

7. Has thinking about food, eating or calories made it very difficult to concentrate on things you are interested in (for example, working, following a conversation, or reading)?

8. Has thinking about shape or weight made it very difficult to concentrate on things you are interested in (for example, working, following a conversation, or reading)?

9. Have you had a definite fear of losing control overeating?

10. Have you had a definite fear that you might gain weight?

11. Have you felt fat?

12. Have you had a strong desire to lose weight?

Questions 13-18: Please choose the appropriate number. Remember that the questions only refer to the past four weeks (28 days). Over the past four weeks (28 days) ….

Never happens	**0**
Rarely	**1**
Sometimes	**2**
Often	**3**
Always	**4**

13. How often have you eaten what other people would regards as an unusually large amount of food (given the circumstances)?

14. How often did you have a sense of having lost control over your eating (at the time you were eating)?

15. Have often have such episodes of overeating occurred (i.e., you have eaten an unusually large amount of food and have had a sense of loss of control at the time)?

16. Over the past 28 days, how often have you made yourself sick (vomit) as a means of controlling your shape or weight?

17. Over the past 28 days, how often have you taken laxatives as a means of controlling your shape or weight?

18. Over the past 28 days, how often have you exercised in a "driven" or "compulsive" way as a means of controlling your weight, shape or amount of fat, or to burn off calories?

Questions 19 to 21: Please choose the appropriate number. Please note that for these questions the term "binge eating" means eating what others would regard as an unusually large amount of food for the circumstances, accompanied by a sense of having lost control overeating.

No Days	**0**
1-5 Days	**1**
6-12 Days	**2**
13-15 Days	**3**
16-22 Days	**4**
23-27 Days	**5**
Every Day	**6**

19 Over the past 28 days, on how many days have you eaten in secret (i.e., furtively)? … Do not count episodes of binge eating.

20. The number of the times that you have eaten, and you felt guilty (felt that you've done wrong) because of its effect on your shape or weight? … Do not count episodes of binge eating.

21. Over the past 28 days, how many days have you been concerned about other people seeing you eat? … Do not count episodes of binge eating.

Questions 22 to 28: Please choose the appropriate number on the right. Remember that the questions only refer to the past four weeks (28 days).

ON HOW MANY OVER THE PAST 28 DAYS ...

Not at all	**0**
Slightly	**1**
Sometimes	**2**
Moderately	**3**
Usually	**4**
Markedly	**5**
Always	**6**

22. Has your weight influenced how you think about (judge) yourself as a person?

23. Has your shape influenced how you think about (judge) yourself as a person?

24. How much would it have upset you if you had been asked to weigh yourself once a week (no more, or less, often) for the next four weeks?

25. How dissatisfied have you been with your weight?

26. How dissatisfied have you been with your shape?

27. How uncomfortable have you felt seeing your body (for example, seeing your shape in the mirror, in a shop window reflection, while undressing or taking a bath or shower)?

28. How uncomfortable have you felt about others seeing your shape or figure (for example, in communal changing rooms, when swimming, or wearing tight clothes)?

Appendix B

Sociocultural Attitudes Toward Appearance Questionnaire – SATAQ

Thompson, J., Berg, P., Roehrig, M., Guarda, A., & Heinberg, L. (2004) Sociocultural Attitudes Towards Appearance Scale-3 (SATAQ-3): Development and Validation *The International journal of eating disorders*, 35 (3), 293-304 https://onlinelibrary-wiley-com.lib.proxy.csustan.edu/doi/abs/10.1002/eat.10257

Please read each of the following items carefully and indicate the number that best reflects your agreement with the statement.

Definitely disagree	**1**
Mostly disagree	**2**
Neither agree nor disagree	**3**
Mostly agree	**4**
Definitely agree	**5**

1. Posts on social media are an important source of information about fashion and "being attractive."
2. I've felt pressure from social media to lose weight.
3. I do not care if my body looks like the body of people who are on social media.
4. I compare my body to the bodies of people who are on social media.
5. Social media advertisements are not an important source of information fashion and "being attractive."
6. I do not feel pressure from social media to look pretty.
7. I would like my body to look like the models who appear on social media.
8. I compare my appearance to the appearance of social media influencers.
9. I've felt pressure from social media to be thin.
10. I would like my body to look like the people who are on social media.
11. I do not compare my body to the bodies of people who appear on social media.
12. Social media is not an important source of information about fashion and "being attractive."
13. I've felt pressure from social media to have a perfect body.
14. I wish I looked like the models on social media.
15. I compare my appearance to the appearance of people on social media.
16. Social media advertisements are an important source of information about fashion and "being attractive."
17. I've felt pressure from social media to diet.
18. I do not wish to look as athletic as the people on social media.
19. I compare my body to that of people in "good shape."
20. Pictures on social media are an important source of information about fashion and "being attractive."
21. I've felt pressure from social media to exercise.
22. I wish I looked as athletic as social media influencers.
23. I compare my body to that of people who are athletic.
24. I've felt pressure from social media to change my appearance.
25. I do not try to look like the people on social media.
26. Social media influencers are not an important source of information about fashion and "being attractive."
27. Social media influencers are an important source of information about fashion and "being attractive."
28. I try to look like social media influencers.

Appendix C

Social Media Engagement Questionnaire: SMEQ

Przybylski, A. K., Murayama, K., DeHaan, C. R., & Gladwell, V. (2013). Motivational, Emotional, and Behavioral Correlates of Fear of Missing Out. *Computers in Human Behavior*, 29, 1814-1848. https://www-sciencedirect-com.lib.proxy.csustan.edu/science/article/pii/S0747563213000800

Participant Instructions: Please reflect on how you used social media (e.g., Facebook or Twitter) in last week and respond to the following items.

Response Anchors:

Not one day	**0**
One day	**1**
Two days	**2**
Three days	**3**
Four days	**4**
Five days	**5**
Six days	**6**
Every day	**7**

Items

1. How often did you use social media in the 15 minutes before you go to sleep?
2. How often did you use social media in the 15 minutes after you wake up?
3. How often did you use social media when eating breakfast?
4. How often did you use social media when eating lunch?
5. How often did you use social media when eating supper?

Appendix D

Depression Anxiety and Stress Scales – DASS-21

Lovibond, S.H. & Lovibond, P.F. (1995). Manual for the Depression Anxiety & Stress Scales. Sydney: Psychology Foundation, 2. https://arc.psych.wisc.edu/self-report/depression-anxiety-stress-scale-21-dass21/

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you over the past week. There are no right or wrong answers. Do not spend too much time on any statement. The rating scale is as follows:

Did not apply to me at all.	**0**
Applied to me to some degree, or some of the time.	**1**
Applied to me a considerable degree or a good part of the time.	**2**
Applied to me very much or most of the time.	**3**

1. (s) I found it hard to wind down

2. (a) I was aware of dryness of my mouth

3. (d) I couldn't seem to experience any positive feeling at all

4. (a)I experienced breathing difficulty (e.g., excessively rapid breathing, breathlessness in the absence of physical exertion)

5. (d) I found it difficult to work up the initiative to do things

6. (s) I tended to over-react to situations

7. (a) I experienced trembling (e.g., in the hands)

8. (s) I felt that I was using a lot of nervous energy

9. (a) I was worried about situations in which I might panic and make a fool of myself

10. (d) I felt that I had nothing to look forward to

11. (s) I found myself getting agitated

12. (s) I found it difficult to relax

13. (d) I felt downhearted and blue

14. (s) I was intolerant of anything that kept me from getting on with what I was doing

15. (a) I felt I was close to panic

16. (d) I was unable to become enthusiastic about anything

17. (d) I felt I wasn't worth much as a person

18. (s) I felt that I was rather touchy

19. (a) I was aware of the action of my heart in the absence of physical exertion (e.g., sense of heart rate increase, heart missing a beat)

20. (a) I felt scared without any good reason

21. (d) I felt that life was meaningless.

Appendix E

Demographic Items

Questions 1-4 below are demographic questions with multiple choice responses, please choose the best option(s) that apply to you. There will be one scaler question in which you are asked to slide the cursor to the best position that applies to you.

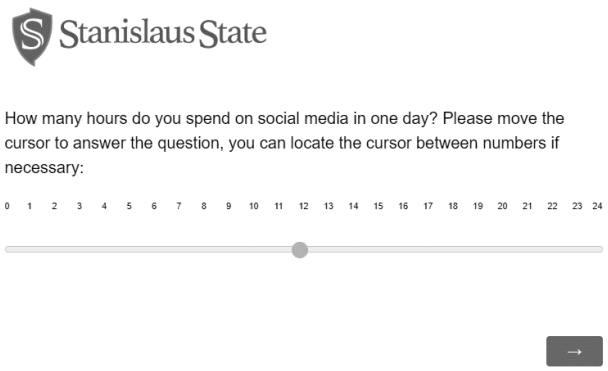
1. What gender do you identify with?
    a) Male
    b) Female
    c) Transgender
    d) Non-binary
    e) Other

2. What year student are you?
a) First year
b) Second year
c) Third year
d) Fourth year
e) Fifth year
f) Sixth year +

3. Which social media websites do you use (please select all the websites that apply to you)?
    a. Instagram
    b. TikTok
    c. YouTube
    d. Twitter
    e. Facebook
    f. Snapchat
    g. Reddit
    h. Linked in
    i. Discord
    j. What's app
    k. Twitch

l. Pinterest
m. Tumblr
n. Flickr
o. Quora
p. WeChat
q. Dating apps

4. On average, how many hours do you spend a day on social media?



Questions 5-9 are free response demographic questions where you will fill in the best answer that applies to you.

5. What is your age?
6. What is your race and/or ethnicity?
7. What is your current height?
8. What is your current weight?
9. Of the social medias that you picked previously, which social media do you spend the **most** time on?
10. How much do you exercise per week in minutes?

Appendix F

CONSENT FORM

The relationship between Social Media usage and College Student's Habits

1. **Summary:** This research study will examine social media, feelings and habits. If you agree to participate, you will be asked to complete a multiple-choice survey with about seventy questions.

2. **Your right to withdraw/discontinue:** You are free to discontinue your participation at any time without penalty. You may also skip any survey questions that make you feel uncomfortable. Even if you withdraw from the study, you will receive any entitlements that have been promised to you in exchange for your participation, such as an experimental credit in Qualtrics.

3. **Benefits:** Participation in this research study does not guarantee any benefits to you. However, possible benefits include the fact that you may learn something about how research studies are conducted, and you may learn more about your habits and feelings. There is no anticipated commercial profit related to this research.

4. **Additional information:** You will be given additional information about the study after your participation is complete.

5. **Costs:** If you agree to participate in the study, it may take up to 45 minutes to complete the survey. There are no costs to you beyond the time and effort required to complete the procedures listed above.

6. **Guarantee of Confidentiality:** All data from this study will be kept from inappropriate disclosure and will be accessible only to the researchers and their faculty advisor. Data collected online will be stored on a password-protected website and de-identified for analyses. The researchers **will** keep your data to use for future research (or other purpose, if applicable). We may share your research data with other investigators without asking for your consent again, but it will not contain information that could identify you. The researchers are not interested in anyone's individual responses, only the average responses of everyone in the study.

7. **Risks:** The present research is designed to reduce the possibility of any negative experiences as a result of participation. Risks to participants are kept to a minimum. However, if your participation in this study causes you any concerns, anxiety, or distress, please contact the Student Counseling Center at (209) 667-3381 to make an appointment to discuss your concerns

8. **Researcher Contact Information:** This research study is being conducted by Alainna Davis. The faculty supervisor is Dr. Esteban Montenegro-Montenegro, Department of Psychology and Child Development, California State University, Stanislaus. If you have questions or concerns about your participation in this study, you may contact the researchers through Dr. Esteban Montenegro-Montenegro at emontenegro1@csustan.edu.

9. **Results of the Study:** You may obtain information about the outcome of the study at the end of the academic year by contacting Dr. Esteban Montenegro-Montenegro. You may also learn more about the results of the study by attending the Psychology Department's Undergraduate Research Symposium at the end of the semester.

10. **Psychology Institutional Review Board Contact Information:** If you have any questions about your rights as a research participant, you may contact the Chair of the Psychology Institutional Review Board of

California State University Stanislaus at psychologyIRB@csustan.edu.

11. **Personal Copy of Consent Form**: You may print a blank, unsigned copy of this consent form now.

12. **Verification of Adult Age:** By clicking "I Agree" below, you attest that you are 18 years old or older.

13. **Verification of Informed Consent:** By clicking "I Agree" below, you are indicating that you have read and understand the information above, that all of your questions have been answered to your satisfaction, and that you freely consent to participate in this research study.

- I agree
- I do not agree

Appendix G

DEBRIEFING FORM

The relationship between Social Media Usage and Eating Disorders among College Students

Thank you for participating in this study! We are interested in understanding if increased social media usage is correlated with increased rate of eating disorders on college campuses. Prior research suggests that college students are an at-risk population for eating disorders due to factors like stress, a new routine, and societal standards. More recent studies are looking to see if social media is another factor that contributes to the rate of eating disorders on college campuses because young adults make up the majority of social media users, and mass media has been significantly linked to promoting body ideals for decades. We expect to find comparable results in our study.

All the information we collected in this study will be kept safe from inappropriate disclosure, and there will be no way of identifying your responses in the data archive. We are not interested in anyone's individual responses; rather, we want to look at the general patterns that emerge when all the participants' responses are put together. We ask that you do not discuss the nature of the study with others who may later participate in it, as this could affect the validity of our research conclusions.

If you have any questions about the study or would like to learn about the results of the study, you may contact me, Alainna Davis through my research supervisor, Dr. Esteban Montenegro-Montenegro, emontenegro1@csustan.edu. You may also learn more about the results of the study by attending the Psychology Department's Undergraduate Research Symposium at the end of the semester. If you have questions about your rights as a research participant, you may contact the Chair of the Psychology Institutional Review Board of California State University Stanislaus at psychologyIRB@csustan.edu. If participation in the study caused you any concern, anxiety, or distress, you may contact the Student Counseling Center at (209) 667-3381.

If you would like to learn more about this research topic, we suggest the following references:

Ioannidis, K., Hook, R., Grant, J., Czabanowska, K., Roman-Urrestarazu, A., & Chamberlain, S. (2021) Eating Disorders with Over-Exercise: A Cross-Sectional Analysis of the Mediational role of Problematic Usage of the Internet in Young People. *Journal of Psychiatric Research*, 132, 215-222 https://www-sciencedirect-com.lib.proxy.csustan.edu/science/article/pii/S0022395620310608

Lipson, SK. & Sonneville, KR. (2017) Eating Disorder Symptoms among Undergraduate and Graduate Students at 12 U.S. Colleges and Universities. *Eating Behaviors: an International Journal* 24, 81-88 https://www-sciencedirect-com.lib.proxy.csustan.edu/science/article/pii/S1471015316302586

Rounsefell, K., Gibson, S., McLean, S., Blair, M., Molenaar, A., Brennan, L., Truby, H., & McCaffrey, T. (2020) Social media, Body Image and Food Choices in Healthy Young Adults: A Mixed Methods Systematic Review. *Nutrition & Dietetics*, 77 (1), 19-40 https://web-p-ebscohost-com.lib.proxy.csustan.edu/ehost/pdfviewer/pdfviewer?vid=0&sid=91d76058-d3fb-4d04-ac76-b8d2b5fb6cb5%40redis

Appendix H

Inventory of Peer Influence on Eating Concerns

Oliver, K. & Thelen, M. (1996). Children's Perceptions of Peer Influence on Eating Concerns. *Behavior Therapy*, 27, 25-39. https://www-sciencedirect-com.lib.proxy.csustan.edu/science/article/pii/S0005789496800335

Response Anchors:

1	Never
2	Almost never
3	Not Very Often
4	Sometimes
5	A lot

1. Friends and I compare how our bodies look in our clothes.
2. Friends say that they don't like me because of my body.
3. I think that my friends think I would look better thinner.
4. My friends say that I am fat.
5. My friends and I compare the size and shape of our bodies.
6. If I were thinner, I think that my friends would want to sit next to me more often.
7. Friends tease me or make fun of me about the size or shape of my body.
8. My friends and I compare how our bodies look in the mirror.

9. Friends laugh at me or make fun of me because of my body.
10. I think that my friends would want to hang out with me more if I were thinner.
11. My friends and I talk about what we would like our bodies to look like.
12. My friends say that I should go on a diet.
13. My friends say that I eat food that will make me fat.
14. I talk with friends about what types of food make people fat.
15. I think that my friends would talk to me more if I were thinner.
16. I think that having a thin body is a good way for me to be liked by my friends.
17. My friends say that I would look better if I were thinner.
18. I think that my friends would like me more if I were thinner.
19. I think that my friends think I am fat.
20. If I had a thinner body, I think that people would pay more attention to me.

Climate Change Analysis and Datasets Derived Through Computer Vision

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Abstract

Since the 1970s, Climate Science has come to produce significant contributions towards an understanding of climate change, and humanities understanding of this world that supports it. The development of climate data is essential to the ability of Climate Science to monitor the climate system, detect contributors to climate change, measure the impacts of climate variability, and support an improved understanding of the climate system. This work aims to contribute to this body of research through the development of a novel methodology for creating climate data sets from satellite generated image data. Utilizing Computer vision on image data this work intends to produce climate data sets that can be analyzed and visualized. The resulting analysis on the developed data sets will demonstrate the effectiveness of the computer vision model to generate usable numerical data form image data.

Introduction

This interdisciplinary work will operate in both the Climate Science and Computer Science domains. The value of the incite that Climate Science provides can be seen in the $37 billion investment in relevant research by the world bank in 2022 alone. These incites include better understanding of weather phenomena like El Niño, allowing for predictions of precipitation, heat waves tidal activities and more. Climate Science has become essential to agricultural production which is charged with meeting the demand of societies' needs worldwide and is essential to the survival of humanity. Climate change effects the ability of agricultural production meet its societies demands. Changing seasonal trends affect when the crop should be planted and when they should be harvested. Changes in lengths of seasons have an impact on the ability of crops to mature. Shorter and lighter rainy seasons affect the available water supplies, and replenishment of water tables vital to the success of agricultural production. The effect of climate change on agricultural production is discussed in the work of Naveen Kumar Arora (2019). The focus of the work by is the projection of climate change over the next twenty-five years and its impact on the ability of agricultural productivity to supply a growing population worldwide. Another work by Tapan B. Pathak, et al. (2018) utilizes Climate Science to describes the effect of climate change on California ability to maintain its agricultural productivity in the future. Essential to these and other works that utilize climate science is climate data.

Computer vision is the concept of teaching a computer to gather and interpret usable information from image data. It is widely used as a tool across many disciplines. In the medical industry computer vision models are trained on large image data sets so that they may be used in the identification of abnormalities that may be missed by a fatigued human eye. Computer vision is also used in self driving cars, military and civilian drones. It also finds daily implementations every time face recognition is used to unlock a smart phone or googles image search tool is used, computer vision is at work. This work aims to use computer vision on image data in order to develop numerical datasets representing climate data.

Methods

This work utilizes satellite generated image data sets from NOAA, NASA, and Organ State University which visualize temperatures, precipitation, and snow cover as global maps examples from the datasets can be seen in Figure 1.0. The generation of a data set in a manner aligned with the goals of this work requires the development of a computer vision model that can parse information found in satellite generated image data. We first aim to develop a mode that can successfully operate on a subsection of the Western United States. After developing the ability to parse information as described on a subsection of the Western United States we need a way to take, then generate representative numerical data. To do this we measure the area in pixels that are within a targeted measurement range for each type of climate map. With respect to temperature the targeted measurement ranges include first temperatures at or below thirty-two degrees Fahrenheit, then greater than or equal to ninety degrees Fahrenheit. With respect to precipitation, we have limited observation

Fig. 1.0: Three Examples of the image data utilized as inputs to computer vision model.

range to greater than or equal to one half an inch to less than five inches. For snow coverage we target areas that have a measurement of one hundred percent snow coverage. Once the area in pixels within the targeted measurement range has been calculated we then use a determined pixel to mile ration to find the corresponding area in miles. This process is completed on every image provided to the model and the area in both pixels and miles is recorded into a data table. After operating the computer vision model on all three data sets, totalling more than six thousand images, we proceed to the analysis phase in which we analyse and visualize the data in order to demonstrate the effectiveness of the computer vision model at generating usable numerical data from image data.

Results

The resulting data sets from operating the developed model on over six thousand images have been calculated and visualized, some of the results from these operations are included below. In Figure 1.1 and Figure 1.2 we have graphed the generated data for temperatures, at or below thirty-two degrees Fahrenheit and at or above ninety degrees Fahrenheit, by day. We do this in order to get an initial look at the behaviour of the data produced by the model. Looking at the data in this way motivated the search for the greatest peak values on the graph of Figure 1.1. We observed that the date with the largest recorded area was found in January of 2020 with a value of 265,300 square miles. We compared this to the largest value recorded in the first year of our data 2015 which was 264,291 square mile and found that the January, 2020 reading was more than 1,000 square miles greater than the largest reading in 2015.

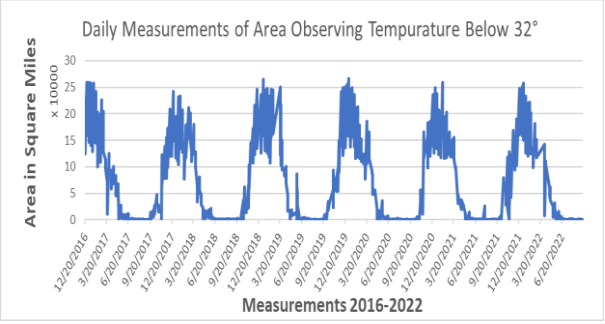

Fig. 1.1: Daily value of area where temperatures measurements were below 32°.

In Figure 1.1 and Figure 1.2 we see a repetition of peaks and valleys. Which prompted the question, how do the values in the graph compare to one

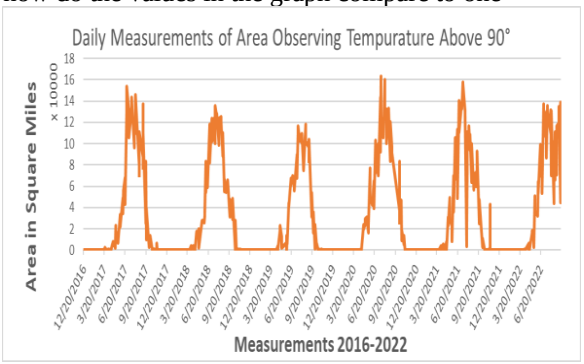

Fig. 1.2: Daily value of area where temperatures measurements were above 90°.

another in relation to their peaks and valleys. This question is answered by Figure 1.3. Figure 1.3 is a clipping from the larger graph which expands to the entirety of the observation period. Looking at the graph we see that the clusters of peaks for each considered temperature occur during the valleys of the other. This graph also brought to our attention that the amplitude of the peaks for each considered temperature are noticeably different. With temperatures at or below 32° achieving nearly twice the amplitude in peak value. Which means that at their peak values temperatures at or below 32° covered much more area than that of temperatures above 90°.

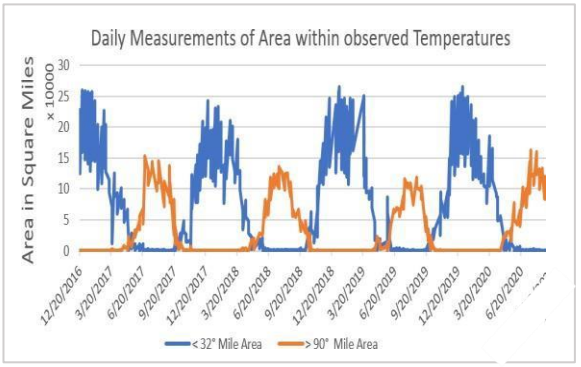

Fig. 1.3: Daily value of area where temperatures in observation range.

Year	Temperature ≤ 32° F	Temperature ≥ 90° F
2015	7,1936	3,0174
2016	7,2188	2,9035
2017	7,2066	3,1755
2018	6,8179	3,1957
2019	8,3385	2,4537
2020	6,8640	3,4701
2021	6,5212	3,3506
2022	6,5783	4,0459

Table. 1.0: Yearly average area with temperatures in observations range.

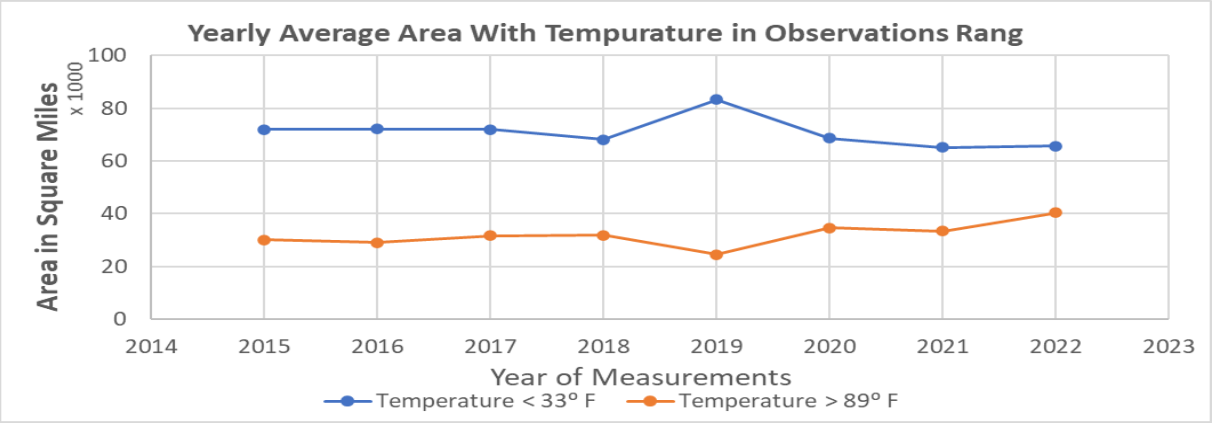

Fig. 1.4: Yearly average measurements of area with temperatures in observation range.

With a desire to see the behaviour of the data over an annual bases, the average observed measurement for each considered temperature have been calculated for each year in the data set. The results of these calculations can be seen in Table 1.0. The graph of the calculations can be found in Figure 1.4. In Figure 1.4 we can see that, during the observed period, there is a decrease in average area with the temperatures at or below 32° and an increase in average area with temperatures at or above 90°. While this is an interesting observation of the data it is important to note that the time period utilized is too small a sample size to generate results to be used as a foundation to make any claims on climate trajectory.

The analysis on the temperature data has served to demonstrate the capabilities of the model to successfully take image data and generate relevant datasets. The model was also successful in generating datasets for both snow coverage and precipitation, however because of the successful demonstration of the model work on temperature images, minimal analysis was conducted on data generated from the snow coverage and precipitation images. Graphs of the model generated data for snow coverage which can be found in Figure 1.5 and precipitation which can be seen in Figure 1.6.

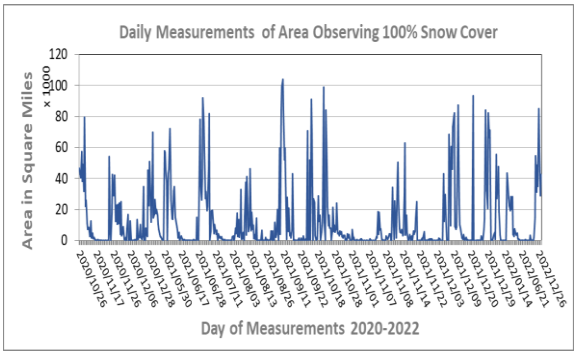

Fig. 1.5: Daily Measurements of area observing 100% snow coverage.

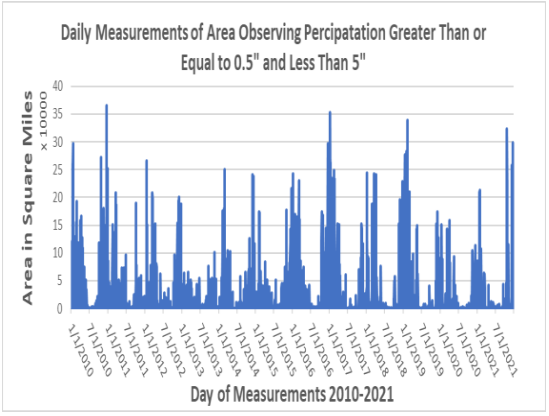

Fig. 1.6: Daily Measurements of area observing greater than or equal to 0.5” or less than 5”.

Conclusion

The goal of this work was to develop a computer vision model that could take in climate image data as an input and provide representative numerical data as an output to further support meteorologists. While this work chose to operate the developed model in the domain of climate science; however, it is important to note that the applications of this model are not limited to climate science. The model could very easily operate in other domains for example, the model could be implemented in bacteriology. Providing the model with images of bacteria, the effectiveness of different antibiotics could be compared by calculating the area of expansion or contraction of the bacteria on a petri dish over time. This would then relieve the bacteriologist from having to manually measure the bacteria on each dish, allowing for mass calculation and analysis in minutes compared to hours. Future work will include tunning the model to operate equally as successful at a global scale. Additional work could include adding a machine learning component to the model that allows the program to automatically identify an image's colour key and reliably couple pixel colour values to targeted image characteristic values. In closing as demonstrates by the analysis above this research has produced a computer vision model that can successfully utilize image data to generate numerical data.

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How Does Sharing Artwork on Social Media Affect Artists and their Artwork?

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Abstract

The purpose of this research is to find the effects placed on artists and their artwork by using social media as a platform to share said artwork. Artists are to promote themselves and their work throughout their career in order to gain employment and a larger audience. In today's world, social media seems to be an effective way to do so, with virtually instant results and the ability to reach out to different parts of the world simultaneously. However, using social media comes with many serious risks, such as exploitation and cyberbullying, due to how social media functions. Through literary analysis of artist manuals and existing research articles relating to art and to social media, it was found that although social media could pose a risk to one's safety and productivity, it could be beneficial, especially as a tool of self-promotion. A survey released to the Art Department of CSU Stanislaus found that social media was also generally beneficial; artists who reported using social media to share their artwork felt that it helped them reach a broader audience and become better artists without a significant increase in stress. Artists who did not use social media to share their artwork did not report significantly less stress than those who did, but they also sold less work than those who did. In conclusion, using social media to share artwork affected artists and their artwork in a positive manner but not very significantly. It should be noted that these participants are students and are only beginning their careers, and the sample was very limited in scope and number.

Keywords: social media, sharing, artwork

Background

The world of art is an interesting one. Those pursuing careers in that field face unique challenges, and these vary as time progresses. However, the challenges that do stay the same are those of finding employment, creating pieces for a purpose, and self-promotion. In today's world, these may require the use of social media, and it is important to know the dangers and possible effects of doing so.

Using social media to share artworks is a great opportunity for self-promotion, which can in turn open employment opportunities and solidify an artist's reputation. It also allows for broad communication between the artist and the audience. These opportunities are not without potential downsides. Social media in itself has a special kind of stress associated with it that has been dubbed "social media exhaustion." (Yu et al., 2018) Self-promotion may cross a line, in which it becomes exploitation of either the digital persona existing online or even the physical individual living in the real world. The perpetual communication may be overwhelming, and the need to constantly update their social media platforms may also prove to be overwhelming to the artist. Feelings of being overwhelmed also result in increased stress, which in turn may affect the artist's workflow and thus their artwork or even lead to burnout, in which the artist is too exhausted to create new pieces.

The concepts of burnout and social media exhaustion can be applied directly to the artist who uses social media in order to share and promote their work. When exhaustion and burnout begin to affect the artist's work, their livelihood will then be impacted – especially for those whose main income comes from commissions and selling existing pieces. In understanding how social media affects artists who use it for work purposes, one can then find a way to mitigate the negative consequences in order to create a safer digital environment for today's artists and a smoother passage for the artists of tomorrow to find their success.

Heather Darcy Bhandari and Jonathan Melber wrote *Art/Work* as a guide to help artists hoping to make it in the art world. This guide includes many aspects of a career in art – including how to submit work and portfolios, how to interpret responses to portfolios, how to promote oneself, and how to sustain one's practice financially. On the topic of self-promotion, Bhandari and Melber (2017) strongly recommend that artists create their own websites--not only for promotion, but also that others in the industry can get a better understanding of the artist's work and about the artists themselves: "Galleries, curators, collectors, the press, and the general public rely on artist websites to quickly find accurate, up-to-date information on the artists their interested in" (Bhandari and Melber, 2017). In having an artist website, people can find information about the artist and their work relatively easily, notwithstanding

location or language. Many pages of *Art/Work* include in the margins quotations from those already in the industry, offering advice and experiences to readers. One such quotation on page 90 comes from Micaela Giovanotti, a curator and consultant based in New York: "Being social media savvy is also mandatory. Instagram, in particular, can initiate sales and other projects" (Bhandari & Melber, 2017). This again reinforces the idea that social media can act as a powerful tool for not just self-promotion but can also as an important platform for business.

Unfortunately, having a presence on social media will make one more vulnerable. In the research done by Baccarella et al, it was realized that the foundational structures of social media, such as identity, conversations, and presence, could be utilized against those using social media. The identity one assumes on social media can be exploited, one's presence can be tracked (through location monitoring), and conversations can include cyberbullying.

Communication is not the only aspect of social media that exists; a model proposed by Baccarella and his team for the *European Management Journal* shows seven critical parts of social media, which they dubbed "the seven building blocks of social media" (Bacarella et al, pg. 432). These are identity, sharing, presence, conversations, relationships, groups, and reputation – all of which are meant to create a positive experience for users of social media and their digital interactions with other users. The article, entitled "Social media? It's serious! Understanding the dark side of social media" investigated how the seven building blocks could actually be detrimental for users. Putting forth a large amount of content on social media will give users a presence, and artists who post on social media their names and works indeed have intentions of gaining a firm presence. Having such a presence can make these artists more vulnerable to the ills of society, as they can be subject to cyberbullying, anonymous threats, and exploitation. Those who post something that could be perceived as controversial, no matter how slight, could have their reputation damaged. Reputation could also be heavily damaged through infringing on another's intellectual property rights (Baccarella et al., 2018). The vulnerability of having an online presence may also add to the existing stress in the artist's life, which can negatively affect their work.

When artists share their works on social media to promote them and themselves, they are essentially marketing themselves. In the article "Creating 'Buzz': Opportunities and limitations of social media for arts institutions and their viral marketing," Hausmann took a deeper look at the roles social media and the web can play in the marketing field. Hausmann determined that online viral marketing was similar to "word-of-mouth," as both concepts involve informal statements between people to determine the quality of the idea being marketed or discussed. (Hausmann, 2012). The art institutions that Hausmann studied included blogs, Twitter, Facebook, a combination of these, and other social media platforms in order to generate discourse. Those who were more successful in generating discourse gained a larger fanbase and reached an even greater audience through reposts. Although Hausmann did not report on the impact viral marketing had on the sales of these institutions, the study did reveal that the more active the institution online, the more people the institution could reach.

In their article "Using social media for arts marketing: theoretical analysis and empirical insights for performing arts organizations," Andrea Hausmann and Lorenz Poellmann looked into social media specifically for how it can be used in marketing for the art world. Concepts from Hausmann's previously mentioned article were expanded here to explain how social media could be exploited for marketing purposes. The authors believe that it is very important that these organizations have a social media presence, stating "…German performing arts organizations continuously need to explore new strategies to be more competitive, more market-oriented and more attractive for a future audience. It is now common ground in the body of arts management literature, that stimulation of demand in the arts can be achieved with the help of marketing…" (Hausmann & Poellmann, pg. 144). Here, the authors speak to the importance of having social media not only to have a stronger connection with the audience, but also to keep up with the competition. It is also recognized here that social media has become an important tool for art institutions to market their services to others.

Social media can also be viewed as an asset to the workplace, especially in the world of art and more so in the marketing aspect. Studies have been conducted to determine how reaching out through social media has affected the sales of individuals and of companies, many of which saw a positive correlation. Art institutions who used social media often received more interactions from followers, and followers sharing those posts resulted in new users following the institutions (Hausmann, 2012). Musicians who shared their work on social media (as well as non-work-related posts) also received many interactions from followers, and many of these interactions resulted in a positive correlation with the sales of their work (Chen et al., 2015).

Social media has distinctive features that are necessary for basic functions as we know it today and for user experiences – these features are identity, reputation, groups, conversations, relationships, sharing, and presence (Baccarella et al., 2018). However, these features that make social media such an appealing concept for users can also have serious, deleterious effects. These add extra vulnerabilities to artists who turn to social media for self-promotion and to share their work, as well as anyone else who uses social media. Those who have a distinctive identity and a strong presence in social media may well be the most vulnerable, as these are the individuals who are more likely to exploit their online personalities and run a

significant risk of being defamed. Other risks of using social media include location tracking, misinformation, threats and abuse from so-called "friends," and exchange of inappropriate content.

However, these social media features are actually quite useful in the long run, especially when it comes to researching upcoming trends. Within the realms of communication and sharing, people can spread their opinions and share those of other users whom they agree with (Foka, 2018). The popularity of these opinions reflect the sentiments of the general public, sentiments which can determine the likelihood of success or failure for a particular subject – such as stocks, political players, products, celebrities, and many others.

Social media has also been recommended to artists as a means to advocate for themselves and essentially to advertise their own skillsets. In Bhandari and Melber's book *Art/Work*, one of the suggestions they emphasized was that artists develop their digital or online presence; aside from social media, they recommend that artists create their own websites. A website would act as a digital portfolio, allowing galleries to quickly view their work without initially contacting the artist – contact would occur later when a gallery actually considers presenting the artist's work. It also allows for potential clients to vet the artist's work from afar and provides for a link of contact if they so choose to connect with the artist.

Methods

To collect my data, I first did a literary analysis. This analysis consists of studies and articles regarding productivity, social media, art, or a combination of these concepts, as well as artist manuals aimed at guiding aspiring artists to success.

The next step was to create an online survey, using the current version of Qualtrics accessible to the students of CSU Stanislaus – there were no monetary benefits to participants. The survey is of an original design and was conducted online. This survey is comprised of about 30 questions to be answered in a variety of ways, such as multiple choice, 10-point likert scale, open-ended questions, and yes/no options. The questions are based on my research and the questions that could not be answered simply through the literary analysis.

The recipients of this email were members of the California State University Stanislaus Art Department. The email included a consent form, and agreeing to participate in the survey allowed them to participate in the survey. Due to the short period of time, in which it was available, 18 participants provided responses to derive information from. Participants were allowed to skip questions they did not feel comfortable answering. These participants were students above 18 years of age within the art department, these were art majors or art minors.

Once closed, the survey was analyzed using analysis features on Qualtrics. This analysis is to be presented in whole numbers, representing individuals who responded. This data will be able to provide an answer as to whether or not using social media to share artworks is beneficial to artists, their artwork, and their workflow.

Results

It was found that most survey participants did indeed use social media (11), but there was one who stated that they might use social media.

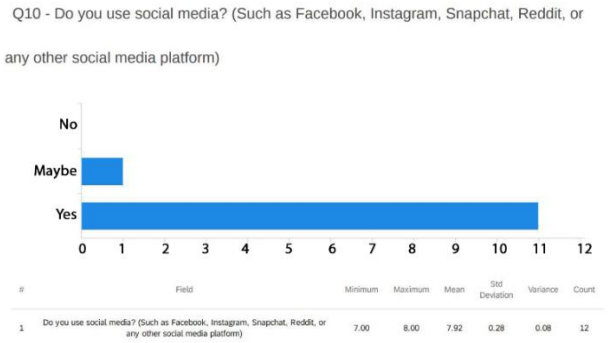

Figure A (report of social media usage)

When asked if they used social media to share their artwork or to gain feedback on that artwork, over half (seven) of the participants replied that they did, and five responded that they did not.

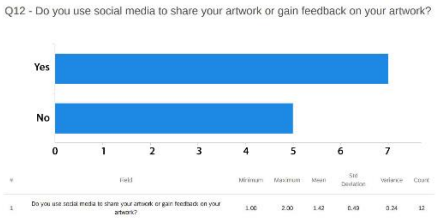

Figure B (report of social media to share artwork)

When asked how much income they received from selling on social media, participants reported that they received a minimum of $30 - $50 and a maximum of $100-$150 per piece. Those who reported selling through a gallery reported a minimum of $10-$20 and a maximum of $100-$150 per piece.

Figure C (report of average income per piece through social media)

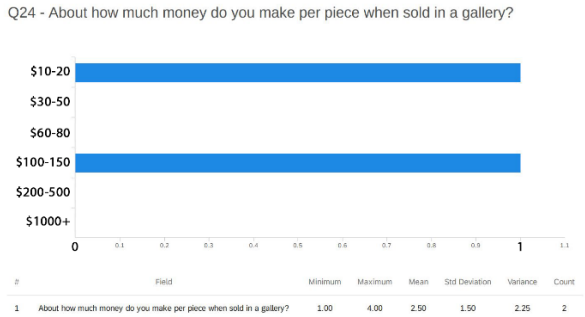

Figure D (report of average income per piece through the gallery)

Participants were also asked how stressed creating art made them feel – they were given likert-scale type options from 0-10; 0 being completely relaxed and 10 being extremely stressed. Qualtrics graded responses as an NPS (net promoter score), which can be used by companies to gauge how satisfied their customers are. Most respondents found it relatively relaxing (0-5) while only two respondents stated that it was somewhat stressful (7).

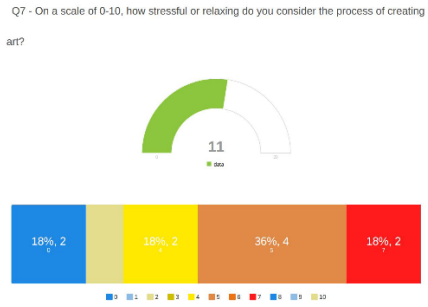

Figure E (rating of stress when creating art)

Discussion

The intentions of this research were to find what the effects of sharing artwork on social media are and how those will affect artists and their artwork. This research should be able to inform the art community on this topic, especially those who create, intend to share, or even sell their work to others. More specifically, it will affect those who use social media to complete those actions. My research provides insight as to how sharing on social media in itself makes an impact on artists and the role it plays in the creation, workload, business, and peer reviewing aspects of the art world.

This research is most relevant to universities and perhaps even high schools, as those are typically the locations where young, emerging artists are coming to their own and building the foundations to start their career in art. It is also relevant to all artists who are considering incorporating social media into their practice. For those who are beginning their careers, this may be the time where they begin to consider reaching out to fellow artists for feedback or to potential consumers to sell their works. It may also have an impact on galleries and studios, as these are the locations where art is most sold and created, respectively.

My research should be replicable in different conditions; the survey can remain the same no matter who is responding or what region they are working in. The sources used for the literary analysis are reliable, as they are scholarly sources available in the database of the CSU Stanislaus Library; most of these are also peer-reviewed, adding to the reliability of these sources.

I designed my research question with the intent of finding out the relationships between variables (art and social media) but I also wanted to examine the influences between these relationships. I believe that this study is advantageous because it builds upon related research that has already been done and published by others and puts them together in a way that is more relevant to today's part of the ever-changing digital landscape. This also had a live survey component in which I have received contemporary data from my peers. One main disadvantage to this is that this research could only show what was experienced by the students and faculty of the Stan State Art Department, rather than all artists in general.

Limitations

One of the limitations of this research is the time that was allotted to its conduction – although the literary analysis was done over both semesters, the survey was built, released, and interpreted in one. Furthermore, the survey was finished during spring break but could not be released until shortly after, which also negatively affected the amount of time for it to capture usable data.

The biggest limitation is the small sample size, which may have happened due to the fact that the survey was only available after spring break and gave potential participants less than a month to choose whether or not to participate and provide responses to the survey. Furthermore, participants are exclusively students of California State University Stanislaus' art department; their views will not reflect the views of students in other departments or those of artists outside of the academic scene. Another to take into consideration is the fact that the careers of these students are just beginning – they are not yet established artists.

Conclusions

The hypothesis was partially supported by the survey. The hypothesis was that artists who use social media to share their artwork will experience benefits in regard to connections with other artists, as well as income, but they would experience significantly more stress than those who do not. There was, in fact, a benefit to using social media, but not to the extent expected. Participants reported a slight increase in income made selling artworks through social media as opposed to selling artworks through a gallery. Participants also reported feeling as though sharing artwork on social media did make them feel as though they were becoming better artists.

The part of the hypothesis not supported was that sharing artwork on social media will also cause artists to feel significantly more stress than those who do not – most participants in general reported that creating artwork felt more relaxing than stressful. Even those who reported using social media to share their artwork as well as to update existing artwork reported that it added a slight amount of work, but not enough to be overwhelming.

All in all, this research has concluded that there is a slight benefit to sharing artwork on social media, but it does not cause a significant amount of stress. Considering the small and particular pool of participants as well as the short amount of time the survey was available, a longer study with a larger and more diverse pool of participants may yield different, more conclusive results.

Acknowledgements

I would like to thank the Honors Program of California State University Stanislaus for the opportunity to work on and present my research on this topic. I would also like to thank Dr. Suditi Gupta and Dr. Jamila Newton for providing guidance on how to approach the research and its presentation. A special thank-you goes to Dr. Staci Scheiwiller for her mentorship and support throughout this project, as well as for providing important insight on the different aspects of this topic.

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The Relationship Between Covid-19 Related Stress and Fatigue of CSU Students

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Abstract

The Coronavirus pandemic that started in 2019 has affected the world in a variety of ways. Stress can affect students including impacts on physical well being. For this project, I assessed the relationship between Covid-19 related stress and fatigue among CSU students. Student's stress levels were assessed using the Covid-19 Student Stress Questionnaire. The Multidimensional Fatigue Inventory was used to assess fatigue levels, which is a component of physical well being. These results were used to determine the correlation between stress and fatigue. It was found that there was no significant correlation between stress and fatigue due to the Covid-19 pandemic among CSU students. When comparing the stress and fatigue levels of women and men, on average women had higher levels of stress and fatigue. Although there was no correlation between stress and fatigue, future studies should investigate stress level and fatigue level differences between different majors, specific age groups, or even faculty members.

Keywords: Covid-19 Related Stress, Fatigue, College Students

Introduction

The Coronavirus pandemic that started in 2019 has affected the world in a variety of ways. Schools were shut down and businesses forced to close, because the entire world had overcome with fear. What was said to be a two week shut down, turned into a two year shut down and people are still suffering today, mentally and physically. In March of 2020, colleges and universities switched to remote learning to keep everyone safe and protected from the pandemic. There was a lot of uncertainty while doing this because it was unknown when it would be safe to return to on-campus learning amongst other individuals (Manchia, 2022).

Stress is a state of mental or emotional tension that results from a perceived threat or challenge. It is the body's natural response to a perceived danger or demand, whether real or imagined. Stress can be caused by various factors, such as work pressure, relationship problems, financial difficulties, health issues, or major life changes. Prolonged or chronic stress can have negative effects on our physical and mental health, leading to a range of problems such as anxiety, depression, high blood pressure, and heart disease (Schneiderman, 2005).

Fatigue is a state of physical or mental exhaustion that results from prolonged periods of mental or physical activity or from insufficient rest or sleep. It can be caused by a variety of factors, including stress, illness, poor nutrition, medication, and lack of exercise. Fatigue can manifest itself in different ways, such as feelings of tiredness, weakness, lack of energy, or difficulty concentrating. It can also affect our mood, causing us to feel irritable, anxious, or depressed. It can significantly impair a person's ability to perform daily activities and is often accompanied by other symptoms such as muscle pain, joint pain, headaches, and memory problems (Harrington, 2012).

The level of concern and uncertainty from the pandemic has caused an increasing level of stress. On top of being afraid to get sick, people were afraid that their livelihoods would be affected. However, yet to my knowledge, no studies have looked into how students' physical well being has been affected due to this prolonged period of stress caused by the pandemic. This is why there is a critical need to investigate the relationship between Covid-19 related stress on physical well-being. For my study, I am focusing on one aspect of physical well being, fatigue. The question of my research study is, is there a relationship between Covid-19 Perceived Stress and Fatigue among CSU students?

This study will determine how college students perceived stress during the Covid-19 pandemic and determine if there is a correlation between stress and physical well being. I hypothesize that there will be a significant relationship between perceived Covid-19 stress and fatigue. For demographics, I also hypothesize that females will have higher levels of stress and fatigue compared to males.

Research Design and Methods

My study was conducted on 221 college students that attend California State Universities to understand how they perceived the stress and fatigue in their lives during the pandemic. This study was conducted from February 28 to March 28, 2023. Participants consisted of undergraduate and graduate students whose ages ranged from 18-77. Participants indicated their sex by selecting male or female. Professors were asked if they could distribute the survey to their students.

The online survey was dispersed using CSU Stanislaus's version of Qualtrics. The survey consisted of a consent form, three sets of questions, and a debriefing form.

The first set of questions are from the COVID-19 Student Stress Questionnaire (CSSQ), which was specifically developed to assess university students' perceived stress during the COVID-19 pandemic lockdown (Zurlo, 2020). Each question was developed to cover different domains that could have been subject to variations due to the Covid-19 pandemic lockdown, and, therefore, that may be potentially perceived as sources of stress (i.e., risk of contagion; social isolation; relationship with relatives; relationship with colleagues; relationship with professors; academic studying). The questions pertaining to stress were scored based on a 5 point likert scale ranging from zero, not at all stressful, to four, extremely stressful. One of the questions students were asked was, "How did you perceive the risk of contagion during the period of the Covid-19 pandemic?". The second set of questions pertained to their physical health during times they felt stressed.

The Multidimensional Fatigue Inventory (MFI), was used to assess five different dimensions of fatigue (Smets et al., 1995). The MFI is a 20 item self report scale, designed to objectify fatigue and covering the following dimensions: general fatigue, physical fatigue, mental fatigue, reduced motivation, and reduced activity. Each section correlating to the specific dimension consisted of two items indicating fatigue and two items contradicting fatigue. Students were asked to rank how true the statements were to them. One of the statements the students were asked to rank was, "I feel fit."

The last set of questions were the demographic questions that identified participants' age, sex, and year in college. I also included in this question set questions pertaining to technical and computer issues during the pandemic. The demographic questions were asked at the end of the survey to alleviate any bias that could occur. This data was collected to determine if there were any other specific trends and provide guidance for further studies.

A qualitative design was utilized via a survey made available to CSU students. The survey was administered using Qualtrics and was accessible to students through a link. The survey consisted of questions from the COVID-19 Student Stress Questionnaire (CSSQ) asking students how they perceived stress during the pandemic. The survey was administered to assess the relationship between Covid-19 perceived stress and fatigue. How the students were affected and if increased stress levels were correlated in any way to their physical well being were assessed.

For data analysis, I used the likert scale to determine each student's Global stress score. Scores of 6 or below indicate low levels of perceived Covid-19-related Global stress, scores of 7–15 indicate average levels of perceived Covid-19- related Global stress, and scores of 16 or more indicate high levels of perceived Covid-19-related Global stress among university students. For MFI scores, they ranged from 20-100, the higher the score, the higher the level of fatigue.

To determine correlations between stress and fatigue and any demographic trends, I used JMP version 17.1.0 (Statistical Analysis System Institute., Cary, NC, USA). I conducted one way ANOVAs on non transformed data, to determine significance across the trends found in the data.

Results

The intent of this study was to assess if there is a relationship between Covid-19 related stress and fatigue amongst college students at California State Universities. Of the 221 participants of this survey, 160 of them were female and 60 of them were male. Most participants had ages ranging from 18-26 (184, 83.3%), some ranged from 27-42 (33, 15.0%), few ranged from 43-58 (2, <1.0%), and few ranged from 59-77 (2, <1.0%) (Fig. 1).

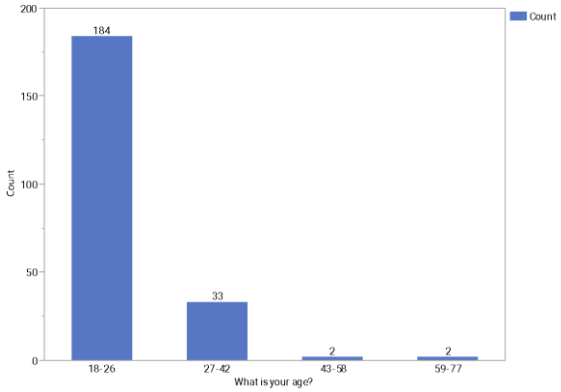
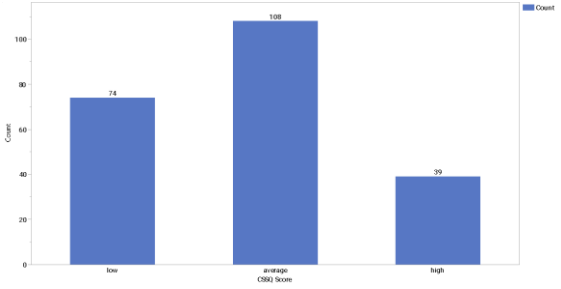


Figure 1. Number of California State University Students that participated in research study separated by age. Data are a count of 221 students. CSSQ = Covid-19 Student Stress Questionnaire.

The data from the CSSQ was first analyzed. Students had average levels of perceived Covid-19 related Global stress (mean = 9.64, SE = 0.411, N = 221) (Table 1). There were 33.5% of students with low levels of perceived Covid-19 Global stress, 48.9% of students with average levels of perceived Covid-19 Global stress, and 17.6% of students with high levels of perceived Covid-19 Global stress (Fig. 2). The MFI was then analyzed and students had an average fatigue score (mean = 56.01, SE = 1.18, N = 221).

Figure 2. Number of California State University Students that



participated in research study separated by low, average, and high CSSQ scores. Data are a count of 221 students.

	Mean	Std Err	N
CSSQ	9.64	0.411	221
MFI	56.01	1.18	221

Table 1. Summary statistics for student survey respondents' CSSQ and MFI scores.

When comparing the CSSQ across sex, on average females generally had higher CSSQ scores (mean = 10.0, SE = 0.48, N= 161) than males (males mean = 8.69, SE = 0.80, N = 60) but were not statistically significant (p value = 0.1548) (Fig. 3). However females had significantly higher MFI scores than males (p value = 0.0002). Females on average had MFI scores of (mean = 59.85, SE = 1.21, N= 161) and males (mean = 51.44, SE = 1.75, N = 60) (Table 2).

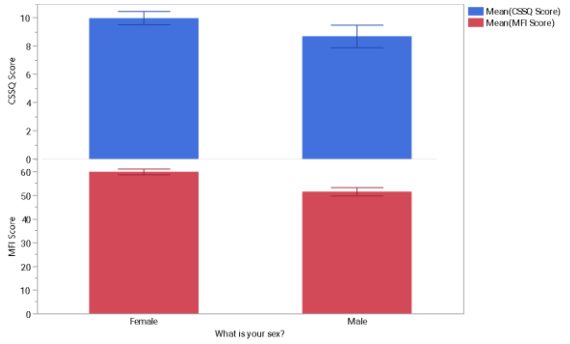


Figure 3. Sex of participants separated by average CSSQ score and MFI score. Data are a count of 221 students.

Sex	CSSQ Mean	CSSQ Std Err	MFI Mean	MFI Std Err
Female	10.0	0.48	59.85	1.21
Male	8.69	0.80	51.44	1.75

Table 2. Mean and SE of sex of participants separated by average CSSQ score and MFI score.

The CSSQ was also compared across year in school and on average sixth year students had higher levels of perceived Covid-19 Global stress than the other students (sixth year mean = 12.67, SE = 2.60, p value = 0.5650, N = 3) (Fig. 4). The MFI was also compared across year in school and on average first year students had the highest levels of fatigue (first year mean = 60.71, SE = 1.65, p value = 0.1173, N = 75) (Table 3).

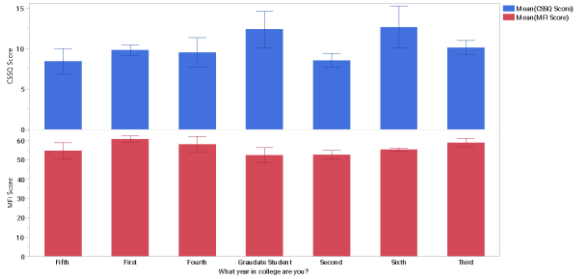


Figure 4. Year of college of participants separated by average CSSQ score and MFI score. Data are a count of 221 students.

Year in College	CSSQ Mean	CSSQ Std Err	MFI Mean	MFI Std Err
First	9.8	0.674	60.71	1.65
Second	8.55	0.856	52.63	2.29
Third	10.14	0.853	58.95	2.13
Fourth	9.53	1.82	58.07	4.15
Fifth	8.43	1.59	54.64	4.14
Sixth	12.67	2.60	55.33	0.882
Graduate	12.38	2.27	52.5	3.79

Table 3. Mean and SE of year of college of participants separated by average CSSQ score and MFI score.

A comparison of CSSQ across age was also assessed and on average 18-26 year olds had higher levels of perceived Covid-19 Global stress than the other age ranges (mean = 9.79, SE = 0.44, p value = 0.2073, N = 184) (Fig. 5). The MFI was also compared across age and on average 18-26 year olds had significant higher levels of fatigue than the other age ranges (mean = 58.71, SE = 1.12, p value = 0.0134, N = 184) (Table 4).

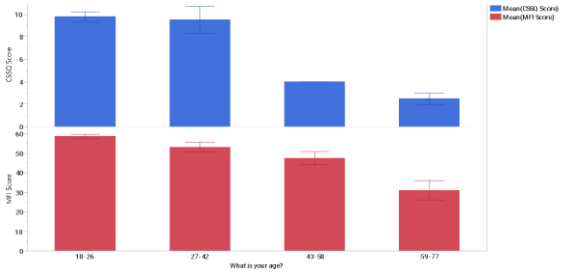


Figure 5. Age of participants separated by average CSSQ score and MFI score. Data are a count of 221 students.

Age	CSSQ Mean	CSSQ Std Err	MFI Mean	MFI Std Err
18-26	9.8	0.44	58.7	1.21
27-42	9.5	1.19	53.2	2.56
43-58	4.0	0	47.5	3.5
59-77	2.5	0.5	31	5

Table 4. Mean and SE of age of participants separated by average CSSQ score and MFI score.

Using the CSSQ scores and the MFI scores a bivariate of MFI score by CSSQ score was analyzed to determine the relationship between stress and fatigue. The bivariate showed that generally fatigue is not dependent on stress. A high CSSQ score did not indicate that the participant had a high MFI score (Fig. 6). I wanted to see if CSSQ score ranges correlated with MFI scores if the data was split up into the ranges of low level of perceived Covid-19 global stress, average level of perceived Covid-19 global stress, and high level of perceived Covid-19 global stress (Fig. 7). These bivariates also showed that there is no correlation between the CSSQ scores and the MFI scores.

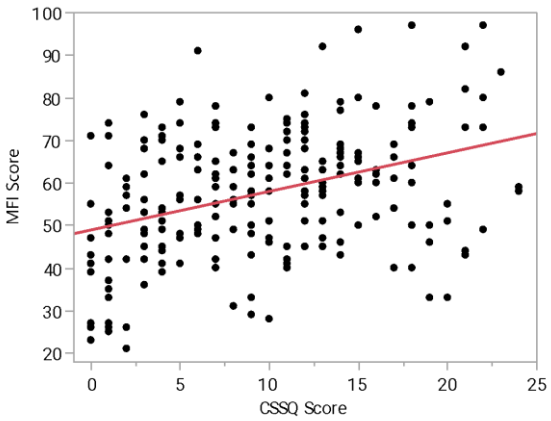


Figure 6. Sample size, 221. Bivariate analysis of student responses' CSSQ score and MFI score.

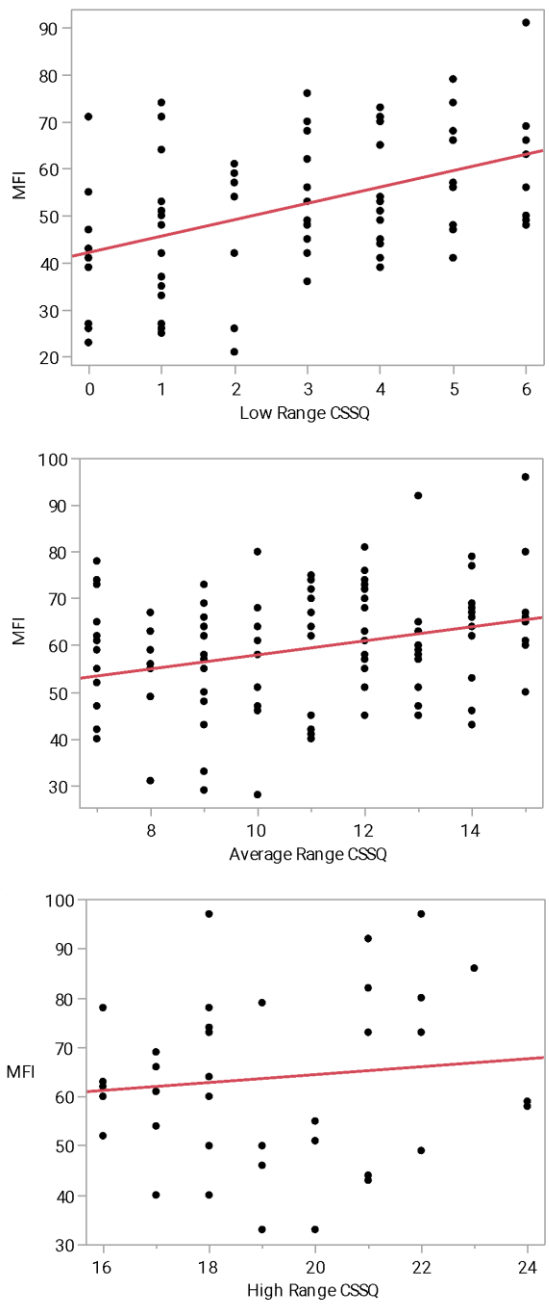


Figure 7. Sample size, 221. Bivariate analysis of student responses' CSSQ score and MFI score broken down into 3 separate ranges.

Other interesting findings included topics regarding technical issues and computer problems during Covid-19 as well as if participants had feelings of stress and fatigue prior to the pandemic. Students that experienced problems with computer hardware and software for remote learning during Covid-19 had higher levels of perceived Covid-19 Global stress (mean = 11.46, SE = 0.62, N = 104) than students who did not (mean = 8.02, SE = 0.50, N = 117). Participants that experienced problems with computer hardware and software for remote learning during Covid-19 had higher levels of fatigue (mean = 59.31, SE = 1.52, N = 104) than students who did not (mean = 55.95, SE = 1.39, N =117) (Table 5). Students that experienced problems with internet connection for remote learning during Covid-19 had higher levels of perceived Covid-19 Global stress (mean = 11.18, SE = 0.56, N = 124) than students who did not (mean = 7.66, SE = 0.55, N = 97). Students that experienced problems with internet connection for remote learning during Covid-19 had higher levels of fatigue (mean = 59.57 SE = 1.37, N = 124) than students who did not (mean = 54.91, SE = 1.54, N = 97) (Fig. 8).

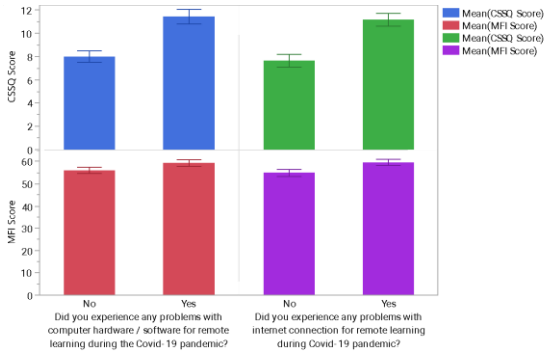


Figure 8. CSSQ and MFI scores of students and their response regarding technology problems during the pandemic.

Computer Hardware Problems	CSSQ Mean	CSSQ Std Err	MFI Mean	MFI Std Err
No	8.02	0.50	55.95	1.39
Yes	11.46	0.62	59.31	1.52
Internet Problems				
No	7.66	0.55	54.91	1.54
Yes	11.18	0.56	59.57	1.37

Table 5. Mean and SE of CSSQ and MFI scores of students and their responses regarding problems with internet connection.

Participants that indicated they had feelings of stress and fatigue prior to the pandemic had higher levels of perceived Covid-19 Global stress and fatigue levels (CSSQ mean = 10.46, SE = 0.55, N = 111; MFI mean = 60.77, SE = 1.36) than those that did not (CSSQ mean = 8.82, SE = 0.62, N = 105; MFI mean = 54.52, SE = 1.53) (Fig. 9)(Table 6).

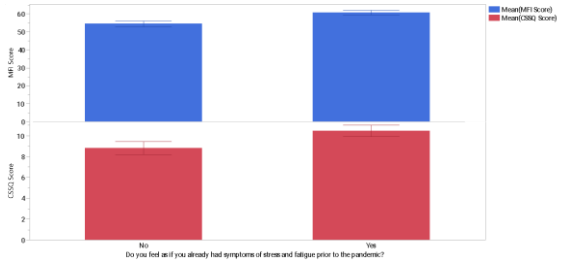


Figure 9. CSSQ and MFI scores of students and their responses regarding prior symptoms of fatigue and stress.

Symptoms	CSSQ Mean	CSSQ Std Err	MFI Mean	MFI Std Err
No	8.82	0.62	54.52	1.53
Yes	10.46	0.55	60.77	1.36

Table 6. Mean and SE of CSSQ and MFI scores of students and their responses regarding prior symptoms of fatigue and stress.

Discussion

A correlation between stress and fatigue was not found, this could be due to participants being students from multiple campuses in California. Different campuses may have handled navigating the pandemic differently resulting in a variety of experiences students were exposed to. The main findings across demographics showed that younger age groups showed significantly higher MFI scores. This could be a result of experiencing the pandemic at its peak when transitioning from high school to college. This creates a massive culture shock for students which most likely did not have a larger impact on older age groups. Females also had significantly higher MFI scores which is mostly likely a result of hormonal and lifestyle differences such as menstruation and pregnancy (Bensing, 1999). For future studies, I would like to test if there are stress and fatigue level differences between different majors and specific age groups. I also would like to replicate this study among faculty members of California state universities. Overall, this study serves as an example of the importance of baseline data which can be used to further investigate the relationship between Covid-19 related stress and physical well being.

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Gendered Attitudes and Beliefs Among Latinx Youth

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Abstract

This research focuses on comparing the gender ideologies of Latinx youths with their parents. In semi-structured interviews with ten participants, we found that Latinx youths have less traditional gender ideologies than their parents. Even though these parents are resisting the changes with stereotypical beliefs like "machismo" and "machista," they were not as strong and enforced as their own parents (youths' grandparents). This research will also involve how parents are shaped by their children. This suggested that Latinx youths are more likely not to follow these gendered ideologies but constantly challenge their parents' ideologies. We anticipate that there be some traits and values that youths are following that their parents taught them, but they reject the roles of "machismo" and "marianismo." This research demonstrates if Latinx youths follow the gender beliefs of "machismo" and "marianismo" that their parents implemented in their childhood. We see if the youths intend to continue the roles of "machismo" or "marianismo" as part of their beliefs once they form a family in the future or have the same beliefs. We discuss whether youths have seen stereotypes in their household and how they react to them. We also compare and contrast the youths' responses to their parents' questions like "Did your parents follow the gender roles like your father being "machismo" or mother being "marianismo?"

Keywords: Latinx, Gender role attitudes, Machismo, Machista, stereotypes, Mexican

Introduction

In the previous research, they did not focus on Latinx youth and parents. Now we focus on both perspectives and their interpretation of gender beliefs. Knowing about the next generation is giving more freedom and not being ashamed of not following the norms of "machismo" and "marianismo." It will make a difference in Latinx families. It will bring awareness to how beliefs about gender are changing. Many Latinx families describe the men in society as having values and beliefs composed of both positive and negative but do not label it marianismo (Piña-Watson et al., 2014). Studying families of Mexican descent is interesting, innovative, and important because everyone has a story on how machismo and marianismo impact their lives. Latinx families did not grow up from day one and had these gender roles. Over time, the parents decide on the children's roles and choose what to do about them. Latinx men/boys have the traditional gender roles embodied by machismo, and Latinx women/girls have the values of marianismo (Piña- Watson et al., 2014). Additionally, if Latinx youths do have these traditional gender roles embodied, they are not accepting the gender roles and are willing to challenge their parents' ideas with them.

Marianismo, and masculinity are norms that are not placed and directly spoken of but are used daily in Latinx families. Piña- Watson et, al. (2014) refers to Marianismo as the belief that a woman should:

> "(a) be the central figure of her family, thereby holding the family together and ensuring connectedness among them (family pillar); b) be the one who models spiritual fortitude and ensures the spiritual health of the family (spiritual pillar); c) ensure control over sexual desires and be sexually "pure" (virtuous and chaste); d) put her own needs second to others (subordinate to others); and e) not speak out with her wants, desires, or needs as a means of maintaining harmony in interpersonal relationships and among groups." (p.285)

Machismo is a traditional gender role value among Latino men and boys (Arciniega et al., 2008). Traditional machismo has some characteristics of violent, aggressive, and sexualized behaviors. It can also be associated with violence and heavy drinking (Arciniega et al., 2008). It also involves Latino men dominating women and having control (Arciniega et al., 2008). In former research, Piña- Watson et al. examined various gender of Mexican descent youth in mental health (p.280); however, they have not focused on Latinx youth of Mexican descent to individual gender role values. The previous research by Gerson, (2009) forced on men and women that were interviewed about their experiences of living in the U.S., which was based on varied racial, and ethnic identities and class backgrounds. While he was studying how "structural and cultural conflicts play out in the lives of young women and men" (Gerson., 2009). They focused on the whole population but not specifically on the Latinx population. This research will focus on looking into Latinx youths' ideologies about gender attitudes and if they continue traditional

gender roles in their household of machismo or marianismo. The research will also provide new information on the newest generation of Latinx youth by knowing what they plan to do next with their families. It also provided new insight to both the youths and their parents on how parents are shaped by their children. By doing so, we demonstrate if Latinx youths follow the gender beliefs of "machismo" and "marianismo" that their parents implemented in their childhood.

Background

Many Latinx families know gender-role norms, particularly women's roles at home and men's roles as economic providers (Endendijk et al., 2018). Endendijk et al. (2018) noted that Latinx families are more traditional but decide not to change their gender beliefs or acknowledge their beliefs. Endendick et al. (2018) also mentioned that the children of mothers involved in stereotypically masculine housework tend to have less traditional beliefs on gender. This study demonstrated that as the future progress on gender beliefs, youths would have more flexibility in gender attitudes. Other studies have shown that children's gender stereotypes come from the ages 3 to 5 years and in behaviors of attitudes toward gender norms (Halim et al., 2013). This research found that children have moments in their lives where they pick up these gender attitudes. There is little research on Latinx youth between the ages of 16 to 22 years old. This study will address whether Latinx youths will follow the gendered attitudes grounded by their parents or if they have challenged them.

Method

Participants

Participants were part of this research that focused on semi-structured interviews. Choosing the interview process helps us better use because it allows us to know one-on the participants and understand their stories. It allows us to understand the participants in a more intimate way and share their experiences. Interviews took about 40 to 50 minutes. We collected data from 10 participants, including youths and parents. Of those 10, 6 were youths, and 4 were parents. Overall, there were 9 females and 1 male. The youths ranged from 16 to 22 years old, while the parents' ages ranged from 33 to 52. The sample among youths was primarily of Mexican descent (60% of respondents), with the other (40% of respondents) parents of Mexican origin. Something else to note is that we interviewed youths and their parents, so it was with the same families. Interviewing participants from the same families allows us to see the similarities and differences in their beliefs of "machismo" and "marianismo." There were patterns in the parents' beliefs versus the beliefs of the youth.

Table 1. Demographic details are available for all those who took part in audio-recorded qualitative research sessions (n = 10 participants)

Table 1. *Participant Demographics*

Parent or Youth	Ages	Relationship Status (a)	Sexual Orientation (b)
Parent	52	Married	Female
Youth	21	Single	Female
Youth	18	Single	Female
Parent	42	Married	Male
Parent	33	Married	Female
Youth	19	Single	Female
Youth	21	Single	Female
Parent	38	Married	Female
Youth	16	Single	Female
Youth	21	Single	Female

a. Participants relate as to Single or Married
b. Participants related as either Female or Male

Figure 1.

Parents Treatment of their Children Based on Gender

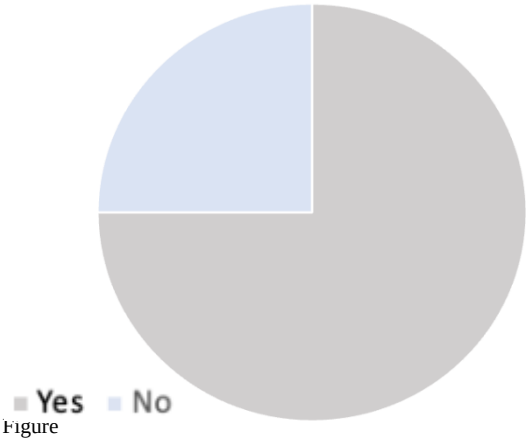


Figure 1. Parents were asked if they treated their children differently based on gender. 1 out of 4 (25%) indicated that they treated their children differently because of gender, while 3 out of 4 (75%) stated that they did not treat their children differently based on gender.

Table 2. Describes how youths' expectations they had and what their parents expected from them.

Expectations (a)	Challenging (b)
Clean bedroom, cooking, independent	Yes
Attending school, getting a job, independent, cleaning, sweeping, mopping	Yes
Clean bedrooms, assist in cleaning the kitchen, bathroom, and living room	Yes
Graduate school, become my own person, independent, and cook	Yes
Cooking, cleaning, clean bedroom, be independent	Yes
Work, clean, clean bedroom do errands, wash the dish, laundry, wash the car, mowing the lawn	Yes

a. Participants were asked if they had any expectations from their parents and if it was challenging
b. Yes or No

Materials

The materials used for the research were a recorder, computer, paper, pencil, and a coding program NVivo, a computer software. NVivo is a qualitative data analysis (QDA) developed to help qualitative data. It allows for organizing, analyzing, and find significant ideas with unstructured or qualitative data like interviews. Also, I was aided by my mentor Dr. Jennifer Whitmer. The sampling method used was convenience and snowball sampling. To recruit the participants and their families, we send an email via the Sociology department requesting participants. This also included methods in selecting and recruiting participants on social media like Instagram, Facebook, and Twitter. While there are unlikely to be 16 and 17-year-olds receiving these emails, we also got the participants that allow recruiting older participants who can refer anyone else that was younger participants. There was also compensation for the participants, a raffle. I also needed to obtain an IRB application, which I have completed two because of minors. The methods for selecting my participants were self-identified Latinx youths ages 16-22. We include at least one parent from the youth if they want to get interviewed. We provide five gift cards from Amazon. By doing some, we made a list of the participants and used a random number generator to select the winners.

Measures

The measures were forward-translated to Spanish in the interview for the parents; then, it was noted back-translated to English by separating the individuals' dialects. Final versions of the themes were used to compare and analyze the parents' responses. Some questions asked of youths were, “Have you seen stereotypes in your household? Do you consider your father being “machismo” or your mother to be “marianismo”? “Can you think of any examples from your childhood when you became aware of different expectations for men and women?” “When you picture your own family, how do you envision household responsibilities and why? “Do you agree with the traditional gender roles or not?” “Do you ever have conflicts with your family about their ideas about gender?” While the questions asked of parents were, “Do you treat your sons differently from your daughters?”, “What did your parents like when growing up regarding home duties?”, “Did your parents follow the gender roles like your father being “machismo” or your mother being “machista?”, “Do you think your partner helps you with duties? (at home, outside, or with children)”, “How did you divide the labor at home when you were young? Do you think there is equality with your partner's help?”

Finding, Results, and Discussion

Youths Challenging Gender Attitudes

The center goal was understanding the kinds of gender ideologies youths are socialized into and if youths followed or resisted these gender attitudes. While youths push and resist, they also challenge their parents to change their beliefs. With data collected, gendered attitudes among Latinx youths overlap with their parents with their character traits. Youths and parents described growing up in households that displayed machismo and marianismo. Youths also resisted traditional gender stereotypes. And youths are showed that parents are more open to different gender ideas but still have some ideas of changes. This demonstrated objections when youths question their parents' attitudes toward gender roles. The youths are constantly resisting and challenging these gender attitudes with their parents. For instance, when the youth participant challenged her father's gender attitudes:

> “But this one time when we were sharing our closet and my brother and I, we had his same clothes in the closet so that I would tell him…I'll wash this time, and then you dry the clothes. And then my dad saw one day; he said, why is your brother touching your clothes? That's not right. Then he's over here looking at your clothes. And I told him like dad; we are siblings. Like, it's OK. If he likes putting my clothes in the dryer, nothing will happen. Nobody's going to think less of him. But yeah, after that, he understood”.

This youth challenged her father's ideas of gender attitudes by telling him it was okay that her brother

would help dry her clothes. Rather than the youth agreeing with her father, she could resist and challenge her father's ideas of machismo. This pattern was seen through the interviews conducted by the youths constantly having a small war on the battlefield with these gender attitudes with their parents.

Result from Youths

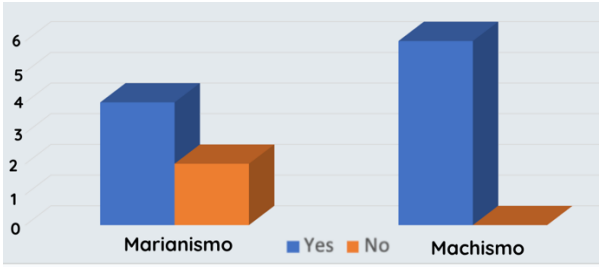
Youths were asked, "Do you consider your father being "machismo" or your mother to be "marianismo"? (See Graph 1). This demonstrated that youths responded with mothers being "marianismo" by saying Yes (4) and No (2) while youths said that fathers were "machismo" Yes (6) and No (0). This allowed us to see that Latinx youths felt that fathers were more dominant to "Machismo" and their character traits. Some traits they described being associated with "machismo" were dominating, selfish, narrow-minded, arrogant, and strong. While mothers' character traits of "marianismo" were described as kind, selfless, soft, safe, and submissive. While the mothers were more lenient with their roles of "marianismo." This was important to note because youths have more challenges with their fathers about these gender roles than mothers. For instance, youth says:

> "When it comes to my dad, males are supposed to be dominant, they're supposed to be in charge of the women, and they should be strong, and they don't have to serve their own plate. They already work outside, so they do as much as possible for the family. And then when it comes to mom, it's always like assist the men because the men already have to do so much. So, like, survey their plate or get them a utensil or do the household chores, we have to take care of them because we are female of it."

Even though mothers are willing to stand with their husbands, they still show less hardheaded gender roles of "marianismo." This allows the youth to have opposites of resisting and challenging their parents' ideas. Youths have the balance to rebel against the gender roles they grow up in because one parent is lenient with these "stereotypes." It allows them to express how they feel about what they see in society now. Another example youth says: "dad is like the one that kind of like is the one who was the last word." When the youth described her father, she saw that his character trait dominated because he had the final say. This allied with the previous example of youths seeing gender attitudes with "machismo."

Graph 1. Youth' were asked, "Do you consider your father being "machismo" or your mother to be "marianismo?"

Youths Believe in Marianismo and Machismo



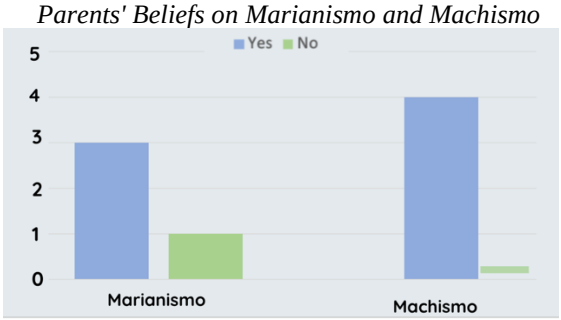
Marianismo: Yes (4) vs. No (2)
Machismo: Yes (6) vs. No (0)

Result from Parents

Parents were also asked the same question by youths "Did your parents follow the gender roles like your father being "machismo" or your mother being "marianismo?" Parents said mothers "marianismo" Yes (3) and No (1) in told 4 (See graph 2). In contrast, parents said that the father did follow "machismo" with Yes (4) and No (0) in told of 4. This was similar to youths' responses, with fathers dominating their gender roles. Parents also have these values as their youths make youths more willing to challenge gender roles. Parents are all from Mexican origin, so during their adolescence, they grow up with what was normally "machismo" and "marianismo." When coming to the USA, they opened new ideas and values from what they grew up their whole life. Parents had many fights or accepted these gender roles they saw. It allowed youth to rush these gender roles because of their parents. It demonstrated that parents were the first to stop and change these gender roles because of moving and choosing to leave the gender roles. The parents have helped their youths challenge these gender roles.

Graph 2. Parents were asked if "Did your parents follow the gender roles like your father being "machismo" or your mother being "marianismo?"

Parents' Beliefs on Marianismo and Machismo



Marianismo: Yes (3) vs. No (1)
Machismo: Yes (4) vs. No (0)

Youths Challenging Gender Attitudes

The parents are either accepting them or also challenging these gender attitudes. The parents' beliefs were not as strict as those of their parents (youth grandparents). During the interviews, they seemed more lenient towards the gendered attitudes of their children. Research has provided that these youths are having daily battles with their parents. These results have demonstrated that Latinx youths are challenging these gender attitudes, and parents are slowly adjusting to them (Graph 2). So far, the preliminary results are that youths can change these social norms.

Regarding the possible results, Latinx youths follow their parents' attitudes but are willing to challenge them. As discussed above, machismo and marianismo are seen in Latinx families, but machismo is more present in fathers. The youths noted that the father had harder beliefs than the mothers because the fathers of the action did. It is important to note that youths did not blame their fathers' actions, but they acknowledged their beliefs. Furthermore, marianismo for Latinx youth is not as recessive as machismo.

Limitations/Future Research

Future research could focus on the parents' ideals of machismo and marianismo. It was seen that parents were the first ones to take a step on stopping these beliefs. It puts to question what else have they resist in their culture.

Acknowledgments

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Evaluating the Antimicrobial Properties of Madagascar Cockroaches

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Abstract

Antibiotics have been in use far before people even knew what bacteria was. We have been using them unknowingly and with good intentions. Their use has grown exponentially after the discovery of what they could really do. Similarly, we have made great leaps and bounds in discovering more sources of these sacred panaceas. However, with that great discovery, comes serious ramifications. The consequence, in this scenario, is that of antibiotic resistance (Chokkshi, 2019). It has been found that American and German cockroach species have incredible antimicrobial properties held within their chitin. This study aims to see if that same property is held within Madagascar hissing cockroaches, despite their thinner chitin. It is assumed that due to their thinner chitinous layer, there may not be as much antimicrobial activity, this study aims to answer whether or not that is true. This will be done in the lab through similar experiments as done by Basseri and her colleagues during their study of American and German cockroaches. If similar results are found, these results could be useful in the case that cockroaches are ever sourced as an antibiotic, since hissing cockroaches are cleaner and easier to keep in the lab.. Either way, this study is an attempt to further the research in the area of antibiotics.

Keywords: Madagascar Cockroaches, Chitin, Antimicrobial Activity

Introduction

Antibiotics have been in use far before people even knew what a bacterium was. However, their use has grown exponentially after discovery of what they could really do. Similarly, we have made great leaps and bounds with discovering more sources of these sacred panaceas. However, with all of that discovery comes ramifications. The consequence, in this scenario, is that of antibiotic resistance, and what that resistance means for clinical usage, farming, and water acquisition. Antibiotics come from known organic sources, which means that they are a finite resource. Some sources hypothesize that at some future point there will be at least some resistance to all antibiotics (Laxminarayan, 2013). Although there are ways this can be slowed, and even combatted, there may also be ways to find more antibiotics. Cockroaches have proven to have antibiotic properties in their chitosan and chitin

The purpose of this study is to evaluate the common household pest, the cockroach for antimicrobial qualities, and then compare those qualities to antibiotics in use to determine the viability of this source of antibiotics. The research question as it stands is whether or not the development of this as a treatment would be useful through both the lens of medicine and the growing rates of antibiotic resistance.

Antibiotics are naturally derived compounds which result in the death of bacteria, often by targeting their cell wall. The first widely known antibiotic was Penicillin which was discovered in 1928 by Sir Alexander Fleming (Ventola, 2015). However, antibiotics were mentioned and commonly used as far back as in ancient Greece, Rome, and Egypt (Ventola, 2015). Antibiotic resistance is only the natural course of things, and scientists would not believe it to be uncommon if there was some number of antibiotic resistant strains found for every pharmaceutical antibiotic on the market today (Ventola, 2015).

When an infection is being treated with an antibiotic, the bacterial cells that are susceptible to that treatment will die off, leaving behind only the cells that are resistant(Laxminarayan, 2013). For a one-time infection this may not result in too much of a problem as bacteria far outnumber people and animals. However, this has become increasingly concerning as antibiotics are being prescribed when an infection does not necessitate them (Laxminarayan, 2013

There are several factors for why the rates of antibiotic resistance are growing all over the world. However, those explanations vary between countries (Sifri, 2013). In underdeveloped countries the reasons for the rising prevalence stem from the lack of surveillance via governmental programs, lack of quality antibiotics, a clinical over prescription, and it being too easy to acquire antibiotics for conditions that do not necessitate their use (Laxminarayan, 2013). In developed countries the main issues stem from lack of

hospital control and regulation of antibiotics as controlled substances, and excessive use in the livestock industry (Laxminarayan, 2013). There are other reasons for lack of progress in slowing the prevalence as well. There is a lack of governmental funding and interest in research (Laxminarayan, 2013). This leads to less research, less headway, and less ability to discover more antibiotics.

Methods

Sample Preparation

Begin with reared cockroaches. They should have been reared at room temperature with twelve hours of light, and twelve hours of dark. They Should be fed bread and dates, as that is what they prefer. Then starve them for forty-eight hours to empty the inside contents of their digestive tract. Then kill any full-grown adults by placing them in the freezer. Dry the corpses at 50 degrees C for 24 hours.

Then mechanically grind the bodies in a blender to obtain five grams of cockroach powder. The chitin then must be treated with 1 molar HCl for 24 hours at room temperature. Then a series of washes takes place, first distilled water, then oxalic acid, repeated again with water and then bleach. Finally, wash again with water and filter the powder and dry.

Bacterial Preparation

Four different strains of bacteria: S. pyogenes, E. coli, P. aeruginosa, and S. aureus, were to be inoculated on nutrient agar plates and incubated.

Experiment

Pour NA plates with different concentrations of the chitin powder mixed in, 7.5% w/w, 15% w/w, and 50% w/w. Finally pour one negative and one positive control NA plate for each of the bacterial strains that will be tested.

Plate the bacterial strains on these plates. Incubate at 37 degrees C for 24 hours and examine. Further incubate for another 24 hours.

Data Analysis

Using excel plot growth of different bacterial strains graphically.

Results

The results of the study were promising for the activity of the Madagascar hissing cockroach chiton. S. aureus and P. aeruginosa had the most promising results overall. This is odd in of itself since they are not both gram positive or gram negative. If they had both been one or the other a conclusion could be drawn about the effectiveness of the chitin against a certain subset of bacteria. However, that is not the case here. S. aureus demonstrated an almost 90% decrease in growth when treated with the chitin at the concentration of 15% and an almost 95% decrease when treated with the chitin at 50% concentration, as can be seen in both figure 1 and figure 2. P. aeruginosa demonstrated an almost 100% decrease at all concentrations greater than 15%, seen in figure 1. E. coli, while still affected by the chitin had some of the lowest reactions to it. It only decreased by approximately 75% at both concentrations. The chitin, while still showing antimicrobial activity, isn't performing at the level that would like to be seen for this bacterium.

Overall, the data is promising for the level of antimicrobial activity that can be seen for the chitin. It would be wise to conduct further analysis on the efficacy of its effects on bacteria before drawing a conclusion on whether or not it could be used commercially in any industry. However, it is safe to say that the chitin does demonstrate significant antimicrobial activity towards common pathogens.

Discussion

The preliminary results of this study were promising. The decrease in the growth of the bacteria witnessed post treatment with the chitin is in line with the hypothesis. However, there is quite a bit of further study necessary to be able to say definitively that Madagascar cockroach chitin is a viable source of antibiotics. There are a lot of extraneous factors that play into this assumption as well. While cockroaches are relatively simple to rear there are other issues with keeping them in the lab. Although Madagascar cockroaches cannot fly, they are fairly decent climbers and can escape their enclosures. They also proliferate at a rate that can be somewhat unfortunate as well. Although, on the positive side of that argument there would never truly be a shortage of specimens. Madagascar cockroaches are also much cleaner than their American and German cousins, which makes their use in laboratory activities more reassuring. However, there is a phenomenon that an allergy to cockroaches can be acquired after working with them for an extended period of time, and this could pose issues for the general public.

Further study would be interesting to explore as there is a lot of potential for growth in this subject. It would be valuable to establish the ideal concentration of chitin for bacterial death, as well as establish a cleaner technique of chitin preparation. Similarly, it

would be interesting to see if the chitin could be combined with another compound to enhance its overall activity. Insects hold valuable secrets for longevity and novel genetics. Cockroaches , with their antimicrobial properties and cancer resistant genes, may very well be the secret to all of science's problems.

Conclusion

The results of the preliminary study are in line with the hypothesis. However, further testing of the ideal concentration of the chitin for antimicrobial activity is still necessary. It is likely that a streamlining of the process is also necessary. Overall, the results are promising, but it is yet unclear if this is as viable a source as had been originally hoped.

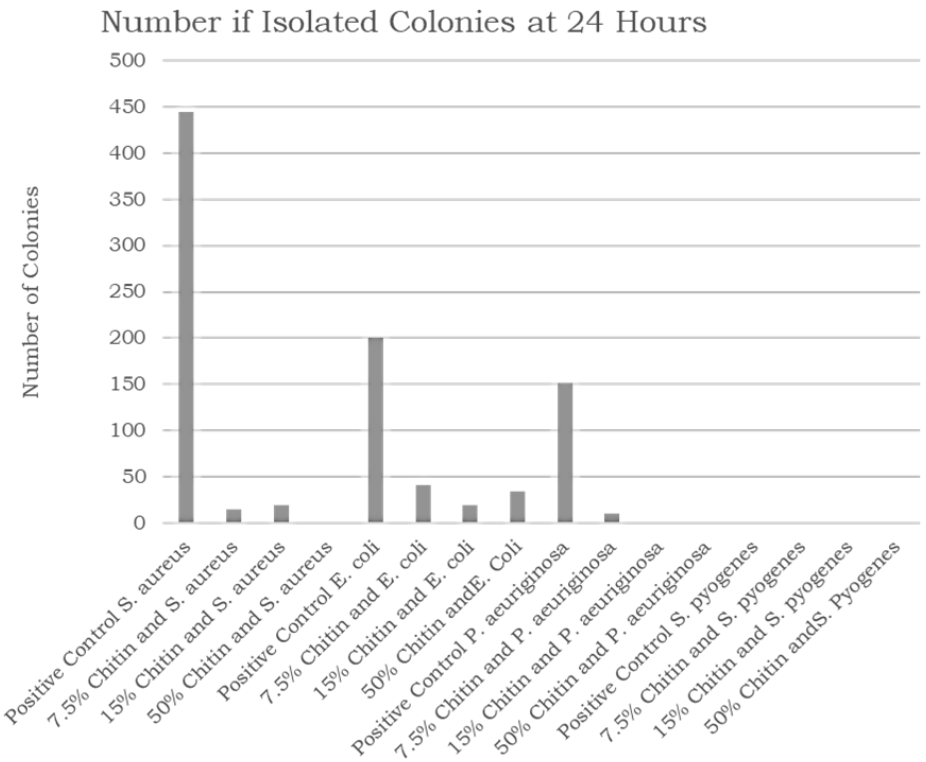

Figure 1: Number of Isolated Colonies at 24 hours

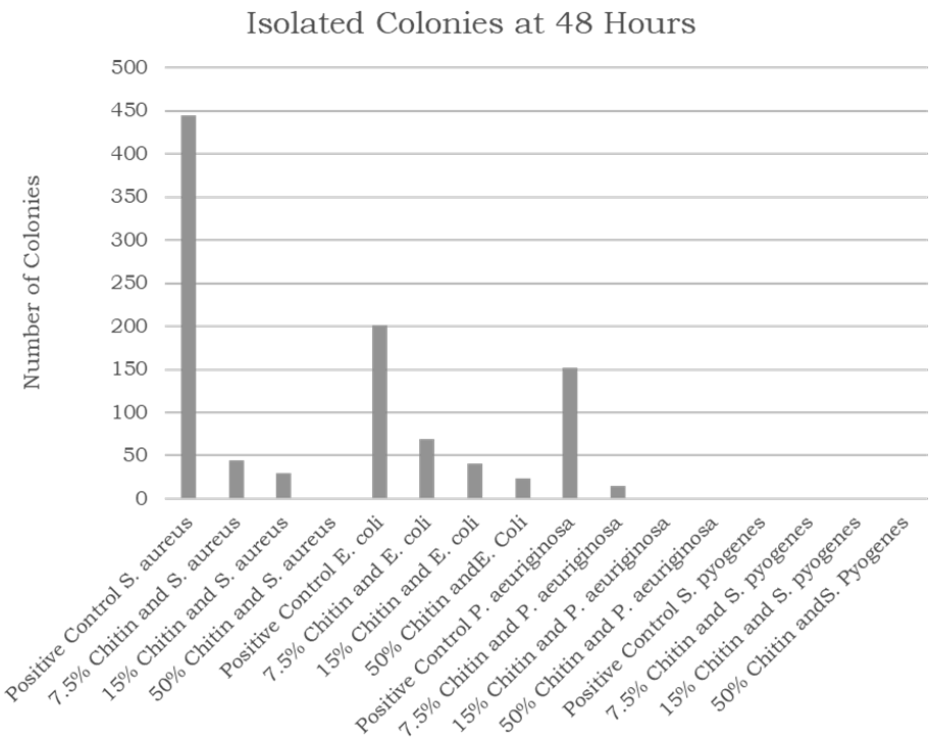

Figure 2: Number of Isolated Colonies at 48 hours

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The Effects and Impacts of Subliminal Affirmations on the Subconscious

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Abstract

Subliminal affirmations are recognized as hidden messages through the uses of audio or imagery, much akin to advertisements. These affirmations can also be remotely compared to how music affects individuals, in the sense that we are directly or indirectly persuaded around the concept of the theme being expressed through auditory stimulations, and then desire the theme that's being presented. The use of subliminal affirmations themselves have been met with controversy over their actual uses and as such, are met with individual bias on their effectiveness. I have reviewed many articles that identify the uses of subliminal affirmations and previous recorded impacts in which certain environmental and individual factors are prevalent in subliminal affirmations having an impact, and have discussed whether there is an untapped area that these affirmations hold. The purpose of this research is to analyze how significant subliminal affirmations and whether their uses are versatile enough to be used within different environments.

Keywords: subliminal, affirmations, messages, subconscious, association, mental

Introduction

In essence, subliminal messages are techniques in which individuals are exposed to images, words, sounds, or any other types of stimuli in which the users are unaware of the message within them (Arendt, 2021). According to Arendt (2021), they are perceived by the mind through sensory information, and as such information either becomes aware or unaware depending on many differences, one key difference being if an individual becomes consciously aware of the information taking place, otherwise known as supraliminal perception, then the information is not identified as a subliminal (p. 264). In addition, subliminal messages that do not become aware immediately become subjective and directly processed into the individual's mind without conscious awareness, however, the process of information is dependent on numerous factors, such as attention on the content itself, the depiction of the content, and the environment around the individual (Arendt, 2021, p. 264). Furthermore, identifying what subliminal messages are enhances the understanding of their uses.

Dzamtoska Zdravkovska et al. (2021) states that even though the use of subliminal messages among the media has met controversial arguments from both public and specialist outcries, the use of extent has still been used by corporations in order to successfully promote products since 1975 (p. 368). With this in mind Dzamtoska Zdravkovska and company have also identified priming, that is, a difference in approach to subliminal messaging that relates to an unconscious message being activated by certain physical responses, to be an integral part in understanding the baseline between conscious awareness and hidden stimuli (p. 371). Subliminal messaging and subliminal priming indicate awareness to be a subjective matter in the event of behavioral change, thus resulting in the nuance understanding of what subliminal messages are.

The effects of subliminal messaging reveal that certain factors must be recognized in order for them to make an impact. One such example that would greatly present subliminal messaging working through certain factors would be advertising. Within a social context, advertising relies on four recognized indicators for the concept or promoted product to take effect; attention, emotion, memory, and preference. These four indicators determine an individual's neural response towards the targeted ad, and in contrast, demonstrate that understanding of these specific indicators help specify how these neural responses are affected by subliminal messaging (Pozharliev et al., 2017, p. 359). In addition to this, Pozharliev et al. (2017) recognize that to understand such neural responses brought on by the analysis of advertising effects would only work within a controlled environment, and as such, state that understanding the environment within a

social context setting coupled with understanding neural responses within an individual is a more beneficial way for advertising to have a greater impact (p. 359).

Looking back to Arendt's stance on recognizing what subliminal messaging is, it should be noted how behavior is affected through the exposure of subliminal messaging. Treimer and Simonson (1988) found throughout their own study that, as half their subjects were exposed to subliminal stimuli containing positive messages to combat undesirable actions, in this case, subliminal stimuli of weight loss alongside eating less, there was a significant change in mood however the data indicated that there was little to no improvement on caloric intake or loss of fat percentage (p. 564). Fleming's (2019) also found that within their study to understand the effects of subliminal self-help audio aids, control, awareness, and self-motivation play an integral role towards the impacts on the individual. What this indicates is that even as the subliminal messages took effect on the subjects and impacted their behavior to a significant degree, it is also dependent on the individual themselves how much to a degree the subliminal message can take effect. This understanding plays a key concept in the differences between the usage of subliminal messages and whether purpose can actually make a difference.

It is understandable that because of the controversial viewpoints surrounding subliminal messages, most would often immediately regard them as having little to no effect. Not only that, but most are also not comfortable with the idea of losing control and would immediately demand and become aware of what they are being exposed to, or at least be given a basic understanding of the concept at hand. Research by Spangenberg et al. (1992) indicates that expectancies can change the overall impact and outcome in relation to a subliminal messages' prime directive, where in this case of self-help audiotapes, subjects think and believe that the tapes are helping when in actuality they are not (p. 34). It is from this context that some may also inquire whether there is an actual influence within the use of subliminal messaging, and whether or not the influence itself is subjective to belief.

Psychologist Sigmund Freud (1915) states within his theory explanation of the subconscious mind that "the unconscious mind is the primary source of human behavior. Like an iceberg, the most important part of the mind is the part you cannot see. Our feelings, motives and decisions are actually powerfully influenced by our past experiences, and stored in the unconscious." Other psychologists such as Carl Jung (1928) states that the collective unconsciousness, a theory inspired by Freud's work, is a "universal version of the personal unconscious, holding mental patterns, or memory traces, which are shared with other members of human species. To expand on Jung's theory, he believes that these memory traces, also known as 'archetypes,' are universal themes represented through various forms of cultures, and as such, are imprinted within the human mind as a result of evolution, which in turn, correlates a connection of human responses being equivalent towards animal instincts. In general, Freud argues that the unconscious mind is an area that houses all experiences within an individual's lifetime, whereas Jung's theory argues that experiences themselves are what make up the unconscious mind, which then becomes a housing area for experiences.

While both psychologists' theories support each other through the usage of identifying what the unconscious mind is as well as its functions, many others would disagree with the validity of both theories. In Freud's case, much of his ideas can be pointed out through the use of an empirical role, which narrows the gap between psychology and psychoanalysis. Wilson (2004) points out that "whereas Freud (1915) viewed the unconscious as a single entity, psychology now understands the mind to comprise a collection of modules that has evolved over time and operate outside of consciousness." It isn't so much as the unconscious mind works as one mind and has one level of storage, but rather it is a collection of minds that act away from consciousness rather than within. Wilson (2004) also points out that information processing and storage by the unconscious mind is the result of efficiency rather than that of impactfulness.

In the case of Carl Jung, much of his ideas are seen as "a little more mystical and obscure, and less clearly explained" (McLeod 2018). While bringing a certain light onto ancient myths and legends along with his fascination with astrology and Eastern religion, modern psychology has criticized his ideas as New Age mystical speculation rather than scientific contribution. Roesler (2012) points out that on the basis of Jung's proposal on human responses being equivalent to animal instinctual responses, there is no evidence that archetypes are biologically based or even remotely similar to that of animals. Young-Eisendrath (1995) proposes that archetypes, rather than being purely biological, emerge directly from experiences and take reflection from cultural characteristics.

Subliminal messaging and its impacts can vary upon an individual and many other factors, yet there is still an excessive amount of negative stigma that surrounds the topic that most do not understand how

beneficial subliminal messaging can become. Understanding the causes of what factors subliminal messaging needs to affect an individual, the neurological responses that work in conjunction through exposure of subliminal messaging, and the predetermined behavior/mindsets individuals have are imperative towards shaping human identity itself. Based on the research question, I hypothesize that there will be a distinct association between affirmations and positive changes in mentality and mood throughout a single session of exposure.

Methods

This study was made up of at least 30-50 participants from CSU Stanislaus. Participants included undergraduate and graduate students who were between the ages of 18 and 25. Participants had indicated their age, gender, and college year. Additionally, my participants indicated whether they understood what subliminals were prior to the start of the study, as well as indicating whether or not they have purposefully been exposed to subliminal messaging on their own accord.

Within the study itself, half of the participants were exposed to audio subliminal stimulations focusing on "I am" affirmations for a duration of however long the audio lasts, while the other half of participants will be exposed to the same concepts except in the form of visual subliminal stimulations. Afterwards, a survey was distributed amongst my participants, the questions relating to any changes they feel in behavior before and after subliminal exposure as well as any slight physiological changes they feel and how much they remember about the subliminal concepts after exposure. Answers had ranged from a scale of 1-7 and as followed: "Strongly Agree"= 1, "Slightly Agree"= 2, "Agree" = 3, "Neutral"= 4, "Disagree"= 5, "Slightly Disagree"=6, "Strongly Disagree"= 7.

The design was an experimental design surrounded with an independent/dependent variable-based method, where the independent variables were the formats of subliminal messaging my research participants were focusing on, and the dependent variables being the effects my participants experienced afterwards, while analyzing quantitative data within them. Through the analysis of how memory, behavior, and physiology have been impacted from exposure between audio and visual subliminals, these three indicators were measured via survey that questions participants how they felt, if they experience any physical/mental changes, and if they can recall what pertained to the subliminal messaging after partaking in a 15 to 20 minute break, with the entirety of the experiment resulting in at most 90 minutes.

The survey was administered through Google Forms available to Stanislaus State students in a link through email with a brief description of the purpose of the study, along with a video link and a set of directions concerning the "how-to" of the study. Upon opening the survey after viewing the video, the participants viewed a disclaimer stating, "This survey is both confidential and anonymous. I appreciate your participation." Participants had then answered questions from the survey regarding how they feel, if they experience any physical/mental changes, and if they can recall what pertained to the subliminal messaging after partaking in a 15 to 20 minute break, with the entirety of the experiment resulting in at most 90 minutes. Upon completion of the survey, a final screen will say, "Thank you for participating in this survey. Your response is appreciated." To gather data, I will need to leave the survey open for one week. Upon completion of gathering data, I had spent u to two weeks analyzing my data.

Results

Throughout the course of my studies, I found that there is a significant change within a person's behavioral and mental/physical performance through the usage of subliminal affirmations, which also indicates that there is a positive association between subliminal affirmations and mentality. Based on the Finalized Results data, Figure 1 indicates participants' response in mood prior to subliminal affirmation exposure. Within Figure 1, participants indicated their overall mood prior to their exposure to subliminal affirmations, in which 66.7% of participants indicated to have a Neutral mood, 28.2% were Relaxed, 23.1% were Content, and 20.5% were Distracted/Calm.

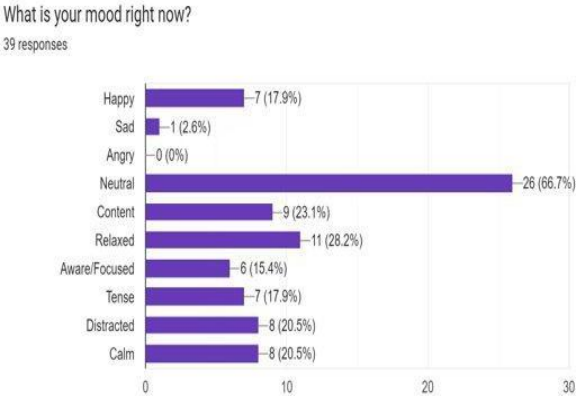

Figure 1- Question: What is your mood right now?

Within Figure 2, the data represents participants' change in mood shift after subliminal affirmation exposure. From the sudden shift in mood, we can see that the exposure from subliminal affirmations indicates that participants experienced a change in mood compared to their prior responses and thus, establishes an association between subliminal affirmations and mentality. Compared to the data within Figure 1, we can see that participants' prior Neutral mood has significantly decreased to 28.2%, whereas mood Relaxation has increased with a difference of 25.6% in mood when compared to the prior indicated data. Not only that, but moods such as Content, Aware/Focused, Tense, Happy, and Calm have also experienced an increase in participant responses after subliminal affirmation exposure, further establishing that there is an association that exists between subliminal affirmations and mentality.

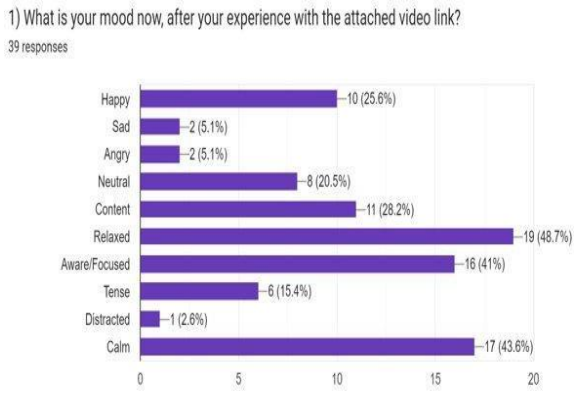

Figure 2- Question: What is your mood now, after your experience with the attached video link?

Discussion

Subliminal affirmations within the present day are used in a discreet and minute form. Social media already successfully takes advantage of these techniques through the use of images that present silent social cues in the form of advertisements that we, the individual, have already consciously witnessed through some other form of medium, that we instantly recognize what it is we're being presented with and begin to already develop an attachment to the object or concept in question. When understanding the subconscious mind, it is always imperative to understand that the subconscious mind is the part of the mind that controls our daily habits and our way of thinking. One such example would be brushing your teeth, as you are not consciously aware of how you execute the action of brushing your teeth, but rather you've already ingrained the action into your mind after countless times of repetitive action that you barely have to think about doing it. My study recognizes the baseline of subliminal affirmations and how versatile their usage can become within a clinical environment, as well as within daily living. This recognition also explains why the implications of my research proposal focuses on college students between the ages of 18 and 25, as it is generally understood that within this age range, individuals are highly susceptible and more aware.

In response to possible drawbacks relating to the methodology of this research proposal, I believe that the sample population I currently have is enough to establish the baseline of subliminal affirmation effects, although some limitations, such as the validity of response answers and more likely larger sample population, can affect the outcome to be slightly incorrect than what I've predicted to be, which is that the effects of subliminal affirmation are able to have a vast impact on individuals.

Additionally, the strengths and weaknesses within my study reside among my participants; the study's strength being that my participants have access to the subliminal affirmations as well as the questions to better aware themselves to understand what subliminal affirmations are, yet the weaknesses within this study are based on the validity of response answers my participants give, as well as my sample population having to be likely larger than its current state. To ensure strong reliability and validity while conducting my experiment, I will strongly emphasize to my participants to outreach either myself or my sponsor, as this study is done online rather than in-person.

The impact of this study affects the field of study of Behavioral Sciences, and as such I believe that this study can become practical. Within a clinical environment, one word associated to any medical term or negative connotation contrived from the stigma of "broken," "sick," or "disease," any one of those listed and every other word that was not, already puts the patient into a subconscious state of dread and worry. My research deals in a much more applied approach towards the patient, in which when exposed to subliminal affirmations that contain positive messaging centered around the idea of healing and feeling better, and if exposure is done on a daily basis along with applied actions, then that will tell the subconscious that the body needs to heal, and in turn, the body will respond in healing itself.

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The Efficacy of Music on Emotional Well-Being During Covid-19 on College Students

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Abstract

Music is a crucial element of everyday life and plays a central role in all human cultures: it is omnipresent and is listened to and played by persons of all ages, races, and ethnic backgrounds. The average American is exposed to about 4 hours of music a day. However, music is not simply entertainment. Scientific research has shown that it can influence physiological processes that enhance physical and mental well-being. This study will define the effect of music on emotional well-being during Covid-19. In the course of this study, "Emotional Well-being" will refer to the state of college students in regard to their physical, mental, emotional, and social health. This study will analyze each aspect of emotional well-being and shows the effect that music had on that aspect of emotional well-being. The results of this literature review show that music had a profound impact on mitigating the negative mental effects of the Covid-19 virus.

Keywords: Music, Emotional Well-being, Mental Health, Cognitive Processes

Literature Review

This study will define the effect of music on emotional well-being during Covid-19. In order to look at Music and its effect on emotional well-being during Covid-19, we must first define the meaning of psychological and emotional well-being. To define psychological well-being, we must look at positive emotion, engagement in relationships, self-meaning, and also accomplishments (Carter, 2021). When referring to emotional well-being, it includes several aspects of emotion and cognition. "Although precise definitions of emotions continue to be debated, virtually all theorists concur that emotions are adaptive experiences with strong physiological and subjective components. Emotions serve an adaptive function by eliciting experiential, behavioral, cognitive, and physiological responses that promote action tendencies" (Charles, 2010). Emotional well-being is subjective to each person, therefore the aspects may be slightly different. For the purposes of this study, "Emotional Well-being" will refer to the state of college students in regard to their physical, mental, emotional, and social health. According to Charles (2010), Emotional well-being is closely tied to how well people, in specific, college students, regulate their emotions.

Benefits of Music as a form of Therapy

There are marked benefits to using music as a form of therapy for emotional regulation. For example, "Positive effects of music are that it helps to improve the ability to communicate with others, helps to improve mood, music helps to process emotions, and fosters a feeling of acceptance within peer groups" (Hou, 2022). Music is a common ground to bridge gaps between college students and their peers. It can be universally relatable to peer groups that would not usually have an intersect. Evidence suggests that [subjective] sleep quality improved after listening to happy music and sad music compared with listening to pink noise (Majheed, 2021). Meaning that music was found to be more impactful than listening to another form of background noise while sleeping, and music improved sleep quality in the patients surveyed. Music was also studied along with recorded spoken word and another form of mediation that contained no music. While all three methods were proven to reduce stress music was shown to have a higher level of effectiveness in reducing stress and increasing activation (Kappert, 2019).

Music as a Stress Reduction

Emotional well-being is tied to how well people regulate their emotions. According to Garrido (2022) in a survey of students aged 14-25, young people use music to manage negative moods including sadness and depression, anxiety, or low motivation and energy. Music can be considered fairly easily accessed and low cost, making it easy to obtain it's benefits. Music engagement can also be used as a coping strategy for problem-solving (Weinberg, 2017). Currently, college students are facing increasing daily pressures since the beginning of the Covid-19 pandemic, and the pressure comes from many different aspects (Hou 2022). Since the beginning of the covid-19 pandemic, college

students have had to balance stress of the pandemic with the pressures of completing their classes, they are also facing job loss or financial issues. “Music therapy, with its unique advantages of strong operability, wide application range, high acceptance, and large cost controllable scope, will be favored by more and more students and the attention of mental health educators in Colleges and universities” (Feng, 2020). Music is low, cost relatively, low risk and widespread making it an ideal choice for college mental health programs to utilize its benefits. In fact, adolescents already spend a large portion of time-consuming music; this amount only increases when adolescents are experiencing generalized anxiety or major depressive disorder (Garrido, 2022). This type of method of stress management or reduction can often be more appealing to college students because of the stigma that surrounds treatment for mental health services making them difficult to access (Benjet 2020). Music listening or music use is already a familiar tool used by college students and their peers regardless of mental health status. This makes music an effective strategy for stress management for college students.

One counterpoint to the collection of benefits of music therapy is that “some young people report increased depression after listening to music, whereas others are drawn to motivating music that increased their sense of connectedness to others” (McFerran et al., 2015). Suggesting that music does have an emotional sway over students and can cause a negative emotional state as well as a positive emotional state. Adolescents with depression also sometimes use music in processes of rumination with negative impacts on their mood (Garrido 2022). Students who are already diagnosed with a major depressive disorder may listen to music that may cause rumination or the idea that it brings up previous negative emotions. This is why it is important to study the effect of music on the emotional well-being of college students during the pandemic.

Method

Materials

There are a total of 14 peer-reviewed Scholarly articles used for this research article.

Design

The design is a comprehensive literature review using scholarly articles to look at the effect of music on emotional well-being. This was done by summarizing and breaking down the definition of emotional well-being according to the American Psychological Association 2010 Study on emotional well-being across adulthood which textualizes and defines this broad concept (see Figure 1). After breaking down the definition of emotional well-being, into four aspects, each aspect is analyzed and broken down further.

Procedure

The materials were accessed through the CSU Stanislaus library using databases such as One Search, PsycINFO, and PsycArticles. Primary and Secondary Materials were also accessed on the American Psychological Association Website. Materials included 14 scholarly peer-reviewed articles that defined emotional well-being and showed the link between music and emotional well-being.

Results

Physical

After analyzing the physical aspects that listening to music impacts it was found that listening to music has a physiological response within the body. The average American adult listens to 4 hours of music a day. Listening to music can manipulate the heart rate, lower blood pressure, and decrease the production of the stress hormone, cortisol. In fact, music has been proven to increase the release of feel-good hormones, serotonin, and dopamine. Music also increases productivity while working laboring or working out this is due to the increase in dopamine. Another physiological response that was discovered when listening to music was the Frission experiment which measured emotional experiences accompanied by goosebumps, shivers, and tingling sensations while listening to samples of music. Skin conductance and skin temperature were measured in addition to self reported measures, which proved a subconscious physiological response that occurs when listening to music. This indicated that persons listening to music may experience being moved, empathy or social bonding. In addition to this, It was discovered that heartrate can be altered by the beats per minute that were included in the piece. For example songs used for upbeat motivation, songs with beats per minute that were between 80-120 bpm raised heartrate while songs with bpm that fell into the 40-70 range tended to lower heart rate.

Mental

Numerous studies have focused on the effect of music interventions on individuals in clinical settings. Many of these studies concluded that music interventions positively impact mood and anxious or depressive symptoms in both children and adults. Studies on patients diagnosed with mental disorders have shown a visible improvement in their mental health after interventions using music as primary tool. Other studies have demonstrated the benefits of music, including improved heart rate, motor skills, brain stimulation, and immune system enhancement.

Emotional

Individuals can influence mood regulating functions of music by applying emotion regulation strategies when listening to music. Individuals can apply regulatory strategies to modify their experienceof emotions. Two strategies are suppression of emotion experience and enhancement of emotion experience. Suppression refers to the down-regulation of feelings, that is, not allowing yourself to experience the focal emotion, which requires self-regulatory resources; enhancement refers to the up-regulation or accentuation of feelings, that is, giving in to emotions.

Social

Evolutionary theories have proposed that empath the tendency or ability to understand and share others' emotion increases cooperation and social cohesion among individuals. Research has indicated that engaging with music alone may improve physical health and emotional wellbeing , other research has shown that engaging with music in the company of others is associated with stronger positive experiences. Given the importance of social connection to subjective well-being, it may be expected that the benefits of music to subjective well-being are limited to those who engage with music as a means of social facilitation. There is also Increased engagement due to a release of dopamine levels. Lastly there is increased well-being due to an increase of engagement.

Implications of Covid-19

The Physical implications during the pandemic would have been an increase in music use for the benefit of physical exercise due to the shutdown of public spaces. The Mental implications would be an increased well-being during shutdown and isolation. Listening to music has proven to have a positive impact on people during the pandemic. It would also have lowered stress and increased the amount of dopamine in an individuals system. The Emotional implications would be mitigated negative effects and emotional impacts due to an increase of music use for emotional regulation, increase in rumination, and acceptance. The social effects of emotional well being were definitely neagtively impacted, as individuals culd not meet in person to enjoy the benefits that are included in this section.

Discussion

This research is important because music is such a commonly used medium and exploring its effect would be beneficial to multiple populations. The expected results of this study would be a negative correlational relationship between music and stress. This means that the expected results would be that as students use more music, their stress levels decrease.

This study will contribute to the field's body of research because it will illuminate whether or not music is an effective tool for students to use to cope with stressors. Music is cost-effective, widely available, and can be found in every language and culture. Evaluating this technique will add to our understanding of how music can manipulate emotions, lower stress, and calm anxieties. Understanding how music can be used to lower stress and boost emotional well-being can have an impact on students of any age and can be generalized to other mediums such as music therapy. Covid-19 was an incredibly stressful and isolating time for students and it is important to evaluate the effect that music may have had in relieving stress and boosting emotional well being.

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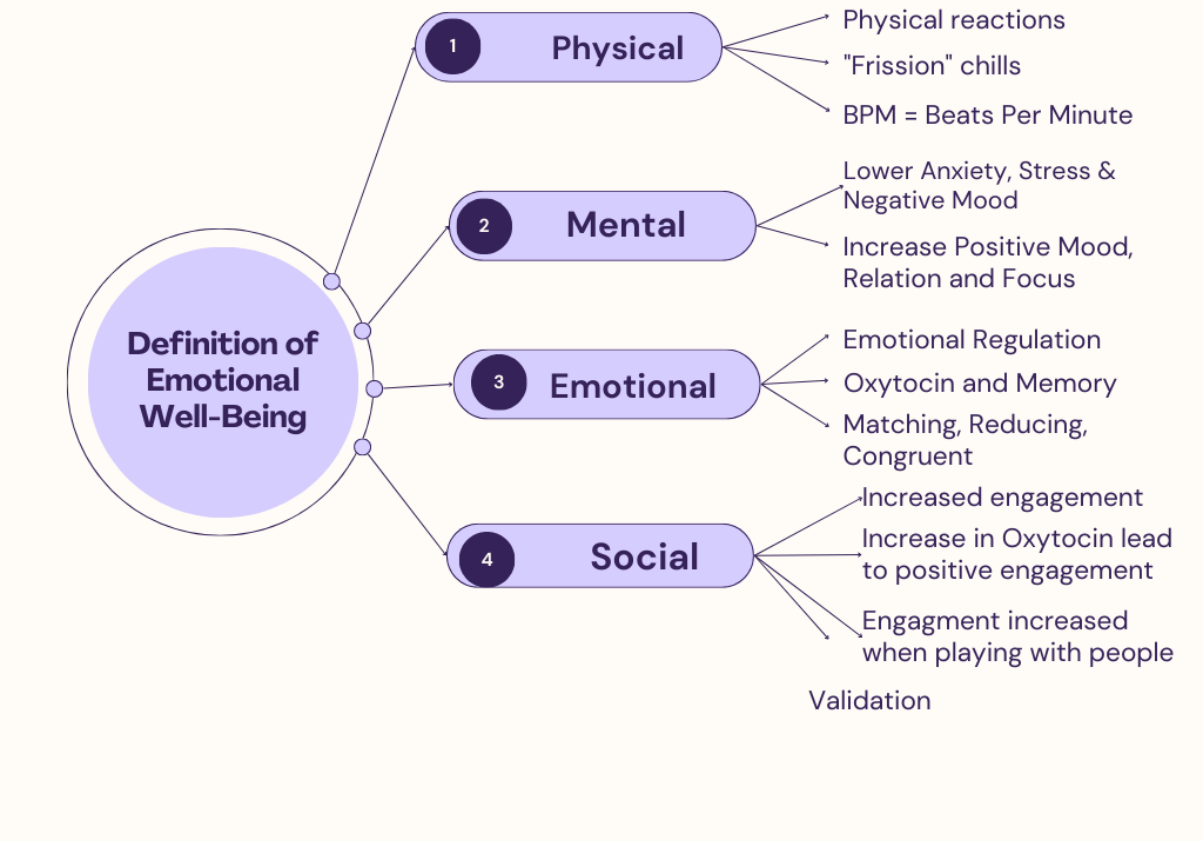
Figure 1: Flow of information chart



Psychosocial Stressors and Nicotine/Tobacco, Cannabis Product Use Among Diverse Young Adults

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Abstract

Psychosocial stressors such as everyday discrimination, adverse childhood experiences, and concerns of social hostility are emerging as influential on health behaviors especially among young adults. Understanding the association of these behaviors with substance use among racial/ethnic minority and non-racial/ethnic minority young adults could shed light on disparities in substance use and outcomes among this population subgroup. This study examined associations of tobacco/nicotine and cannabis product use (smoking and vaping) with three psychosocial stressors—everyday discrimination, adverse childhood experiences, and social concern— among racial minority young adults and their white counterparts. Cross-sectional data used in the study was from a longitudinal study of Los Angeles public high school students. Stratified multivariate logistic regression models were used to examine the relationship between these psychosocial stressors and past 6-month substance use. Findings show that among racial/ethnic minority young adults, stressors were associated with increased odds of substance use. These results highlight the unique impact that psychosocial stressors have on racial/ethnic minority young adults. Prevention programs need to incorporate culturally sensitive programs that acknowledge the potential for use of maladaptive behaviors (substance use) to cope with psychosocial stressors.

Keywords: psychosocial stressors, cannabis, nicotine, vaping, young adults

Introduction

Since their introduction to the market, combustible nicotine and cannabis products have been the primary delivery method; however, electronic cigarettes (e-cigarettes or vapes) have caused a recent shift in use patterns (Perikleous et al. 2018; Fadus et al. 2019). E-cigarettes have emerged as the main method of delivery for nicotine, whereas cannabis smoking remains most common (Fataar & Hammond, 2019). Although there are limited studies examining short and long-term health effects of these noncombustible and smokeless products, current evidence links use to adverse mental health outcomes especially among adolescents (Becker et al. 2021) Despite such evidence, noncombustible nicotine and cannabis products continue to proliferate the market often targeting vulnerable youth and adolescent populations.

Several studies have evaluated racial/ethnic differences in substance use. In adolescent e-cigarette users, non-Hispanic white males of higher economic status report more frequent or recent use (Perikleous et al. 2018; Dai et al. 2021). Furthermore, non-Hispanic white users saw a 2.5-fold increase in frequent e-cigarette use from 2014-2019, are more likely to report frequent use, and more frequently use flavored nicotine products (Dai et al. 2021). Non-Hispanic black adolescents' reports of frequent e-cigarette use remained stable; however, they are more likely to be dual users of e-cigarettes and other tobacco products (Dai et al.2021). In regard to cannabis product use from 2006-2015, black and Hispanic young adults saw an increase in use whereas white users saw little change (Hasin et al. 2019).

While various risk factors associated with substance use have been previously identified, limited research has evaluated the influence of psychosocial stressors on the use of these substances. Current findings suggest that adverse childhood experiences (ACEs) are associated with nicotine and cannabis use (Shin et al. 2019; Fortier et al. 2022; Boccio et al. 2022). Another psychosocial factor influencing American adolescents is perceived discrimination (Jones et al. 2021). Discrimination has emerged as a substance use risk factor (Jones et al. 2021) and several studies have reported an association between perceived discrimination and e-cigarette use specifically (Jones et al. 2021; Fahey et al. 2021). For example, Fahey et al. (2021) reported that among college students, greater perceived discrimination was associated with increased frequency of vaping (i.e., more time spent vaping per day). Although concern of social hostility has not been extensively studied, it is synonymous with social anxiety which has been previously evaluated for its association with substance use (Lemyre et al. 2019). Social anxiety has

also been found to increase risk for current smokers to maintain smoking behaviors (Watson et al. 2018).

A current gap in the literature is the dearth of studies examining the specific impact of these pertinent psychosocial stressors (ACEs, discrimination, CoSH) on nicotine/tobacco and cannabis use among racial/ethnic minority and non-racial/ethnic minority youth/young adults. Research is needed to examine racial patterning in the impact of these stressors on use of combustible and noncombustible forms of nicotine/tobacco and cannabis products. To fill this gap, this study examined the associations between ACEs, everyday discrimination, and CoSH on the use of nicotine/tobacco and cannabis among a racially diverse sample of young adults. We hypothesize that there will be a direct relationship between ACEs and substance use behaviors, discrimination and use behaviors. We also hypothesize that racial minority young adults will report higher and more intense ACEs and discrimination when compared to their white counterparts.

Methods

Sample and Procedure

This research utilized data drawn from the Happiness and Health Study (H&H), a longitudinal cohort study on substance use patterns and mental health within Los Angeles metropolitan area high school students. 40 public high schools were approached to participate based on their diversity and proximity; only 10 schools agreed to participate. To enroll, students and parents were required to offer active consent. Nearly 3,400 participants were initially enrolled in the study. Data was collected across 8 waves approximately 6 months apart, once during the fall and spring semesters each. After graduating, participants continued survey responses annually for a total of 13 waves as of 2023. Post-graduation surveys were administered online once a year, approximately 12 months apart. This study used data from wave 9 (2021) when questions on the psychosocial stressors of interest where first asked. The longitudinal study was approved by the University of Southern California Institutional Review Board (IRB) and California State University, Stanislaus IRB deemed this secondary analysis of data exempt.

Measures

Substance Use

Participants were asked, "Have you used the following substances in the past 6 months?". A list of various substances, along with examples of common alternative names and products for each, were provided for each substance. Responses were measured on a binary scale of 1=yes or 0=no. The substances included in analyses include, "Cigarettes," "Any electronic cigarette with nicotine," "Smoking marijuana," and "Electronic device to vape marijuana, THC or hash oil." Responses to each question were used to create the study outcome variables: cigarette smoking, e-cigarette vaping, cannabis smoking, and cannabis vaping, respectively.

Everyday Discrimination

Everyday discrimination was measured using the Everyday Discrimination Scale (EDDS) (Williams et al. 1997). The scale asked respondents how often they felt they were treated differently because of their gender, ethnic or cultural background, social class, or sexual orientation. Responses to the 11-item measure were on a 4-point scale from "Never" (0) to "Frequently" (3). Responses for each participant were summed for a possible total score of 33.

Adverse Childhood Experiences (ACEs). Participants completed the 10-item ACEs measure (Felitti et al. 1998) about experiences of abuse, neglect, and household dysfunction during the first 18years of their life. Responses to the 10 questions were on a binary scale of no (0) or yes (1). Responses for each participant were summed for a possible total score of 10.

Concern of Social Hostility

Participants responded to a question asking them to rate their degree of concern, worry, and stress towards "increasing hostility and discrimination of people because of their race, ethnicity, sexual orientation/identity, immigrant status, religion, or disability status in society." Responses to questions assessing their feelings of concern, worry, and stress were each on a Likert scale from "Not at all" (0) to "Extremely" (4). Responses from the three items were summed for a possible total score of 12.

Demographics

Participants' sociodemographic characteristics were assessed. Participants indicated their race/ethnicity (Hispanic/Latino, Asian, Black/African American, White, Native Hawaiian/Pacific Islander or American Indian/Alaskan Native, and Other/Cannot Choose One). Responses were used to place participants into non-racial/ethnic minority (White) and racial/ethnic minority (all other groups). Participants also indicated their age (in years), gender (male, female), and socioeconomic status (live comfortably, meet needs with little left, just meet basic expenses, don't meet basic expenses).

Statistical analysis

Statistical analyses were conducted in the Windows edition of SPSS (ver. 28). Univariate

analyses were used to describe the study sample and stratified multivariable logistic regression models examined association of psychosocial stressors with cigarette smoking, e-cigarette vaping, cannabis smoking, and cannabis vaping. All models adjusted for age, gender, and socioeconomic status.

Results

Descriptive Statistics

The study sample included a total of 2,207 young adults (mean age: 21.84, SD=0.40). The majority of participants were female (60.3%, n=1,330), nearly half were of Hispanic/Latino racial identity (46.4%, n=1,023), and approximately one sixth were of white racial identity (16.0%, n=353), as shown in Table 1.

Table 1.
Descriptive characteristics of study sample

Characteristic	n	%
Overall	2207	100%
Mean Age	21.84 (±0.40)	—
Gender		
Male	863	39.1%
Female	1330	60.3%
Ethnicity		
Hispanic/Latino	1023	46.4%
Asian	408	18.5%
Black/African American	105	4.8%
White	353	16.0%
Native Hawaiian/Pacific Islander; American Indian/Alaskan Native	107	4.8%
Other	175	7.9%
SES		
Lives Comfortably	865	39.2%
Meets Needs with Little Left	660	29.9%
Just Meets Basic Expenses	525	23.8%
Doesn't Meet Basic Expenses	116	5.3%
Cigarette Use (Past 6 Months)		
Yes	236	10.7%
E-cigarette with Nicotine Use (Past 6 Months)		
Yes	495	22.4%
Cannabis Smoking (Past 6 Months)		
Yes	769	34.8%
Cannabis Vaping (Past 6 Months)		
Yes	666	30.2%

Within the sample, 10.7% reported cigarette smoking, 22.4% reported e-cigarette vaping, 34.8% reported cannabis smoking, and 30.2% reported cannabis vaping within the past 6 months. Comparisons between racial groups are provided in Figure 1 and 2.

Association of Psychosocial Stressors with Substance Use Among Racial/Ethnic Minority Young Adults

Racial minority young adults include participants who identify as any race other than white. Racial minority young adults made up 82.4% of the sample (n=1,118). Figure 3 presents the results (adjusted odds ratios [aOR]) from the multivariable logistic regression analyses examining significant relationships between the psychosocial stressors and tobacco and cannabis use. ACEs was associated with an increased odds of cigarette use (aOR=1.14, 95%CI=1.06-1.23), cannabis smoking (aOR=1.09, 95%CI=1.04-1.15), and cannabis vaping (aOR=1.06, 95%CI=1.01-1.12). Experience of everyday discrimination (EDDS) was associated with increased odds of e-cigarette vaping (aOR=1.31, 95%CI=1.09-1.56). Concern of social hostility (CoSH) was associated with increased odds of cannabis smoking (aOR=1.17, 95%CI=1.07-1.28) and cannabis vaping (aOR=1.18, 95%CI=1.08-1.30). Additional odds ratios regarding covariates are presented in Table 2. Compared to males, female racial/ethnic minority young adults were at reduced odds of cigarette use (aOR=0.60, 95%CI=0.43-0.85) and e-cigarette vaping (aOR=0.60, 95%CI=0.47-0.77). Racial/ethnic minority young adults who just meet their basic expenses were significantly more likely to vape cannabis (aOR=1.32, 95%CI=1.00-1.74).

Association of Psychosocial Stressors with Substance Use Among Non-Racial/Ethnic Minority Young Adults

Non-racial/ethnic minority young adults were categorized to only include participants who identify as white. White participants made up 16.0% (n=353) of the total sample. As shown in figure 4, no statistically significant relationships were found between the psychosocial stressors and substance use; however, significant relationships were found between financial situation and cannabis product use. As shown in Table 3, not meeting basic needs significantly increased odds of cannabis smoking (aOR=3.88, 95%CI=1.36-11.10) and cannabis vaping (aOR=3.77, 95%CI=1.28-11.11). Just meeting basic expenses increased odds cannabis smoking only (aOR=2.14, 95%CI=1.13-4.07). Meeting needs with little left increased odds of cannabis smoking (aOR=3.88, 95%CI=1.36-11.10) and cannabis vaping (aOR=3.77, 95%CI=1.28-11.11).

Discussion

This study advances knowledge regarding psychosocial stressors' influences on nicotine/tobacco and cannabis use among diverse young adults. Results of this study indicate a differential relationship between the experience of psychosocial stressors and various substance use in racial minority young adults. Specifically, experience of ACEs and concern for social hostility was associated with increased risk for cannabis smoking and vaping. ACEs was also associated with risk for cigarette smoking, and everyday discrimination was associated with an e-cigarette use risk.

No significance was found in the relationships between psychosocial stressor experience and substance use among non-racial/ethnic minority participants despite similar experience of ACEs and CoSH. The lack of statistical significance may be related to the smaller number of white participants when compared to the racial/ethnic minority group. Furthermore, this result may imply that the relationship between lower SES and cannabis product use is more influential on the maladaptive behaviors among this demographic than experience of psychosocial stressors.

These findings implicate voluntary use of nicotine/tobacco and cannabis products among minority young adults as coping for experienced psychosocial stressors among. This is in accordance with past studies which found the use of said products as self-medicating or relaxation devices to cope for psychological distress (Watson et al. 2018; Donaldson et al. 2022). Nicotine products, in particular, have been found to have relaxation and stress relief effects (Watson et al. 2018). Furthermore, vaping products are often marketed to target youth or young adults through the inclusion of flavorings which have been found to increase willingness to try said products (Chaffee et al. 2023).

This study's findings further support the previously established Race-Based Traumatic Stress model (RBTS) which posits that traumatic stress on the basis of racism can negatively impact psychological outcomes in people of color (Badien et al. 2023). While past studies have explored the associations between RBTS model and alcohol problems (Su et al. 2020), this study expands upon the model and its relationship with nicotine/tobacco and cannabis product use.

Conducting analyses within a racially diverse sample of young adult participants expand upon past findings which only explored one product, stressor type, or racial group (Fahey et al. 2021; Fortier et al. 2022; Assari et al. 2019 Shin et al. 2019). Addressing this gap can introduce greater acknowledgement of childhood trauma on the development or aggravation of maladaptive behavior. Thus, intervention strategies should be culturally sensitive when targeting nicotine/tobacco and cannabis use in young adult populations.

Despite increasing the current understanding of risk factors for maladaptive substance use, this study had various limitations. The use of existing secondary data restricted the scope of this project and the measures included in statistical analysis.

Conclusion

In this study of psychosocial stressors' association with substance use, racial/ethnic minority young adults who experienced these stressors saw an increased likelihood of nicotine/tobacco and cannabis product use. Experience of ACEs increased odds of cigarette and cannabis (vaping and smoking) product use. Everyday discrimination increased odds of e-cigarette vaping. CoSH increased odds of cannabis smoking and vaping. These findings implicate the experience of psychosocial stressors as influential on maladaptive substance use behaviors in young adults. Further research and interventions should take into consideration the impact of psychological stressors when developing substance use prevention programs among diverse population subgroups.

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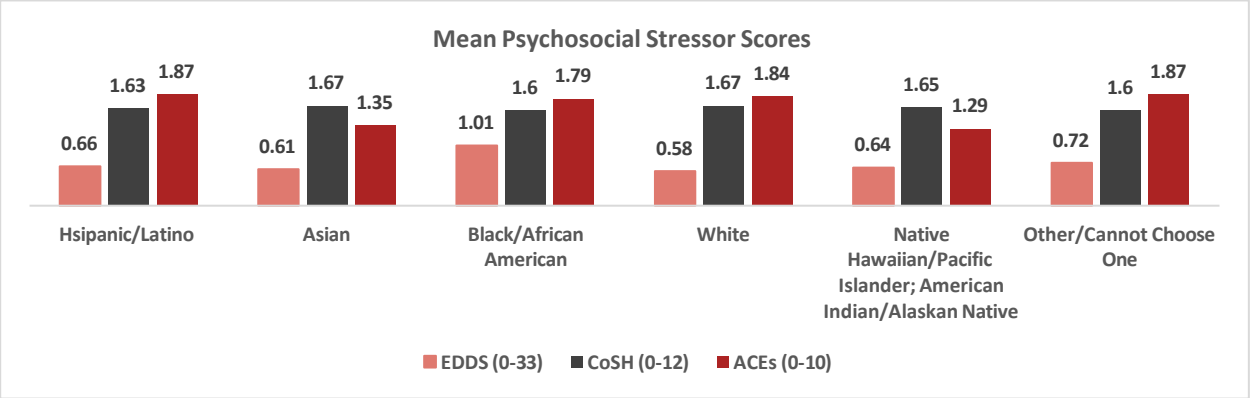
Figures

Figure 1.
Mean psychosocial stressor scores by racial group.



EDDS = everyday discrimination scale, CoSH = concern of social hostility, ACEs = adverse childhood expreiences

Figure 2.
Substance use by racial group.

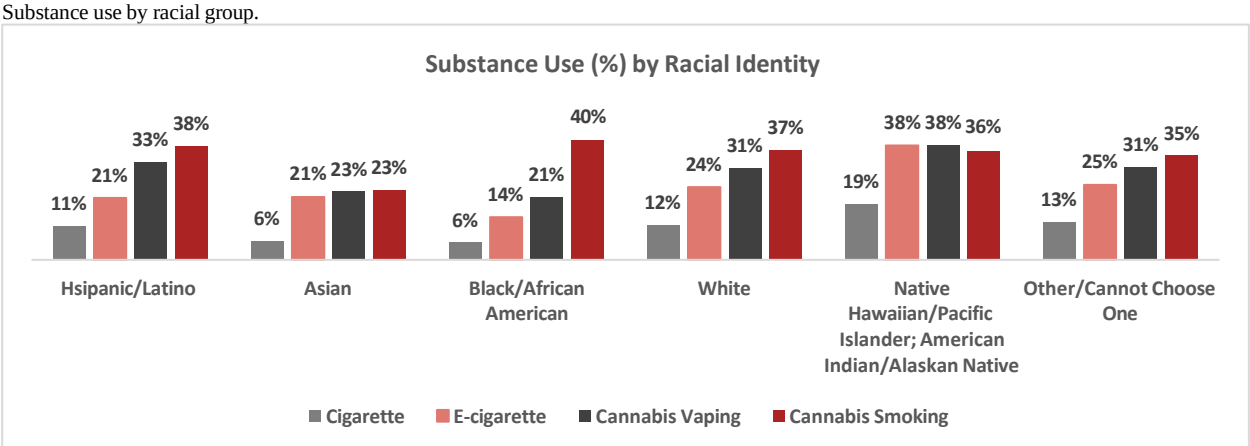
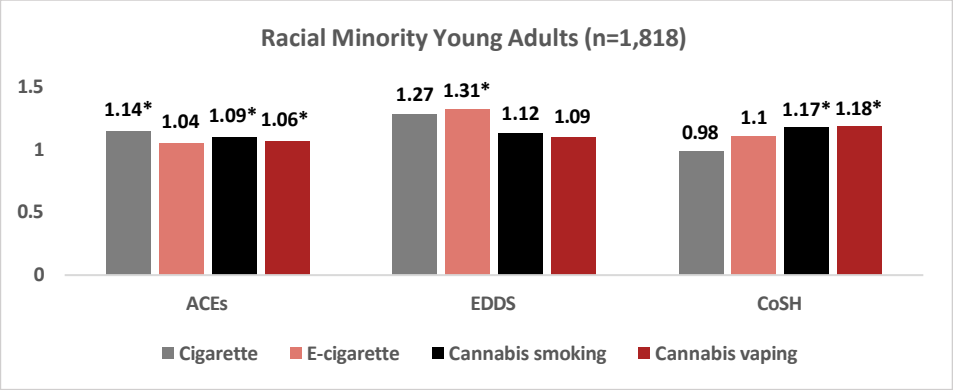
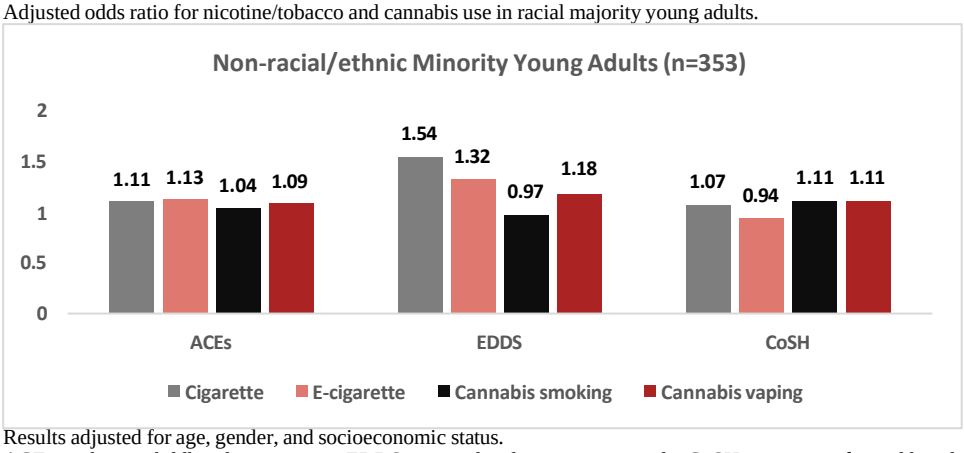


Figure 3.
Adjusted odds ratios for nicotine/tobacco and cannabis use in racial minority young adults.



* = Statistical significance. Results adjusted for age, gender, and socioeconomic status.
ACEs = adverse childhood experiences, EDDS = everyday discrimination scale, CoSH = concern of social hostility

Figure 4.
Adjusted odds ratio for nicotine/tobacco and cannabis use in racial majority young adults.



Results adjusted for age, gender, and socioeconomic status.
ACEs = adverse childhood experiences, EDDS = everyday discrimination scale, CoSH = concern of social hostility

Table 2.
Logistic regression models for nicotine/tobacco and cannabis use in racial minority young adults (n = 1,818)

	Cigarette Smoking		**E-cigarette with Nicotine Vaping**		**Cannabis Smoking**		**Cannabis Vaping**	
	OR (95% CI)	P value	OR (95% CI)	P value	OR (95% CI)	P value	OR (95% CI)	P value
Age	1.18 (0.80-1.75)	.398	0.88 (0.66-1.19)	.408	0.93 (0.72-1.21)	.592	0.81 (0.62-1.06)	.122
Female	0.60 (0.43-0.85)	**.004**	0.60 (0.47-0.77)	**<.001**	0.97 (0.78-1.22)	.814	0.91 (0.72-1.14)	.410
SES								
Doesn't meet basic expenses	0.97 (0.47-2.01)	.941	1.41 (0.85-2.33)	.187	1.25 (0.78-1.99)	.352	1.39 (0.87-2.24)	.171
Just meet basic expenses	1.03 (0.68-1.55)	.895	1.13 (0.84-1.53)	.420	1.20 (0.92-1.57)	.175	1.32 (1.00-1.74)	**.047**
Meet needs with little left	0.86 (0.57-1.28)	.450	0.86 (0.64-1.12)	.316	1.18 (0.92-1.51)	.202	1.16 (0.89-1.51)	.262
ACEs	**1.14 (1.06-1.23)**	**<.001**	1.04 (0.98-1.10)	.166	**1.09 (1.04-1.15)**	**<.001**	**1.06 (1.01-1.12)**	**.022**
EDDS	1.27 (0.99-1.64)	.061	**1.31 (1.09-1.56)**	**.005**	1.12 (0.94-1.32)	.202	1.09 (0.92-1.30)	.321
CoSH	0.98 (0.85-1.14)	.822	1.10 (0.99-1.22)	.090	**1.17 (1.07-1.28)**	**<.001**	**1.18 (1.08-1.30)**	**<.001**

Abbreviations: SES, socioeconomic status; ACEs, adverse childhood experiences; EDDS, everyday discrimination scale; CoSH, concern of social hostility
*Reference Groups include male for female and lives comfortably for SES. Significant relationships (p = <.05) denoted in boldface.

Table 3.
Logistic regression models for nicotine/tobacco and cannabis use in non-racial/ethnic minority young adults (n = 353)

	Cigarette Smoking		**E-cigarette with Nicotine Vaping**		**Cannabis Smoking**		**Cannabis Vaping**	
	OR (95% CI)	P value	OR (95% CI)	P value	OR (95% CI)	P value	OR (95% CI)	P value
Age	2.11 (0.86-5.19)	.105	1.97 (1.00-3.89)	.050	0.80 (0.43-1.48)	.472	0.78 (0.40-1.50)	.451
Female	0.68 (0.32-1.46)	.323	1.14 (0.64-2.02)	.654	1.49 (0.89-2.51)	.133	1.60 (0.91-2.82)	.103
SES								
Doesn't meet basic expenses	3.29 (0.98-11.04)	.054	2.31 (0.80-6.73)	.123	3.88 (1.36-11.10)	**.012**	3.77 (1.28-11.11)	**.016**
Just meet basic expenses	1.66 (0.68-4.04)	.266	0.91 (0.44-1.89)	.801	2.14 (1.13-4.07)	**.020**	1.60 (0.79-3.21)	.191
Meet needs with little left	0.82 (0.33-2.04)	.663	1.21 (0.65-2.23)	.549	2.47 (1.42-4.31)	**.001**	2.58 (1.43-4.68)	**.002**
ACEs	1.11 (0.94-1.30)	.210	1.13 (0.99-1.29)	.064	1.04 (0.92-1.17)	.548	1.09 (0.96-1.24)	.185
EDDS	1.54 (0.83-2.88)	.174	1.32 (0.81-2.16)	.267	0.97 (0.61-1.55)	.890	1.18 (0.72-1.93)	.506
CoSH	1.07 (0.81-1.41)	.657	0.94 (0.76-1.16)	.570	1.11 (0.92-1.34)	.274	1.11 (0.91-1.35)	.309

Abbreviations: SES, socioeconomic status; ACEs, adverse childhood experiences; EDDS, everyday discrimination scale; CoSH, concern of social hostility.
*Reference Groups include male for female and lives comfortably for SES. Significant relationships (p = <.05) denoted in boldface

Fluency vs. Literacy in Multilingual College Students in the Central Valley

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Abstract

As the title implies, the sole focus of this research study is to measure and record the percentage of fluency and literacy skills multilingual college students exhibit within the Central Valley with the very intent to reveal the challenges multilingual students face. Often enough the case being the conflicting competition between their foreign languages, native, or target languages they hone against the usage of the English language. In today's world, there is a constant usage of English among the globe. One can observe it in action through our surroundings from the education system, workforce, and social networks. As a result, student's literacy skills in their native and learnt foreign languages will significantly demonstrate a negative decline in comparison to their literacy skills in the English language due to the lack of need to practice literacy skills in these foreign languages. Whereas for their fluency skills on the other hand, it may not appear significantly affected because conversation is generally facile to convey due to repetition of common words, phrases, or expressions that one often comes to be confronted with on the daily. With the aforementioned, to carry on a tradition, maintaining native or learnt foreign language ensures the culture along with its tongue remains striving and alive. It is inevitable to avoid culture and all that enwraps around it when learning or speaking a language as both the existence of culture and language are codependent hand to hand to one another. With the data collected from this very research, I hope to promote and motivate participants and a much wider audience to continue or begin to hone a language they find themselves interested in or to further encapsulate oneself into a culture because we are to celebrate diversity of origins that carries thousands of stories, not uniformity.

Introduction

Through years of repetitive exposure to today's English-influenced speaking environment, students' literacy skills in Spanish and other learned foreign languages will significantly decrease due to the lack of practice of these literacy skills within these languages. Whereas their fluency skills on the other hand, will not appear to be as affected because conversation arises generally much easier; a skill that improves and becomes master through practice through repetition of common frequent phrases and expressions.

Languages, though many and all unique, all enable society to convey thoughts, feelings, ideas, and information across to others to ignite actions. Often communication is key for functions to occur, a simple error in a set of instructions can result in mishap, further issues, and prevention of moving forward; a concept that very much applies to beings in a social aspect, electronic devices, and much of life within itself. As impactful and wide language finds itself applicable to much of life, the research refers to the social aspect of language that society utilizes every day. Being that the case, to better understand language means growth and the maintenance of culture that will soon be elaborated ahead.

Furthermore, with regards to the terminology within the title of the research, there is often a misconception between bilingual and multilingual that leads to misunderstanding. While the terms bilingual and multilingual may appear as synonymous, they are not completely synonymous with each other. The key distinction between these two terms is in their prefixes.

The prefix "bi-" means two such as biannual, bicycle, bilateral and the prefix "-multi" means many such as the words multimedia, multiplayer, and multiplier. A bilingual person hones their ability to read and write in only two languages while a multilingual person, on the other hand, hones the ability to both read and write in three or more languages.

According to some academics, trilingualism research is conducted in the theoretical vein of bilingualism, with no actual efforts to delimit trilingualism as a distinct entity (Aronin & Hufeisen, 2009; Hoffmann, 2001; Njurai, 2016). Although there are some striking similarities between bilinguals and trilinguals, there are distinguishing characteristics of trilingualism. It is best to understand the

distinguishing characteristics and some bilinguals' habits as it could be proven useful to further about through the exploration of those basic characteristics of trilingual practices; to develop an improved understanding of the concept.

Multilingualism, according to Aronin and Hufeisen (2009), is complex in several ways and facets. Multilingualism is becoming increasingly more complex than bilingualism in terms of complexity. While the evidence isn't conclusive, the findings from several studies may suggest that in many ways there are several significant differences between learning a third language and learning a second language (Aronin & Hufeisen, 2009). A bilingual or multilingual person may arrive at varied conclusions about his or her bilingualism or the multilingual self and his several personas in his quest to learn and acquire new languages (Lvovich, 1997).

Furthermore, fluency is the ability to effectively communicate and convey ideas. Literacy is the ability to comprehend while reading and writing. Now, to what extent or degree do multilingual college students or individuals possess both abilities in the languages learnt? The results and findings of this research study will share the answer to this question.

As mentioned before, language goes hand to hand with any culture. Through previous study, it has been proven both language and culture are inseparability to one another (Galante, 2022). Within the study, a Plurilingual and Pluricultural Competence (PPC) scale was utilized to further study multilingual individuals. Through the case study, they concluded a significant upward trend in culture in relations to language.

Culture, an umbrella term that manifests itself through daily rituals, objects, and languge all share variation. Those variations of society should be cherished as they hold stories of upbringing, development, striving societies, and define individuals as uniquely one of a kind.

Though groups may share a culture, each has hundreds of roots that slowly begin to differentiate one another that bend slightly in a different direction. Without attending to these roots, the stories carried through these roots will wither away. To prevent such a terrible fortune, individuals must do more to preserve diversity, draw more attention and encourage diversity to nourish these roots rather than lose them to uniformity.

Methodology

A sample of fifty bilingual, trilingual, multilingual, and proclaimed participants who state they are proficient, all from various ethnicities were recruited, surveyed, and documented for this research. With the use of an online survey, all fifty participants answered 12 survey questions.

Some sample questions from the survey are the following: “How many languages do you speak?,” “Do you feel that an English-speaking environment competes with the growth in both your fluency and literacy skills of the foreign languages you know?,” “What language(s) do you use at home?,” “What languages do you use amongst your friends?.” For the interview portion, student participants were given the opportunity to participate in an interview either in-person or online. Their participation was voluntary. Those who decided to participate in an interview were mainly Spanish and Portuguese speakers. The interview questions were an extension of the survey and the purpose of the interview was to further assess the participants' fluency and literacy knowledge in their foreign language. Such was measured by having participants take a fluency test that required reading and engaging in conversation. For the literacy portion, participants were asked to demonstrate their writing abilities by writing down phrases said to them in the foreign language or by answering a prompt.

Results

The results were gathered: through questions, assessments, and further study conducted. The recorded data will not find individuals or students who speak a type of foreign language followed by Spanish in that order. As displayed in Figure 1, Languages Spoken Amongst College Students, this figure demonstrates that all students speak English. The other languages are shown within the figure: forty-three Spanish speaking students and seven other students who speak either Portuguese, Khmer, Korean, Japanese, and Punjabi. Figure 2, Fluency Survey Results, and Figure 3, Literacy Survey Results, demonstrate both the fluency and literacy levels in Spanish and the previous foreign languages in comparison with those skills in the English. In both the English fluency and literacy both Spanish-speaking students and foreign language speaking students scored a 5 indicating proficiency in the language. In Spanish fluency students scored an average of 3 proficiency and for literacy they scored an average of

3 as well. For foreign language speaking students, students scored an average of 2 for their fluency skills and an average of 1.5 for their literacy skills.

Discussion/Conclusion

The participants who participated within the questionnaire survey may perhaps speak excellent English, good in their native language, or have learned the language beyond intermediate to advanced standards. However, the participants will very much unlikely hold Spanish as one's second language which is very much interesting as many of the students and indivduals surveyed state they speak spanish. To achieve a breakthrough, the research will require many more multilingual college students or individuals who speak in three languages.

Which by itself comes to be a roadblock obstacle within the research study as the likelihood of individuals being multilingual college students or individuals have been proven to be low. With that being the situation, the research will array it finding among more college students perhaps of just one specific group within the Central Valley. If required, the study may even require additional outreaches toward a broader study group who are capable of speaking Spanish, English, and/or a different language for further inferences. In closing, through the questionnaires, interviews, and involvements of students and individuals, it has resulted in a raise of self-awareness of one's fluency and literacy skills for those involved with the research study in both their native languages and foreign languages; encouraging the students and individuals to further improve one's skills in a native or foreign language that aligns with my mission to promote variety, not uniformity.

With the aforementioned, if a multilingual is an individual with the abilities to speak, read, write, and understand three or more languages, could there be a possibility that the multilingual college student might result more fluent and literate in a specific language compared to the other languages they claim to know? With this question in mind, this question poses further investigation in the areas of fluency and literacy. Which would lead to another question: what is the significance of these components when it comes to honing and learning a language? These are the questions I hope to further develop with future research, however, not only with college students of the Central Valley but in other regions such as cities in the bay or possibly in other states. Perhaps I might study specific linguistic backgrounds such as the Hmong, Mixtec, and Hindi-Urdu communities. I might also expand my research to include age diversity and make comparisons between children and adult language learners.

Figures

Figure 1. *Survey groups*

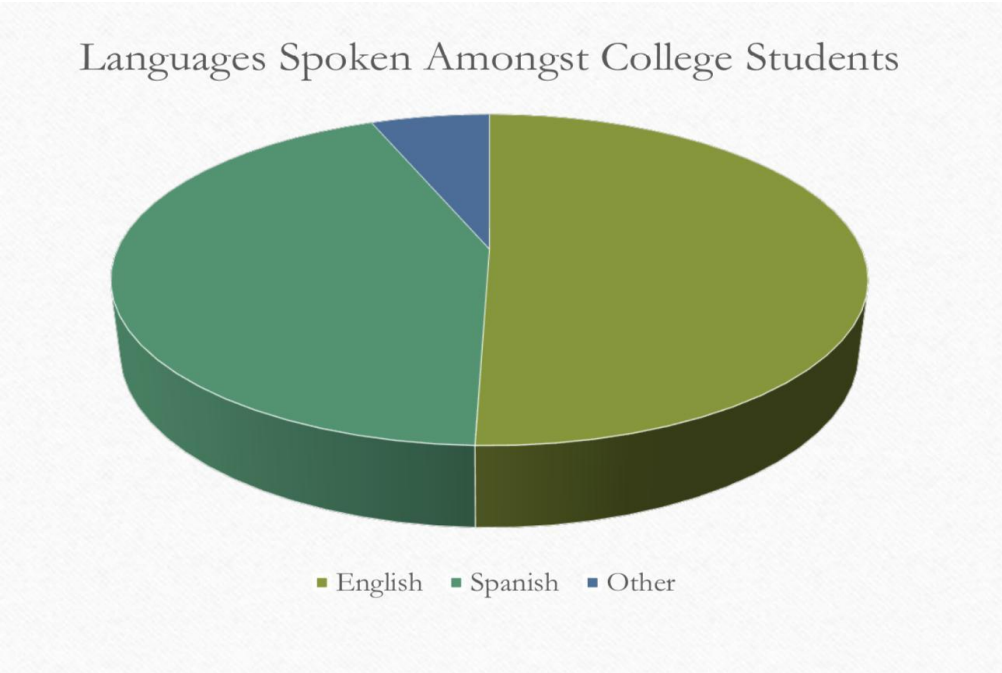


Figure 2. *Fluency survey results*

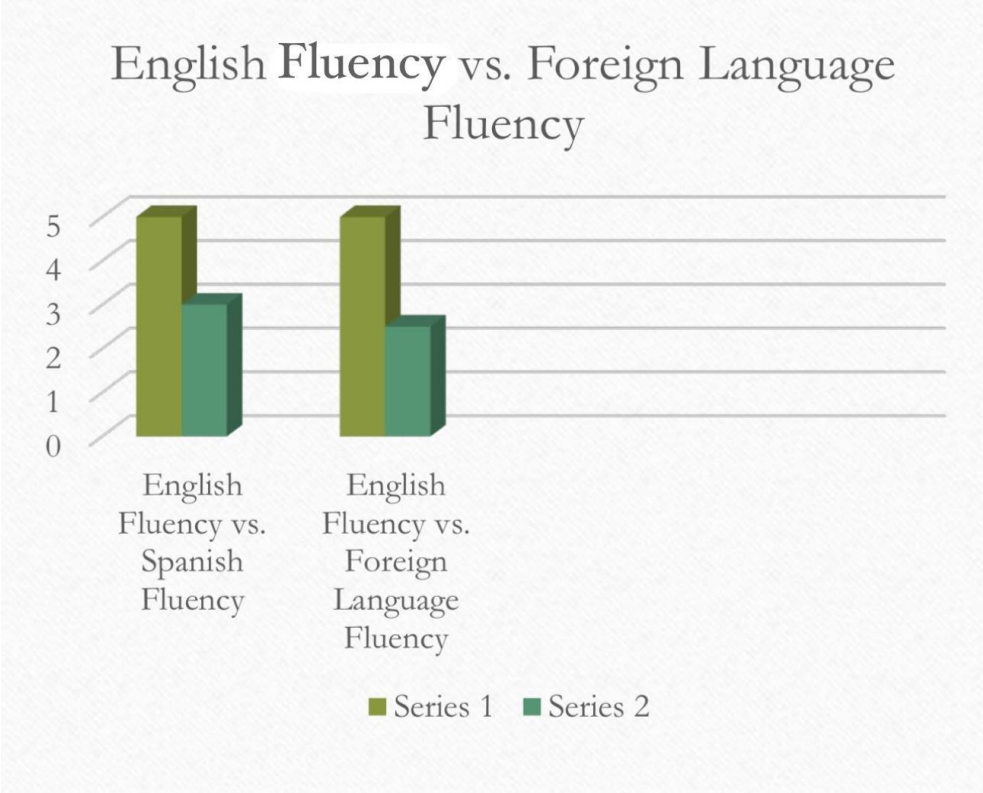
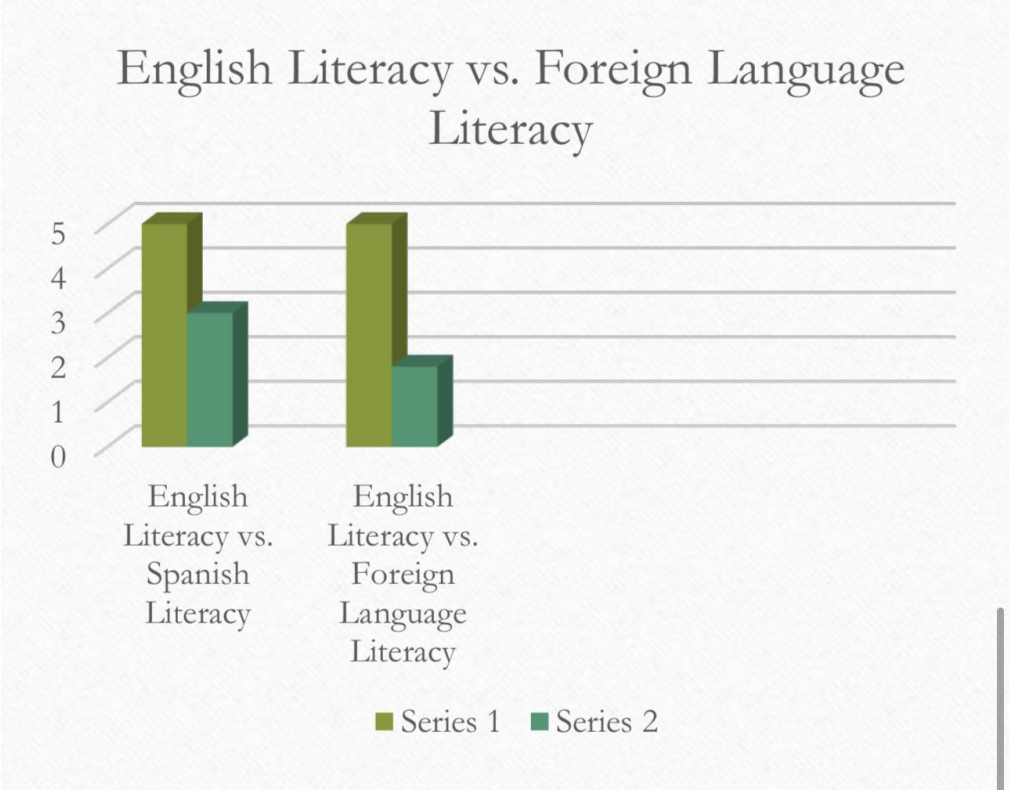


Figure 3. *Literacy Survey Results*



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Representations of Skin Tone, Colorism, and Reimagining Marginality for Black Women

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Abstract

Engaging intersectional analysis of the issues of colorism shows how participant interviews among Black women in the university systems in this research are viewed, how they view themselves, and the expectations they are held to. Consequently, the United States perspective of worldview expectations and assimilative practices yield contrasting viewpoints and frame a social construct of colorism within Black communities. Suppose one reimagines the representations of Black women to be centered on their experiences and standards of self-reliance. In that case, we can see beyond a colorist caste system in various spaces where Black women belong – everywhere. In discussing experiences from Black women's standpoints, we are reimagining ideologies that shift narratives of assimilation praxis. Much research examines the effects of colorism and how race and representation stem from colonial thinking. We can discuss how we respond to the worldview of marginality, an informed epistemic response to how we participate. Participants of this study, shaped from various backgrounds and environments, are all members of a university or college or have been in higher education, offering perspectives of their own and other Black individuals. The social locations of Black women should not be dependent on the consequential marginality that oppression has placed them in. To consider a dynamic shift in centralizing the reimaginitive process for Black marginality, we may construct a new theory for inclusion by representation.

Keywords: African American Women/ Black Women, Colorism, Representation, Co-cultural and Standpoint theories, Reimagine, Marginality.

Introduction

Many Black women are racially socialized to enlist in standards that provide them access and belonging to their racial identity. In Everyday Colorism (2019), Sarah Webb, looks to Alice Walker's essay, "If the Present Looks like the Past, What Does the Future Look Like", (1983) in defining colorism as "prejudicial or preferential treatment of same-race people based solely on their color" (p. 290). Most Americans are taught ideologies of light-skin superiority. Author of One Drop (2021), Yaba Blay, suggests that the unification of two races, "Black and White became a distorted line". This distorted line is where misrepresentation engages with colorism and increases abuse between women. BreAnna Davis Tribble et al., (2019) explored gendered racial socialization among Black women in their research, no [Right] Way to Be a Black Woman, Davis Tribble denotes that colorism is a global ideology that has placed two physical traits on women: (1) darker skin and (2) coarse hair. bell hooks' work in Black Looks (2015) challenges her readers to recognize that white supremacist, capitalist, patriarchal culture is the leading system to which we justify the continued production of racist-driven media representations.

These worldviews force Black women into beliefs ignited by colorism, abuse through systemic white supremacy, deceptions of representations, assimilative tactics, messaging, media/visual art, ideologies, and institutions. Worldviews will continue to be centered on assimilation strategies that stimulate skin tone bias or colorism, there is a need to reimagine them from their perspectives. As a bi-racial Black (Mulatto) woman, I have been invited into spaces outside the weary walls of my perspective. I have looked back to see Black women and girls like me be given kinder eyes than those who have darker skin. The notion of being forced to accept social and mental invitations by white women instead of resisting them to stand with Black friends and family that do not include those dark-skinned women is how colorism persists. For example, I am biracial, and my skin tone is medium, and I have been chosen over other darker-skinned individuals at work, in classrooms, and other diverse situations. In light, I should have resisted it all, but to

understand and actualize opportunity was a desperate move. Inviting Black women into physical spaces for inclusion is not a viable solution. Asking them to build from their perspectives invites the reimagination of spaces while simultaneously developing self-reflective representations.

The objective of this project is to demolish perpetuating issues surrounding colorism such as (mis)representations of race, oppression, assimilation, microaggression/invalidation, and caste-like systems affecting Black women by reimagining the social location of their spaces. We do this by using existing research on standpoint and co-cultural theories as processes that discuss Black women's experiences. The process of reimagination is a multiple-perspective initiative that detaches from ideologies of white supremacy intending to engineer a resounding theoretical lens and comprehensive strategies to shift the idea of inclusion among Black women that expands by appropriate representation. The objective asks all other individuals to reimagine equity and equality from Black woman's perspectives.

This development embraces informed ways of thinking when considering how we marginalize many Black women. It asks us to reconceptualize progress that has been made for Black women and suggests we rewire ideologies that centralize Eurocentricity as a standard. To consider this, I examine standpoint theory and co-cultural theory. Sandra Harding's controversial standpoint theory is often utilized for research that is race-based according to her article, "Standpoint Theories: Productively Controversial," (2009). This theory intended to explain the trajectory of earlier feminist research organization, which called for a tiered methodology; first as sociological, then as political philosophical, and then finally, biological.

Here, in my research, I recognize the limits of the possibility that not all participants involved have similar Black experiences, and they do not. While the limited number of participants all come from a collegiate background, findings still showed a diverse frame of standpoints from each. In contrast, a quantitative study that examines standpoint theory by Catherine E. Harnois (2010) challenged the recent responses to standpoint theory by other academics, citing that there was not enough quantitative research to prove that Black women were far more subject to experience the issues within the theory, and that gender wasn't as important to her participants. However, her findings showed that most of her work enlisted at least 80 % of participants to admit to issues surrounding feminist standpoint theory, along with race, class, and gender issues.

Over time, we have seen an uptick in gender awareness, fluidity, and promise to even the playing field, but when it comes to positions of power and hierarchy, we still see a vast majority of those roles being upheld by men/white men. I argue that standpoint theory appreciates the alignment of reimagination for Black women because of its ability to be exclusive, while also accounting for many variables that could speak to a broad representation of Black women such as skin-tone differences, colorism, LGBT+, class identification, and several other outlining intersections. We can still use standpoints to frame the ideology of how we teach others to view, envision, and investigate.

Sarah Webb describes in Everyday Colorism (2019) colorism as being actualized by European colonialism and American Slavery, that it reflects class hierarchies in other countries and is implicated by White supremacy. Webb suggests racialization of physical traits, and an individual's outward appearance have long tended to be Eurocentric in preference and has associated with Western beauty standards. Webb looks to Alice Walker's essay, "If the Present Looks like the Past, What Does the Future Look Like" (1983) in defining colorism as "prejudicial or preferential treatment of same-race people based solely on their color" (p. 290).

Webb argues that colorism is not only a skin tone bias, but a physical appearance bias by saying that the more a Black individual looks "less archetypical," the closer their resemblance is to that of Eurocentric beauty standards. Webb's argument that physical traits affect the boundaries of colorism may also suggest that the levels of how Black women see themselves may vary depending on what they believe is an accepted standard. As a professor, Webb uses Walker's essay to bridge the conversation between students, asking them about the experiences they have had where they are reminded of how the "present looks like the past." Verifying these conversations with students offers an opportunity to further explore how fragments of our time are spent qualifying experiences with colorism. These notions can have adverse effects on individuals and make them believe they are unworthy of space if they genuinely believe that Eurocentric beauty standards are normative. Racializing physical traits promote worldviews that isolate individuals who do not meet beauty standards that were not written for their skin tones or hair types. However, if a Black woman is lighter skinned, and has fine or softer hair as

opposed to coarse hair, they are more closely able to resemble the proximity of Whiteness, a systematic divide between Black women, or freedom.

Walker describes her reality as being a mother who is brown skin, with a daughter who is a lighter complexion, and straighter hair. She mentions that her daughter had it easier than she did. She further explains that she understands the ingrained beliefs that she and her mother were programmed to know. She writes, "Escape the pain, the ridicule, escape the jokes, the lack of attention, respect, dates, even a job, any way you can" (291). This reminds us that we are still thinking about racial socialization, the upbringing tactics for children by parents to cope, blend, assimilative behavior or to simmer down, and find freedom by way of proximity to whiteness. Walker asks the question, is it freedom, or Whiteness?

Black women with lighter skin tones have been used more generously in commercial/media and marketing spaces, and the exposure of that is far more frequent than decades before. These are not representations of all Black women but are more largely accepted because of their proximity to whiteness. They are mostly Eurocentric versions of Black acceptance. Davis Tribble et al. explored gendered racial socialization among Black women in their research, "No [Right] Way to Be a Black Woman" (2019). Davis Tribble denotes that colorism is a global ideology that has placed two physical traits on women: (1) "darker skin" and (2) "coarse hair". They further explain the consequences of colorism in their research. The data has shown that women with darker skin have more disadvantages, such as physical and mental health issues and socio-economic problems. Such findings discern that in the beginning years of childhood, the familial discourse was the preliminary source of gendered racial socialization, and that attitude surrounding Black hair was the center of family messaging. Tribble et al. recognize that family was not the only factor in how hair/skin messaging prevailed, clarifying that outside relationships from the home took a large part in the "hair hierarchies' endemic to colorism."

Participants in Tribble's study discussed family issues that pertained to lightness as a high beauty standard. The article shares with us how the political journey with hair is a decision to be made dependent on whom they want to address in society whether it be at work, school, or in a place that is regulated by a strict dress code. In this case, hair is the medium, and it is the message that validates or invalidates a Black woman's purpose. The familial pursuit of racial socialization serves to protect Black children and young adults as they develop into a mentally and physically divided nation. But it is this indoctrination that is additional to life lessons being already taught. It is information for survival. It is understood that colorism is a part of the entire social construct and does not only breed between single origins of race, but it cross-lists between races, too. It is saying that for Black women to survive, they must not only meet the expectations of a society that was not intended for them, but they must also be willing to go beyond within their communities to be accepted into one that does not feel welcome. This framework that excludes Black women more often than not can mean colorizing one another to achieve status, mobility, or power.

While Davis Tribble's noteworthy example of physical traits is a premise for colorism, we still see an opportunity to look at proximity in terms of skin tone, proximity to Whiteness, family/home life, and demographics that may shift what that narrative looks like for other Black women. Disadvantages that Davis Tribble points to are not issues that can be managed easily; instead, they require the attention of a global perspective. Without a global recognition of the issue, colorism will continue to implicate those disadvantages.

Colorism is not only the visual mode of categorizing one brown person against the next but also a set of ideologies, beliefs, and meanings that are attached to a negotiation of hegemony and hierarchy. In Patricia Hill Collins's Black Feminist Thought (1990, p. 90), she identifies colorism in its operative mode, diving into the embedment of what is considered American. She states that it is a "distinctly American form of racism grounded in Black/White oppositional differences." She further explicates how this distinct form is in a U.S. context due to the nature of systems and institutionalization that attaches "color" to "hierarchy." She contends that there is a top and a bottom to the hierarchy of color, where White and Black are components holding significance because of their relationship to each other. This relationship was founded on Americanness in what Collins calls, "a by-product of U.S. racism."

In *Caste: The Origins of Our Discontent* (2020), Isabel Wilkerson metaphors the inner workings of a theatrical play, and the roles within them to be mirrored images of the roles we play in society. Everyone has a part. Regardless of the part and role they play, it is not their own, but given to them, and they are to play that role, without a miss. You are not to be yourself. Wilkerson illustrates that the "social

pyramid" known as the caste system (p. 40) is not like a cast in a play, yet we are racially socialized to imagine we have a role outside our own. This is thought to be how we learn to keep our place in that society. If you did not look like those who were colonizing, you were at the bottom of the hierarchy. Wilkerson reminds us that we know this is the oldest recount of shipped Africans based on a letter from the early English Colonizer, John Rolfe in 1619. This is how the caste unfolded, categorizing humans by religion, then race (p. 41-42).

The American caste system is a social stratification that places membership on people based on their appearances. In an interview with NPR (2020), Wilkerson asserts without reservation that the caste system is a more appropriate term than racism. She claims that the term racism itself cannot carry meaning for the entirety of the systemic oppression that Black people continue to endure. The relationship between Black and White as Collins suggests is a consequence of the first trials of segregation by what Wilkerson notes were religious. It was the look of a person that caused immediate segregation because profiling was the first assumption to be processed. Once it was established that a Black person was in a White space, it stuck, and that became far more dangerous than religious. We can further examine the nature of light skin on Black women versus dark skin and infer that lighter-skinned Black women are more likely to represent Black women as a whole because of the proximity to Whiteness they physically feature.

Historically, the "one-drop rule" was the most actualized term that is used to describe Black individuals who are comprised of any length of Black ancestry. It is a drop away from purity or Whiteness. Yaba Blay, the author of *One Drop* (2021), depicts how in the United States, a person who holds any Black ancestry is Black and therefore held to this term. She presses, "If you were White, you were free; if you were Black, you were enslaved. Simple" (p. 6) The miscegenation or unification of two races complicated it further, and the ideas of Black or White became a distorted line. This distorted line is where misrepresentation engages with colorism and increases abuse between women. This is a worldview that establishes expectations for Black women, indicating that Eurocentric standards, mostly imaged-based and in visual culture are the itinerary for success, health, and accessibility to resources. The oppression that continues to carry Black women is in part due to the hierarchy of time and skin tone. Representations of Black women that challenge hierarchy will continue to challenge the Americanness of worldview expectations within White supremacy. In acknowledging how our country views Black women as the other, we can imagine and access equality through a measure of providing equity.

In *Biracial American Colorism: Passing for White* (2018), Keshia L. Harris expands on the importance of discussing the reality that those who are Black, are Black by default. Whatever the otherness of their race is no longer supersedes their Blackness, regardless of the amount. Therefore, biracial African American individuals are expected to identify as Black when possible. That is unless they live in affluent neighborhoods and can pass as White, then they can experience the embrace of White affiliation. Blay shares the narratives of several Black individuals in her book who are white-passing but identify with their Blackness. A good portion of these individuals lives in cities and towns where Black identity is shaped and accepted fluidly among all other races.

We know that this battle is dependent on the person, and one's environment. As a child, I was forced to change my choice of bubbling in a scantron test sheet from "Caucasian" to "African American" by my teacher, because of my hair and skin. I had entered "White" because I had felt as if I was not giving any credit to my "white" mother who was recently single and divorcing my Black father. In church, I could identify as white, because it was all around me, but I would feel guilty about my belief because I knew I was Black, that my family was Black, and that there should be nothing holding me back from expressing that. When children are pressed to believe that the American dream is represented by an industrious white family, what types of indoctrinating ideologies are carrying their hopes?

In qualifying worldviews as a specific means to pace hierarchical standards and expectations, we can look at several intersectional lenses that scope the authority of behavior, communication, and theoretical analysis to further discuss the possibility of reimaging representations of Black women, by Black women, and all women.

Methodology

Procedure

Participant selection was based on individuals being in higher education and by personal solicitation among peers or existing relationships. All participants were to meet the criteria of identifying as Black

women. Eleven women were administered a semi-structured interview and asked questions directed from Dr. Sarah L. Webb's work on 100+ Colorism Questions (2015). Data collection followed the completion of the IRB process (proposal and consent forms) for approval.

In interviewing participants, I asked questions on colorism and responded by discussing their personal life experiences and the representations of their lives in the Black culture. Colorism has served as a vector for worldviews, such as light-skin superiority, capitalizing on standards within a patriarchal culture that embraces sameness of dominancy by assigning accessibility and freedoms constructed by skin tone predilection in American culture. Social mobility is misled by Black (mis)representation in media by using skin tone classifications and political/systemic structures. Colorism stemmed from colonialization and slavery and continues to narrate expectations of Eurocentric standards. Because of these intersectionalities, the continuance of Black women's autonomy being challenged has forced Black women to be subjected to the paradoxical consequences of skin tone stratification.

I ask participants (n = 11) to explore ways in which they have been directly affected by colorism and to discuss triggers, obstacles, and challenges that have maintained these effects in various living spaces. Ways they have been affected may include situations on a college campus regarding the environment or climate, the workplace, within their family and friends, or anywhere else where they may feel their lived experiences have shaped their outcomes. For example, some of the women discuss workplace situations where lighter-skinned women have been chosen over them or are talked to more often, and so on. From this data, we suggest that feminist standpoint theory is one vector for how we could reimagine Black women's experiences from the outside by soliciting their perspectives (Allen, 1998). We ought to imagine the important paradigms and rich contributions of Black women from a central socialized location as key to the process (Orbe, 2021). It encourages a unique and emboldened togetherness that aims to envision new theoretical standpoints of Black inclusion of women, steers away from preferential/colorist treatment, and embraces a methodology for representations that invite progress.

Webb's questions are a comprehensive, not exhaustive list of questions to consider when discussing colorism (Appendix A). Some questions furthered discussion in sub-topic scaffolding. Questions that were selected and answered were copied into a raw data table for Figures 1, 2, and 3 of the research paper. Not all questions were used in the interview process. Table 1 presents a pie chart showing the thematic analysis percentage of responses that exhibited characteristics per the theme. Code words emerged directly from questions and were then assigned to responses. Code words of the thematic analysis include "attitudes, think, manifest, perpetuating, play, affect, and impact".

Data

Participants were either students in higher education, faculty, or staff. The interviews were scheduled to be one participant at a time, over Zoom, with no time limitations. There was one participant who submitted written responses. I contacted Dr. Sarah L. Webb, a public speaker, corporate trainer, and professor who has worked in Illinois and Louisiana. Her website, Colorism Healing, is dedicated to education on colorism in the African American/Black communities across the U.S. With her consent, Dr. Webb gave written permission for me to utilize her public questions within the scope of my research. All interviewers were given a mixed set of questions from Dr. Sarah L. Webb's, 100+ Colorism Questions. These questions were entered in the chat text box and were to be answered in/out of order. Participants were allowed the opportunity to answer or not answer any questions. Some interviews consisted of fewer or more questions and lasted between one and three hours.

Once the interview process was complete, all interview transcripts were copied and pasted into a Word document formatted, and saved to an external hard drive. All participants were randomized by number and labeled "P1-P11". All interviews were read and organized by questions and answers, highlighted for expanded conversations, edited to preserve confidentiality, and then summarized and numbered for the final tables and figures.

Analysis

Questions and answers were organized into three themes for thematic analysis. These themes include: (1) Experiencing Attitudes, Assumptions, and Stereotypes Concerning Skin Tone, (2) Social, Environmental Experiences, and (3) Workplace, Educational, and Judicial Experiences. In the final research, each result discussed will be cross-

referenced to identify as F1:3, figure 1, number 3 (Appendix B).

Themes were used to establish the analysis basis to further discuss the experiences of the participants and to begin curating the process of reimaginitive shifting within the thoughts on race, representation, colorism, and how we perceive Black women's experiences to be their own, and not fragmented justifications of white supremacist standpoints as an educational discussion. The opportunity that thematic analysis bridges create a scope of thought processing for the reader that is analytical in nature, but also proposes a consideration for thinking processes outside of a normative framework and works to include varied theories of thought. The result magnifies a pattern for disrupting constructs, to validate the process of reimagining what marginality is among Black women.

Results

In explicating preliminary results, we looked at what themes held significant weight in the interviews/data. Theme 1: Experiencing Attitudes held a great range of attitude and thought in responses that shaped the significance of experiences in colorism for Black women. Theme 2: signified a great deal of social and environmental situations and exchanges participants shared, and finally, Theme 3: validated the rampant issues of colorism in professional and institutional/judicial settings.

Experimental considerations consider the vast differences between the origin stories of African Women who moved to the U.S., refugees, descendants of slaves, multiracial, bi-racial, interracial, religious Black women, skin tone differences, and responses to different variations of skin tone, and ideologies of intersectionality. Limitations to this study include a small sample size, all participants being in higher education, the primary residence of California, and other characteristics or demographics. The next steps would include further expanding thematical analysis within standpoint and co-cultural theories in an additional table. This will further exploration within theoretical praxis for designing a proposal for reimagination ideology or theory in furthering this research. This research has shown that Black women's experiences are largely shaped by the themes I analyzed, and could potentially include a significant amount more upon further research and discussion, and could be further examined in different interdisciplinary studies.

Theme 1: Experiencing Attitudes, Assumptions, and Stereotypes Concerning Skin Tone

F:1, 18. Why do you think some people have negative attitudes about light skin? Feelings of superiority over dark skin are ingrained.

Attitudes and assumptive thoughts stem from and also give birth to stereotyping Black women and their experiences, and how that makes a white person feel. In my research, the experiences of Black women are central to the reimagination process, but there is an opportunity to see "White Fragility" beyond recent studies. Participant Nine (P9) discussed an antagonistic perspective in discussing how white women and girls must feel by saying:

> *"I can remember people saying things about other light skin women, other Black/brown skin women saying things about light-skinned women… when we were girls or something oh, she thinks she's cute, you know, and you know everybody always almost assumed that if you were light skinned then life was better for you. We never thought about it like… Is it rough for the light skin girls? What struggle are they going through that we don't recognize and do not acknowledge? And if a light skin girl did say she was going through something … would we find a way to dismiss that and act like it, wasn't it a big deal? (P9, 2022)"*

What P9 is referencing is summarized as "White Fragility". DiAngelo (2011) states that "White Fragility is a state in which a minimum amount of racial stress becomes intolerable, triggering a range of defensive moves. These moves include the outward display of emotions such as anger, fear, and guilt, and behaviors such as argumentation, silence, and leaving the stress-inducing situation. These behaviors, in turn, function to reinstate white racial equilibrium. She utilizes the words "white" and "whiteness" to describe processes and practices.

Ford et al. (2022) discuss "White Fragility" as a negative emotional response that causes discomfort. They suggest it can include anger, anxiety, and guilt. Contextually, Ford explains that it is associated with a historical theory of white privilege. P9 challenges the preconceived notion of assuming privilege in a modern light, when we may not be accessing acknowledgment of a white struggle. In the reimagination process, Black women are not centered on superiority, instead, they may dominate their own mental and physical spaces, where concern for the other normalizes by acknowledgment of equality.

Theme 2: Social, and Environmental Experiences

F:2, 30: How are children affected by colorism? Parents comparing skin tones.

As social scientists, we attribute foundational learning as a means to transfer learning that ultimately drives how we make decisions (Hattie et al., 2017). Within this scope, I envision the opportunity for representation to be a topic of priority conversation as a mother, a daughter of a white mother, and a Black woman to her Afro-Latino son. How we begin to shape what representation looks like at the earliest stages will transfer that at-home learning to the school, and outside environment for children. Without these teachings, we are part of the perpetuation that colorism prevails. "Showing our children and our youth that real, rough representation matters, and that we have to have fair equal fair representation. It will make them make better decisions further down the line (P1, 2022)."

F:2, 31: How are children affected by colorism? Teaching how representation and equality matter.

Kimberly Moffit (2020) conducted a study that examined "Women, Gender, and Families of Color". In her exploration of colorism, she discusses the skin-tone differences between her and her darker-skin daughter. She argues that the "historical perpetuation of white skin as the epitome of beauty and purity" distinguishes it from the darker shades of skin that are often depicted as unfavorable and are often cast on TV as the more difficult individual than that of lighter skin Black women. These thought processes, she explains, are maintained by institutions, and as we know – media. Is it as easy as teaching and instilling representation as a reimaginitive process for equality that will transfer the progress from our children out into the world? P1 shares how she views recent representations, and how they affected her experience.

> *"Well, now, they have more representation than we'd ever have. I've seen more black baby dolls and things of that nature, characters on TV and in cartoons. It's a lot more representation, it is a positive representation. But it depends upon that parent and that child. How much they pour into the beauty of that child and that individual to love each part of themselves. As a woman of a particular age, I loved to do that when I worked for this school – to pour into our little brown children and to show them a positive image of a black woman that maybe they don't see in their family. Oh, they don't see it on TV because they're not exposed to that, they watch ratchet TV where it's "Real Housewives" or someone cussing, fussing, and throwing a glass (P1, 2022)."*

We ought to disable systems and institutions that latch these stereotypes. Children have a cascaded assortment of media they have to choose from. It starts at home, and the racial socialization that affords Black girls the scale to envision their skin color, their sister's skin color, and their mother's skin color, as a related lens to their Blackness should only be a viable key for social care and responsibility for the other in ways that have no colorist system of hierarchy.

Theme 3: Participant Responses on WORKPLACE, EDUCATIONAL, AND JUDICIAL EXPERIENCES (29%)

F:3, 9: What role does colorism play in education in school? Feelings of having to prove intelligence.

Griffith et al. (2019) produced a qualitative study that discussed "race-related stressors" and "coping responses" that Black students have experienced at predominately white institutions (PWI). Griffith acknowledges that the stressors Black students must endure are additional challenges to already existing college issues that all students experience. They discuss the hardships of being a "numerical minority" and the "psychologically distressing" ways they may feel isolated and excluded. Results indicated that Black students who undergo race-related stressors are seeking ways to implement behavioral strategies as a means to cope.

> *"I've had to work harder in school to prove myself, and people would be very surprised at the level of intelligence that I do have. I think it's really in terms of race, like a black person having to prove themselves more in school. I've even had an instance with a teacher who thought that I cheated on a test because I got an "A" and I was like, I didn't cheat on it, but I had to fight for my grade in that instance. But it was a shock to me to see that I had to go through that experience at such a young age, too, where excellence isn't expected of me in school, and I have to show that I can do it on my own. You know, I literally study all day, every day, I have to. If I do work, I have to be able to defend it. I put a lot more time into my academics than most other people would just 'cause I'm trying to prove myself, especially at a school where it's not a place where excellence is expected of me. So, I have to go that extra mile (P9, 2022)."*

In recent generations, Griffin suggests that these coping strategies among others have played a significant role in Black communities. In Griffin's research, the most highly regarded coping strategy was to "disprove negative stereotypes". In our case, P9 chooses to study all day to ensure her intelligence is proof her grade reflects her work. While this may seem to be normative, the excruciation of having to "disprove" others' stereotypical belief systems, in this case, cheating and beliefs on intelligence – is not only disruptive to her educational environment but also shows us the continued issues surrounding a real lack of representation. With more adequate representation, the color of her skin wouldn't stimulate this response so gravely, and the continuance of proximity to whiteness would be less prevalent.

Discussion

This project is important because it looks at skin-tone biases from within the in-group of Black women and asks them to discuss their perspectives. It examines what Eurocentric worldviews expressed in the United States ask of Black women and how they have been socialized to interpret the ideologies behind them (Blay, 2021). These women are asking themselves to envision their lives through a coloristic lens, which is different from overt racism. They are recalling circumstantial evidence of in-group abuse, how they have seen and resisted the limitations of colorism, and how it has affected how others perceive them.

As we learn how paradoxical the consequences are of colorism and the misrepresentation of Black women, we can broaden the scope of work to dismantle systemic colorism by including theories and strategies that decolonize Eurocentric preferences. We must explore the areas of marginalization that Black women must navigate and have direct, primary resources to gather firsthand information and perspective. If we participate in Eurocentric media expectations for Black women, we neglect acknowledgment of the issue of colorism. We must not only recommit to building spaces that are inclusive to Black women but look to them to see that these spaces mark representative natures both culturally and competently and written by them as well.

This project has asked Black women within the U.S. to discuss their experiences concerning colorism and representation and compare personal ideas and definitions of marginality. The women in this research have come from varied backgrounds, lending an extensive array of results to analyze, but the sample size can grow to meet the needs of the many voices who were not asked to participate in this research. I examined attitude, social/environmental factors, workspace, and institutional and judicial settings through thematic analysis, and the amount of intelligence received from the participants far surpasses this paper's parameters and calls for significant development in the reimaginitive process within and for our community of Black women.

Because of the limitation of time, several points addressed here in question were only expanded on lightly, leaving room for other probing concerns as addressed by participants that I will continue to develop in my graduate studies and research. This work does not validate the entire Black experience nor function as a liaison between structural differences. It is important to note that not all Black women share the same background and developmental styles or familial, cultural, or otherwise views. It is important to recognize the alterity in this conversation as we develop in current conversations around otherness, sameness, and assimilative environments that embrace white supremacy.

Black women are socialized to center themselves on varied parts of a colorist scale ranging from light to dark skin on a visual and image-obsessed basis that not only plays a role in stereotyping skin tones but creates social mobility standards and statuses that decry Black women ontologically. The reimagination process asks Black women to envision themselves from a central space if they do not already and challenges others to reconceptualize their standpoint.

How can we reimagine spaces as/for Black women? Representations of Black women are centered on their experiences, and standards of self-reliance, allowing us to see beyond a colorist caste system in a variety of spaces where Black women belong – everywhere. The social locations of Black women should not be dependent on the consequential marginality that oppression has placed them in. Consider a dynamic shift in centralizing the reimaginitive process of Black marginalization and assumptions. Construct a new ideological theory for inclusion by way of representation and let Black women speak for ourselves/themselves. Reimagine Black women from the center of the spaces we marginalize their existence: i.e., workplaces, institutions, communities, justice, and judicial spaces. Repeat these action items, and continue to develop operational strategies that center Black women until they are not marginalized or othered as secondary to

others, can redefine their narratives, and are likely to attain and achieve equitably.

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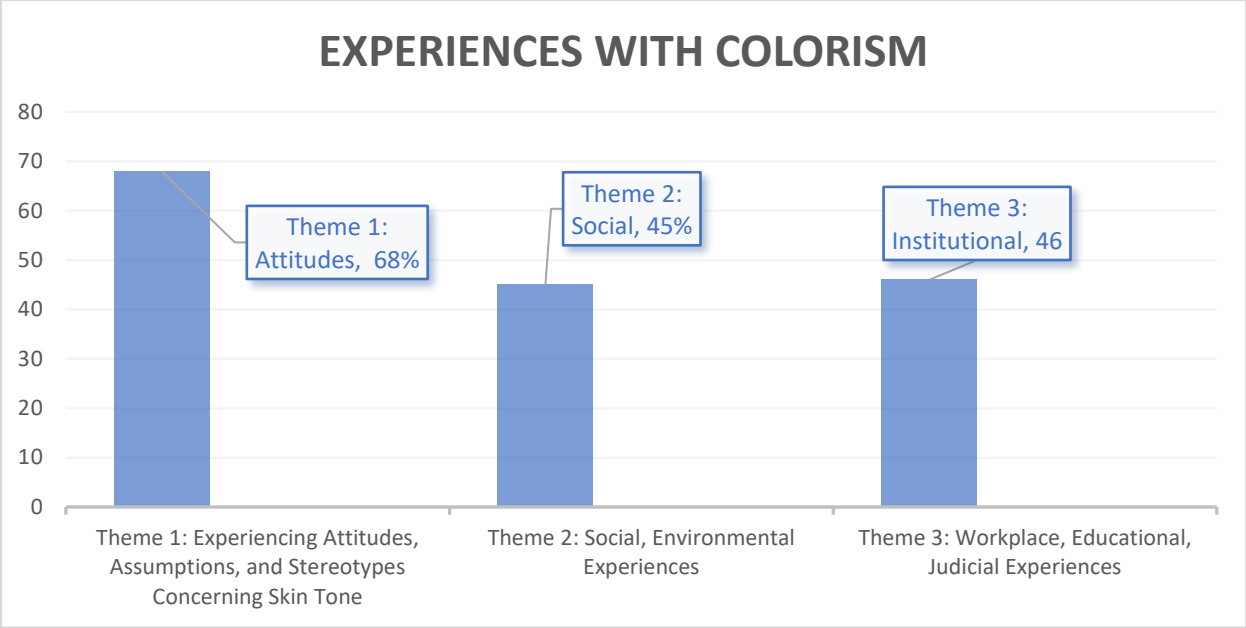
Appendix A

Key terms

- Colorism: an act of prejudice or discrimination against individuals with darker skin, typically within the same racial or ethnic group
- Eurocentric: a regard of focus on European history/culture that excludes otherwise.
- Standpoint theory- a post-modern approach to people's perception created by Sandra Harding and Nancy Hartsock
- Co-cultural theory- a framework that provides insight into communication behaviors from typically marginalized individuals or groups, written by Mark Orbe
- Representation for our terms and purposes is a discussion around same race and skin-tone color representation that appropriately depict an individual in media and the community or may also coincide with how we view one another based on the allotment of skin-tone preference in determining how to represent a person.

Table 1

Semi-Structured Interview, Thematic Analysis of Experiences by response rate with Colorism as Reported by Participants, using Dr. Sarah Webb's "100+ Colorism Questions".



This table represents the responses to Experiences with Colorism of participants in the semi-structured portion of each interview. Each individual had the opportunity to expand their thoughts, and experiences, and share the experiences of others. The thematic analysis includes three themes: Theme 1: Experiencing Attitudes, Assumptions, and Stereotypes Concerning Skin Tone, Theme 2: Social, Environmental Experiences, and Theme 3: Social, Environmental Experiences. Code words for the thematic analysis include attitudes, think, manifest, perpetuating, play, affect, and impact.

Figure 1

Semi-Structured Interview, Thematic Analysis - Theme 1: Experiencing Attitudes, Assumptions, and Stereotypes Concerning Skin Tone (43% of responses) using Dr. Sarah Webb's "100+ Colorism Questions."

THEME 1:	PARTICIPANT RESPONSES ON EXPERIENCING ATTITUDES, ASSUMPTIONS, AND STEREOTYPES CONCERNING SKIN TONE (43% OF RESPONSES)
Why do you think some people have negative attitudes about darker skin?	1. People associate darker skin with violence 2. Over-sexualization 3. Being seen as human is less likely 4. Blackface made to appear ugly/unattractive 5. Media portrayal of Blacks being in poverty 6. Social structures/equity 7. Historical attribution in socialization 8. Dark skin as a license 9. Dark skin committed to staying dark (not trying to lighten) 10. Treatment of individuals with darker skin is standard 11. Feelings of having more opportunity because of European features/ light skin 12. Representations on TV/media 13. A belief that European features are more appealing 14. Insecurity 15. How whiteness factors into – expectations 16. Slavery – dark complexion being looked down upon, dark skin slaves work outside
Why do you think some people have negative attitudes about light skin?	17. Eurocentric belief systems 18. Feelings of superiority over dark skin ingrained 19. More beauty choices that link to whiteness 20. More opportunities for light-skinned women 21. Historical treatment 22. Feelings of neglect, extreme emotional response

	23. Light skin slaves working indoors
What do you think about light-skin and dark-skin privileges?	24. The perception of articulation 25. Treatment from other races 26. Exclusion of dark skin when lighter skin is available 27. Light skin representation 28. Light skin assumptions on health 29. Confidence among light skin is a privilege 30. Presumptions of darkness as erotic 31. How dark or light skin is portrayed in the media in terms of representation 32. Light skin favoritism 33. Exclusion for darkness 34. Proximity to whiteness equals more invitations to events associated with/led by whites 35. Other's comfort around you 36. Associating dark skin with comfort 37. Brown versus Black or darker, treatment 38. Education level associated with privilege
How does colorism manifest in predominantly white media?	39. They are gatekeepers 40. Competing with oneself 41. Tv shows have little representation 42. Children watching kids shows that limit Blackness 43. *You're so pretty for a Black girl!* 44. Stereotyping Blackness and Culture 45. One-drop rule 46. Cultural appropriation 47. Not being able to wear certain clothing 48. Perpetuating criminality
What are some examples of colorism?	49. In the family – being the darkest and therefore treated differently or being excused as the dark one, not the cute one 50. Lighter Family members are closer to the opportunities that whiteness lends (e.g. educationally, socially, economically) 51. Compensation for work or services is often higher for lighter skin Black women 52. Having family members who are lighter skin 53. Feelings of inadequacy in dark skin 54. Being a child who is darker among light children who are being praised for the beauty 55. Paper bag testing for skin tone 56. Assumptions of Black Life and Culture
How does colorism influence or impact friendships?	57. When one friend gets different attention because of their lighter skin 58. When families have extreme socio-economical disadvantages

Note: Items are numbered to reference from results and discussion sections (ex. F1:3, figure 1, number 3)

Figure 2
Semi-Structured Interview, Thematic Analysis - Theme 2: Social, Environmental Experiences (28%) using Dr. Sarah Webb's "100+ Colorism Questions"

THEME 2:	PARTICIPANT RESPONSES ON SOCIAL, AND ENVIRONMENTAL EXPERIENCES (28%)
What role does social media play in perpetrating colorism?	1. Not using a platform built off your preference (if you're not plotting African American info 2. Entering information into a search, the result will not adapt to your preference 3. Sponsorships for Black influencers 4. Whiteness in social media as a baseline, every other color is secondary 5. Images of very objectified and sexualized Black women 6. Black creators have to do more work to get viewers, (e.g. *Black Tick Tok*) 7. Intersectional preference (e.g. LGBT and white versus LGBT and Black) 8. Limited representation 9. Over-sexualization of Black women and men 10. Objectification 11. Intersectionality between race and gender 12. Content creators stealing intellect and ideas

	13. Black women have more responsibility in how they represent themselves/ difficulty in breaking myths and stereotypes 14. Lack of accountability for behavior 15. The feeling of living behind a façade 16. The ability to engage online solely among a Black community 17. Micro/macroaggression 18. Black content creators and influencers have to do more work to be recognized
What role does colorism play in dating in marriage?	19. Only with Black men, because they understand me 20. Black entitlement – Black men who feel they can have me/obtain me 21. Lighter skin loving darker skin, and feeling inferior 22. Thoughts on why a light-skinned Black man would choose a dark-skinned woman 23. Light men are viewed as more attractive 24. Dark men being viewed as more recently as attractive 25. Objectification 26. Different relationship issues dependent on the color scale 27. Being open in conversation with significant other about color differences and issues that arise between one another 28. A sense of safety in dating Black men 29. The ability to have a preference
How are children affected by colorism?	30. Parents comparing skin tones 31. Teaching how representation and equality matter 32. Guiding decisions 33. Children are often more harshly disciplined at school by security and faculty, not given as many chances
What are some examples of colorism and traditional media?	34. Mainstream colorism is a hot topic on social media 35. Key role in the perpetuation of colorism 36. Minstrel shows 37. Depicted and stereotyped as enjoying slavery, visuals 38. Prone to violence 39. Assumptions of a lack of control 40. Marketing 41. Post-war images of Black men/treated as animalistic 42. Black rap artists using light skin or white women in music videos 43. White women who use Black-fishing to identify as Black or being ethnically ambiguous 44. Media and film

Note: Items are numbered to reference from results and discussion sections (ex. F1:3, figure 1, number 3)

Figure 3
Semi-Structured Interview, Thematic Analysis - Theme 3: WORKPLACE, EDUCATIONAL, AND JUDICIAL EXPERIENCES (29%) using Dr. Sarah Webb's "100+ Colorism Questions"

THEME 3:	PARTICIPANT RESPONSES ON WORKPLACE, EDUCATIONAL, AND JUDICIAL EXPERIENCES (29%)
What role does colorism play in education in school?	1. Teachers pushing students to be assimilative, not having culturally responsive tact 2. Assumptions that Black means strong, less soft skills among teachers/faculty 3. Nicknaming/butchering Black names to feminize 4. Ratios of diversity between students and teachers/faculty being disproportionate 5. Indoctrination of cultural differences that negate a student's sense of self 6. Pre-existing racial discriminatory behavior 7. How it's discussed at home 8. Black people have to work much harder than others 9. Feelings of having to prove intelligence 10. Telling children they can do better at a different school that has more white students 11. Harsher discipline for darker students 12. Light skin students typically have more chances to learn from behavior/mistakes
What role does colorism play in the judicial system?	13. Lack of police representation 14. Being taught to fear police 15. Predisposal of Blackness 16. Higher rates of Black incarceration in the U.S. 17. Heavier penalties for the same crimes committed as whites

	18. No prioritization for reforming from the government 19. Centuries-old 20. Automatically targeted 21. More discipline 22. Darker skins are in more danger 23. Lack of Black representation 24. Same offenses, different races getting different sentencing 25. Automatically being stereotyped and targeted
What are some examples of colorism in (PLACE)?	26. Depending on where you came from, your confidence in Blackness shifts 27. Larger cities have stronger bonds with in-group Blacks 28. Generationally- being told to *marry lighter* by an older family member 29. Being hired because of looking like an *unproblematic* Black woman 30. Being told that they were the *right* shade of Black 31. Not being cared for or taken seriously in the doctor's office 32. Wearing straight hair/wig to the office and being treated differently than when wearing braids
How does colorism affect employment and career opportunities?	33. Microaggressions in the workplace 34. Feelings of not being taken seriously by peers and colleagues 35. Passive-aggressive communication 36. Hair and *texturism* 37. Being told you're being hired deliberately to meet a quota 38. Significantly greater access to social mobility if lighter skin toned 39. Corporations/executive positionality

Note: Items are numbered to reference from results and discussion sections (ex. F1:3, figure 1, number 3).

Criminal Justice or Public Health: An Analysis of California Central Valley's Approach to Drug Addiction

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Abstract

This study looks at the repercussions of tackling drug addiction from a criminal justice lens. The Modesto Police Department (MPD) was utilized in this case study since it is the Central Valley's largest city. This included seven officers engaging in ethnographic interviews where they were questioned about their impressions of the local drug problem. An examination of the city of Modesto's budget during the last decade, from 2012 to 2022, revealed that MPD was prioritized. Media records were utilized to demonstrate drug enforcement operations as it relates to MPD. The findings support the notion that MPD and the criminalization of substance misuse in the city are priorities for Modesto. Through interviews, financial, and government document analysis, my goal is to investigate the repercussions of tackling drug addiction through the perspective of criminal justice rather than as a public health issue.

Keywords: Police intervention, militarization, substance use, addiction.

Introduction

Background

The United States has a long history of moral panics against drugs, from prohibition to the present day. Since the beginning of The War on Drugs in the 1970s, the impact it has had on society has been detrimental. It has resulted in exacerbating racial disparities in incarceration. Most importantly, The War on Drugs has been one of the main contributors to the militarization of the police in the United States (Balko, 2021). Through the development of neoliberalism, there has been a shift in blaming the individual, neglecting the systemic flaws in place such as low wages, unemployment, homelessness, and low quality of life. From the Drug Enforcement Agency (DEA), the Anti-Drug Abuse Act of 1986, and the Drug Abuse Resistance Education program (DARE) the United States has sponsored many fear-based campaigns for this ongoing war. This phenomenon has led to the militarization of domestic policing, increasing criminalization and police presence rather than sponsoring public health programs to treat drug addiction.

Today, it can be more difficult to distinguish between mainstream policing and police paramilitary units (PPUs). These units were once a rare tool, used in response to terrorism, riots, and other high-risk situations. In modern times, the use of police paramilitary units is more prevalent, used for no knock warrants typically having to do with drug busts (Kraska & Keppeler, 1997). To fund PPUs, police departments must have extensive budgets. For instance, Modesto Police Department, in the last decade, has been allocated around 50% of the city of Modesto's budget. There is priority given to law enforcement and their support for drug enforcement.

The increase in drug addiction has resulted in more police intervention making this social problem a criminal justice issue rather than a public health issue. This is an important area to shed light on because the United States has such immense wealth but have centered the importance of certain issues like drugs in the wrong area. This nation has a strong police presence, favoring its activities in all sectors of society. I would like to investigate whether this is the best approach or whether there is another option that is more cost effective in terms of money and social welfare in the long run. LEOs are given far too many resources, leaving other social services to pick up the slack (Cooper, 2015). We must critically examine the expanded police activities and militarization in light of the damages it creates. This study aims to analyze the approach that favors treating drug addiction through criminalization rather than through means of public health measures.

Theory Analysis

Neoliberalism is a political approach where certain markets in an economy are privatized. This approach adheres to economic growth as its main principle. Neoliberalism also promotes the idea of individual responsibility rather than society's. This leads to define addiction as an individual choice and responsibility rather than a response to stress and strains produced by society. Consequently, it is not the state's responsibility to provide help because it is all about the individual choices. Nancy Reagan's "Just Say No" Campaign connects to the idea of individual responsibility. This campaign created

lasting effects, oversimplifying the issue, and labelling addiction as a moral failure. Again, neglecting the systemic flaws in place such as unemployment, low wages, and low overall quality of life.

In the world of criminal justice, in the context of neoliberalism, Broken Windows was developed, and it expresses the values of neoliberalism. Broken Windows Theory plays on the idea that visible signs social disorder invites more of this behavior. The only way to reduce this level of disorder is to control it. According to Broken Windows Theory, when minor disorders, such as substance use remain undisciplined, this creates a widespread disorder throughout society. This is the basis behind the punitive crime control approaches generated from the neoliberal doctrine (Herbert, 2001). Following this logic, only zero-tolerance approaches would help in preventing future decay. When following the example of substance use, Thompson (2015) describes this as a regular low-income behavior which is not necessarily considered a disorder or presents an actual threat to a neighborhood.

This approach delegitimatizes a social welfare approach because this low-income behavior is seen as resistant to order. The only viable option at this point is a necessary punishment to restore order. This model characterizes our current approach to addiction which is allocating funds towards law enforcement to control the problem at hand. The criminalization of substance use is highly sought over in low-income communities, which are labelled as dangerous areas, where punishment is seen as the optimal way for control. The high levels of inequality and instability generated by neoliberal policies lead to an increase in an informal economy like drug sales to make ends meet and addiction as a coping mechanism.

Methods

Ethnographic Interviews

Ethnographic interviews seek to understand the subjects' perspectives, beliefs, and practices related to the topic at hand. This method was essential for the project because it allowed for the police officers to have a window to describe their insight on the issue of addiction in the central valley. The ethnographic interviews allowed for the comparison between the police officers' perspectives and the interest of the Modesto Police Department.

The selection process consisted of asking colleagues from the Stanislaus County Probation Department to ask officers from the Modesto Police Department. The officers were selected after hearing about the study through their colleagues. Officers from the Modesto Police Department were approached by colleagues about the possibility of being interviewed for a research project for this research work.

Each interview was conducted at a location and time chosen by the police officer, this was to ensure that the officers were in a comfortable and convenient setting. They were advised of their role in this study, given the consent form for their approval, and once everything was signed and they were well informed of the procedures, the interviews started.

The interviews typically lasted 30 minutes. The same questions were asked to each officer who was interviewed. The questions started simple such as, "why did you choose to be a police officer?" They progressed to more complex questions, such as "what do you believe is the cause of the drug war in the general area?" Each officer was given a judgement-free zone in which to express their thoughts on each question. The officers were asked a total of nine questions. After the interviews were done, the officers were thanked for their time.

There was no clear goal with the number of officers to interview, the objective was to interview as many officers as possible to collect unique perspectives. As a qualitative study, these interviews are not necessarily representative of the perspectives of the whole agency.

Budget Analysis

The second set of data collected included a collection of the Modesto Police Department's budget from 2012-2022. This data was collected from the City of Modesto's Annual Operating Budget documents. The budget was then compiled and organized into a table showcasing the year, the amount in dollars, and the percentage of the city's budget. The objective was to collect budget information from the last decade to show a broad enough data set.

Social Media and Government Document Analysis

For the final set of data collected, the Modesto Police Department's Instagram was examined for any reference to militarized activity. This was to ensure that there would be an example of how the line between local law enforcement and the military has been blurred.

For the government document analysis, the 2018 community health assessment from Stanislaus County was reviewed for information regarding substance misuse. Information about drug overdose death rates within different ethnic groups in 2017 was used to question if the War on Drugs was successful.

Analysis

Throughout the ethnographic interviews with police officers, there were many perspectives received. Many of these perspectives were not expected, especially when it came to questioning how the issue of drug addiction should be resolved. It is

important to recognize the dichotomy between the interest of the police officer and the police institutions.

After asking the following officers how they believed the drug issue should be resolved, they responded with this:

> Officer N: "The CJ system should intervene when the cartel is involved. Health professionals should intervene so that they can get into the root of the issue when it comes to addiction. This issue is so prevalent, I'd like there to be more to combat this issue."
>
> Officer D: "There should be services provided for people who are vulnerable. An advocate for programs to elevate people's situations to prevent addiction from spreading and advocates for social mobility programs."

Through these responses, there is a consistent theme present here that is important to highlight. Each of these officers calls for more funding for public health measures as it relates to resolving drug addiction in the area. The police officers express an interest in wanting more funding to be allocated for social services, however, there is no institutional interest for this cause. This is important because an individual officer or officers do not have the political power to make such a decision.

Figure 1 displays MPD's budget throughout the decade of 2012-2022. In the fiscal year of 2012-2013, MOD was allocated approximately $48.1 million which is roughly 45% of the city of Modesto's budget. A decade later in the fiscal year of 2021-2022, MPD was allocated $72.4 million, which is roughly 47.3% of the city of Modesto's budget. The Modesto Police Department can justify these immense amounts of funding through tropes of war. The unkillable entity or unknown enemy, which are drugs in this case, calls for an everlasting struggle with no clear end date. To combat the "enemy" there needs to be an endless supply of money in the name of increasing public safety. Without disciplining drug addiction in this society, the decay spreads throughout society.

To highlight the contradiction of policing, Officer I's response to the question, "how do you believe the drug issue should be resolved?" is intriguing. Officer I: "There should be more funding for drug education and rehabilitation, less of a focus on incarceration. CJ system should intervene because without it, there is no regulation."

Officer I's response is particularly interesting because it displays the contradiction of policing. Officer I starts off by mentioning that the criminal justice system should not be involved with handling drug addiction but finishes it off by mentioning that there should be criminal justice intervention. This exemplifies the contradiction with policing since officers do not have the adequate training to handle such a health issue, rather, there is an institutional interest for budget increase present.

Officer I's response exemplifies the neoliberal approach to combatting drug addiction. As mentioned previously, substance use is seen as a resistance to order which can only be handled with punitive crime control approaches. In this case, this would be considered the criminalization of substance use. Instead of there being a social welfare approach which would include funding public health measures such as quality health care access for individuals with substance use disorders, syringe exchange programs, outpatient clinics to name a few, law enforcement agencies are allocated immense amounts of funding instead.

The priority of criminalizing substance use is not by accident. Broken Windows Theory and Neoliberalism help to contextualize the failures of the War on Drugs. The United States has yet to eradicate substance use from society, which was the War on Drugs' sole mission. Despite this, there are still millions of individuals in this country who suffer from substance misuse, substance use disorders, and other co-occurring disorders. Herbert (2001), describes a segregation tactic that does not allow the merge between "respectable" citizens and the "others." The others in this case would be the most vulnerable coming from underserved communities, which would be substance users in this case. This creates a fear of the "others," poor people, and those most vulnerable. This fear is expanded by Broken Windows, which creates support for aggressive tactics to combat drug addiction. A social welfare approach is not considered favorable or effective compared to restoring order through punitive measures. Drug addiction is then seen as a moral failure, a result of personal choices which neglects the systemic flaws in place such as unemployment, low wages, housing crises, and low quality of life.

Conclusion

This effort raises awareness of the massive amount of funds that law enforcement agencies receive. In comparison to other big city police departments, the Modesto Police Department is a modest one. This also helps to rethink the United States' approach to drug addiction and raises the question of whether criminalizing substance use is a feasible solution to drug addiction.

This could result in a larger-scale effort involving additional law enforcement agencies around the country. Given that many people with substance use issues originate from underserved communities, this might be the first step toward health equity. As a student interested in public health, this initiative might be replicated across the country to demonstrate what law enforcement organizations are doing with the funds paid by U.S. taxpayers. This could assist in the implementation of public health policies aimed at combating drug addiction, which has been demonstrated to lower the prevalence of substance

misuse, substance use disorders, and fatal drug overdoses.

Year	MPD's Budget	% of City's Budget
2012-2013	$48,198,767	45%
2013-2014	$50, 727, 818	45%
2015-2016	$53, 521, 714	49%
2016-2017	$58,295,575	50%
2017-2018	$59,102,867	48.6%
2018-2019	$62,573,944	48.3%
2019-2020	$67,035,584	48.5%
2020-2021	$69,052,876	49.3%
2021-2022	$72, 417, 502	47.3%

Fig. 1. Modesto Police Department's Budget (2012-2022)

Caption: The data shown depicts the city of Modesto's allocation of funds to the Modesto Police Department. It specifies the amount and the percentage of the city's budget.

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The Colonial Duality of the Curatorial Perspective

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Abstract

This paper explores the social aspects of colonialism in relation to history, theory, and politics of the curatorial world. By questioning the "modern Integration" of the museum and its core concepts of colonialism (ethno-psychological, the feminist theory, the race theory, and geography) we can then dive into the development of the museum and how it functions as a corporate spectacle. I then introduced a work of art (*Uncle Tom and Little Eva*, by Robert Duncanson) to dissect how these previously mentioned intersectional theories influences the politics of the curatorial and colonial discourse. With unraveling the birth of the museum, we can then question its position within the colonial concept of slow violence.

Keywords: Colonialism, Museum, Aesthetics, Orientalism

The public museum, is "an institution devoted to the procurement, care, study, and display of objects of lasting interest or value" (Oxford Dictionary). The environment in which today's modern museum operate, have changed significantly today—from landscapes, buildings, object, and most importantly, its multi-sensory experiences (installation and performative arts). Of course, the term museum is used flexibly however, the commonality are the objects of interest that challenges distinct issues and relationships (artists, curators, and the audience) in society. The museum culture from a social perspective is filled with emotional satisfaction, cultural stimulation, and an overall sense of public awareness. While these characteristics are true, we must also consider the museum as a business. The museum much like any other educational institutions, have social strategies that aims to evoke certain responses from the audience. Overall, by operating through social analysis, the museum challenges and reconstruct the social developments of society. Since art is a reflection of society it is only fair to say that the configuration of art and society functions as a continuous loop with causes and effects based on independent variables such as the audience, artists, and the space in which a specific work is presented. Viewing art is not the only purpose of a museum, but to show them in its "truest" form. However, there is a huge contradictory of this democratic statement since the objects are attributed to various meanings and values.

Before the birth of the museum the relationships of the museum were once private collections by the royal, the church, and the aristocratic. The museum has now become a public modality, fully accessible to all; while having a utilitarian incitement towards democratic based learning. Despite the intersecting fields of ethnography, archeology, science, and biography, the joined collectivism of the museum classifies and dissect society in a scholarly manner. Though many artists from polarizing parts of the world can attest to the effects of colonialism through iconographical and iconological significances in art—there are not much thought on how these works are exhibited, by whom, for whom, and for what purpose. To understand the structure in which the museum and curatorial projects lie, we must first understand the ideas that birthed the space historically, theoretically, and politically.

Colonization is a Western experience adjacent to Europe, amongst the greatest source of civility, cultural, linguistic, and economical advancements. Countries attributed to colonial order were European colonies such as the French, British, German, Russian, Spanish, and later the Americas—then came the development of what author and Scholar Edward Said calls, Orientalism. The concept of Orientalism is not imaginary but is ideologically constructed as a material that forges civilization and culture through colonial bureaucracies and colonial styles. According to Said, "Orientalism is an academic one, and indeed the label still serves in a number of academic institutions. […] (it) is a style of thought upon an ontological and epistemological distinction made between "the Orient" and (often) "the Occident" (Said 2). In understanding the Orient or the Other we must understand the need for the distinction between the Orient and the Occident. The relationship between the orient and the Occident is a dynamic of power in which the Occident recognizes the histories, customs, and culture of the Orient to be much greater than and in return—often challenging its reality through a configuration of power, domination, and hegemony. Due to this comparative historical relationship

between the West and the East, the structure of Orientalism became about using myths, and fabrications through political, social, and cultural discourses. Said believes that the Orientalist discourse is closely related to the political socio-economic institutions to further its' agenda. In relation to the museum, the European-Atlantic power presents itself in a scholarly form, filtering the Orient through social consciousness.

Said states:

> "After all, any system of ideas that can remain unchanged as teachable wisdom (in academies, books, congresses, universities, foreign-service institutes) from the period of Ernes Renan in the late 1840s until the present in the United States must be something more formidable than a mere collection of lies" (Said 6).

Said believes that by using educational institutions through theory and practice is a mere investment to proliferate Orientalism into society. By using analytical distinction between the "civil" and "uncivilized" one gets to redefine what it means to be worthy and unworthy through learned behaviors. It is true that certain ideas are more influential than others to build a system in which cultural hegemony is at work. The mere space of these ritualistic and unconscious acts by society are therefore dependent on the strategic flexibility of the Oriental's superiority.This flexibility questions the types of circumstances in which the estimates of power are being used to execute the curatorial context and if it is dependent on the detachment of exclusive social and political entities, towards social accessibility in a non-coercive way.

The academic complexity of the museum as a colonial construction of theory, language, anthropology, race, and history "theses about mankind" are all instances where the development, revolution, and cultural personality is fabricated and challenged (Said 8). In developing the modern museum, the distinction between "humanists" and political knowledge is dependent the conscious and unconscious members of society. The birth of the museum by Tony Bennet exclaims, "If under feudal and monarchal systems of government, art and culture forms a part, (…) of the 'representative publicness' (…) with the development of new institutions and practices which detached art and culture from the function and enlisted it for a cause of social and political critique (Habermas 1989) (25). This enabled society to digest the re-modification of culture "in accordance with a governmental logic". In the mid-nineteenth-century, the reconceptualization of the museum space and the public sphere of the colonial discourse influenced an unequal distribution of power through psychological and sociological differences. The nuanced elaboration of difference played a huge role in the exchange of power as it is dependent on the iconoclastic interpretation of art and literature. Looking at the museum as a "contact zone" helps us to reconceptualize the museum as a "cultural source that might be deployed as governmental instruments entailing a significant revaluation of earlier cultural strategies [such as Orientalism]" (Bennett 28). The "contact Zone" is where the population becomes one — where one might civilize themselves by imitating appropriate forms of 'class' exhibited. Anyone who is categorized as the Other or the Orient is subjugated to the didacticism of cultural and social behaviors through political hegemony. Not only the public sphere of the museum is differentiated but also incorporates strategic reordering of the objects to magnify the political domains through a "democratic form of public representativeness" (Bennett 33). The reordering of the contact zone then relies on the psychology of art, the space itself, in accordance with the objects structure, classification, and geography. Jan Mukrovsky: *The semiology of Art*, dissects the aesthetics of art in relation to social interpretation. However, I would like to touch on two elements, space, and rhythm. Mukrovsky states that, "the aesthetic is a matter of the whole collective, not just the individual" (200). The sociology of art depends on many elements including the idea or intent behind the space (contact zone). As a historian, one may contemplate the work of art and how well it fits with the space however, "the ratio of the category of space and time has changed in the course of the development of art" (Mukrovsky 201). The principle of the museum is therefore seen as a contact zone that represents the performative arrangement of political entities. In correspondence to space, it also plays a huge role in the history of architecture in which the development of the art is dependent.

Would we then consider the contact zone as a form of art configured with its own ideas and motifs, socially and/or politically? According to Mukrovsky, "today, aesthetics cannot exist without historically situated material" (202) and so —hypothetically, if the museum functions as a form or art, would the intent of its' origin be its' ideas reflected in an outwardly form? Would the contact zone be deemed a semiology of structure, division, and classification? Much like art, the museum functions as a sign that serves a purpose. Mukrovsky states, "Without society there would probably be no signs. The most fundamental function of the sign is the communicative function. A percept is incommunicable, that is, it cannot be identified with the meaning of a word; and yet a percept itself contains sign elements" (204). Anything can become a sign, including the museum as a contact zone that transform the undeveloped into civility. The museum is reshaped

into a social institutional model while using objects as instructional tools.

Bennett states:

> "The visitor at such museum is not placed statically before and order of things whose rationality will be revealed to the visitor's immobile contemplation. Rather, locomotion—and sequential locomotion—is required as the visitor is faced with an itinerary in the form of an ordered things which reveal itself only to those who step by step, retrace its evolutionary development" (43).

The relationship between the audience, the sequential display of collections, and the museum space displays the principle of classification linear to the Occident. By using the space as a binding agent to society, the linear plan of each work exhibited gives the impression of history in a rational and linear path to social progression. Not only the contact zone is used as a tool for self-regulation, but it also performs as a transparent space to quickly highlight the Other. The power of the museum as a contact zone is highly rigorous as it impedes itself as a permanent display of power by rationalizing its disciplinary contents as beneficial to society.

The Orient is a highly articulated discipline with techniques far more intricate, intertwined with colonial authorities, organizations, and doxological ideas. The idea of Orientalism is more than a mythological practice but also a linguistic one. Scholarly works such as books, journal and just about all works of literature can and if used, as a form of colonial linguistic pedagogy. It is important that we look at the linguistic sign of Orientalism as a representative function. The linguistic sign can also be articulated that to constitute the different objects and verbal meanings. As Mukrovsky states, "the Ausdrucksfunktion is the expressive function [as it] relates to the speaker. (…) Because of its internal structure, the linguistic sign is very complex. A word in a sentence has many aspects" where each meaning can have various meanings within one context (205-206). In understanding the truth, the expression of the museum is an didactic instruction. In opposition—the "truth" of something is always in question and therefore never literal.

Before we address the colonial linguistics of the Orientalist, I would like to first analyze Robert Duncanson's *Uncle Tom and Little Eva, 1853,* in response to the duality of the curatorial perspective. The African American painter Robert Duncanson was inspired by Harriet Beecher Stowe's *Uncle Toms Cabin, 1852*, that reframes the literary perspective of the historical and personal experience of the black "mans" lived experiences. Robert Duncanson was prominently known for his production of landscapes however, the panting—Uncle Tom and Little Eva that was commissioned by James Francis capturing a little girl as the prototype. Duncanson was sent to Europe to study paintings where he gained great status and reputation as well as his home in Detroit and Cincinnati (Cavallo). The desire to create *Uncle Tom and Little Eva* was said to be a quotation of Stowe's *Uncle Tom's Cabin, 1852.* The painting evoked what was said in Stowe's book:

> "At this time in our story, the whole St. Clare establishment is, for the time being, removed to their villa on Lake Pontchartrain (...) St. Clare's villa was an East-Indian cottage, surrounded by light verandas of bamboo-work, and opening on all sides into gardens and pleasure- grounds. The common sitting-room opened on to a large garden, frag- rant with every picturesque plant and flower of the tropics, where wind paths ran down to the very shores of the lake . . . It is now one of those intensely golden sunsets which kindles the whole sky into one blaze of glory and makes the water another sky. The lake lay in rosy or golden streaks, save where white-winged vessels glided hither and thither like so many spirits, and little golden stars twinkled through the glow(…)."

Duncanson replicated this exact scene adding the literary subject to serve as a political mission. In highlight of the social and political climate of the late eighteenth-century, we can state that there were theoretical discussions around, race, identity, colonialism, along with the social dilemmas of the Oriental performative strategies. The literary subject of Duncanson's work had become fully awakened as it played a huge role in the power structure of the museums' hierarchy or what Norman L. Kleeblatt calls the master narrative. In efforts of gaining professional and personal acceptance, Duncanson had to sought access to the status quo by embracing the ideologies of the academics in turn validating the otherness through the African American protagonist framework. In treating this, "the choice of nationalists literary subjects and conservative artistic styles and conservative artistic styles must be read as operating somewhere between resistant affirmation of cultural specificity and total accommodation to the host culture" (Kleeblatt 3). By representing the artistic style in the pictorial form, Duncanson focused on the simple yet highly iconographic interaction of *Uncle Tom and little Eva*. Through this painting alone, we can see the power dynamic of religion and race at play. The subjects are in an Idyllic landscape with little Eva standing next to Uncle Tom as she points to the sky, alluding to sublime idea of freedom by death. Even though the work was said to hold Eva as the protagonist, what made Duncanson work so powerful is that the protagonist can be shifted to Uncle Tom viewed from an African American identity. Jan

Mukrovsky states, "reality is projected into the intentional objects, but the word also has a relationship to them. Thus, the special scheme of the intentional object is given" (209). Otherwise, the reality of the work can be presented as "fact", yet the intentional narrative also has its own existence. As we continue to unravel the linguistic aesthetics of Duncan's work, one can see that the communicative function in art is not always direct—that the linguistic aspects of a work can have a non-communicative meaning separate from the verbal.

In clarifying the modes of communication regarding to Duncanson's work, we can then question the relationship of the art with something external, in need of truth. In a system of values, there is always a possibility to establish a relationship with a work of art, "In other words, it is a matter of a relationship, not of concord, which means that the work of art need not always seamlessly coalesce with our system; indeed, it can evoke antagonism" (Mukrovsky 212). By projecting the self onto the (art) work, the mind unravels a new perspective which gives the work life relating or disrupting societal structures. Duncanson attitudes towards the hegemony of the Other is deeply complex. And that by using the appropriate linguistic texts became a clever and accommodating against the Occident. The paradoxical duality of Duncan's efforts to assert his identity and the need to please his white leader became a struggle that was unanimously shared among the Orient. Fanon's book, *Black Skins, White Masks* States that it is dissembling to be in two places at once. That the displacement of the otherness is accounted to not only the lack of self-identity but also the acceptance of the Occident invitation to identity. By enforcing psychological and social authority, "[the] social alignment of self and society or history and Psyche is rendered questionable (…) of the colonial subject who is historicized as it comes to be inscribed in the texts of history, literature, science, [and] myth" (Markmann 12). In other words, the development of society was highly dependent on the ethnographical collections of a large section of humanity as well as the primitive works—designed to extend the colonial narratives diluted in democratic strategies (such as public domain). In relation to Duncanson's *Uncle Tom and Little Eva*, the literary function of the work is different from the image. Although Little Eva is the protagonist, as historians we would want to know whether Robert Duncanson's expression is linear to his identity. Mukrovsky's *Semiology of Art* states that the work of art itself, may be in-between—which would support the idea that Duncanson's work reflects the self and the Other.

In comparison to the Other, if Duncanson's work spoke to the audience that is a product of colonialism then the work of art would be universal. However, there are layers that attributes to the relevance of art: the intentional object, the object relation, and the verbal meanings. Looking at the *Uncle Tom and Little Eva*, we can say that the intentional object is Little Eva (as the protagonist) and Uncle Tom, the object of relation. The painting is dependent on the subject(s) in connection to space to create a narrative, pictorially and linguistically. The subject of relation could be true, a lie, an error, or an unconscious intent. As Mukrovsky states, "A lie can also be revealed in a work of art: then it is a matter of Baron Munchausen, a certain way of artistic presentation. Every artistic narrative is normally fiction, and yet we would distinguish between a narrative plot and a fictitious plot, and between a plot that is narrated as fiction" (211). If Uncle Tom is the main subject, then the essence of the artistic narrative changes. The work then becomes a direct confrontation to reality while evoking enmity. This strategic positioning of Duncanson's work is what makes him such a great artist. He was able to use the communicative and uncommunicative parts of art to speak to his audience.

By analyzing Duncanson's ability to mask the subject (Uncle Tom) as an objective instrument —I would like to compare his tactics to the museum has its' own strategic positioning.The mere distinction between Duncanson and the museum is the autonomy of the object (museum) and the other (mankind). There are many instances today where the museum pushes certain agendas against society creating normalization through order and self regulation. Much like the school structure, the museum is used as a learning tool placed in the social category of eminent domain. In teaching the public the social modes of space, language, and body regulation ethno-psychology and surveillance takes place. Edward Said states, "Anyone who teaches, writes about, or researches the Orient-and this applies whether the person is an anthropologist, sociologist, historian, or philologist--either in its specific or its general aspects, is an Orientalist, and what he or she does is Orientalism" (7). By evaluating todays society in a post-colonial setting, we have seen a huge shift the political and social progressions of museums. Although the public display of the museums have been reorganized and more culturally diverse, curators have exhibited the reinterpretation of ethnographic collections as "early" or "distant" implying Western society as already progressive and civilized using the construct of time. As curators, this type of Slow Violence that continues to perpetuate and exploit society would be a polarizing position to be in if one deems the museum as a tool that could perhaps be used to positively influence society. Moreover, if the museum was intended for categorization by "lying" by omission and social "brainwashing". Would this mean that curators are in the same position

as Duncanson—to uncover the truth depending on the viewers identity to speak to society? Could “hidden meanings” be a progressive strategy towards radical change in the curatorial world?

The effects of colonialism is deeply rooted in all areas of our society, and so the practice of decolonization in the curatorial field must take on other forms of methods to effective reconstruct society accordingly. Beyond the object repatriation, the usage of words in exhibitions that can lead to confusion, prejudice, and lack of understanding, many believe that the museum cannot truly be decolonized. Curators practicing decolonization holds the vulnerable experience of the Artists and the Artists work that should not be presented in a stigmatizing or one sided perspective. In Duncanson’s work we can still see his beautiful landscape while also appreciating the beauty and innocence of Little Eva (that can attribute to the hope of the new generation). The power that curators must hold is the strict dichotomy against colonizers and those who were colonized —not erasing the past, but presenting each work so that it may evoke empathy and inspiration. The decolonization of the museum is a huge part in decolonizing the world. If art is a reflection of the world, curators have the power to positively influence the society through linguistic correctness and radical neutrality of the Orient and the Occident.

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Artwork

Uncle Tom and Little Eva, 1853, Robert S. Duncanson, American, 1821 - 1872
Oil on canvas
Unframed: 27 1/4 × 38 1/4 inches (69.2 × 97.2 cm)
32 13/16 × 43 3/4 × 2 1/2 inches, 30 pounds (83.3 × 111.1 × 6.4 cm, 13.6 kg)

Defining Minimalism and Exploring its Effects on Well-Being

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Abstract

I hypothesized that after extensive research, I would discover that Minimalism, while a great tool for increasing well-being, is poorly defined and therefore misunderstood. I proposed a new definition of Minimalism which is: a form of intentional living that seeks to reduce various forms of consumption that are negatively impacting the consumers' life. I compared this definition with the American Psychological Association's (APA) definition of well-being: "A state of happiness and contentment, with low levels of distress, overall good physical and mental health and outlook, or good quality of life.". I found that Minimalism does have an effect on well-being and depending on how the consumer uses it, will see an increase in their well-being. Ultimately, the purpose of this research is to encourage further research as a means of encouraging a new solution to increase well-being across diverse communities.

Keywords: Minimal, Simplicity, Well-being, Clutter, Materialism

Introduction

Many in this world suffer from a decreased sense of well-being and there are many markets that try and convince you that if you have something more, it will make you happy. But what if the answer isn't more, but less. My sources introduce multiple definitions of Minimalism, show some positive effects of Minimalism, some negative effects of excess, and lastly offer insight into why there is a need for continuous research.

Minimalism as a lifestyle is a fairly new concept and therefore has not been officially defined by the American Psychological Association (APA). I also believe this research is particularly important because it is something most people can adopt. It's more of a mindset paired with lifestyle changes. This makes it very inclusive and puts a lot of responsibility on the consumer instead of outside resources.

Literature Review

Defining Minimalism

When we see or hear the word minimalism, one might imagine a white house, simple artwork, a small monochromatic closet, or maybe a bare living room. It might also be assumed that anything outside of this norm Is not considered minimalism.

Aspects of Minimalism were alive in Eastern cultures and religion long before the term Minimalism was even heard of. Buddhists work toward achieving enlightenment and they do that by doing things like meditation which has a positive impact on well-being (Smith et. al. 2019). When these aspects made it over to the West, it was first seen in the teachings of philosophers. It later went through art and ultimately to the internet. There has been no official definition for this lifestyle but there have been some attempts.

Before there was Minimalism, there was voluntary simplicity, which is "a diverse social movement made up of people who are resisting high consumption lifestyles and who are seeking, in various ways, a lower consumption but higher quality of life alternative." (Alexander & Ussher, 2012, pg. 66). In Alexander & Ussher's 2018 study, they concluded that 90% of the participants who had transitioned to a simpler life reported that their happiness was increased. The article concludes that overconsumption is a multi-faceted problem, and that this movement has a lot of potential to be a response to these problems.

Wilson & Bellezza (2021) worked to establish a definition for consumer minimalism. They developed a 12-item Minimalist Consumer Scale to measure this. They not only looked at the material side of minimalism by studying the number of possessions, sparce aesthetic preferences, but also looked at mindfully curated consumption. Beginning to look into the mental aspect of minimalism is important because for most people it starts at the physical possessions aspect but then it can quickly turns into a mental health resource. Their results were expected, and they were able to validate their Consumer Minimalism Scale and display its usefulness. In their directions for future research, they express that understanding why people turn to minimalism is worth

researching. It is also important to note that minimalism is not a one size fits all movement which is partially why it may be difficult to define and research. Their directions also allude to that.

It Is also important to note the differences in the need of Minimalism in Western cultures compared to Eastern cultures. Sandlin and Wallin (2022) look at the contemporary minimalist movement and decluttering. Decluttering is a key word when learning about minimalism. It is often the first thing people learn about and perform as their first step on their minimalist journey. It is very popular on social media, specifically YouTube. This article is especially important because it points out that minimalism has become more popular in recent years and specifically names Marie Kondo as a key figure. She has a Netflix show and a lot of social presence so her methods and line "spark joy" are familiar to many. This article also highlights the ecological issues brought on by consumerism and how it relates to Western culture. It's possible that overconsumption does not apply to all countries or maybe it applies more to western countries or ones with a certain culture centered around consumption. Because of this we see minimalism becoming more of a trend for the privileged.

Trend vs. Lifestyle

Platt (2022) confirms that there are many misconceptions that caused her to originally be discouraged by minimalism. She questioned if she could embrace it as a Black woman. She makes very good points about minimalism seeming very white, both literally and figuratively. She later goes on to call herself the "Afrominimalist". She was able to redefine the term to include herself. Aja Barber wrote her book *Consumed* in 2021 with the purpose of evoking change in our consumerism behaviors. She tackles subjects often left unturned like colonialism and injustices that are interwoven in our consumption.

The United News of Bangladesh (2022) state various cons of a minimalist life. They mention how digging deep into your life and adapting is important to consider. They discuss how difficult it can be and which is also correct. This goes hand in hand with digging deep into your habits and the decisions you make in life. They also note that it's not always practical. But for this one their examples are a little weak. They note that sometimes you go on vacation and need something like a tent, and you can't get rid of it because maybe you might need it again. If you camp once a year, keep the tent. If you rarely camp, consider borrowing one instead of buying one or getting one second hand. Their reasons show why it is important to be honest about the definition of minimalism and how it affects us deeply.

Minimalism and Well-Being

Mailk and Ishaq (2023) conducted a study that looked at the relationship between Minimalism and well-being. They also considered well-being and happiness to be separate. They concluded that Minimalism directly affects financial well-being, and that financial well-being has a direct positive effect on happiness. Therefore, via financial well-being, Minimalism has an effect on happiness. Their limitations did include a smaller sample size and they express the need to expand their sample size to include larger consumer segments. This study is especially important because it was done so recently and published during the time of my research. It touches on multiple aspects that I mention in my research.

Hook et al. (2021) conducted a more recent study that is finally looking at that I am trying to discover here and that is the relationship between minimalism and well-being. Twenty-three empirical studies were conducted with a total of 10, 842 participants. Overall, there was a positive relationship between the two. This study is a great starting point as they discuss various limitations and improvements for future research. They also point out that the long-term impact is unclear.

A big part of increasing well-being is being able to dig deeper into ourselves. An example of this is analyzing our habits and relationships. The various books that The Minimalists have written throughout the years are a prime example of the conversations necessary to feel supported during the time of adopting minimalism. Chapters in their books cover an impressive variety of topics like relationships with yourself and others, money, values, ego, health, trust, honesty, passion, authenticity, and so many more. It's like sitting with a much-needed guide. If we are to consider using minimalism as a tool for increasing well-being, there needs to be proper education and training on it.

Methods

Materials

I used the CSU Stanislaus library to access databases such as One Search, PsycINFO, the Oxford Academic Journal of Consumer Research, and Sage Journals. I used a total of eight peer reviewed articles and four books. Most articles from the databases are scholarly. The books offer both primary and secondary sources.

Design

This is an extended literature review analyzing qualitative data such as interviews from books written by minimalists and quantitative data such as survey data like in the Wilson & Bellezza (2021) data. I analyzed these sources and compared and contrasted them with my proposed definition of Minimalism and the APA's definition of well-being which is defined as "A state of happiness and contentment, with low levels of distress, overall good physical and mental health and outlook, or good quality of life.". Currently, Minimalism has no definition provided by the dictionary. Therefore, I would like to propose my own definition: a form of intentional living that seeks to reduce various forms of consumption that are negatively impacting the consumers' life. This definition varies from previous research and can add an additional layer to its definition as I work towards a professional definition of Minimalism.

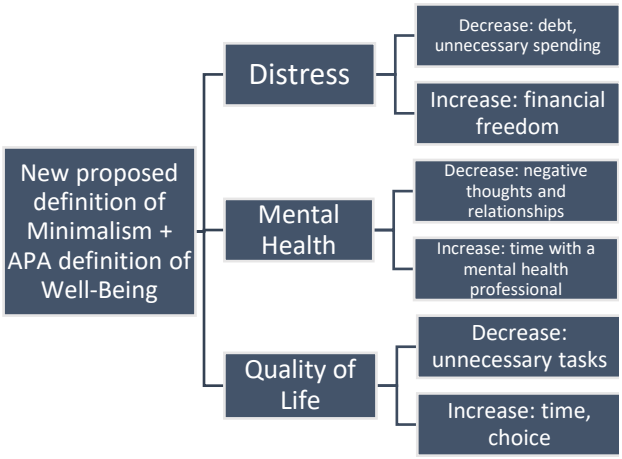
Procedure

As this was an extended literature review there was no data collected. Keywords used were minimal, simplicity, well-being, clutter, and materialism.

Results

After comparing my definition for Minimalism and the APA's definition for well-being, I expected Minimalism to show an increase in well-being specifically in the areas highlighted by the APA's definition. They are distress, mental health, and quality of life. My results supported my hypothesis and are summarized in **Table 1** and detailed in the paragraphs below.

Table 1



Distress

For the distress category, I decided to focus on financial distress because of how relatable it is. The APA conducted their annual Stress in America survey and in March 2022 stated that "Stress related to money and inflation is at the highest level recorded since 2015." When I took this topic and looked at it through the lens of the Minimalism lifestyle, I found that Minimalism seeks to reduce things that cause this distress. Malik and Ishaq state in their article that "…one aspect of Minimalism is attaining financial well-being due to spending less, which leads to avoiding unnecessary debt and enhanced savings." (Malik & Ishaq, 2023, pg. 4). Therefore, when adopting a minimalist lifestyle, you obtain tools to reduce things like unnecessary spending, therefore reducing and even eliminating financial distress and increasing well-being.

Mental Health

Mental health is a growing topic of interest. The APA stated in 2020 that "We are facing a national mental health crisis that could yield serious health and social consequences for years to come." With Minimalism, once the journey begins, you are often faced with the reality behind the habit. If the person chooses to continue on that journey, it is encouraged to always seek the help of a mental health professional. Testimonials show that after learning the real meaning behind behaviors, mental health well-being increases.

Quality of Life

When looking at quality of life, the APA notes that we obtain satisfaction from life via these categories: Emotional, Material, Physical well-being, Engagement in interpersonal relations, Opportunities for personal development, exercising rights, Making self-determining lifestyle choices, and Participation in society. Given Minimalism's unique personal journey, after reducing negativity that is consuming a person's life, space is made for more fulfilling activities. This might include learning a new skill or hobby, going back to school, volunteer work, etc.

Discussion/Implications

When beginning this research, I considered conducting survey research but believed the confusion behind the definition of Minimalism would hurt the study. The biggest limitation I have faced has been

defining Minimalism. This is what ultimately led me to propose my own. We are shown how much overconsumption affects not only ourselves but contributes to the health of others and our world. I believe it to be clear that our world is suffering and looking for a solution. Solutions will vary across cultures, locations, and beyond but that is expected and encouraged. Minimalism is about the individual and their personal well-being journey. Defining Minimalism and concluding that it increases well-being will open the doors to more research that could ultimately help us provide an additional resource for mental health and an increased understanding of cultures across the world. It is essential that continued research prioritizes diversity when gathering participants and clearly defines Minimalism. I would encourage further research to make sure their definition of Minimalism is clearly inclusive and that the participants understand the difference between the trend of Minimalism and lifestyle changes. I would also encourage documents to be drafted that can be used in a therapeutic setting to assess Minimalism tools and their effect on well-being.

Acknowledgements

I would like to thank the CSU Stanislaus Honors Program for giving me the opportunity and resources to complete this research. I would specifically like to thank Mr. Held, Dr. Newton, and my mentor Professor Gupta for their support, guidance, and insight.

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Hidden Markov Models on DNA Sequencing Data

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Abstract

Hidden Markov Models (HMM) have previously been used to identify single-molecule interactions on Molecular Electronics chips with a great degree of success. Currently, the new problem is how to identify DNA sequences read by these chips. Hidden Markov Models have the possibility of identifying the 5 states present in DNA sequencing data. This is tested in Python using the package hmmlearn to create an HMM algorithm with 5 possible states. DNA data was generated at varying levels of noise and standard deviations before being sent through the HMM algorithm. This paper reviews the results of an HMM algorithm on DNA sequencing data and analyzes possible future routes.

Keywords: Molecular Electronics, Hidden Markov Models, DNA Sequencing

Introduction

Roswell Biotechnologies has created the first Molecular Electronics (ME) chip, a microchip that uses a molecule as a sensor element (Fuller, Padayatti, Abderrahim, & Merriman, 2021). Molecules were first used as circuit elements in 2000 (Roswell Biotechnologies, 2022), however, a years-old problem has been how to implement them in a stable form on a microchip. This is related to the More-than-Moore problem, an issue within the field of electrical engineering detailing how even though other chip elements have shrunk in size, it has been difficult to shrink the size of the sensor element within a chip. Roswell has solved this problem by creating an ME chip, where a molecule is used as a sensor. Currently, these sensors can detect single-molecule presence, which is highly beneficial for diagnostic testing. The chip will cheapen costs of testing for both healthcare providers and patients if it can correctly read DNA sequences.

Literature Review

DNA sequencing is a fast-growing industry, allowing doctors to diagnose diseases that otherwise would take years to show symptoms. The first type of DNA sequencing developed 40 years ago was Sanger Sequencing, which requires growing a culture with the DNA sample for a week prior to sequencing (França, Carrilho, & Kist, 2002). In Sanger sequencing, first the DNA sequence is amplified within a polymerase chain reaction (PCR). Then, electrophoresis is used to separate DNA bases by size. Finally, the sample is run through a gel analysis and a sequencing machine to extract the DNA sequence. This method is slow and costly. Since then, new methods known as next-generation sequencing (NGS) methods have taken prominence, as these methods require relatively few pre-processing steps, allowing for DNA to be sequenced within two days (Mardis, 2017). While NGS methods use a variety of technologies, they all share three main steps. First, the DNA sequence is used to construct a collection. Second, the DNA sample is cloned and amplified with PCR. Third, the DNA is sequenced based of the collection from step 1. However, NGS techniques contain a major technical limitation in their lack of ability to sequence long strings such as the human genome. While these techniques are very accurate, they still have limitations and are costly both in expenses and in time.

Roswell Biotechnologies is attempting to solve this issue with their new Molecular Electronics chip (Roswell Biotechnologies, 2022). This chip consists of 16,000 molecule sensors, a novel technology that is the first to use a molecule-sized sensor, thus solving the More-than-Moore problem. In the More-than-Moore problem, chip sizes have been unable to shrink further because of a lack of progress in shrinking sensor element sizes (Fuller, Padayatti, Abderrahim, & Merriman, 2021). So, while other chip elements have shrunk, the sensors have not. Each sensor is connected to the circuit by a molecule-wide wire. They currently have two forms of this chip, one for basic molecule presence detection, and one for DNA sequencing. This chip is meant for use both in healthcare settings to lower the cost of diagnostic testing, and in individual homes to increase access to medical care in healthcare deserts. Currently, the molecule presence chip is working and ready to release to market. However, the DNA sequencing chip still requires work, specifically on how to analyze the results gathered from the chip.

The single-molecule detection chip uses a molecule sensor that can bind with specified molecules. In this model, when a target molecule attaches to the molecule sensor, an increased current

is sent through the circuit, which is then recorded as a measure of electrical amplitude in picoamps. This produces data with two states, when the molecule is present, and when the molecule is not present. These states can then be identified using a Hidden Markov Models algorithm (Zen, Tokuda, & Kitamura, 2004).

In a Hidden Markov Model (HMM), we have two sequences of events (Eddy, 1996). First, we have the sequence of x-events, where each x_k influences the following x_{k+1}. However, each x_k also influences some outside event, y_k. In this model, the state that each y_k holds is something we can directly observe, while the state that each x_k holds is something we cannot observe (Sgouralis & Pressé, 2017). So, in our single-molecule model data, the x-events would be holding one of two states, "molecule present" or "molecule not present". The y-events would be holding a value equivalent to the amplitude recorded by the chip. This assignment of x- and y-events satisfies the HMM because the amplitude values are influenced directly by molecule presence, but we can directly observe amplitude while we cannot directly observe molecule presence. Thus, Hidden Markov Models are the best model to predict our data's labels.

The second model uses a DNA strand connected to the molecule-wide wire as a sensor, giving a binding site for DNA samples to connect to. This model generates data that has five states, one state for each DNA base, adenine (A), guanine (G), cytosine (C), and thymine (T), and one state when there is no DNA present. However, the current recorded for each base can be similar in amplitude, with plenty of noise present, making the use of Hidden Markov Models difficult. In addition, based on prior Roswell research we know that in this type of data we must consider both the recorded amplitude, and how long that amplitude lasted within the section, requiring two types of analysis.

Due to this, there is a possibility of obtaining ideal results using Hidden Markov Models with proper denoising and model training. To identify ideal training data from the real-world set, model fitting must be used. By using the Viterbi Algorithm in this step (Viterbi, 1967), we can determine the maximum a posteriori probability (MAP) estimate of the set of states that is most likely to fit the data. A MAP estimate is an estimate of the mode of an unknown variable, which allows us to determine the mode that is closest to the actual mode of the data. The Viterbi algorithm works by generating multiple sequences of states that could possibly fit the given data, and then calculates a score based on how well the generated sequence aligns with the data (Ryan & Nudd, 1993). From there, it chooses the sequence with the best MAP estimate score, which can then be used as a base for the training data. By using the Viterbi algorithm to generate a set of training data, we can more accurately identify states within the five-state DNA sequencing data.

In addition, we need to create multiple instances of a Hidden Markov Model algorithm running through the data, to create multiple sequences of labels. So, we need multiple iterations running either in parallel or linearly. From there, we once again align the labeling against the full data set to determine the best sequence. We do so by assigning each HMM iteration a score based upon the MAP estimates generated by the Viterbi algorithm (Barrett, Hughey, & Karplus, 1997). This allows us to determine the best possible scoring dependent on the number of iterations we can run within a reasonable time period.

Once we determine how to use Hidden Markov Models to generate a labeling for clean DNA data, we also need to determine a way to remove noise from datasets that more closely resemble real-world data. One way to do so is using Total Variation Denoising (TVD) (Vogel & Oman, 1996). In TVD, we assume that the data has a high total variation, meaning a low signal-to-noise (SNR) ratio. To be clear, a low SNR ratio means that there is a high amount of noise present. From there, we apply the Rudin-Osher-Fatemi Partial Differential Equation to smooth over the data, removing unwanted noise while preserving key features.

Another way to denoise our data would be to use the Fast Fourier Transform (Brigham & Morrow, 1967). In this algorithm, a dataset is converted to a series of frequencies and keeps only the frequencies that have magnitude of at least epsilon, where epsilon is set by the user. In turn, this keeps the coefficients with a low frequency. However, the Fast Fourier Transform does not preserve "sharp" edges within data, thus removing important features. (Nussbaumer, 1981). As such, Total Variation Denoising would be the best option for this type of complex data in order to preserve key features.

In all, it would be beneficial to test Hidden Markov Models on DNA sequencing data due to their structure and their previous success on single-molecule data. However, we would need an accuracy of 95% due to the implications of DNA sequencing.

Methods

This research was conducted in Visual Studio Code and in Google Colab using the Python programming language. First, an algorithm was developed to simulate realistic DNA data. DNA data was simulated in order to accurately measure the success of the algorithm. Real DNA data would not have true labels to compare our predicted labels to. With simulated data, we can include true labels in the dataset to test the accuracy rate of the HMM algorithm. This simulator algorithm contains three different parameters. The first parameter is the Noise, which can be set at 0, 50, or 100 picoAmps (pA). This parameter adds pA to the existing values in place to mimic noise that would be picked up by the microchip in real life. For example, noise could produce a peak

with an amplitude of 50, making it similar to a peak with base "T". The second parameter is the Standard Deviation, which can be set to either 2, 6, or 10 pA. This affects the amplitude value of a certain base. For example, if base "A" is set to have an amplitude of 220, a Standard Deviation of 2 means the value of an "A" can range from 218 to 222. The third parameter is the Gap, which can be set to 5, 15, or 30 pA. This is the difference between amplitude values of distinct bases. For example, with a Gap of 30, an "A" can have an average value of 220 while a "C" can have an average value of 120. Examples of these three parameter values are shown in Figure 1 below.

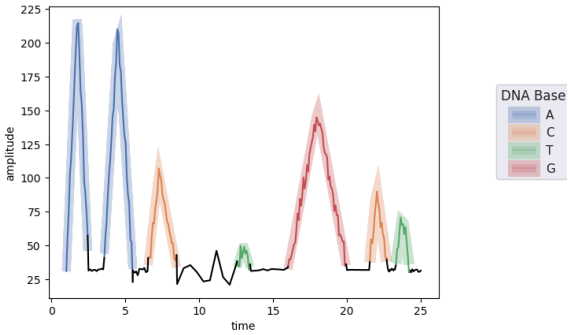

Fig. 1. Example of realistic data

27 datasets were simulated with a range of parameter values. Nine of these datasets were considered "clean", meaning 0 pA of Noise was present. Nine were "medium", reflecting 15 pA of Noise, and nine were "noisy", with 30 pA of Noise.

Once the datasets were generated, they were run through an algorithm that used both the Viterbi algorithm and the HMM algorithm. Both algorithms were available through the free and open-source Python package *hmmlearn*. The algorithm was written in Python on Google Colab. While multiple distributions of the HMM algorithm were available, the Poisson distribution was used to maintain similarity to the two-state molecule sensing algorithm.

In order to run the HMM algorithm, first a small part of each dataset was sent through the Viterbi algorithm, which utilizes machine learning to make predictions about the probability of each base occurring. Once these probabilities were generated, they, along with the full dataset, were sent through the HMM algorithm, which was tailored to consider 5 states. To test the success of this algorithm, the frequencies of the labels were compared and used to generate accuracy numbers for each dataset.

Results

This paper will highlight some of the better performing datasets out of the 27 datasets tested. One of these datasets is from the "clean" sets, while one is from the "noisy" sets. However, we will review all 9 clean sets and all 9 noisy sets. We aimed for an accuracy of 95%, as with DNA sequencing, a high level of accuracy is required to avoid misdiagnosing patients.

Within the clean datasets, the set that had the highest accuracy was the one with 0 Noise present, a Gap of 30 pA, and a Standard Deviation of 10 pA. This dataset, shown in Figure 2, achieved an accuracy of 82.19%, which still falls short of our desired accuracy of 95%. However, the average accuracy across all 9 clean datasets was 62.05%, with the lowest accuracy being 37.18%.

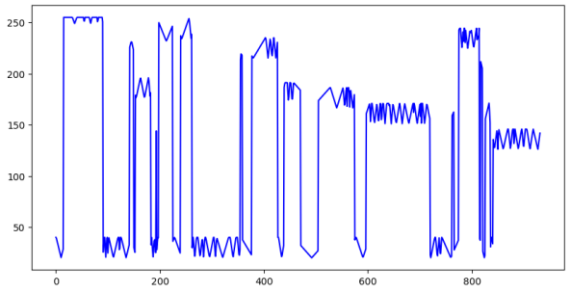

Fig. 2. Clean dataset 1 (amplitude vs time)

Within the noisy datasets, the set that had the highest accuracy was the one with 100 pA of Noise present, a Gap of 30 pA between peaks, and a Standard Deviation of 2 pA. This dataset, shown in Figure 3, achieved an accuracy of 72.91%. The average across the 9 noisy datasets was an accuracy of 50.5%, with the lowest accuracy being 20.44%.

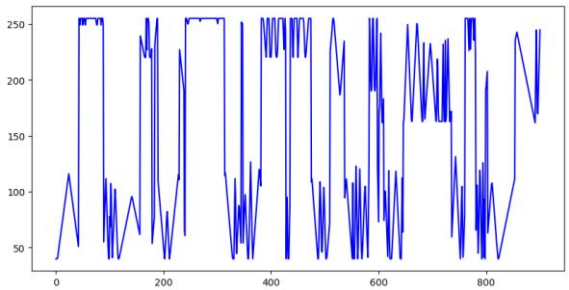

Fig. 3. Noisy dataset 1 (amplitude vs time)

Discussion

Currently, the methods of sequencing DNA samples are expensive and time costly. In the big picture, if we successfully develop an algorithm using Hidden Markov Models to sequencing DNA data, DNA sequencing as a medical test would be expanded to many people who otherwise would not have had access. By digitizing this technique, we would remove the waiting period associated with Sanger sequencing and newer NGS techniques. And, because the ME chips are cost-effective, individuals could sequence their DNA at home, expanding access for those in rural areas with healthcare deserts. This would lead to more individuals being able to test themselves for genetic diseases and maladies. However, in the short-term, this research will be greatly helpful to Roswell

Biotechnologies in their own research concerning DNA sequencing.

The results obtained do not support the effectiveness of the HMM algorithm. Even on the best datasets from the clean group, the highest accuracy achieved was 82.19%, which falls too short of our desired accuracy of 95%. In addition, the variation in accuracy across the group is too great to say that the HMM algorithm is consistent, with the lowest accuracy from the clean datasets being 37.18%, and the average accuracy across the 9 datasets being 62.05%. In the noisy datasets, the average accuracy was 50.5%. While we saw a drop in accuracy from the clean sets to the noisy sets, the drop is smaller than expected, only being 11.55% lower. This indicates that the HMM algorithm currently is not successful.

In the future, other versions of the algorithm can be tested, such as those that utilize a Gaussian distribution instead of a Poisson distribution. In addition, the current model tests a single dataset with certain parameters. In the future, we would like to test multiple datasets with the same parameters and average the accuracy across them to determine a "truer" accuracy rate. In addition, we can also test various denoising algorithms such as Total Variation Denoising, which was used on the two-state data mentioned previously.

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A Hidden Epidemic: Domestic Violence During the Covid-19 Pandemic

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Abstract

It is generally understood that stressful crises are correlated with increased rates of domestic violence, suggesting that this threat would have been exacerbated during the Covid-19 pandemic. This review looks at existing empirical research on domestic violence during the Covid-19 pandemic to examine whether domestic violence occurrence changed with the pandemic and what pandemic-related risk factors were present. A systematic search process using specific inclusion and exclusion criteria was approached to select eligible articles for this study. The literature findings may be used to inform future policy and resource allocation for survivors in the face of other natural disasters or health crises.

Keywords: (Covid-19, Pandemic, Domestic Violence, Crises)

Background

The Covid-19 Pandemic stretched from March 2020 to October 2022, infecting millions, and changing the lives of billions of people across the globe. As the virus swept across nations, communities faced limitations and restrictions that exacerbated less than favorable social phenomena, which many professionals feared would include threats of domestic violence.

Domestic violence is a global public health issue that encompasses any pattern of behavior such as physical, sexual, emotional, economic, or psychological force exercised to have control within a home or domestic setting (WHO 2020). As it stands, 1 in 3 women will experience intimate partner violence, a category of domestic violence, within their lifetime (WHO 2020). It is generally understood that stressful times of crises are correlated with increased rates of domestic violence, suggesting that this threat would have been exacerbated during the Covid-19 pandemic. After Hurricane Katrina, four times the rate of gender-based violence was reported among displaced women in Mississippi, and there was a staggering 98% increase in physical victimization of women in harder-hit regions such as in southern Mississippi (Kofman and Garfin 2020). This has also been seen with the subsequent spikes in domestic violence after the 2004 Indian Ocean earthquake and tsunami and with the Black Saturday bushfires in Australia (Kofman and Garfin 2020).

As the Covid-19 pandemic recently ended, it is essential to look at these pertinent research questions: "How did the occurrence of domestic violence change with the onset of the pandemic?" and "What indications of pandemic-related risks of domestic violence were present?". The goal of this systematic review is to locate themes among the existing body of research regarding domestic violence in the US during the Covid-19 pandemic, looking at empirical evidence in order to answer these questions. Looking at this research will allow us to understand the extent to which a crisis like the pandemic may pose a risk to victims of domestic violence and identify the factors most pertinent to be aware of in future crises. Determining these concepts will also allow us to discuss potential interventions and resources which may be useful in supporting domestic violence survivors in such circumstances. In this examination, it was hypothesized that there would be a theme among the research examined suggesting an increase in domestic violence in the US during the Covid-19 pandemic, and that common risk factors would be present which can be applied to the development of future policies and provision of care.

Method

This project was conducted via a systematic literature review, using specific search techniques in the Google Scholar scientific search engine and CSU Stanislaus library resource EBSCOhost, including specific inclusion and exclusion criteria for relevance and quality of data.

First, the search was narrowed to studies relevant to the key variables of "domestic violence", "Covid-19", and "United States" (meaning studies that did not pertain specifically to domestic violence in the United States during the

Covid-19 pandemic were excluded). This was achieved by entering these key phrases in the search engine for Google Scholar and EBSCOhost, connected with the use of the Boolean operator "AND". Subsequently, keywords "keywords", "corresponding author", and "doi" were used to create a smaller pool of only published articles. The search was also narrowed to include only peer-reviewed articles (to ensure the quality of data), by adjusting the search parameters and filters provided on Google Scholar and EBSCOhost. These parameters initially garnered 474 available articles.

These eligible sources were further examined using specific exclusion and inclusion criteria, firstly excluding articles that were published before 2020, as the date that the pandemic began was declared by the World Health Organization as March 11, 2020 (WHO 2020). This left 455 eligible sources. From here, the titles, abstracts, and methods of texts were reviewed to narrow the selection to empirical research data (meaning the exclusion of literature reviews) demonstrating the influence of Covid-19 on domestic violence, leaving a pool of 61 research articles. After a further in-depth review of these sources and of referenced sources within the most relevant articles, 11 eligible research articles containing empirical evidence were selected. This process of article identification, screening, eligibility assessment, and selection is displayed in Figure 1, with the basic organization of selected articles displayed in Figure 2.

Fig. 1 PRISMA Flow Chart of Article Selection

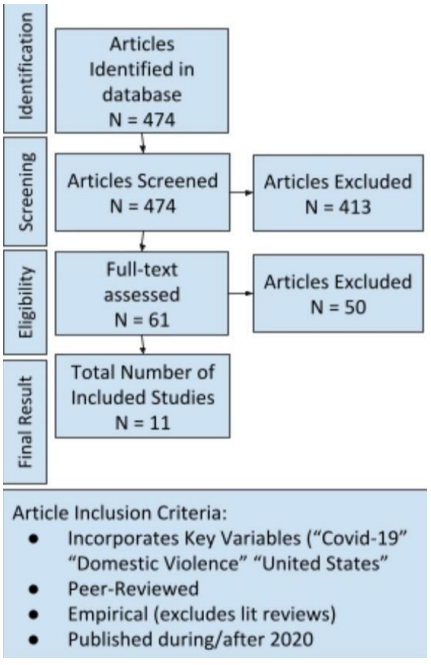

Fig. 2: Articles Selected

Study #	Author	Title	Location
1	Bullinger et al	"Covid-19 and Crime: Effects of Stay-at-Home…"	Chicago, Illinois
2	Campedelli et al	"Exploring the Immediate Effects of Covid-19…"	LA, California
3	Evans et al	"Domestic Violence in Atlanta, Georgia Before and During Covid-19"	Atlanta, Georgia
4	Gosangi et al	"Exacerbation of Physical Intimate Partner Violence During Covid-19 Pandemic"	Northeastern US
5	Gresham et al	"Examining Associations Between Covid-19 Stressors, Intimate Partner Violence…"	US
6	Hsu & Henke	"Covid-19, Staying at Home, and Domestic…"	36 US cities
7	Leslie et al	"Sheltering in Place and Domestic Violence…"	14 US cities
8	McLay et al	"When "Shelter in Place" Isn't Shelter That's Safe…"	Chicago, Illinois
9	Mohler et al	"Impact of Social Distancing During Covid-19…"	LA, California Indianapolis, Indiana
10	Piquero et al	"Staying Home, Staying Safe?..."	Dallas, Texas
11	Rhodes et al	"Covid-19 Resilience for Survival…"	South Carolina

(Study #'s correspond to findings in Fig. 3 and Fig. 4)

Following the organization of article information, relevant article content was extracted to draw conclusions to answer research question 1 (RQ1: "How did the occurrence of domestic violence change with the onset of the pandemic?"), and research question 2 (RQ2: "What indications of pandemic-related risks of DV were present?")

Results

RQ1: Change in DV Occurrence

To answer Research Question 1, study content was extracted including the study design, the measured constructs of domestic violence (DV), and the concluded change in DV occurrence, shown in Figure 3.

Fig. 3: Content Extraction for RQ1

Study #	Design	Measured Construct	Conclusion of Change in DV Occurrence
1	Difference-In-Differences (DID)	Arrests for DV	Decrease (26.4%)
		Police Reports	Decrease (6.8%)
2	Bayesian Structural Time-Series (BSTS)	Police Reports	Increase (3.3%)
3	Descriptive analysis and layered bar chart with percent changes	Police Reports	Increase (21.77%)
4	t-tests, χ2 tests, Poisson regression analysis	Incidence of physical IPV	Increase (30%)
5	Qualitative analysis with cross-sectional design	IPV	_____
6	Fixed-effects regression analysis	Varying measures	Increase (5.31%)
7	Event Study Specification and Differences-in-Differences (DID)	Police Calls	Increase (7.5%)
8	Logistic Regression analysis	Police Reports	Decrease (2.52%)
9	Diff. of Means	Police Calls	Increase (13.17 pts)
		Police Calls	Increase (13.71 pts)
10	Auto-Regressive Integrated Moving Averages (ARIMA)	Police Reports	No significant change
11	χ2 tests	ED Admissions for DV	Increase

(DV= Domestic Violence; IPV= Intimate Partner Violence; ED= Emergency Department)

As we can see from this content extraction, 10 of the 11 selected studies provide quantitative conclusions regarding the occurrence of domestic violence during the pandemic. Of these 10 studies, 7 conclude that DV increased during the pandemic (Campedelli et al 2020; Evans et al 2021; Hsu et al 2020; Gosangi et al 2021; Leslie et al 2020; Mohler et al 2023; Rhodes et al 2020). Three of these 10 studies provided conclusions of either no change or a decrease in the occurrence of DV during the pandemic (Bullinger et al 2021, McLay et al 2022, Piquero et al 2020). It is important to note that studies 1 and 8 by Bullinger (2021) and McLay (2022) were both based in Chicago Illinois, so the results of a decrease in domestic violence would have been expected to be repeated, however, both studies were included in this analysis to provide greater insight to the examined risk factors and explanations for the change in DV occurrence. Furthermore, among the studies that did conclude a decrease in DV, several insights were provided to help explain this contradiction of what would have been a predicted increase, such as underreporting due to limited services, as well as fear or uncertainty among survivors in their ability to reach services outside of the home due to health concerns or monitoring by the abuser (Piquero et al 2020, McLay et al 2022). Based on the content provided by these selected studies, it can be safely concluded that domestic violence occurrence did increase during the Covid-19 pandemic.

RQ2: Pandemic- Related Risks for DV

These studies were also used to inform my analysis of the second research question assessing the risk factors of domestic violence which were presented with the onset of the pandemic, in conjunction with the additional qualitative research article included. The content was extracted from these 11 articles noting the identified pandemic-related risk factors for domestic violence, shown in Figure 4.

Fig. 4: Content Extraction for RQ2

Study #	Conclusions of Pandemic-Related Risk-Factors
1	Isolation at home and exposure to abuser
2	Isolation at home and exposure to abuser; lack of social support; mental health stressors
3	Limited DV services; economic stress; Isolation at

	home and exposure to abuser
4	Substance abuse; lack of social support; isolation at home and exposure to abuser; economic stress; limited DV services
5	Isolation at home and exposure to abuser; economic stress; lack of social support; limited DV services; health anxiety
6	Isolation at home and exposure to abuser; unemployment/financial obstacles
7	Isolation at home and exposure to abuser; economic stress; disruption of routine
8	Isolation at home and exposure to abuser; economic stress; stress and decreased mental health; limited staff/service provision
9	Isolation at home and exposure to abuser; increased stress
10	Isolation at home and exposure to abuser; limited DV services; economic stress; alcohol abuse; lack of social support; health & security stress
11	Economic stress; isolation at home; limited DV services; lack of social support; alcohol abuse; PTSD symptoms; depression

Among the selected studies, there were several common explanations of risks for upticks in domestic violence with the onset of the pandemic. I have found these to be: isolation in the home, disruption of support networks, financial insecurity, and deterioration of mental health.

Isolation in the Home

Isolation in the home was cited as a key factor of exacerbation of domestic violence in 11 out of 11 of the included studies. Notably, Hsu and Henke explain that due to the theory of exposure reduction, stay-at-home orders increase the risk of couples and families fighting, leading to an increase in domestic violence (Hsu and Henke 2020). Campedelli and associates discuss the influence of increased strain subsequently after isolation measures on the overall increase of crime rates, specifically noting that intimate partner violence is a crime that is known to be related to strain dynamics (Campedelli et al 2020). With extended periods of contact between victims and offenders and limited ability to separate while coping with the burdens of the pandemic, domestic violence was at high risk of increasing, particularly as it thrives "behind closed doors" (Mohler et al 2023). Researchers note that the mandated isolation even mimicked "common forms of partner abuse such as forcing isolation from friends and family, preventing the victim from working or attending school, and generally controlling the victim's associations, movements, and activities" (Piquero et al 2020). Ultimately, all sources evidenced an agreement that the increased time at home presented a risk for rising tensions and opportunities for violence that may not have been present before the lockdown or would have been greatly exacerbated.

Disruption of Support Networks

Disruption of support networks was a pandemic-related risk factor cited by 7 of the 11 included studies (Campedelli et al 2020; Evans et al 2021; Gosangi et al 2021; Gresham et al 2021; McLay et al 2022; Piquero et al 2020; Rhodes et al 2020). This risk of domestic violence is tied closely to risks presented by isolation and stay-at-home orders. Evans highlights the threat posed by diminishing healthcare capacity to provide care for survivors, in addition to the uncertainties that victims may have in their ability to contact or receive services from the police due to pandemic measures (Evans et al 2021). One of the main concerns for victims in contacting police or domestic violence service providers was closely connected to isolation within the home, as victims faced the fear of close monitoring by perpetrators (Piquero et al 2020). Gosangi elaborates on this issue, explaining that, in the face of the pandemic, many ambulatory and community referral sites faced closure, and as healthcare providers were overwhelmed with the magnitude of patients, screening for signs of domestic and intimate partner violence-related injuries was greatly inhibited and potentially overlooked (Gosangi et al 2021). This increase in demand for services was coupled with the experience of reduced staffing among service providers and first responders (McLay et al 2022). Furthermore, the risk for violence against children increased with the removal of mandated reporters and other informal support, namely school and childcare personnel who typically function as guardians for at-risk children and are responsible for most referrals that are made to child protective agencies (Piquero et al 2020). A similar risk is faced by survivors of intimate partner violence, who often turn to informal support systems like family and friends or other community members throughout the stages of abuse- a resource also greatly limited due to pandemic restrictions and social distancing orders (Rhodes et al 2020).

Financial Insecurity

Financial insecurity was a risk factor identified by 8 of the 11 studies (Evans et al 2021; Gosangi et al 2021; Hsu & Henke 2020; Leslie et al 2020; Gresham et al 2021; McLay et al 2022; Piquero et al 2020; Rhodes et al 2020). Many people have become unemployed due to the Covid-19 pandemic, while also facing uncertainty regarding the future financial state of the economy. Evans notes that even under normal circumstances, poverty, unemployment, and economic stress are leading risk factors for the perpetration of violence, with financial strain increasing in natural disasters and emergencies such as the Covid-19 pandemic (Evans et al 2021). Other

studies provide similar insight. Notably, Piquero explains that this financial strain or disarray creates a need for power or control, often translated to becoming abusive toward partners or family members (Piquero et al 2020). Hsu and Henke support this notion that economic stress increases the risk of violence in the home, while also suggesting that the financial obstacles of the pandemic make it more difficult for survivors to relocate or find new jobs, furthering the risk for continued victimization (Hsu & Henke 2020).

Deterioration of Mental Health

Finally, 6 of the 11 studies cited increased stress or other mental-health-related risk factors (Campedelli et al 2020; Gresham et al 2021; McLay et al 2022; Mohler et al 2023; Piquero et al 2020; Rhodes et al 2020). In tandem with the stress of financial instability that arose with the pandemic, individuals in the home also faced various other mental health struggles and inadequate coping mechanisms, such as alcohol abuse, which exacerbated the risk of domestic violence. In general, the presence of external stress resulting from the pandemic was a key risk in bringing about maladaptive relationship processes like negative and hostile behavior (Gresham et al 2021). Some examples of pandemic-specific stressors which arose were fear of infection, frustration and boredom, and inadequate information (Campedelli et al 2020). These stressors are cited by other researchers, in addition to lack of control and fear, as well as psychological stressors of depression, alcohol abuse (which is directly linked to DV risk), and post-traumatic stress symptoms exacerbated through the pandemic (Rhodes et al 2020).

Discussion

In this study, a systematic literature review was conducted, selecting 11 empirical studies based on search and inclusion criteria, to investigate the themes within the research to answer these questions: "How did the occurrence of domestic violence change with the onset of the pandemic?" and "What indications of pandemic-related risks of domestic violence were present?". Based on the content, it is concluded that the Covid-19 pandemic was related to increased occurrence of domestic violence, with the presence of these risk factors: isolation within the home, disruption of support networks, financial insecurity, and adverse mental health effects.

There are certain limitations to this study. As a secondary analysis, there was no control over how primary data was collected or presented. As shown, the individual studies used in this review are comprised of a mix of methods and chosen measure constructs of domestic violence, garnering the conclusions made from this review as content-based, not statistical analysis. Research on Covid-19 and its ramifications are not finalized, and new discoveries will likely continue to be made in regard to its influences on domestic violence, so this review is a reflection of the findings made to date. In further research, as more empirical data becomes available, I would like to conduct a meta-analysis to assess the exact percentage influence of Covid-19 on the rates of domestic violence in the US, to assess the full extent to which the pandemic exacerbated this issue. An appropriate meta-analysis would require at least one other researcher to collaborate with, which I could foresee doing during graduate study. Furthermore, I think that this research could usefully inform a doctorate-level empirical study on the influence of Covid-19 on domestic violence, for which I would be interested in focusing on the California Central Valley.

As this research has provided material to reasonably conclude that domestic violence increased during the Covid-19 pandemic following several predictable risk factors, it is useful to look forward at ways that this research can inform adaptation of service provision for victims of domestic violence amid crises. The issue has not necessarily been prioritized in the US, potentially due to a misleading perception of its magnitude or direct relation to the pandemic. When looking at the Biden-Harris plan to combat Covid-19, which was published by the Whitehouse, priorities included free testing, financial packages for schools and families, distribution of vaccinations, and expanding abilities to predict and prevent pandemic risks (The White House 2022). These are all great initiatives, yet with little attention to other key issues such as mental health and domestic violence. The United Nations Entity for Gender Equality and the Empowerment of Women, aka UN Women, call national governments to action in combating violence against women during the pandemic with several advised tasks: "increase resources for shelters, hotlines, and other services; consider the communication needs of older women and women with limited access to information and communications technology; make information and communication channels accessible for women with disabilities; scale up public awareness campaigns; increase funding to women's organizations; ensure women's economic independence with access to and control over regular, secure, and long-term income" (UN Women 2023). UN Women has collaborated with several countries and regions not including the US to collect data on the impacts of Covid-19 on gender-based violence and improve access to essential services for survivors such as funding shelters and support services, providing emergency legal services, and expanding helplines (UN Women 2023).

Among the emerging research in the US on this topic, several authors discuss service practices and goals which may be useful for treating and

aiding victims of the pandemic and in the future. For example, researchers suggest using technology and mental health resource allocation to help prevent domestic violence in these crises. Additionally, telehealth services and social media outlets can help raise awareness and provide 24/7 virtual assistance for domestic violence-related issues and prevention (Goh et al. 2020). As more data is available on the influences and use of these services, it may be useful to conduct research assessing the effectiveness of these new adaptations to domestic violence service provision, in order to mitigate the risks for survivors in the resolution of this pandemic, and in future crises.

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